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E-tender for "Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust".

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Civil Engineering Department
KOLKATA PORT TRUST

TENDER NO. : KOPT/KDS/CIV /T/2429/91 Dt. 01.11.2019

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Kolkata Port Trust
Civil Engineering Department

1.0 NOTICE INVITING TENDER

NIT NO. : KOPT/KDS/CIV /T/2429/91 Dt. 01.11.2019

E-Tender under single stage two part system (Part I: Techno-Commercial Bid and Part II: Price Bid) are invited from reliable, bonafide & experienced agency with required experience as per Prequalification criteria stipulated in Tender Document for " **Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust "** as per Bill Of Quantities**.** The Bid Document may be seen from the Central Public Procurement Portal (CPPP).Corrigenda or clarifications, if any, shall be hosted on the above mentioned website only.The tender is also published on KoPT website **(**www.kolkataporttrust.gov.in**). The tenderer should check the website from time to time and collect such documents, if any, from time to time.**

SCHEDULE OF TENDER (SOT)

a. NIT NO.	**KOPT/KDS/CIV /T/2429/91 Dt. 01.11.2019**
b. MODE OF TENDER	e-Procurement System (**Online TWO** part Techno-Commercial Bid and Price Bid through CPP Portal **https://eprocure.gov.in/eprocure/app**) The intending bidders are required to submit their offers electronically through e-tendering portal. No physical tender is acceptable by KOLKATA PORT TRUST.
c) i) Estimated Cost Of Work ii) Earnest Money Deposit @2%. iii) Tender Document fee (**non-refundable)**	**N.A** The intending firms would require to submit an EMD o **Rs. 12,24,000.00 (Rupees Twelve lakh twenty four thousand Only)through online only** through DD/ Banker Cheque in favour of Kolkata Port Trust, otherwise their offer will be summarily rejected. Copy of the DD/Banker's Cheque should be uploaded. As per cl. 2,page no.13 The intending bidders should submit the tender cost of **Rs.2950/-**(**Rupees Two thousand nine hundred fifty only) including @18% GST)** (non-refundable) separately to KoPT through DD /Banker's Cheque in favour of Kolkata Port Trust; otherwise their offer will be summarily rejected. Copy of the DD/Banker's Cheque should be uploaded. As per cl. 2,page no.13.
d. Date of NIT available to parties to download	**06.11.2019 to 12.11.2019 (**up to **14:00 hrs**.)

f. Pre – Bid Meeting date & Time	**No Pre-bid meeting**
g. Last date of issue of EMD & Tender Document fee in favour of Kolkata Port Trust. Last date of physically submission of Demand Draft/Cheque/Bank Draft.	**12.11.2019** **16.11.2019**
h. Date of Starting of e-Tender for submission of online Techno-Commercial Bid and price Bid at CPP Portal	**06.11.2019 (From 17:30 hours onwards)**
i. Date of closing of online e-tender for submission of Techno-Commercial Bid & Price Bid.	**12.11.2019 (Up to 3:00 P.M.)**
j. Date & time of opening of Techno-Commercial Bid.	**13.11.2019 (After 3:00 P.M.)**

Note: In the event of any unforeseen closure of work / holiday on any of the above days, the same will be opened / held on the next working day without any further notice.

List of Annexures

Important Instructions for E- procurement	:- Annexure -A
Commercial Terms & Conditions	:- Annexure -B
Techno Commercial Bid(Cover-I)	:- Annexure -C
List of Scanned Documents required to be uploaded	:- Annexure - D
Price Bid (Cover-II)	:- Annexure – E
General Conditions of Contract	:- Annexure – F

A.K. Jain
Chief Engineer
KOLKATA PORT TRUST
Tender Inviting Authority

Annexure-A

2.0 Important Instructions for e-Tender

Bidders are requested to use internet Browsers Firefox version below 50 / Internet Explorer version 8 or above, and Java 8 Update 151 or 161.
Further, bidders are requested to go through the following information and instructions available on the CPP Portal **https://eprocure.gov.in/eprocure/app** before responding to this e-tender :

- Bidders Manual Kit
- Help for Contractors
- FAQ

Contact Persons (Kolkata Port Trust):

1. S.Mitra, Superintending Engineer(Contract)
2. S.K.Halder Ex.Engineer(Contract)
3. S. Das, Ex. Engineer(Contract) M.No. 9830621827

Phone no. 9836298680, **03371012486, 03371012380, 03371012398**
e-mail :- santanumitra**@kolkataporttrust.gov.in &**
cecontract@kolkataporttrust.gov.in

Contact persons (CPP Portal):
1. Shri Nazmush – Mob: 9563251950 email: **webhelpdesk@gmail.com**
See CPP Portal for contact details.

1	Bidding in e-tender : a. Bidder(s) need to submit necessary EMD & Tender fees to be eligible to bid online in the e-tender. Tender fees is non refundable. No interest will be paid on EMD. EMD of the unsuccessful bidder(s) will be refunded by KOPT. b. The process involves Electronic Bidding for submission of Technical and Commercial Bid.
2	Any order resulting from this tender shall be governed by the terms and conditions mentioned therein.
3	All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.
4	E-tender cannot be accessed after the due date and time mentioned in NIT.
5	KoPT reserves the right to cancel or reject or accept or withdraw or extend the tender in full or part as the case may be without assigning any reason thereof.
6	Any order resulting from this tender shall be governed by the terms and conditions mentioned therein.
7	No deviation to the technical and commercial terms & conditions are allowed.
8	The bidders must upload all the documents required as per terms of tender. Any other document uploaded which is not required as per the terms of the tender shall not be considered.
9	The bid will be evaluated based on the filled-in technical & commercial formats.

10	Bidder has fully read and understood the entire Tender Document, GCC, Corrigendum and Addenda, if any downloaded from under the instant e-tender and no other source, and will comply to the said document, GCC, Corrigendum and Addenda.” . **A declaration in this regard is to be made by the bidder.**
11	(A) Part-I i.e. Techno commercial bid will be opened electronically on specified date and time as mentioned in the NIT. Bidder’s can witness electronic opening of Bid. (B) Part-II i.e. Price Bid will be opened electronically of only those bidder(s) whose offer will be techno commercially qualified and accepted by KoPT. Such bidder(s) will be intimated the date of opening of Price Bid(Part-II) in due course through valid email confirmed by them. (C) Necessary addendum/corrigendum (if any) of the tender would only be hoisted in the Central Public Procurement Portal (CPPP).

Annexure –B

KOLKATA PORT TRUST
Office of the Chief Engineer
Head Office Building, 15, Strand Road
Kolkata 700 001
Tele – 033 2230-3451 Extension: 398,399,400
Fax - (033) 2230-0413
E-mail id: santanumitra@kolkataporttrust.gov.in &
cecontract@kolkataporttrust.gov.in

3.0 Commercial Terms & Conditions

1 Mere participation in e-tender will not mean that a particular bidder will be automatically considered qualified and their bids will be entertained. Such qualification will be reviewed at the time of techno-commercial evaluation of bids also.

2 Copy of valid NSIC Certificate or MSE Certificate under **MSME** has to be submitted along with the bid.

3 EARNEST MONEY : As Per NIT

4 E-Tenders submitted without requisite Earnest Money are liable to be summarily rejected excepting in case of Micro & Small Enterprises (MSEs) registered with NSIC (under single point registration scheme) or MSME for items for which the tender is invited.

5 SCOPE OF WORK :
As per E-Tender Document

6 The Terms and Conditions of E-Tender shall be read in conjunction with the General Conditions of Contract, Specifications, Bill of Quantities and other documents forming part of this Contract wherever the Contract so requires.

7 The several documents forming the Contract shall be taken, as mutually explanatory to one another and in case of any discrepancies; the Bill of Quantities shall prevail over the Specifications and the Terms and Conditions over the General Conditions of Contract of Ko.P.T. In case of any dispute, question or difference either during the execution of the Contract or any other time as to any matter or thing connected with or arising out of this Contract, the decision of the Chief Engineer , KOLKATA PORT TRUST, thereon shall be final and binding upon all parties.

8 The Contract will include the Client's Bid Documents with the General Conditions of Contract and the Bidder's Offer as finally accepted by the Client, together with Addenda, if there be any. Trustees' General Conditions of contract is the integral part of the tender / contract. The above mentioned General Conditions of Contract may be inspected at the office of the undersigned on any working day before quoting for the Tender.

9 The Trustees are not bound to accept the lowest or any Tender and reserve the right to accept a tender in full or in part and / or reject a tender in full or in part without assigning any reason thereof.

10 The contract shall be governed by all relevant Indian Acts applicable only within the jurisdiction of the High Court at Calcutta.

11 Intending bidders must take into account any cost or expense incurred by them in connection with the preparation and submission of their bids or for any other expenses incurred in connection with such bidding.

12 Bidders are advised to visit the site of work prior to submission of their bid. Bidder shall get himself thoroughly familiarized with the site conditions, existing road facilities for carrying materials etc. before submission of the e-tender. He may contact the Chief Engineer/**Superintending Engineer (KPD)** or his authorized representative at his office at 15, Strand Road, Kolkata 700001 in this regard. Non compliance of the same will in no way relieve the successful bidder of any of his obligations in performing the work in accordance with this Bid Document within the quoted price.

13 VALIDITY :

The tender shall remain open for acceptance for a period of **4 months** from the date of opening of techno-commercial bid.

If before expiry of this validity period, the Bidder amends his quoted rates or tender, making them unacceptable to the Trustees and / or withdraws his tender, the Earnest Money deposited shall be liable to forfeiture at the option of the Trustees / sanctioning Authority.

14 NON- RESPONSIVE BIDDER :-

The offer/tender shall be treated as non-responsive, if it :

(i) is not accompanied by requisite earnest money /valid NSIC Registration Certificate /MSME Registration Certificate.

(ii) is not accompanied by requisite tender paper cost / or valid NSIC/MSME Registration Certificate.

(iii) validity of the offer is less than tender stipulation,

(iv) does not meet the Qualification Criteria as stipulated in the NIT.

(v) The bidder submits conditional offer / impose own terms and conditions / does not accept tender conditions completely/offer or tender if submitted with any deviation from the tender terms & conditions.

In addition to above, a bidder may be disqualified if –

a) The bidder provides misleading or false information in the statements and documents submitted.

b) Record of unsatisfactory performance during the last seven years, such as abandoning of work or rescinding of contract for which the reasons are attributable to the non-performance of the contractor or inordinate delays in completion or financial bankruptcy etc.
The decision of Kolkata Port Trust in this regard shall be final and binding on the Bidder.
Offer / tender is submitted with any deviation from the tender terms & conditions.

15 EARNEST MONEY AND SECURITY DEPOSIT : As per short NIT in annexure-C

16 Performance Guarantee : Not Applicable

17 In the event of the successful bidder failing to execute the order within the stipulated delivery period without sufficient reasons acceptable to the Trustees, the Security Deposit may be forfeited and the order be cancelled at the option of the Trustees' **apart from other actions**.

18 PRICES: As per BOQ given in the tender document.

19 The bidder shall quote his price as per the Bill of Quantities in the Price bid

20 Orders may be placed in full/part to the lowest bidder.

21 Price(s) to be quoted should remain firm over the contract period.

22 **The prices quoted shall be including all statutory levies excluding GST, which shall be paid extra.**

23 **EVALUATION CRITERIA: As per relevant clause of Tender document.**

24 PAYMENT: As per Tender document.

25 Location: As per Tender document.
26 Time of Completion: As per Tender document.
27 Work is to be carried out as per terms & condition of the contract document.

28 JURISDICTION OF COURT :
The contract shall be governed by all relevant Indian Acts applicable within the jurisdiction of Kolkata.

PERSONAL PROTECTIVE EQUIPMENT (PPE):
29 Contractor and their workmen including driver & helper must use PPE i.e. safety helmet etc. at the time of work inside the dock premises. For safety measure Cl. No.25, page-23 may be referred to.

30 Compensation (Liquidated Damages) against failure to complete the work within the stipulated time as per tender condition.

31 Price adjustment clause: As per Tender document.
32 Technical capacity: As stipulated in Tender document.
33 Financial capacity: As stipulated in Tender document.
34 Deleted.

35 The bidder may offer a Bank Guarantee in the Trustees' specified proforma from any Scheduled/ Nationalized Bank of India having Branch at Kolkata in lieu of Earnest Money /Security Deposit beyond **Rupees 10 (Ten) lakhs**.

Besides the above conditions all other conditions as stated in the NIT, BOQ, Special Conditions of Contract, Instruction to the tenderers, G.C.C. shall have to be agreed by the Bidders.

Annexure –C

कोलकाता पत्तन न्यास

Kolkata Port Trust

सिविल इंजीनियरिंग विभाग

CIVIL ENGINEERING DEPARTMENT

15, स्ट्रैंड रोड, कोलकाता -700001

15, Strand Road, Kolkata – 700001

NIT No.: **KOPT/KDS/CIV /T/2429/91 Dt. 01.11.2019**

NOTE: Last Date of **Download** of tender documents : **12.11.2019 (up to 14.00 hours)**

Tender is due for submission by 3:00 P.M. On **12.11.2019**
Tender is to be opened **on 13.11.2019** (After 15.00 Hours)

Techno Commercial Bid

Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust.

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SHORT TENDER NOTICE

E-Tender under single stage two part system (Part I: Techno-Commercial Bid and Part II: Price Bid) are invited from reliable, bonafide & experienced agency with required experience as per Prequalification criteria stipulated in Tender Document for the following work at Kolkata Port Trust.

Name of work	**:**	**Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust.**
NIT No	**:**	**KOPT/KDS/CIV /T/2429/91 Dt. 01.11.2019**
Period Of Execution	**:**	**6(Six) Months**.
Earnest Money	**:**	**Rs. 12,24,000.00 (Rupees Twelve lakh twenty four thousand Only)**
Period of Download of E-Tender (Both Days Inclusive)	**:**	**06.11.2019 to 12.11.2019** (UPTO 14:00 HRS.) (Bid document will be available on Central Public Procurement Portal (CPPP).
Date and Time for pre-bid meeting & site visit	**:**	**No Pre-bid meeting**
Last date of submission of e-tender and opening of the tender	**:**	**Submission on 12.11.2019 Up to 15:00 hrs.** **Opening on 13.11.2019 After 15:00 hrs.**
Cost of Tender Document (Non-refundable)	**:**	**Rs.2950/-(Rupees Two thousand nine hundred fifty only) including @18% GST)**
➢ **Contact Person.**	**:**	**S. Mitra, Superintending Engineer(Contract)** **S.K.Halder Ex. Engineer(Contract)** **S. Das, Ex. Engineer(Contract) M.No 9830621827** 9836298680,**03371012486, 03371012380,03371012398**

5.0: INSTRUCTIONS TO BIDDER

E-TENDER FOR " Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust."

NIT NO : KOPT/KDS/CIV /T/2429/91 DT. 01.11.2019

1.0 GENERAL

The work as described in the tender shall be executed in Kolkata and in accordance with the attached General Conditions of Contract, Special Conditions of Contract, Particular Specifications, and Drawings (if any) & detailed Bill of Quantities. Location Plan of the place of work might be inspected at the office of the **Superintending Engineer (KPD**) **for Civil works & Superintending Engineer (Elec-I) for Electrical works** on any working day before quoting for the tender.

2.0 EMD must be submitted online by Indian bidders. EMD in the form of Demand Draft / Banker's cheque, Swift Transfer will be accepted only from foreign bidders. Tenders without Earnest Money are liable to be rejected. However, Agencies mentioned at sl. No. 14 below under "Earnest Money Deposit (EMD) clause are exempted from submission of EMD. Bidder claiming such exemption needs to submit necessary documentary proof of their eligibility along with their techno-commercial bid. The certificate must be valid on the bid submission date. In absence of same their offer are liable for rejection. Su motto submission of MSE certificate after the due date of bid submission will not be considered for EMD exemption / Price preference

2.0 Earnest money and cost of tender paper are to be physically deposited at the office of Chief Engineer at 15, Strand Road, Kolkata-700 001 by vendors/contractors through Bank Draft/Banker's Cheque/Demand Draft/Pay Order etc. in favour of Kolkata Port Trust, payable at Kolkata, within 3 days after opening of tender.

2.1 Details of cost of e-tender paper remitted should be entered by the participating vendor/contractor in the space provided in the e-tender as indicated hereunder:

a) Name of remitting vendor/contractor :
b) Tender No. :
c) Amount remitted :
d) Date of remittance :
e) Bank Draft / Cheque No. :

2.2 Details of Earnest money remitted should be entered by the participating vendor/contractor in the space provided in the e-tender as indicated hereunder:

a) Name of remitting vendor/contractor :
b) Tender No. :
c) Amount remitted :
d) Date of remittance :
e) Bank Draft / Cheque No. :

Tender submitted without requisite Earnest Money and cost of tender paper will be liable for rejection.

3.0 MODE OF SUBMISSION OF BID :

3.1 All bidders must submit their offers through e- tendering in accordance with the terms and conditions set out in the bid documents and no deviation will be accepted.

3.2 A Bid shall contain the following *scanned copies of* which are to be uploaded (Refer Annexure D):-

i) GST registration certificate.

ii) Valid Trade Licence (Valid for current period & also for type of work).

iii) Valid Professional Tax Clearance Certificate / Up to date tax payment challan. If this is not applicable, the bidder must submit a declaration in this regard.

iv) Proof of possessing valid Employees' Provident Fund (EPF) Account. EPF Registration Certificate.

v) Proof of being registered with Employees' State Insurance Corporation (ESIC), ESI Registration Certificate.

vi) Details of the firm as per Schedule-O (in Part-I) of the tender document duly filled up.

vii) Credentials in the form of copies of Letters of Award of Works along with corresponding/successful Completion Certificates from owners to justify that the intending bidder satisfies the earlier mentioned pre-qualification criteria.

viii) Last three years balance sheet and profit & loss account in support of Annual Financial turnover (i.e. 2016 –17, 2017-18 and 2018-19) The same should be audited as per relevant norms wherever required.

ix) PAN Card

x) NEFT online payment receipt regarding EMD & Cost of Tender documents/valid NSIC certificate

xi) A list of technically qualified and skilled persons would be engaged to supervise and execute the work

xii) Self declaration of the bidder that the Bidding Firm has Not been debarred / de-listed by any Govt / Quasi Govt. / Public Sector undertaking in India(**to be mentioned in the letter head of the Firm).**

xiii) Self-declaration regarding the proprietor/partner(s)/authorized signatory of the bidding firm (in the case of proprietorship firm /partnership firm /limited company, as the case may be) is/are not associated with any other firm bidding for the same work(**to be mentioned in the letter head of the Firm).**

xiv) A list of works which are in hand at the time of submitting the offer as per the enclosed proforma titled 'Concurrent Commitments of The Bidder' vide 'Annexure-C' (Schedule –T) in Part-I of the tender document.

xv) Undertaking of the tenderer to be submitted as per enclosed Pro-forma (Annexure –D-1) in lieu of submission of signed copies of the full Tender document ,G.C.C,addenda & corrigendum **in the letter head of the Firm.**

xvi) Last page of "Bill Of Quantities" & the "Form Of Tender" duly filled up (without price quoted) shall be duly signed and stamped by the Bidder.

N. B.-1 The bidder will have to produce the original documents or any additional documents, if asked for, to satisfy the Authorities for clarification of his documents or credibility.

N.B.-2 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements and their **EMD will be forfeited for such action**.

3.3 All the bidders should submit the e-tender in accordance with the Mode of submission of Bid as afore-said.

4.0 **SECURITY DEPOSIT:-**

4.1 For the successful Bidder, the Earnest Money deposit will be converted to part of Security Deposit and the remaining security deposit will be recovered from the contractors each and every On-Account Bill [including the final bill, if necessary] at the percentage of each such bills as set forth in **Clause. 3.4, 3.5 & 3.6 of the General Conditions of Contract.**

4.2 Refund of S.D. and forfeiture S.D. shall be guided by Cl. 3.5 (i) & (ii) of the G.C.C**.**

5.0 **Delay/ Extension of time/ Liquidated Damage/ Termination of Contract.**

Clause 8.0 of G.C.C. to be referred regarding Delay/ Extension of time/ Liquidated Damage/ Termination of Contract.

6.0 **REFUND OF EARNEST MONEY:-**

The Earnest Money received, will be refunded or released as the case may be to the unsuccessful Bidders without any interest after opening of Price bid (Part – II) of the e-Tender document.

7.0 **VALIDITY OF OFFER:-**

The e-tender shall remain valid for a period of **4 (four) months** from the date of opening the same. If before expiry of this validity period, the Bidder amends his quoted rates or tender, making them unacceptable to the Trustees and / or withdraws his e-tender, the Earnest Money deposited shall be liable to forfeiture at the option of the Trustees/ Sanctioning Authority/Engineer.

8.0 **DETAILED SCRUTINY OF E-TENDERERS :**

8.1 During the course of examination of Part-I of the bid, the bidders, if asked for, shall furnish any or additional document(s) for the purpose of evaluation of his / their bids.

9.1 During techno-Commercial Evaluation, i.e. evaluation of Part-I of tender, an offer shall be considered non-responsive in case it :-

(i) is not accompanied by requisite Earnest Money /NSIC /MSME Registration certificate.
(ii) is not accompanied by requisite Tender paper cost /NSIC /MSME Registration certificate.
(iii) validity of the offer is less than tender stipulation,
(iv) does not meet the Qualification Criteria as stipulated in the NIT.
(v) The bidder submits conditional offer / impose own terms and conditions / does not accept tender conditions completely/offer or tender if submitted with any deviation from the tender terms & conditions.

In addition to above, a bidder may be disqualified if –

a) The bidder provides misleading or false information in the statements and documents submitted.

b) Record of unsatisfactory performance during the last seven years, such as abandoning of work or rescinding of contract for which the reasons are attributable to the non-performance of the contractor or inordinate delays in completion or financial bankruptcy etc.
The decision of Kolkata Port Trust in this regard shall be final and binding on the Bidder.

10. An amount of **Cess** calculated at the rate of **1% of the billed amount** shall be progressively recovered from each running bill as well as from the final bill of the contractor for onward transmission of the same by the appropriate authority statutory deductions will also be made as applicable at the time of payment.

11. For **Micro & Small Enterprises (MSEs) registered with NSIC & or MSME:-**

11.1 Micro & Small Enterprises (MSEs) registered with NSIC (under single point registration scheme) **or MSME** are exempted from depositing Cost of Tender Document and Earnest Money.

11.2 If Micro & Small Enterprises (MSEs) registered with **NSIC or MSME** intends to participate in the tender, for the items they are not registered with NSIC, then they will have to deposit cost of Tender Document, full amount of Earnest Money as per NIT. **Otherwise their offer will not be considered**.

11.3 Copy of valid NSIC Certificate for MSEs has to be submitted along with bid.

12.0 <u>EVALUATION CRITERIA:-</u>

12.1 During evaluation of Part-II i.e. Price Part, provided that the bidder submits his offer following e-tender stipulations & specifications, **the overall lowest offer received** shall be considered for acceptance by the Trustees as the L-1 Bidder.

13.0 ACCEPTANCE OF TENDER:-

13.1 Kolkata Port Trust reserves the right to accept / reject any / all offer(s) without assigning any reason thereof and also reserve the right to accept the tender in part or as a whole.

13.2 Any attempt to exercise undue influence in the matter of acceptance of Tender is strictly prohibited and any Tenderer who resorts to this will render his tender liable to rejection.

13.3 The successful Tenderer will be notified in writing of the acceptance of his tender. The “Tenderer” then becomes the “Contractor” and he shall forthwith take steps to execute the Contract Agreement within six weeks of issue of Letter Of acceptance and fulfill all his obligations as required by the Contract.

14.0 MISCELLANEOUS:

i) Bidder shall submit his offer for complete scope of work, strictly in accordance with the tender documents. Any deviation from the tender documents and / or any incomplete tender shall not be considered.

ii) The bidder shall not impose his own terms & conditions in his offer or quote his rates based on his own terms and conditions, such E-Tenderers are liable to rejection at the option of the Trustees without further reference to the bidder.

iii) All materials shall have to be procured by the successful Bidder and shall be of the best and approved quality conforming to relevant specifications. The successful Bidder shall also arrange for the supply of all labour, tools and plants as stipulated in the Special Conditions of Contract, required for efficient execution of the work.

iv) All measuring units are in Metric System and rates and sums in the tender are in Indian Currency. The language used throughout shall be in English.

v) The Tender Documents with all the enclosures, appendices, Abstract Form of Tender and Form of Tender shall be required to be complete, duly filled in and signed and uploaded.

vi) Enlisted/registered contractor of KoPT will get the benefit of exemption of deposition of Earnest Money **up to the prescribed limit**. They are to upload the scan copy of the original T.R. issued to them by KoPT during registration to KoPT relating to **Permanent Security Deposit**.

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vii) **The Bidder shall give a declaration about the names of their relations employed in Kolkata Port Trust. It is not the intention to debar the Contractors from working if their relatives are working in Ko.P.T, but such a declaration is necessary in the interest of Trustees against any possible lapses**.

6.0: SPECIAL CONDITIONS OF CONTRACT

E-TENDER FOR " Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust.".

1. GENERAL:

These provisions though given in a separate section are part of the tender documents which must be read as a whole, the various sections being complementary to one another and are to be taken as mutually explanatory. These provisions shall be read in conjunction with the other parts of the tender documents viz. General Conditions of Contract, Notice Inviting E-Tender, and Instructions to Bidder, Particular Specifications, Drawings, Bill of Quantities and other documents forming part of the Contract. In case of any discrepancy or ambiguity in the documents, the order of precedence of the documents as stated below will apply. In particular, these provisions will override those in the General Conditions provided there is discrepancy between them.

2. Priority of Contract Documents:

The several documents forming the Contract are to be taken as mutually explanatory to one another, but in case of ambiguity or discrepancies, the same shall be explained and adjudicated by the Engineer of the Contract (EIC), who shall thereupon issue to the Contractor instructions thereon which will be final and binding on the Contractor.Unless otherwise provided in the Contract, if the stipulations in the various documents forming apart of the Contract are found to be in variation in any respect then, unless a different intention appears, the provision(s) of one will override others (but only to the extent these are at variance) in order of precedence as given in the list below i.e. a particular item in the list will take precedence over all those placed lower down the list:

The following order of documents of the Contract Agreement will be in the following sequence of Precedence i.e. any particular item placed in the list will take precedence over all other items placed lower down the list.

a) Letter of Intent (LoI) / Work Order
b) Bill of Quantities
c) Drawings
d) Particular Specifications in Scope of Work
e) Special Conditions of Contract
f) General Conditions of Contract

2.1.Custodian Certificate: After delivery at site the supplied materials are to be verified by KoPT Officials and the custodian certificate is to be issued by the Contractor in this regard, for consumption of such materials in the instant work.

2.2 Termination of contract and Risk Purchase Clause: Will be applicable as per clause No. 8 of KoPT's General Conditions of Contract.

2.3. Special / Additional Security may be arranged by the contractor at the site at no extra cost to KoPT over and above the General Security provided within KoPT premises by Port Security Authority.

2.4. In case of any dispute, question or difference either during the execution of the work or any other time as to any matter or thing connected with or arising out of this Contract, the decision of the Engineer in Charge, Kolkata Port Trust, thereon shall be final and binding upon all parties.

2.5 All other terms and conditions excepting those mentioned separately shall be governed by KoPT's General Condition of Contract.

The execution of work shall conform minutely to the approved & assigned drawings & specification & any other details drawings which shall be provided /duly approved by the Engineer during the progress of the work as to such other drawings those have formed part of the contract documents.

3. PRE-QUALIFICATION CRITERIA FOR BIDDERS: -

i) Satisfactorily completed as Prime Contractor similar works of cost not less than

(i) One similar completed work costing not less than amount equal to 80% of the estimated cost (i.e: **Rs. 4.89 Crore** each)

or

(ii) Two similar completed works costing not less than amount equal to 50% of the estimated cost (i.e: **Rs. 3.06 Crore** each)

or

(iii) Three similar completed works costing not less than amount equal to 40% of the estimated cost (i.e: **Rs. 2.44 Crore** each)

in any one financial year during the last **five** financial years (i.e. from 01-04-2019 to 31-04-2014) updated by giving 10% simple weightage per year to bring them to current Financial year in Central/State Government departments (or) Central/State Autonomous Bodies (or) Central/State Public Sector.

(a) Annual turnover:

Should have Average Annual Financial Turnover of **Rs. 1.71 Cr**. on works during the last ten financial years ending 31st March 2019. However, the annual turnover in the last three financial years ending 31st March 2019 shall be minimum of **Rs. 1.71 Cr**. A certificate by registered Chartered Accountant shall be uploaded

(b) Net Profit:

Net profit (after deducting tax, depreciation and interest) in at least 3 financial years during the last 5 years shall be positive. A certificate by registered Chartered Accountant shall be uploaded.

(c) Liquid Assets:

Liquid assets/credit facilities/Solvency certificates from any Nationalized/Scheduled Bank for not less

iii) Work experience as a sub -contractor shall not be considered as the requisite qualification.

4. BRIEF SCOPE OF WORK:

GENERAL

Contract: REVITALIZATION OF CLOCK TOWER JETTY

WORK CONTENT

2.1.1 Brief Scope

The scope of work, inter–alia, includes the following but not limited to:

- The scope of work is broadly mentioned in Architectural design brief Report and BOQ. as per site requirement any other work as directed by Engineer In charge.

01. Revitalization work of Clock Tower Jetty
02. Boat sculpture Water Bodies and Feature wall
03. Hardscape, Kerb and Railing
04. Restaurant Tensile roof, flooring works, Staircase steel works
05. External Tensile Roof structures
06. Board Walk way flooring
07. Cement concrete on Pontoon jetty view port
08. Open Air Theater and surrounding area
09. Retaining wall
10. Civil work for Toilet block construction
11. Provision for Clock tower & Surrounding area Redevelopment
12. Provision for Structural and marine works for Scenic deck (Structural works for Extension towards jetty)
13. Epoxy flooring below hardscape
14. Provision for Watch tower as per design intent
15. Landscaping and Plants
16. Provision for Signages and Statue as per Architectural design intent
17. Provision for Demolishing and dismantling works as per site requirement as directed by Engineer In charge
18. Internal Electrical works for Restaurant and Toilet block
19. External Electrical works
20. Internal and External PHE works for Restaurant and Toilet block
21. Internal and External Fire fighting works
22. Provision towards Internal finishes & Interiors for Exhibition space

- The value of the work shall be on item rates accepted in letter of acceptance subject to such additions there to or deductions there from as may be made under the provisions of the Contract.

- The Construction Agency shall execute the complete project including land Development& landscaping as per BOQ & GFC, cutting/filling, construction of buildings, including on-site water supply lines, drainage lines, etc (as per BOQ& GFC drawings).On turnkey basis with his own materials/designs as approved. Before handing over the site, the construction agencies shall obtain certificate for (a) drainage completion & fire fighting installation (b) completion of buildings (c) malaria/ Public Health department (d) building occupation (e) assessment (f) fire safety from

CFO/MCGM (g) Necessary certificate (h) garden superintendent and certificates from other authorities like Reliance Energy Ltd/TATA power, HSE Certificate, NOC from PCB,IGBC certificate, etc. BEST and all other relevant agencies/ Govt. offices as may be required.

2.1.2 The rates are inclusive of all cost but not limited to the cost such as for Plants, Equipments, tools, all types of labour, supervision, all materials from the source of supplies as approved by Engineer/Employer including all lead and lifts, transport, all temporary works, erection, maintenance, contractors profits & establishment/overheads together with preparation of designs, structural & architectural drawings etc, all general risks, taxes, royalties, duties, cess, octroi and other levies, insurance liabilities and all other obligations set out or implied in the contract for completion of work except otherwise specified in Bill of Quantities.

2.2 Work Contents:

2.2.1 Scope of Works

I. The Scope of works shall, inter-alia, include the following but not be limited to:

(a) All kind of necessary surveying work including closed traverse, TBM's with co-ordinates & level.

(b) Temporary access roads, fencing, watching, security, electricity, water and lighting;

(c) All necessary arrangements for labour including labour camp, vehicle, water, electricity, adequate lighting;

(d) Safety precautions and all measures to prevent erosion and suppress fire and other hazards;

(e) interference to the Works by persons ,vehicles and the like being legitimate users of the facilities on or in the vicinity of the Site;

(f) supplying, maintaining and removing on completion ,the Contractor's own accommodation, offices, stations, stores ,workshops, transport, welfare services and other facilities including telephones and facsimile machines and all charges in connection there with;

(g) Maintaining public thorough fares and footpaths and maintaining access upon existing recognized routes;

(h) providing, transporting to the Site, operating costs (including all fuel and consumable stores), maintaining and removing from the Site upon completion ,all construction plant and Contractor's equipment necessary for the Execution of the Works and including the cost of all lab tests and other requirements in respect of such plant and equipment;

(i) Working adjacent to or across is services and installations;

(j) Complying with the requirements of the Employer with respect to ear thing and bonding works for safety of human beings or assets, safety (including all cost of barricading, working in the vicinity of

energized over headlines, etc. of the properties, utilities, public and/or employees, health, quality assurance, environmental, and project implementation plans and making periodical submissions;

(k) Coordination and interface of the Works with the works of the Designated Contractors on or in the vicinity of the Site;

(l) Remedying of defect sand shrinkage, and works of amendment, reconstruction, replacement of other faults, fair wear and tear expected, during defects liability periods;

(m) Protections to be implemented against electromagnetic interference effects following line energization;

(n) Insurance as per the provisions of the Contract;

(o) All required machineries, cranes, derrick, tools, and equipment required for Execution of Works;

(p) Various bank guarantees/ warranties /undertakings, as per the provisions of the Contract;

(q) Traffic management; and

(r) Erection, maintenance and removal of all Temporary Works and building.

II. The entire system and its basic components shall comply in all respect to the standard and regulations of National Building Code of India (NBC), and Bureau of Indian Standards.

2.2.2 INTERFACES:

i. The Contractor shall interface and liaise on a timely basis with the Designated Contractors in accordance with the requirements of this General Specification and the other documents forming part of the Contract.

ii. The Contractor shall notify the concerned authority in case of any deviations found on the site from the approve drawings and design.

ii. The Contractor shall coordinate with PMC/Employer for any further assistance & support if required.

2.3 DESIGNCRITERIA

Deleted

2.4 REFERENCE TO THE STANDARD CODES OF PRACTICE

2.4.1 All Standards, Technical Specifications and Codes of practice referred to shall be latest editions including all applicable official amendments and revisions. The Contractor shall make available at site all relevant Indian Standard Codes of practice and IS & NBC Codes as applicable.

2.4.2 Wherever Indian Standards do not cover some particular aspects of design/construction, relevant appropriate/updated building code will be referred to. The Contractor shall make available at site such standard codes of practice.

2.4.3 **Incase of discrepancy among Standard codes of practice, Technical Specifications and provisions in sub clauses in this NIT, the order of precedence will be as below:**

i) Provision in NIT & BOQ,
ii) Technical Specifications,
iii) PWD/ CPWD specifications
iv) Standard Codes of Practice.

In case of discrepancy among Standard Codes of Practice, the order of precedence will be NBC, IS, BS.

2.5 DIMENSIONS

2.5.1 As regards errors, omissions and discrepancies in Specifications and Drawings, relevant clause of Special Conditions of Contract will apply.

2.5.2 The levels, measurements and other information concerning the existing site as shown on the conceptual/layout drawings are believed to be correct, but the Contractor should verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or strata turning out different from what is shown on the drawings.

2.6 FABRICATIONDEPOT

Deleted

2.7 ASSOCIATED WORKS

Works to be performed shall also include all general works preparatory to the construction and works of any kind necessary for the due and satisfactory construction, completion and maintenance of the works to the intent and meaning of the drawings adopted and technical specifications, to best Engineering standards and orders that may be issued by the Engineer from time to time, compliance by the agency with all Conditions of Contract, supply of all materials, apparatus, plants, equipment, tools, fuel, water, strutting, timbering, transport, offices, stores, workshop, staff, labour and the provision of proper and sufficient protective works, diversion, temporary fencing, lighting and watching required for the safety of the public and protection of works on adjoining land; first–aid equipment ,sanitary accommodation for the staff and workmen, effecting and maintenance of all insurances, the payment of all wages, salaries, fees, royalties, duties or the other charges arising out of the erection of work sand the regular clearance of rubbish, clearing up, leaving the site perfect and tidy on completion.

2.8 PRELIMINARY DRAWINGS

Preliminary drawings are enclosed represent Employer's proposal based on preliminary design.

2.9 TIME SCHEDULE & MONITORING OF PROGRESS:

- The agency shall submit with the tender "Time Schedule" for completion of various portions of works. This schedule is to be within the overall completion period as stated in NIT. The detailed programme in the form of a quantified bar chart or CPM network shall include all activities starting from design to completion
- In compiling its Works Programme and in all subsequent updating and reporting, the Contractor shall make provision for the time required for coordinating and completing the design, testing, commissioning and integrated testing of the Works, including, inter alia, design co-ordination periods during which the Contractor shall co-ordinate its design with those of Designated Contractors, there view procedures, determining and complying with the requirements of all Government Departments and all others whose consent, permissions, authority or license is required prior to the execution of any work.
- The Contractor shall submit to the Engineer Four copies of a Monthly Progress Report (MPR), describing the progress and current status of the Works. The MPR shall address the matters set out in the Works Programme.
- The MPR shall be submitted by the end of each calendar month. It shall account for all works actually performed from twenty sixth day of the last month and up to twenty fifth day of the current month.
- A monthly/biweekly meeting to monitor the progress of the project shall be convened by the Engineer, Contractor's site agent and site agent of all interfacing contractors shall attend the meeting. The Employer may also be present in the meeting.
- All the partners those who are holding power of attorney must remain present in quarterly review meeting in MMDRA, Mumbai.

2.10 TRAFFIC MANAGEMENT

The Contractor should inspect the site for this purpose and shall carry out the traffic studies. He will propose suitable traffic diversion plan and get such plan approved by the local authorities. Employer shall facilitate to contractor in getting such approvals, however responsibility of getting approvals shall

rest with the Contractor. Lump-sum quoted for Schedule 'A' shall deemed to include the cost involved in such study, preparation of the proposal and getting the approval from the concerned authorities.

2.11 STANDARDS

Deleted

2.12 Site Establishment

(i) Site Laboratories

The Contractor shall provide a laboratory, as per the requirement as decided by the Engineer.

(ii) Contractor's Site Accommodation

The contractor shall provide and maintain its own site accommodation at locations consented to by the Engineer. Offices, sheds, stores, mess rooms, garages, workshop, latrines and other accommodation on the site shall be maintained in a clean, stable and secure condition. Living accommodation shall not be provided on the site. The contractor shall comply with the requirements.

(iii) Site Office

The contractor shall provide and maintain site office with facilities and details as specified, at locations consented to by the Engineer for staff with toilet, rest room and electricity, water supply facility including attendant services for office upkeep, consumable/stationary,PC & one plotter, one printer, pantry room with accessories, facility, Furniture, security, Air Conditioning, Ventilation etc as directed by the Engineer. Offices on the site shall be maintained in a clean, stable and secure condition. And Two vehicle service for employer & two vehicle for PMC team.

2.13 Time Schedule

The agency shall submit with the tender "Time Schedule" for completion of various portions of works. This schedule is to be within the overall completion period of **36** Months. The detailed programme in the form of a quantified bar chart or CPM network shall include all activities starting from design to completion.

2.14 Tender Price

The tender price shall include all the above listed items as per Bill of quantities.

2.15 Inspection

Employer may appoint an independent agency to ensure the quality checking of design, supply, fabrication, erection and construction of all works under scope of work. The Contractor shall ensure the complete co-operation with the agency to perform their work satisfactorily. In addition Employer also reserves right to undertake quality check and inspection directly by itself.

The contractor shall at all times keep the site and working areas free from all surplus materials, rubbish, other excavated/ offensive matter etc all of which shall be disposed off in a manner to be approved by the Engineer's Representative.

On completion of the works the contractor shall reinstate & make good at his own expense any property or land which might have been disturbed and/or damaged by his works. He should also clean the site as required during execution and fully clear the site after completion of all the works.

The contractor shall forward any usable materials found during the course of construction at the work site or its vicinity to KoPT stores/yards, dispose off the debris beyond the port area all at his own expenses by his own transport and labour and clean out all part of the work and leave everything clean and tidy to the entire satisfaction of the Engineer, failing which suitable deduction will be made from final bill as per discretion of the Engineer/ Engineer's representative

Including all appurtenant works as described & set forth in the Bill of Quantities, Special Conditions of Contract, Technical Specifications of work as per latest IS / IRC etc guidelines with all additional or varied works which may thereafter be required in accordance with clause – 7 of General Conditions of Contract & as per direction and upto the satisfaction of the Engineer or his representatives.

The intended tenderer shall inspect the site of work in consultation with the S.E (KPD), Civil Engineering Department and acquaint himself with the nature of the work before preparing tender. The Tenderer's attention is drawn to Clause No. 3.1 of the General Conditions of Contract in this regards. No excuse or ignorance as to the site conditions, or change in site due to natural factor or availability of space for storing material and approaches to the site etc. will be entertained.
Unless otherwise specified, the work to be provided for by the contractor shall include but not be limited to the following:-
a) Provide all materials, supervision, services, scaffolding, shoring, strutting, form work, reinforcements, vibrators, other tools and plants, transportation, water supply, temporary drainage, dewatering of surface, necessary approaches, temporary fencing and temporary lighting as required for safety and work purposes etc.
b) Prepare and submit for review and assessment to the Engineer documents, bar chart etc showing how the work is actually going to be done including storage of materials, fencing etc., as well as sequence of construction and all other details as may be required by him.
c) Providing all survey equipment with competent personnel to carry out survey works required for execution of the work.
d) Providing temporary drainage diversion works during execution of the work.
e) To exercise rigid quality control in execution of the work and to carry out sampling, testing, and furnishing the test results to the Engineer for the quality of construction materials and the quality of the work done.
f) The contractor shall at all-time carry out work in a manner creating least interference to the existing services/Traffic operation while consistent with the satisfactory execution of the same. For all works , the Contractor shall, in accordance with the direction of the Engineer-In-Charge provide and maintain during the execution of the work, measures taken for safety of workers and the users of the facilitation.
g) The contractor shall carry out the work in phased manner as per availability of the site as the roads & the areas are very busy & cannot be blocked wholly at a time & also for a long period so that normal day to day activities are not affected for which no such extra payment will be entertained.

5. LOCATION:
The site is located near 8,Garden Reach Road,Kolkata-43.

6. ACCESS TO THE SITE:
(a) By Road: Garden Reach Road

(b) By Circular Rail : Kidderpore Railway Station

7. WORK SITE:
The site is located near 8,Garden Reach Road,Kolkata-43. The building consists of two parts: A. Main Building, B. Annex Building. The Main Building is a three-storied heritage building of colonial style whereas the Annex building is seven stories high & modern in style The intending tenderer should contact **Superintending Engineer (KPD)** & **Superintending Engineer (Elec-I) for electrical works** to make the site inspection along with his representative.

8. INSPECTION OF SITE:
The Bidder shall inspect the site of work and thoroughly familiarise himself with the nature of work, site conditions, and access to the site and location before submission of the tender. He should contact the **Superintending Engineer (KPD)** & **Superintending Engineer (Elec-I) for electrical works** for collecting information about the site before submission of the tender. No excuse will be entertained afterwards on the above ground. In case any part of the site cannot be handed over to the successful Bidder in time, no compensation for loss of labour or any other cause nor any claim will be entertained by the Trustees. Suitable extension of time shall, however, be granted to the successful Bidder on that ground if applied for which shall be strictly at the consideration of the EIC.

9. SITE CONDITIONS & METHOD OF WORK:
The site is located near 8,Garden Reach Road,Kolkata-43 as detailed in the Scope of Work & B.O.Q. The contractor shall take adequate measures so as to execute the work with due regard to the above. The cost of which shall have to be included in the quoted rates.
Further, if so required by the Engineer in the interests of normal working of the Port Office, if it is found necessary to shift / suspend some construction activity for some duration, this shall be done in compliance with the instructions of the Engineer and as per relevant clause of the G.C.C. The bidder shall consider all the above points while quoting as no separate claim for idle charges towards labour, material will be considered for payment.
Proper care should be taken to provide adequate protection to the existing structures and cables (telephone, computer, etc.) all such installations against any damage at the Contractor's risk and expense. Any damage / defect to existing structures arising due to the faulty execution of the work shall have to be rectified forthwith as directed to the satisfaction of the Engineer, without charging extra.

10. TIME OF COMPLETION
The work is urgent in nature and must be commenced immediately on receipt of the work order and to be completed in all respects within 6(Six) months including preliminary time from the date of placement of work order.

11. SUFFICIENCY OF TENDER:
i) The tender drawings and all data / information as furnished herein or inspected and / or collected by the tenderer for the purpose of the work should be properly assessed or utilised in his offer at his own responsibility and KoPT does not guarantee sufficiency or adequacy of the data / information so supplied to him or collected or understood by the tenderer.
ii) The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates stated in the priced Bill of Quantities and the rates shall cover all his obligations under the contract and all matters and things necessary for the proper construction, completion, commissioning and maintenance of the work.

iii) In case rate of particular item is printed erroneously in B.O.Q., the rate stated in the schedule of rates will prevail over the rate misprinted in B.O.Q.

12. ACCESSIBILITY FOR CHECKING AND SUPERVISION:
The engaged Contractor is to provide necessary arrangement for free access to the KoPT officer's and personnel for supervision and checking of the subject work at his own cost.

13. PROGRAMME AND PROGRESS:
The contractor shall submit a detailed programme of work within 7 [seven] days from the date of Work Order / L.O.I. showing the commencement, duration and completion time of all major items of work including procurement of all materials etc,. The sequence of work shown in the programme must be practicable and compatible with technical specifications and conditions prevailing at site.
The contractor shall maintain the progress of work as per the approved programme. In case of any slippage of programme the engineer may require the contractor to augment the input of plant, equipment, labour of any item as he may deem fit. The contractor shall comply with the engineer's directive in this regard, without any extra charge whatsoever.
In case of delays caused due to conditions or circumstances beyond the control of the contractor, the delays must individually be informed to the Engineer forthwith in writing and his acceptance in writing obtained.

14. RESPONSIBILITY OF THE CONTRACTOR FOR METHODOLOGY OF WORKS:
i) The Contractor shall be solely responsible for the methodology and detailed working for the whole of the works, keeping in mind the site conditions and shall supply to the Engineer such particulars thereof as he may require from time to time.
ii) The Contractor shall submit within the time stipulated by the Engineer in writing, the details of actual methods that would be adopted by the Contractor for the execution of each item of the work supported by necessary details.
iii) Approval , for the Drawings and sketches, if necessary including those of the plant and machinery that would be used, their locations, arrangements for conveying and handling materials etc., should be obtained from the Engineer well in advance for starting each item of work. The Engineer reserves the right to suggest modifications or make concrete changes in the methods proposed by the Contractor whether accepted previously or not at any stage of the work, to obtain the desired accuracy, quality and progress of the work, which will be final and binding on the Contractor.

15. MATERIALS:
It will be the responsibility of the contractor to make timely procurement of all materials for both temporary and permanent works required in accordance with the Bill of Quantities or for any extra/additional work required as per the directions of the Engineer. The contractor shall procure cement, reinforcement steel, Lime, Surki and other materials from manufacturers approved by the Consultant/Architect/Engineer in keeping with the list of approved make for all the materials.
The contractor will be allowed to take away surplus materials on completion of the work, subject to Engineer's verification of contractor's records of entry and consumption of materials in the works.

16. QUALITY CONTROL:
Quality control is an essential part in the construction of and must be based on proper objective and qualitative measurement. The Contractor will have the full responsibility for quality control and

delivering the acceptable quality in the field. Regular appraisal of the quality control to the Engineer should be made for effecting improvements in the construction techniques to ensure satisfactory quality of work. The quality control function shall include but not be limited to the following items.

17. SAMPLING AND TESTING OF CONSTRUCTION MATERIALS:

For Civil Part: Sampling and testing essentially to be carried out on the materials brought to site for construction work unless permitted otherwise by the Engineer. The Contractor shall undertake all field tests and laboratory tests for all such materials and workmanships as directed by the Engineer or his representative at his own cost. The samples shall be taken for test jointly by the representatives of the Engineer and the contractor at the worksite and tested /sent to a Govt. registered laboratory or Institutional laboratory as may be decided by the Engineer for testing. In case of field test, the contractor shall undertake the test by his own testing equipments or by any approved agency in presence of the representatives of the Engineer and the contractor at the worksite. All the testing charges and all incidental charges like packaging and transporting the test samples, equipments etc. shall be borne by the Contractor.

For Electrical Part: Inspection and testing will be carried out by KOPT Engineer. Inspection will be carried out as applicable as per relevant Standard/ Technical Specification/Approved Drawing etc. Manufacturer's Test and guarantee certificate as applicable will have to be submitted for verification.

Inspection and testing will comprise prototype testing including mechanical and electrical measurements such as stress, temperature, voltage, current, and moisture test. Non- destructive test techniques such as ultrasonic test should be shown to indicate the thermal cycle, accelerated life cycle, mechanical impact, fatigue ,etc of the panel prior commissioning are to be carried out . Insulation Resistance, Earth Continuity and Earth Resistance tests etc. as applicable prior to commissioning are to be carried out for LT cable. All pre commissioning tests of the panels/equipments etc as applicable shall be carried out by the authorized representative of the firm having valid Supervisor's Certificate of Competency

18. SPECIFICATIONS/ CODES AND STANDARDS:

All works under this contract will be executed according to the Trustees' Specification for works.
Whenever the details are not specifically covered in the specifications, relevant provisions in the latest revision and/ or replacements of the Indian Standard Specifications (IS) or any other International Code of Practice/ CPWD specifications will be followed. The Contractor shall have to procure copies of such codes/ standards for ready reference of his own personnel as well as the Engineer or his representative at site at his own cost and without any additional reimbursement.

19. TEMPORARY WORKS:

The successful tenderer shall allow for providing labour and materials for the construction and removal of all temporary works, e.g. site office, site store, scaffolding, fencing lighting; watching, tube well and pipe lines etc. required for constructional purpose as well as for drinking water purpose of contractor's men, water supply, vats, platform, etc. as may be necessary for the successful execution, completion and maintenance of works without any extra cost to the Trustees and the rates should be quoted accordingly. No rent shall, however, be charged to the contractor for construction/erection of such temporary sheds and structures.

20. PLANT & CONSTRUCTIONAL EQUIPMENT:
The contractor shall supply his tools, plants and constructional equipment within his quoted rates. A list of plant as intended to be employed by the tenderers in this construction must be furnished with full details along with the tender.

21. CONTRACT PRICE:
The "Contract Price" for this contract means the sum named in the tender subject to such additions thereto, deductions there from or reductions due to supply of any materials by the Trustees' as provided for in the Contract.

22. SETTING OUT OF WORK AND INITIAL MEASUREMENTS:
The Engineer shall provide the initial reference and Bench Mark for the setting out of work. It will be the contractor's responsibility to set out the work accurately and get them checked by the Engineer. The Contractor shall provide at his own expense all necessary instruments, staff and labour for the checking of the survey.
The Contractor shall be responsible for the true setting out of the work and for the correctness of all dimensions, levels, lines, positions and alignment. Any error in any part of the works shall be rectified by the Contractor at his own cost. The Contractor would set up inspection facilities at Site at his own cost.

23. FORWARDING OF MATERIALS:
The contractor shall have to arrange transport for forwarding any usable/ saleable materials that may be found during the process of execution of the work to the Trustees' Sales yard or any other site/ godown including labourers, transportation, loading, unloading all complete as per the direction of the Engineer or his representative at site. No separate payment will be made to the contractor on this account unless specifically mentioned in the B.O.Q.

24. PARTICULARS OF EXISTING WORKS:
Such information as maybe given in the specification as to the existing features and works other than those now under construction as part of "Kolkata Port Trust" given without warranty of accuracy and neither the Trustees nor the Engineer will be liable for any discrepancies therein.

25. SAFETY MEASURES:
The contractor shall adhere to safe construction practice, guard against hazardous and unsafe working conditions and follow all safety precautions for prevention of injury or accidents and safeguarding life and property. The contractor shall further comply with any instruction issued by the Engineer, Trustees' Safety Officer, Safety Inspector in regards to safety which may relate to temporary, enabling or permanent works, working of tools, plants, machineries, equipment, means of access or any other aspect.
The contractor shall provide all necessary first aid measures, rescue and lifesaving equipment to be available in proper condition.
The contractor shall provide PPE's (Personal Protective Equipment) such as**, helmet, safety shoe** etc. to all workers and shall also provide job specific PPE's e.g. safety belts for working at heights; protective face and eye shield, goggles, hand gloves for welding / gas cutting works; protective foot wear and gloves for hot works; facemasks, gloves and overalls for painting works, mixing and handling materials etc , as directed by the Engineer.
All safety rules shall be strictly followed while working on live electrical systems or installations as stipulated in the relevant safety codes.

Use of hoisting machines and tackles including their attachments, construction tools, machineries and equipment shall comply to the relevant safety codes.
Before allowing workers in sewers, manholes, any duct or covered channel etc, the manhole covers shall have to be kept open and ventilated at least one hour in advance and necessary safety torches / lamps should be inserted first before allowing entry to the worker. Suitable hand gloves and other safety gear will be provided to the worker during handling / removing of slushes / sludge etc. without any extra cost. The contractor shall adopt all the above safety measures at his own cost.
The successful bidder shall also ensure that –
(i) No damage is caused to plants and vegetation unless the same is required for execution ofthe project proper.
(ii) The work shall not pollute any source of water / land / air surrounding the work site so asto affect adversely the quality or appearance thereof or cause injury or death to animal andplant life.
(iii) His office & labour hutment etc. shall be maintained in a clean and hygienic condition throughout the period of their use and different effluents of the labour hutment shall have to be disposed of suitably.

26. HOLIDAY OR SUNDAY WORK:
Subject to provisions in local Acts and any statutes of the State, the Contractor shall arrange for working on Holidays and Sundays whenever so desired by the Engineer to expedite progress and complete the works in time.
The Contractor shall not be entitled to any additional payment for taking up works on Holidays and Sundays. The Contractor should be prepared to resort to round-the-clock working by following shift timings for labour.

27. POWER SUPPLY:
If available and if required, suitable power supply may be arranged by the Trustees at the nearest existing supplies point of the site of work on receipt of request letter from the Contractor to that effect.
All necessary arrangements for the distribution at site will have to be made by the Contractor at his own cost as approved by the Trustees' Engineer or his representative.
Charges for consumption of power shall be periodically recovered from the Contractor's Bill at the rates of KoPT as prevalent amended from time to time including installation and hire charges for meters. The Trustees do not guarantee uninterrupted power supply from the above sources and Contractor shall not be compensated for any delay in providing / irregularity of power supply. The Contractor shall have to arrange for the supply of power at his own cost during such periods.

28. WATER:
The Contractor will arrange for supply of water both for drinking and for construction purposes. However, on written request from the Contractor, water for drinking purposes may be made available free of cost from the exiting water line of the Trustees at a point near the site of work. The contractor will have to arrange for laying pipelines, as necessary, as per approval of the Engineer or his representative, for storing and distributing the same to the work point at his own cost.
i)Under no circumstances, the contractor would be allowed to use such drinking water for constructional works.

29. KEEPING THE SITE AND WORKING AREA CLEAR:
The Contractor shall at all times keep the site and working areas free from all surplus materials, rubbish and offensive matter all of which shall be disposed off in a manner to be approved by the Engineer's Representative.

30. PROTECTION OF EXISTING SERVICES:
The contractor must pay full attention to the fact that the existing service facilities for users are not distributed at any time due to storing of materials and rubbish and take every precaution to keep the entrance passage clear if the same are being used by the laborers.
The contractor shall be held liable for all damage and interference to the existing service, caused by him in execution of works. Should any damage be done to the existing services, in general, the contractor shall make good the same and any further work considered necessary by the Engineer's representative without any delay otherwise the cost of such repairing shall be recovered for his running bill for which Engineer's decision shall be final and binding.

31. CLEANING DURING EXECUTION AND AFTER COMPLETION:
On completion of the works the contractor shall reinstate and make good at his own expense any property or land which might have been disturbed and/or damaged by his works. He should also clean the site as required during execution and fully clear the site after completion of all the works.
The contractor shall forward any usable materials found during the course of construction at the work site or its vicinity to KoPT stores/yards, dispose off the debris beyond the port area all at his own expenses by his own transport and labour and clean out all part of the work and leave everything clean and tidy to the entire satisfaction of the Engineer, failing which suitable deduction will be made from final bill as per discretion of the Engineer/Engineer's representative.

32. METHOD OF MEASUREMENT:
Unless otherwise specified in the Particular Specifications and Bill of Quantities, the work shall be measured according to the current P.W.D.'s (Building, S&P & Road) Schedule of Rates (2017), Govt. of West Bengal with latest amendment and analysed rate. For details of measurement not covered by the above S.P.-27 1987 of B.I.S. shall be referred to.

33. ON ACCOUNT PAYMENT:
On account payment to the Contractor shall be arranged as and when required at the discretion of the Engineer on the basis of measurements of completed works at the quoted rates in the Bill of Quantities.
The terms of payment shall be in accordance with Clause-6 of the General Conditions of Contract. The Bills should be submitted by the contractor **in quadruplicate** to the Office of the respective **Superintending Engineer (KPD)** & **Superintending Engineer (Elec-I) for electrical works** with necessary documents in original. Subject to the availability and feasibility of system, KoPT may make payment directly to the contractor's designated bank account. For this purpose, the contractor will have to indicate (i) name of bank (ii) branch name (iii) branch code and (iv) designated account number in the "Abstract Form Of Tender". In case payment is made directly through bank, the contractor may be required to submit a pre-receipt as per instruction of KoPT.

34. LABOUR, TOOLS & PLANTS:
The Contractor shall supply all necessary labour, tools and plants required for satisfactory execution of the work.

35. ESCALATION / VARIATION ON PRICES:
No Escalation / Variation on the prices on any account will be considered for adjustment /payment.

36. CONTRACT LABOUR LAWS AND INDEMNITY OF KoPT:
The contractor shall be required to comply with the Minimum wages Acts 1948, Employees Liability Act, 1938, Industrial Disputes Act, 1947, and The Contract Labour (Regulation and Abolition) Act, 1970, or statuary amendments and the modifications thereof, any other laws relating thereto and the rules made there under from time to time. Payment to the labourers to be made as per the minimum wage rates fixed by Chief Labour Commissioner (Central) and as per M.W.A. Govt. of W.B. whichever is higher and revised from time to time.
It will be the duty of the contractor to abide by the provisions of the Act. Ordinances, Rules, Regulations, Byelaws and Procedures as are lawfully necessary in the execution of the works. The contractor will be fully responsible for any delay/damage etc. and keep the Engineer indemnified against all penalties and liabilities of any kind for noncompliance or infringement of such Acts, Ordinances, Rules, Regulations By-laws and Procedures. The Contractor shall comply to the Employees' Bonus rules & to pay Bonus once a year to his workmen accordingly, for which no extra payment shall be made to the Contractor.
The contractor shall indemnify the KoPT against payment to be made under or for the observance of the laws aforesaid without prejudice to his right to claim indemnity from his subcontractor.
The aforesaid regulations shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a Breach of Contract. It will be obligatory on the part of Contractor to obtain necessary. Labour Licence from the Competent Authority for deploying requisite Nos. of labours in the work and submit to the Engineer-In-Charge prior to commencement of the work.
The contractor shall also be required to comply regarding 'Workmen Compensation Act, 1923 as amended by Amendment Act No.65 of 1976'
In addition to the above, the Personal Injuries (Compensation Insurance) Act, 1963 and any modifications thereof and rules made there under from time to time. The contractor shall take into account all the above said financial liabilities in his quoted rates and nothing extra, whatsoever, shall be payable to him on this account.
The Contractor shall indicate maximum number of workmen to be engaged on any day for execution of the work in the appropriate place in the ABSTRACT FORM OF TENDER & he shall have to obtain a regular /permanent license as per sec12(1) of the Contract Labour Act.
Further , whenever a contract work has commenced or completed , the contractor has to intimate the same to the Assistant Labour Commissioner(Central) /labour Enforcement Officer (Central) in Form IV-A , within 15 days of such commencement or completion.
The contractor has to arrange for displaying the name of the Regional Labour Commissioner (Central), Asst. Labour Commissioner (Central) & Labour Enforcement Officer (Central) at his worksite(s). The contractor shall inform the Principal Employer the date, time & venue of disbursement to be made by him to his workers.
The successful bidder shall also be required to put up a notice at the site of work mentioning the date, time & venue of disbursement to be made by him to his workers and he or his authorized representative shall have to be present during period of disbursement.

37. COMPLIANCE WITH E.P.F & M. P. ACT & ESI Act 1948:
The successful contractor will have to comply with provision of EPF & MP Act 1952 and also for Employees State Insurance Act 1948 (along with amendments, if any), issued from time to time as applicable.

If asked for by the Employer, the contractor will be required to submit photocopy of all payment challans and produce the original for verification to the representative of the principal employer, i.e. **Superintending Engineer (KPD).**

38. INDEMNIFICATION:
The successful bidder shall be deemed to indemnify and keep indemnified the Trustees from and against all actions, claims, demands and liabilities whatsoever under and in respect of the breach of any of the provisions of any law, rules or regulations having the force of law, including but not limited to –
a) The Minimum Wages Act, 1948.
b) The Building And Other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996
c) The Payment of Wages Act, 1936.
d) The Workmen's Compensation Act, 1923.
e) The Employees Provident Fund Act, 1952.
f) The Contract Labour (Regulation and Abolition) Act, 1970; Rules 1971.
g) The Equal Remuneration Act, 1976.
h) The Employees State Insurance Act, 1948 & Employees State Insurance (Amendment) Act, 1989
i) Child Labour (Prohibition and Regulation) Act, 1986.
j) The Maternity Benefits Act 1961
k) Interstate Migrant Workmen (Regulation Of Employment & Conditions Of Service) Act, 1979.
l) Motor Vehicle Act, latest revision.
m) The payment of Bonus Act, 1965.

39. TAXES & DUTIES: -
The prices quoted shall be including all statutory levies excluding GST, which shall be paid extra.
Supplier/service provider to confirm that the GST amount charged in invoice is declared in its returns and payment of taxes is also made.
· The Supplier/ Service Provider agrees to comply with all applicable GST laws, including GST acts ,rules, regulations, procedures, circulars & instructions thereunder applicable in India from time to time and to ensure that such compliance is done within the time prescribed under such laws. Supplier/Service Provider should ensure accurate transaction details, as required by GST laws, are timely uploaded in GSTN. In case there is any mismatch between the details so uploaded in GSTN by Supplier/ Service Provider and details available with Kolkata Port Trust, then payments to Supplier/Service Provider to the extent of GST relating to the invoices/s under mismatch may be retained from due payments till such time Kolkata Port Trust is not sure that accurate tax amount is finally reflected in the GSTN to KoPT's Account and is finally available to Kolkata Port Trust in terms of GST laws and that the credit of GST so taken by Kolkata Port Trust is not required to be reversed at a later date along with applicable interest.
· Kolkata Port Trust has the right to recover monetary loss including interest and penalty suffered by it due to any non-compliance of tax laws by the supplier/service provider. Any loss of input tax credit to Kolkata Port Trust for the fault of supplier shall be recovered by Kolkata Port Trust by way of adjustment in the consideration payable.
· Supplementary invoices/Debit note/credit note for price revisions to enable Kolkata Port Trust to claim tax benefit on the same shall be issued by bidder for a particular year before September of the succeeding Financial Year.
The purchase order/ work order shall be void, if at any point of time bidder is found be to a black listed dealer as per GSTN rating system and further no payment shall be entertained.

40. SETTLEMENT OF DISPUTES:
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, the same shall be dealt as per relevant provisions of the General Conditions of Contract.

41. CONTRACTOR TO EXECUTE CONTRACT AGREEMENT:
The contractor after acceptance of his tender shall be required to enter into and execute a Contract Agreement to be prepared in the form annexed to the General Conditions of Contract together with such modifications as may be necessary within one month from the date of placement of the order. The contractor shall have to submit copies in sextuplets of all documents; correspondence, connected papers etc. as detailed in the above from of Contract Agreement together with the instrument of Contract Agreement prepared on Non-Judicial stamped paper of requisite denomination having five more copies made on plain paper all at his own cost. The successful tenderer shall have to submit three sets of such Contract Agreement duly executed, sealed, signed and witnessed for execution by the Trustees. The other three sets shall be completed in all respects but not signed. If the successful tenderer or tenderers are a partnership concern, they will have to get Agreement signed by all the partners or by the partner who is authorized to sign for and on behalf of the other partners.
The contractor shall also comply with the requirements of Security Deposit for the due fulfilment of the contract. The blank proforma of tender documents shall be supplied in sextuplets to the successful tenderer free of charge for preparing the documents of the aforesaid Contract Agreement.
The successful tenderer shall have to copy out and prepare the documents of the Contract Agreement neatly and correctly. The necessary amendments, corrections etc. (if any) have to be done at his own cost. The successful contractor shall be required to keep close co-ordination and liaison with the Traffic Department while executing the works. The Superintending Engineer in charge of the construction will direct the representatives of the contractor to maintain liaison with different sections of the other departments and the contractor must keep the concerned Superintending Engineer of the Civil Engineering Department informed and/or posted with the programme contemplated with other departments. The Superintending Engineer of the Civil Engineering Department shall be nodal authority in all these co-ordination and / or liaison and all programmes must be vetted by him. In cases of exigencies, the contractor or his representatives may establish direct liaison/co-ordination but in all such case the Superintending Engineer should be informed promptly.

42. EMPLOYMENT OF LOCAL RESOURCES:
The contractor shall pay special attention to engage the maximum possible number of local Engineer, other technical personnel, office workers; labourers (skilled, semiskilled, unskilled) both at site and in office, details of such recruitment etc. shall be submitted to the Engineer periodically or as and when called for.

43. CALCUTTA PORT TRUST:
The expression “CALCUTTA PORT TRUST’ appearing anywhere in the tender documents, shall be construed to read as “KOLKATA PORT TRUST”.

44. CLARIFICATION OF BIDS:
To assist in the examination and comparison of Tenders, the Employer may, at his discretion, ask any Tenderer for clarification of his Tender, including breakup/analysis of unit rates. The request for clarification and the response shall be in writing, but no change in the price or substance of the Tender shall be sought, offered, or permitted except as required to conform the correction of arithmetic errors discovered by the Employer in the evaluation of the Tenders.

No Tenderer shall contact the Employer personally on any matter relating to his Tender from the time of the Tender opening to the time the contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Employer, he should do so in writing.
Any effort by the Tenderer to influence the Employer's Tender evaluation, Tender comparison or contract award decisions, may result in the rejection of his Tender.

45. WORKMEN AND WAGES:
The Contractor shall deliver, if ordered, a weekly return for all labour employed in writing in the requisite form as instructed by the Engineer or his representative.
The contractor shall have to engage sufficient number of technically qualified and skilled persons to supervise and execute the work and this should be mentioned in the "Schedule-T" of the Contract.

46. RATE FOR PAYMENT AGAINST EXTRA ITEMS:
For any unforeseen work not covered under the Bill of Quantities and Condition of Contract, depending on contingent situation at site, if required for successful completion of the work, extra items have to be carried out by the Contractor. If those items are already available in Trustees' Schedule of rate, payment will be made on the basis of Trustees' Schedule of rate; including surcharge in force at the time of acceptance of the tender, if any adopted by the Trustees with due regard to the accepted contractual percentage, if any, thereon, otherwise, if the rates are not available in the KoPT Schedule of Rates, then the Special Rates will be prepared as follows:-
(i) The rate of payment of work involving labour & material shall be fixed on the following basis.
a) Cost of materials consumed including transport and wastage, plus
b) Cost of labour actually engaged in the works, plus
c) Taxes and Duties as applicable, plus
d) 16% on the aggregate of (a) and (b) towards overhead, profit and cess.
(ii) For any work involving only labour, rate of payment shall be fixed on cost of labour actually engaged in the work plus 11% towards profit and cess.
(iii) For only supply of any material at site, rate of payment shall be fixed on actual cost of material plus transport, loading & unloading (if any) plus 11 % towards profit and cess.

47. WORKING PERIOD:
Normally the work will be carried out between 8 A.M. to 5 P.M. on the Trustees' working days only. However, the tenderer should note that he might be required to carry out the job on Sundays, holidays and after normal working hours and at night in addition to the normal working hours to expedite the progress of the work if permitted by Competent Authority. The tenderer should include in his rates the cost, if any, involved on those accounts.

48. BANK GUARANTEE IN LIEU OF CASH SECURITY DEPOSIT:
Security deposit shall be recovered from the On A/C. Bill as per Clause – 3.4 and 3.5 of General Conditions of Contract. However, Bank Guarantee may be considered in lieu of Cash Security Deposit. In that case, the Contractor shall have to submit to the Engineer a performance Bond in the form of an irrevocable guarantee from any Nationalized Bank at Kolkata in the proforma as given in the G.C.C. In this context Clause 3.6 of G.C.C.may be referred to.

49. MEASURES AGAINST POLLUTION: -
The contractor shall have to take proper measures against environmental pollution during execution of work as directed by the Engineer.

The contractor shall, abide by all the regulations and rules of Kolkata Port Trust and those that may be issued from time to time without any extra cost to the KoPT.

50. DEFECT LIABILITY PERIOD:
The defect liability period for the work is 1 (One) year from the date of completion. During this period, if any defect arises the contractor is bound to repair the same or take any other action as directed by the Engineer including replacement of the defective portion and redoing the same at his own cost within 7 days in case of repairing and 21 days in case of replacement and re-doing from receipt of such instruction failing which the work may be done by the Trustees' by some other agencies and the cost of which including 19 1/4 % departmental charges plus GST will be recovered from the security deposit or any other dues of the contractor.

51. ERRORS IN THE B.O.Q :
In case rate of particular item is printed erroneously in BOQ, the rate stated in the Schedule of rates will prevail over the rate misprinted in BOQ.

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SPECIAL CONDITIONS OF CONTRACT-2

1 Water Supply:

The Contractor has to make his own arrangements for water suitable and required for the work and to the colonies and work sites, which are to be established by the Contractor.

2 Electrical Power:

The Contractors will have to make their own arrangements for drawing electric power from the nearest power line after obtaining permission from the State Electricity Board at his own cost. In case of failure of electricity, the Contractor has to make alternative arrangements for supply of electricity by Diesel Generator sets of suitable capacity at place of work. If the supply is arranged by the Department, necessary Tariff rates shall have to be paid based on the prevailing rates.
The contractor will pay the bills of Electricity Board for the cost of power consumed by him.
The contractor shall satisfy all the conditions and rules required as per Indian Electricity Act as amended from time to time and other pertinent rules.
The power shall be used for Departmental works only.

2.1 Electric Power for Domestic Supply:

a) The contractor has to make his own arrangements for the supply of electric power for domestic purposes and the charges for this purpose have to be paid by him at the rates as fixed by the State Electricity Board from time to time.

b) The contractor will have to make his own arrangements to lay and maintain the necessary distribution lines and wiring for the camp at his own cost. The layout and the methods of laying the lines and wiring shall have the prior approval of the **Employer/Employer's representative**. All camp area shall be properly electrified. All lines, streets, approaches for the camp etc., shall be sufficiently lighted for the safety of staff and labour of the contractor, at the cost of the Contractor and it will be subject to the approval of the **Employer/Employer's representative**.

3 Land:

3.1 Land for Contractor's use:

The contractor will be permitted to use KOPT land for execution of work. The contractor shall have to make his own arrangements for acquiring and clearing the site, leveling, providing drainage and other facilities for labour staff colonies, site office, work-shop or stores and for related activities. The Contractor shall apply to the Department within a reasonable time after the award of the contract and atleast 30 days in advance of its use, the details of land required by him for the work at site and the land required for his camp and should any private land which has not been acquired, be required by the contractor for his use. The same may be acquired by the contractor at his own cost by private negotiations and no claim shall be admissible to him on this account.
The Department reserves the right to refuse permission for use of any KOPT land for which no claim or compensation shall be admissible to the contractor. The contractor shall, however, not be required to pay cost or any rent for the land given to him.

3.2 Surrender of Occupied Land:

(a) The land as here in before mentioned shall be surrendered to the **Employer/Employer's representative** within seven days, after issue of completion certificate. Also no land shall be held by the contractor longer than the Engineer-in-Charge shall deem necessary and the contractor shall on the receipt of due notice from the **Employer/Employer's representative**, vacate and surrender the land which the Engineer-in-Charge may certify as no longer required by the Contractor for the purpose of the work.

(b) The contractor shall make good to the satisfaction of the **Employer/Employer's representative** any damage to areas, which he has to return or to other property or land handed over to him for purpose of this work. Temporary structures may be erected by the contractor for storage sheds, offices, residences etc., for non-commercial use, with the permission of the **Employer/Employer's representative** on the land handed over to him at his own cost. At the completion of the work these structures shall be dismantled site cleared and handed over to the **Employer/Employer's representative**. The land required for providing amenities will be given free of cost from Government lands if available otherwise the contractor shall have to make his own arrangements.

3.3 Contractor not to dispose off Soil etc.:-

The contractor shall not dispose off or remove except for the purpose of fulfillment of this contract, sand, stone, clay ballast, earth, trees and shrubs or other materials obtained in the excavation made or lying on the site of the work, and all such materials and produce shall remain property of the Government. The Department may upon request from the contractor, or if so stipulated in the conditions of the contract allow the contractor to use any of the above materials for the works either free of cost or after payment as may be specifically mentioned or considered necessary during the execution of the work.

4 Payment for Camp Construction:

No payment will be made to the contractor, operation and maintenance of camp and other camp facilities and the entire cost of such work shall be deemed to have been included in the tendered rate for the various items of work in the schedule of quantities and bids.

5 Labour:

The contractor shall, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

Labour importation and amenities to labour and contractor's staff shall be to the contractor's account. His quoted percentage shall include the expenditure towards importation of labour amenities to labour and staff;

The contractor shall, if required by the **Employer/Employer's representative**, deliver to the **Employer/Employer's representative** a written in detail, is such form and at such intervals as the **Employer/Employer's representative** 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 information respecting Contractor's Equipment as the **Employer/Employer's representative** may require.

6.1 **Transportation of Labour:**

(a) The contractor shall make his own arrangement for the daily transportation of the labour and staff from labour camps colonies to the work spot and no labour or staff of the contractor shall stay at the work spot. No extra payment will be made to the contractor for the above transportation of the labour and his quoted percentage to the work shall include the transportation charges of labour from colonies to work spot and back.

(b) The contractor will at all times duly observe the provisions of employment of children Act XXVI of 1938 and any enactment or modification of the same and will not employ or permit any person to do any work for the purpose under the provisions of this agreement in contravention of said Act. The contractor here by agrees to indemnify the department from and against all claims, penalties which may be suffered by the department or any person employed by the department by any default on the part of the contractor in the observance and performance of the provisions of the employment of children Act. XXVI of 1938 or any enactment or modification of the same.

As per Govt. memo No.721/Gr.(1)/81-35, dt:17.11.87. The contractor shall obtain the insurance at his own cost to cover the risk on the works to labour engaged by him during period of execution against fire and other usual risks and produce the same to the Executive Engineer concerned before commencement of work.

6 Safety Measures:

1. The contractor shall take necessary precautions for safety of the workers and preserving their health while working in such jobs, which require special protection and precautions. The following are some of the measures listed but they are not exhaustive and contractor shall add to and augment these precautions on his own initiative where necessary and shall comply with directions issued by the **Employer/Employer's representative** or on his behalf from time to time and at all times.

2. Providing protective foot wear to workers situations like mixing and placing of mortar or concrete sand in quarries and places where the work is done under much wet conditions.

3. Providing protective head gear to workers at places like underground excavations to protect them against rock falls.

4. Providing masks to workers at granulates or at other locations where too much fine dust is floating about and sprinkling water at frequent intervals by water hoses on all stone crushing area and storage bins abate to dust.

5. Getting the workers in such jobs periodically examined for chest trouble due to too much breathing in to fine dust.

6. Taking such normal precautions like fencing and lightening in excavation of trenches, not allowing rolls and metal parts of useless timber spread around, making danger areas for blasting providing whistles etc.

7. Supply work men with proper belts, ropes etc., when working in precarious slopes etc.

8. Avoiding uninsulated electrical wire etc., as they would electrocute the works.

9. Taking necessary steps towards training the workers concerned on the machinery before they are allowed to handle them independently and taking all necessary precautions in around the areas where machines hoists and similar units are working.

7 Fair Wage Clause:

1. The contractor shall pay not less than fair wages to laborer's engaged by him on the work.

2. "Fair" wages means wages whether for time of piecework notified by the Government from time in the area in which the work is situated.

3. The contractor shall not with-standing the revisions of any contract to the contrary cause to be paid to the labour, in directly engaged on the work including any labour engaged by the sub-contractor in connection with the said work, as if the labourers had been directly employed by him.

4. In respect of labour directly or indirectly employed in the works for the purpose of the contractors part of the agreement the contractor shall comply with the rules and regulations on the maintenance of suitable records prescribed for this purpose from time to time by the Government. He shall maintain his accounts and vouchers on the payment of wages to the labourers to the satisfaction of the **Employer/Employer's representative**.

5. The **Employer/Employer's representative** shall have the right to call for such record as required to satisfy himself on the payment of fair wages to the labourers and shall have the right to deduct from the contract amount a suitable amount for making good the loss suffered by the worker or workers by reason of the "fair wages" clause to the workers.

6. The contractor shall be primarily liable for all payments to be made and for the observance of the regulations framed by the Govt. from time to time without prejudice to his right to claim indemnity from his sub-contractors.

7. As per contract labour (Regulation and abolition) Act. 1970 the contractor has to produce the license obtained from the licensing officers of the labour department along with the tender or at the time of agreement.

8. Any violation of the conditions above shall be deemed to be a breach of his contract.

9. Equal wages are to be paid for both men and women if the nature of work is same and similar.

10. The contractor shall arrange for the recruitment of skilled and unskilled labour local and imported to the extent necessary to complete the work within the agreed period as directed by the **Employer/Employer's representative** in writing.

8 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 notifications that may be issued under any labour law in future either by the State or the Central Government or the local authority and also applicable labour regulations, health and sanitary arrangements for workmen, insurance and other benefits. Salient features of some of the major labour laws that are applicable to construction industry are given below. The contractor shall keep the Department indemnified in case any action is taken against Department 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 Department is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provision stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the contractor, the Engineer-in-charge /Department shall have the right to deduct any money due to the contractor including his amount of performance security. The Department/Engineer-in-Charge 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 Department.

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

9 Salient features of some major labour laws applicable to establishment engaged in buildings and other construction work:

The bidder shall implement the following Acts and Amendments thereon invariably and any violation in this regard will lead to penal action as per the provisions of Act.

(a) **Workmen compensation Act 1923:**The Act provides for compensation in case if 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 any employee has completed 5 years service or more, or on death, 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 Department plus workers. The benefits payable under the Act are:

(i) Pension or 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 women employees in case of confinements 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 Department by Law. The Principal Department 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 Department if they employ 20 or more contract labour.

(f) **Minimum wages Act 1948:**The Department 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 or Female workers and for not making discrimination against Female employee 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.

(j) **Industrial Disputes Act 1947:** The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock- out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(k) **Industrial Employment (Standing Orders) Act 1946:**It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the State and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Department on matters provided in the Act and get the same certified by the designated Authority.

(l) **Trade Unions Act 1926:**The Act lays down the procedure for registration of trade unions of workmen and Departments. The Trade Unions registered under the act have been given certain immunities from civil and criminal liabilities.

(m) **Child Labour (Prohibition & Regulation) Act 1986:**The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes, Employment Child Labour is prohibited in Building and Construction Industry.

(n) **Inter-State Migrant workmen's (Regulation of Employment & Conditions of service) Act 1979:** The Act 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 an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home up to the establishment and back, etc.

(o) **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 carryon 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 Department 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 Department to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

(p) **Factories Act 1948:**The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 person or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

10 Liabilities of the Contractor:

10.1 Accident Relief and workmen compensation:

The contractor should make all necessary arrangements for the safety of workmen on the occurrence of the accident, which results in the injury or death of any of the workmen employed by the contractor, the contractor shall within 24 hours of the happenings of the accident and such accidents should intimate in writing to the concerned **Employer/Employer's representative** of the Department the act of such accident. The contractor shall indemnify Government against all loss or damage sustained by the Government resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines if any payable by Govt. as a consequence of Govt. failure to give notice under workmen's compensation Act or otherwise conform to the provisions of the said Act in regard to such accident.

10.2 In the event of an accident in respect of which compensation may become payable under the workmen's compensation Act VIII 23 whether by the contractor, by the Government it shall be lawful for the Executive Engineer to retain such sum of money which may in the opinion of the **Employer/Employer's representative** be sufficient to meet such liability. The opinion of the **Employer/Employer's representative** shall be final in regard to all matters arising under this clause.

10.3 The contractor shall at all times indemnify the Govt. against all claims which may be made under the workmen's compensation act or any statutory modification thereafter or rules there under or otherwise consequent of any damage or compensation payable in consequent of any accident or injuries sustained or death of any workmen engaged in the performance of the business relating to the contractor.

11 Contractor's Staff, Representatives and Labour:

The contractor shall, at all times, maintain on the works, staff of qualified Engineers, and Supervisors of sufficient experience of similar other jobs to assure that the quality of work turned out shall be as intended in the specifications. The contractor shall also maintain at the works, a Work Manager or sufficient status, experience and office and duly authorize him to deal with all aspects of the day-today work. All communications to any commitments by the Work Manager shall be considered as binding on the Contractor.

The Contractor shall at all times submit details of skilled and unskilled labour and equipment employed to the Engineer-in-Charge in prescribed proforma as he may require to assess and ensure the proper progress of work.

If the contractor does not employ the technical person agreed to on the work a fine of **Rs.25,000**/- per day will be imposed. If he does not employ for 30 days, thereafter it becomes a fundamental breach of contract.

12 Accommodation and food:

The contractor should arrange accommodation he needs, at his own cost. The contractor shall make his own arrangements for supply of food grains, fuel and other provision to his staff and labourers including controlled commodities.

13 Relationship:

Contractor shall have to furnish information along with tender, about the relationship he is having with any officer of the Department, of the rank Assistant Engineer and above engaged in the work and any officer of the rank of Assistant Secretary and above of the Department of Government.

14 Protection of adjoining premises:

The contractor shall protect adjoining sites against structural, decorative and other damages that could be caused by the execution of these works and make good at his cost any such damages.

15 Work during night or on Sundays and holidays:

The works can be allowed to be carried out during night, Sundays or authorized holidays in order to enable him to meet the schedule targets and the work shall require MORT&H round the clock working keeping in view:

(i) The provisions of relevant labour laws being adhered to:

(ii) Adequate lighting, supervision and safety measures are established to the satisfaction of the **Employer/Employer's representative**

16 Layout of materials stacks:

The contractor shall deposit materials for the purpose of the work on such parts only of the ground as may be approved by the **Employer/ Employer's representative** before starting work. A detailed survey, clearly indicating position and areas where materials shall be stacked and sheds built is to be conducted by the contractor at his own cost and only after obtaining necessary approval of the plan for use of sites by the **Employer/ Employer's representative**, the Contractor can use the sites accordingly.

17 Use of blasting materials:

The contractor is to act in accordance with Indian Explosive Act and other rules prevailing, during the execution of work.

18 Plant and Equipment:

18.1 The contractor shall have sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress on the work as per the approval progress schedule. The working and shifts hours shall comply with the Govt. Regulations in force.

18.2 It is too expressly and clearly understood that contractor shall make his own arrangements to equip himself with all machinery and special tools and plant for the speedy and proper execution of the work and the department does not undertake responsibility towards their supply.

18.3 The department shall supply such of the machinery that may be available on hire basis but their supply cannot be demanded as matter of right and no delay in progress can be attributed to such non-supply of the plant by the department and the department cannot be made liable for any damage to the contractor. The Contractor shall be responsible for safe custody of the departmental machinery supplied to him (which will be delivered to contractor at the machinery yard at site of work) and he has to make good all damages and losses if any other than fire, wear and tear to bring it to the conditions that existed at the time of issue to the contractor before handing over the same to the department. The hire charges for the machinery handed over to the contractor will be recovered at the rate prevalent at the time of supply. The contractor will have to execute supplemental agreement with Executive Engineer at the time of supply of the machinery.

18.4 The acceptance of departmental machinery on hire is optional to the contractor.

19 Steel forms (Acrow Steel forms)

Acrow Steel forms or equivalent forms approved by Engineer-in-charge should be used for all items involving and use of centering and shuttering shall be leak proof and single plane without any dents and undulations.

20 Inconvenience to public:

The contractor shall not deposit materials at any site, which will cause inconvenience to public. The Engineer-in-Charge may direct the contractor to remove such materials or may undertake the job at the cost of the contractor.

21 Contract documents and materials to be treated as confidential:

All documents, correspondences, decisions and orders, concerning the contract shall be considered as confidential and/or restricted in nature by the contractor and he shall not divulge or allow access to them by any unauthorized person.

22 General obligations of Contractor:

22.1 The contractor shall, subject to the provision of the contract and with due care and diligence, execute and maintain the works in accordance with specifications and drawings.

22.2 The contractor shall promptly inform the Department and the **Employer/ Employer's representative** of any error, omission, fault and such defect in the design of or specifications for the works which are discovered when reviewing the contract documents or in the process of execution of the works.

22.3 If Contractor believes that a decision taken by the **Employer/ Employer's representative** was either outside the authority given to the **Employer/ Employer's representative** by the Contract or that the decision was wrongly taken, the decision shall be referred to the technical expert within 14 days of the notification of the **Employer/ Employer's representative**decisions.

22.4 Pending finalisation of disputes, the contractor shall proceed with execution of work with all due diligence.

23 Security measures:

23.1 Security requirements for the work shall be in accordance with the Government's general requirements including provisions of this clause and the Contractor shall conform to such requirements and shall be held responsible for the actions of all his staff, employees and the staff and employees of his sub-contractors.

23.2 All contractors' employees, representatives and sub-contractor's employees shall wear identifications badges provided by the contractor. Badges shall identify the contractor, showing and employee's number and shall be worn at all times while at the site. Individual labour will not be required to wear identification badges.

23.3 All vehicles used by the contractor shall be clearly marked with contractor's name.

23.4 The contractor shall be responsible for the security of the works for the duration of the contract and shall provide and maintain continuously adequate security personnel to fulfill these obligations. The requirements of security measures shall include, but not limited to maintenance of order on the site, provision of all lighting, fencing, guard flagmen and all other measures necessary for the protection of the works within the colonies, camps and elsewhere on the site, all materials delivered to the site, all persons employed in connection with the works continuously throughout working and non-working period including nights, Sundays and holidays for duration of the contract.

23.5 Other contractors working on the site concurrently with the contractor will provide security for their own plant and materials. However, their security provisions shall in no way relieve the contractor of his responsibilities in this respect

23.6 Separate payment will not be made for provision of security services and its cost shall be deemed to have been included in the offer of tender / contract.

24 Fire fighting measures:

(a) The contractor shall provide and maintain adequate firefighting equipment and take adequate fire precaution measures for the safety of all personnel and temporary and permanent works and shall take action to prevent damage to destruction by fire of trees shrubs and grasses.

(b) Separate payment will not be made for the provision of fire prevention measures.

25 Provisions of Health and Sanitation:

25.1 The contractor shall implement the sanitary and watch and ward rules and regulations for all forces employed under this contract and if the Contractor fails to enforce these rules, the **Employer/ Employer's representative** may enforce them at the expenses of the Contractor.

25.2 **First Aid:** At the work site there shall be maintained in a readily accessible place, first aid appliances and medicine including adequate supply of sterilized dressing and sterilized cotton wool. The appliance shall be kept in good order. They shall be placed under the charge of a responsible person, who shall be readily available during working hours.

25.3 **Drinking water:**

Water of good quality for drinking purpose shall be provided for the worker on a scale of not less than 2 gallons per head per day.

(a) Where drinking water is obtained from an intermittent public water supply each work site shall be provided with a storage tank, where such drinking water shall be stored.
(b) Every water supply storage shall be at a distance of not less than 10 M. from any latrine drain or other source of pollution where water has to be drained. Any existing well, which is within such proximity of any latrine, drain or other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be dust and water proof.
(c) A reliable pump shall be fitted to each inner well. The trap door shall be keep locked and opened only for inspection or cleaning which shall be done at least once a month.

25.4

Washing and bathing place:

Adequate washing and bathing places shall be provided separately for men and women. Such place shall be keep clean and well drained, bathing or washing should not be allowed in or near any drinking water well.

25.5 **Latrine and Urinals:**

There shall be provided within the area of every work site latrines and urinals in an accessible place to men and women separately. For each of them shall be on the following scales or the scale as directed by Engineer-in-charge in any particular case.

(a) Where the number of persons employed does not exceed 50 –2 No's
(b) Where the number of persons employed exceeds 50 but does not exceed 100–3 No's
(c) For every additional 100 –3 No's

If women are employed, separate latrines and urinals separated from those for men shall be provided on the same scale.

Except in work site provided with water flushed latrines connected with a water borne sewage systems all latrine shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. The receipt scales shall be tarred inside and outside at least once a year.

The excrete from the latrines shall be disposed off at the contractors expenses in a way approved by the local public health authority. The contractor shall also employ adequate number of scavengers and conservancy shall to keep the latrines and urinals in a clean condition.

25.6 **Shelters during Rest:**

At the work site there shall be provided free of cost two suitable sheds, one for meals and other for rest for the use of workers.

25.7 **Creches:**

At every work site at which 50 or more women workers are ordinarily employed there shall be provided two huts of suitable size for use of children under the age of 6 years. One hut shall be

used for infants games and other as a bed room. The hut shall be constructed on a standard not lower than the following.

1. Thatched roots
2. Mud floors and wall
3. Planks spread over the mud floor and covered with matting. The use of huts shall be restricted to children their attendants and mothers of the children.

25.8 Land should be acquired temporarily for Storing Contractor's materials or for housing their staff. The contractor should make his own arrangements for temporary acquisition of land required for storing his materials and for the housing of his staff at his own expenses.

26 Training of personnel:

The contractor, shall, if and as directed by the **Employer/ Employer's representative** provide free of any charge adequate facilities, for vocational training of Government Officers, students, Engineers, supervisors, foremen, skilled workmen etc. not exceeding six in number at any one time on the contractor's work. Their salaries, allowances etc. will be borne by the Government and the training schemes will be drawn up by the **Employer/ Employer's representative** in consultation with the contractor.

27 Ecological balance:

(a) The contractor shall maintain ecological balance by preventing de-forestation, water pollution and defacing of natural landscape. The contractor shall so conduct his operation as to prevent any unnecessary destruction, scarring, or defacing of the natural surrounding in the vicinity of the work. In respect of the ecological balance, Contractor shall observe the following instructions.

(i) Where unnecessary destruction, scarring, damage or defacing may occur, as result of the operation, the same shall be repaired replanted or otherwise corrected at the contractor's expense. The contractor shall adopt precautions when using explosives, which will prevent scattering of rocks or other debris outside the work area. All work area including borrow areas shall be smoothened and graded in a manner to conform to the natural appearances of the landscape as directed by the **Employer/ Employer's representative**.

(b) Separate payment will not be made for complying with the provisions of this clause and all cost shall be deemed to have been included in the unit rates and prices included in the contract if any provision is not complied with within a reasonable time even after issue of a notice in this respect, the necessary operations would be carried out by the **Employer/ Employer's representative** at the cost of the Contractor, Orders of the **Employer/ Employer's representative** in this respect would be final and binding on the contractor.

28 Preservation of existing vegetation:

(a) The contractor will preserve and protect all existing vegetation such as trees, on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the **Employer/ Employer's representative**. The contractor will be held responsible for all

unauthorized cutting or damage of trees, including damage due to careless operation of equipment, stockpiling of materials or trecking of grass areas by equipment. Care shall be taken by the Contractor in felling tress authorised for removal to avoid any unnecessary damages to vegetation and tress that are to remain in place and to structures under construction or in existence and to workmen.

(b) All the produce from such cutting of trees by the contractor shall remain the property of Government and shall be properly stacked at site, approved by the **Employer/ Employer's representative**. No payment whatsoever shall be made for such cutting and its stacking by the Contractor. If any produce from such cutting is not handed over to the Government by the contractor, he shall be charged for the same at the rates to be decided by the **Employer/ Employer's representative**. The recovery of this amount shall be made in full from the intermediate bill that follows.

(c) The contractor shall also make arrangements of fuel deposits for supply of required fuel for the labourer to be employed for cooking purpose at his own cost in order to prevent destruction of vegetation growth in the surrounding area of the work site.

29 Possession prior to completion:

The **Employer/ Employer's representative** shall have the right to take possession of or use any completed part of work or works or any part thereof under construction either temporarily or permanently. Such possession or use shall not be deemed as an acceptance of any work either completed or not completed in accordance with the contract with in the interest of Clause except where expressly otherwise specified by the Engineer-in-charge.

30 Payment upon termination:

If the contract is terminated because of a fundamental breach of contract by the contractor, the **Employer/ Employer's representative** shall issue a certificate for the value of the work done less advance payment received upon the date of the issue of the certificate 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 Department exceeds any payment due to the contractor the difference shall be a debt payable to the Department. In case of default for payment within 28 days from the date of issue of notice to the above effect, the contractor shall be liable to pay interest at 12% per annum for the period of delay.

31 Access to the contractor's books:

Whenever it is considered necessary by the Engineer-in-Charge to ascertain the actual cost of execution of any particular extra item of work or supply of the plant or material on which advance is to be made or of extra items or claims, he shall direct the contractor to produce the relevant documents such as payrolls, records of personnel, invoices of materials and any or all data relevant to the item or necessary to determine its cost etc. and the contractor shall when so required furnish all information pertaining to the aforesaid items in the mode and manner that may be specified by the Engineer-in-Charge.

32 Drawing to be kept at site:

One copy of the drawings furnished to the contractor shall be kept by the contractor on the site and the same shall at all reasonable time be available for inspection and use by the Engineer-in-Charge and the Engineer-in-Charge's representative and by any other persons authorised by the Engineer-in-Charge in writing.

33 B.I.S. [I.S.I.] books to be kept at site:

A complete set of Indian Standard specifications, CPHEEO manual and also conform to the standard specifications like BIS Specifications/MoRTH/ NBC/NEC/GOI Manuals/GOI advisories etc., on sewerage and treatment and any other relevant literature referred to in "Technical Specifications" shall be kept at site for reference.

34 Site Order Book:

An order book shall be kept at the site of the work. As far as possible, all orders regarding the work are to be entered in this book. All entries shall be signed and dated by the Project Manager of PMC, Department Officer in direct charge of the work and by the contractor or by his representative. In important cases, the Executive Engineer or the Superintending Engineer will countersign the entries, which have been made. The order book shall not be removed from the work, except with the written permission of the Executive Engineer.

35 Variations by way of modification, omissions or additions:

For all modifications, omissions from or additions to the drawings and specifications, the **Employer/ Employer's representative** will issue revised plans, or written instructions, or both. No modification, omission or addition shall be made unless approved by the Department.

The **Employer/ Employer's representative** shall have the privilege of ordering modifications, omission or additions at any time before the completion of the work and such orders shall not operate to annual those portions of the specifications with which said changes do not conflict.

Employer/ Employer's representative Decision:

It shall be accepted as in separable part of the contract that in matters regarding materials, workmanship, removal of improper work, interpretation of the contract drawings and contract specification, mode of the procedure and the carrying out of the work, the decision of the **Employer/ Employer's representative**, which shall be given in writing, shall be binding on the contractor.

36 Care and diversion of river/stream:

The contractor shall submit details regarding the diversion and care of river or stream during construction of the work along with a separate print-out of the time table showing earliest and latest start and finish dates of various activities. He should submit a detailed layout plan with drawings for the diversion and care of river during construction of work. The above arrangements shall be at contractor's cost.

37 Goods and Service Tax (GST) on works contract:

The percentage quoted by the contractor is exclusive of Goods and Service Tax (GST) but inclusive of other taxes on all materials that the contractor will have to purchase for performance of this contract.

GST component loaded in Part 'B' of the estimate shall be added in each bill of the contractors who opt for composition scheme and recovered.

The contractor should produce a valid GST Clearance Certificate before the payment of the final bill, otherwise payment to the contractor will be withheld.

Any revision in Tax rates will be implemented as per rules from time to time.

Any revision in Tax rates will be implemented as per rules.

38 **Labour Cess**: As per the Building and other Construction Workers Welfare CESS Act, 1996, Section 3 of CESS Act, read with rule 4(3) of the cases rules and in accordance with S.O.No.2899, dt.28-

03-1996 of Government of India, 1% CESS will be deducted from the bills payable to the contractor.

39 Supply of materials:

(i) The contractor has to make his own arrangements for procurements, supply and use of materials.

(ii) All materials so procured should confirm to the relevant specifications indicated in the bidding documents.

(iii) The contractor shall follow all regulations of the Department/Government of India in respect of import licenses etc., of the procurement of the materials is through imports and he shall be responsible for the payment of applicable duties and taxes, port clearances, inland transportation etc.

40 Setting Out

40.1 The contractor shall establish, maintain and assume responsibility for grades, lines, levels and bench marks. He shall report any errors or inconsistencies regarding grades, lines, levels, dimensions to the Engineer-in-Charge before commencing work. Commencement of work shall be regarded as the contractor's acceptance of such grades, lines, levels and dimensions and no claim shall be entertained at a later date for any errors found.

40.2 In order to set the alignment of buildings / foundations and to mark the same on the ground, the agency is to adopt "total station" surveying method. The agency is to engage a well versed and well experienced surveyor in "total station" survey. Nothing extra for this total station survey is payable.

If at any time, any error in the respect of setting out appears during the progress of the work, the contractor shall, at his own expense rectify such error if so required, to the satisfaction of the Engineer-in-Charge.

Though the site levels are indicated in the drawings, the contractor shall ascertain himself and confirm the site levels with respect to GTS bench mark from the concerned authorities. The contractor shall protect and maintain temporary/ permanent benchmarks at the site of work throughout the execution of the work. These bench marks shall be got checked by the Engineer-in-Charge or his authorized representatives.

The work at different stages shall be checked with reference to bench marks maintained for the said purpose. Nothing extra shall be payable on this account.

The approval by the Engineer-in-Charge, of the setting out by the contractor, shall not relieve the contractor of any of his responsibilities and obligation to rectify the errors/defects, if any, which may be found at any stage during the progress of the work or after the completion of the work.

40.3 The contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignments, the level and correctness of every part of the work and shall rectify effectively any errors or imperfections therein. Such rectifications shall be carried out by the contractor at his own cost to the instructions and satisfaction of the Engineer-in-Charge.

40.4 The Contractor shall carry out survey of the work area, at his own cost, setting out the layout of building in consultation with the Engineer-in-Charge & proceed further. Any discrepancy between the architectural drawings and actual layout at site shall be brought to the notice of the Engineer-in-charge. It shall be responsibility of the Contractor to ensure correct setting out of alignment.

Total station survey instruments only shall be used for layout, fixing boundaries, and center lines, etc., along with theodolites. Nothing extra shall be payable on this account.

40.5 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of work. All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings.

41 General cleanliness of the site and Stacking & Storage of Materials:

41.1 The site of work shall be always kept clean in general strictly adhering to approved job layout and green building parameters. The Contractor shall take all care to prevent any water- logging at site. The waste water shall not be allowed to be collected at site. It may be directly pumped into the public drainage system with prior approval of the concerned authorities. For discharge into public drainage system, necessary permission shall be obtained from concerned authorities after paying the necessary charges, if any, directly to the authorities. The work shall be carried out in such a way that the area is kept clean and tidy. All the fees/charges in this regard shall be borne by the Contractor. Nothing extra shall be payable on this account.

41.2 The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, compound wall, services etc. are to be constructed.

41.3 The contractor shall construct suitable godowns, yard at the site of work for storing all other materials so as to be safe against damage by sun, rain, damages, fire, theft etc. at his own cost and also employ necessary watch and ward establishment for the purpose at his cost.

42 Scaffolding & Staging (General):

42.1 Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the contractor. The scaffolding shall be provided strictly with steel double scaffolding system, suitably braced for stability, with all the accessories, gangways, etc. with adjustable suitable working platforms to access the areas with ease for working and inspection. Single scaffolding system is strictly prohibited and shall invite necessary action. It shall be designed to take all incidental loads. It should cater to the safety features for workmen. Nothing extra shall be payable on this account. It shall be ensured that no damage is caused to any structure due to the scaffolding.

42.2 The contractor should submit the shop drawings of staging and shuttering for approval of Engineer-in-Charge before actually commencing the execution of work under the item. Nothing extra shall be payable on this account.

43 SECRECY

43.1 The contractor shall take all steps necessary that all persons employed on any work in connection with the contract have noticed that the Indian Official Secrets Act 1923 applies to them & will continue so to apply even after the execution of such works under the contract.

43.2 The contract is confidential and must be strictly confined to the contractor's own use (except so far as confidential disclosure to sub-contractors or suppliers as necessary) and to the purpose of the contract.

43.3 All documents, copies thereof & extracts there from furnished to the contractor shall be returned to the Engineer-in-Charge on the completion of the work / works or the earlier determination of the contract.

44 LABOUR AND SECURITY

44.1 In the event of the contractor(s) committing a default or breach of any of the provisions of the Contractor's Labor Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Government a sum not exceeding Rs.500/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.500/- per day for each day of default. The decision of the Engineer-in-Charge shall be final and binding on the parties.

No payment shall be made for construction of labor housing.

44.2 The Contractor shall display all permissions, licenses, registration certificates, other statements etc. under various labor laws and other regulations applicable to the works, at his site office.

44.3 Contractor should provide his plan for labor huts as per his requirement and get it approved from the Engineer-in-Charge. The contractor will be provided space for labor huts etc. inside the campus at a suitable place, but the space requirement and location, as assessed by Engineer-in-Charge shall be final and binding.

44.4 If as per the rules of the local authority, the huts for labor are not to be erected at the site of work by the contractors, the contractors are required to provide such accommodation as is acceptable to local bodies and nothing extra shall be paid on this account.

44.5 Contractor has to follow the security requirement of the campus and obtain necessary entry passes for the labor and vehicles and follow security checks at entry / exit gates, restriction on movement of vehicle, restricted timings of working etc. The Department however shall assist the contractor in obtaining such passes for movement of vehicles and labor. No claim whatsoever shall be entertained on account of delay in entry of vehicles and labor including restrictions in working hours, if there is any.

44.6 The contractor shall employ only Indian Nationals after verifying their antecedents and loyalty. The contractor shall, on demand submit list of his agents, employees and work people concerned & shall satisfy as to the bonafides of such people.

44.7 The contractor & his work people shall observe all relevant rules regarding security promulgated in which work is to be carried out by the Controlling Administrative Authority of the campus/area (hereinafter referred to as "Administrator").

44.8 The contractor, his representative, workman shall be allowed to enter through specified gates & timing as laid down by the controlling authority. They shall be issued an identity card or an individual pass in accordance with the standing rules & regulations & they should possess the same while working. The contractor shall be responsible for the conduct & actions of his workmen, agents/ representatives.

44.9 Normally contractor shall be allowed to carry out work between 7 AM to 6 PM. However, he may also be allowed to carry out the work beyond 6 PM & up to 7 AM if the site conditions / circumstances so demand with prior written permission from the "Administrator". However, if the work is carried out in more than one shift or at night, no claim on this account shall be entertained.

44.10 Normally contractor's material / vehicles etc. shall be allowed to move in / go-out between 7 AM to 7 PM only & no movement of material / vehicles out of site of work shall be allowed during night hours unless specific permission is obtained from the "Administrator".

44.11 In case if a separate entry has been allowed, the contractor has to make all arrangement for making a separate entry gate and barricading of the working area to segregate/separate the same from other areas. All these have to be done by the contractor at his own cost including safeguarding any untoward incident in the restricted area due to separate entry gate and barricading arranged by the contractor. No extra amount on this account shall be payable by the department.

44.12 In the event of any restrictions being imposed by the Security agency, movement of labor /material, the contractor shall strictly follow such restrictions and nothing extra shall be payable to the contractor on such accounts. The loss of time on these accounts, if any, shall have to be made up by augmenting additional resources whatever required. Nothing extra shall be payable on this account.

45 DOCUMENTATION

The Contractor shall render all help and assistance in documenting the total sequences of this project by way of photography, slides, audio / video recording & other records etc. Nothing extra shall be payable to Contractor on this account. However, cost of photographs, slides, audio / video graph etc. shall be borne by the Department. The original films shall be the property of the Department. No copy shall be prepared without the prior approval of the Engineer- in – Charge.

46 PROGRESS CHART: -

46.1 The contractor shall submit a Time and Progress Chart for each mile stone. **The Engineer-in-charge may within 15 days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-charge. The work programme shall include all details of balance drawings and decisions required to complete the contract with specific dates by which these details are required by contractor without causing any delay in execution of the work.** The chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones given elsewhere in this tender document.

46.2 The contractor shall submit the **Time and Progress Chart**

46.3 The program chart should include the following: -

a) Descriptive note explaining sequence of various activities.
b) **PERT or CPM** of programming using **MS Project or Primavera** or in other format decided by Engineer-in-charge which will indicate resources in financial terms, manpower and specialized equipment's or every important stage.
c) Program for procurement of materials by the contractor.
d) Program for arranging and deployment of manpower both skilled and unskilled so as to achieve targeted progress.
e) Program of procurement of machinery / equipment's having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor. In addition, to the above to achieve the progress of work as per programme, the contractor must bring at site adequate shuttering material required for cement concrete and RCC works etc. The contractor shall submit shuttering schedule adequate to complete the structure work within the laid down physical milestones.
f) Programme for achieving milestones.

46.4 The submission for approval by the Engineer-in-charge of such programme or such particulars shall not relieve the contractor of any of the duties or responsibilities under the contract. This is without prejudice to the right of Engineer-in-charge to take action against the contractor as per terms and conditions of the agreement.

47 PROGRESS AND MONITORING OF WORK:

47.1 The progress report shall contain the following, apart from whatever else may be required as specified:-

(i) Progress chart of the various components of the work that are planned and achieved, for the month as well as cumulative up to the month, with reason for deviations, if any in a tabular format.
(ii) Plant and machinery statement, indicating those deployed in the work.
(iii) Man-power statement, indicating individually the names of all the staff deployed on the work, along with their designations. Number of skilled workers and unskilled workers deployed on the work and their location of deployment.
(iv) Financial statement, indicating the broad details of all the running account payment received up to date, such as gross value of work done, advances taken, recoveries effected, amount withheld, net payments details of cheque payment received, extra /substituted /deviations items if any, etc.

47.2 The contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge and shall as far as possible arrange his work and shall place and dispose of the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of Engineer-in-charge.

47.3 The Contractor shall do proper sequencing of the various activities by suitably staggering the activities within various pockets in the plot so as to achieve early completion. The agency may

deploy adequate equipment, machinery and labor as required for the completion of the entire work within the stipulated period specified. Also ancillary facilities shall be provided commensurate with requirement to complete the entire work within the stipulated period. Nothing extra shall be payable on this account. Adequate number/sets of equipment in working condition, along with adequate stand-by arrangements, shall be deployed during entire period. It shall be ensured by the Contractor that all the equipment, Tools & Plants, machineries etc. provided by him are maintained in proper working conditions at all times during the progress of the work and till the completion of the work.

47.4 All material shall only be brought at site as per program finalized with the Engineer-in-Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

48 PROJECT REVIEW MEETINGS:

The contractor, immediately on award of work shall submit details of his key personnel to be engaged for the work at site. In addition, he shall furnish the Engineer-in-charge detailed organization involved with the work.

The contractor shall present the programme and status at various review meetings as required.

Monthly Review Meetings: Shall be attended by Project - in - charge and the Management Representative who can take independent decisions along with Client.

Agenda

a) Progress Status/Statistics.

b) Completion Outlook.

c) Major hold ups/slippages.

d) Assistance required.

e) Critical issues.

f) Any decision on queries raised either by Contractor/PMC.

g) Anticipated cash flow requirement for next two months.

49 Rates and other conditions for payment:

The rates quoted by the Contractor are deemed to be inclusive of the following--

49.1 All labor, material, tools and other inputs involved in the item.

49.2 For completing the work in time, the Contractor might be required to work in two or more shifts (including night shifts). No claim whatsoever shall be entertained on this account, not with-standing the fact that the Contractor may have to pay extra amounts for any reason, to the laborers and other staff engaged directly or indirectly on the work according to the provisions of the labor and other statutory body regulations and the agreement entered upon by the Contractor with them.

49.3 The Contractor shall keep himself fully informed of all acts and laws of the Central & State Governments, all orders, decrees of statutory bodies, tribunals having any jurisdiction or authority, which in any manner may affect those engaged or employed and anything related to carrying out the work. All the rules & regulations and bye-laws shall be adhered to, by the contractor, during the execution of work. The Contractor shall also adhere to all traffic

restrictions notified by the local authorities. The Contractor shall arrange to give all notices as required by any statutory / regulatory authority and obtain all requisite licenses wherever required and shall pay to such authority all the fees that are required to be paid for the execution of work. He shall protect and indemnify the Department and its officials & employees against any claim and /or liability arising out of violations of any such laws, ordinances, orders, decrees, by himself or by his employees or his authorized representatives. Nothing extra shall be payable on these accounts. The fee payable to statutory authorities for obtaining the various permanent service connections and Occupancy Certificate for the building shall be borne by the Department.

49.4 The rates of the items indicated in the BoQ are exclusive of the Seigniorage Charges. Appropriate Seigniorage Charges for relevant materials will be calculated and paid by the PM to the concerned department at the time of payment of bills to the contractor.

49.5 All ancillary and incidental facilities required for execution of work like labor camp, stores, fabrication yard, offices for Contractor, watch and ward, temporary ramp required to be made for working at the basement level, temporary structure for plants and machineries, water storage tanks, installation and consumption charges of temporary electricity, telephone, water etc. required for execution of the work, liaison and pursuing for obtaining various No Objection Certificates, completion certificates from local bodies etc., protection works, barricading, testing facilities / laboratory at site of work, facilities for all field tests and for taking samples etc. during execution or any other activity which is necessary (for execution of work and as directed by Engineer-in-Charge), shall be deemed to be included in rates quoted by the Contractor, for various items in the schedule of quantities. Nothing extra shall be payable on these accounts. Before start of the work, the Contractor shall submit to the Engineer-in-Charge, a site / construction yard layout, specifying areas for construction, site office, positioning of machinery, material yard, cement and other storage, steel fabrication yard, site laboratory, water tank, etc.

49.6 The Contractor shall assume all liability, financial or otherwise in connection with this contract and shall protect and indemnify the Department from any and all damages and claims that may arise on any account. The Contractor shall indemnify the Department against all claims in respect of patent rights, royalties, design, trademarks of name or other protected rights, damages to adjacent buildings, roads or members of public, in course of execution of work or any other reasons whatsoever, and shall himself defend all actions arising from such claims and shall indemnify the Department in all respect from such actions, costs and expenses. Nothing extra shall be payable on this account.

49.7 The Contractor shall make all necessary arrangements for protecting from rain or likewise extreme weather conditions, the work already executed and for carrying out the further work, during monsoon including providing and fixing temporary shelters, protections etc. Nothing extra shall be payable on this account. Also, no claims for hindrance shall be entertained on this account.

49.8 In case of flooding of site on account of rain or any other cause and any consequent damage, whatsoever, no claim financially or otherwise shall be entertained not withstanding any other provisions elsewhere in the contract agreement. Also, the Contractor shall make good, at his

own cost, the damages caused, if any. Further, no claims for hindrance shall be entertained on this account.

49.9 No payment shall be made for any damage caused by fire, rain, snowfall, flood or any other natural calamity, whatsoever during the execution of the work. The contractor shall be fully responsible for any damage to the govt. property and the work for which payment has been advanced to him under the contract and he shall make good the same at his risk and cost. The contractor shall be fully responsible for safety and security of his material, T&P/Machinery brought to the site by him. The contractor shall maintain all the work in good condition at his own cost till the completion of the entire work.

49.10 In case the same item appears more than once in the schedule of work under the same sub head or among the different sub heads of works, the lowest rate quoted for that item shall be taken for other items also and tender will be evaluated accordingly.

49.11 The ESI and EPF contribution on the part of 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 applicable and eligible amount of EPF& ESI shall be reimbursed preferably within 7 days but not later than 30 days of submission of documentary proof of payment which are in order.

50 The defect liability / maintenance period shall be 36 months after the date of completion of work for this contract agreement. The Security Deposit shall be released after the defect liability period of 36 months after completion of work and for this, the contractor shall have to produce a certificate stating that no defects are pending for rectification from the Engineer-in-charge, but subject to other provisions specified elsewhere in the contract agreement.

51 The appellate authority is Superintending Engineer in respect of designs and drawings approved by Engineer-in-charge.

52 The appellate authority is Chief Engineer in respect of designs and drawings approved by Superintending Engineer.

53 The appellate authority is the Committee constituted by the Government in respect of designs and drawings approved by Chief Engineer.

54 M. Books and L.F. Books have to be issued by the Executive Engineer to contractor duly certified and numbered for recording measurements and levels. The M. Books and L.F. Books shall be maintained by contractor and bills are to be submitted to the Engineer in Charge by the contractor along with a true extract of the entire set for checking and making payment. The Engineer-in-charge has to keep the full set of true extract with him and return the originals to the contractor for further use. The entire original record shall be finally handed over for record to the Engineer-in-charge by the contractor.

55 Wherever Quality Control agencies are in existence, such agency has to furnish certificates as prescribed separately.

56 The designs are to be submitted by the executing agency which shall be approved by the competent authority. The contractor responsible for the technical features of designs. The competent authority approving the designs is accountable to the department.

57 The Contractor shall prepare monthly work bills based on measurements of work done and submit to Engineer-in-charge.

58 Payments shall be regulated in accordance with Clause of general conditions of contract Schedule of Payments component wise.

59 The eligibility for payment shall be limited to completed portions of works, subject to other conditions envisaged in the agreement and executive instructions from time to time.

60 The Sub Divisional Officer and Engineer-in-charge shall exercise check to see that the bill submitted by contractor is in accordance with agreement conditions and certified by the departmental Quality Control Authorities (or) 3rd Party Quality Control Agency (or) by both if both are deployed on the work.

61 Engineer-in-charge (E.E) should check the claim with reference to the measurements recorded to see that the percentage at which the bill is claimed is clearly traceable into the documents on which payments are to be made. Payments shall be adjusted for recovery of advance payments, liquidated damages in terms of agreement conditions, security deposit for due fulfillment of the contract.

62 ROLES AND RESPONSIBILITIES OF CONSTRUCTION STAFF, QUALITY CONTROL WING AND THIRD PARTY QUALITY CONTROL AGENCY IN EXECUTION OF PROJECT

62.1 FIELD STAFF

(i) The field staff (construction staff) has to associate with the contractor while conducting the tests. In case of necessity they may conduct tests independently whenever required. The field staff play a vital role in quality assurance of the works.

(ii) The field staff shall invariably check and produce all the following Records and OK cards maintained by contractor at the site to the Inspecting Officers.

62.2 Registers

(a) Site Order

(b) Register of Bench Marks

(c) Material OK Register

(d) Register of Foundations

(e) Register of placement for concrete, Embankment, reinforcement and other test reports.

(f) Register of laying pipelines, testing.

(g) Register of test reports of comprehensive strength of concrete specimens

(h) Cement Day Book

In case of Earthwork excavation embankment, the field staff have to check and record the pre levels 25% of the pre levels taken by the contractor. In case of cut-off and foundations the field staff have to check and record 100% levels.

62.3 Department Quality Control Staff.

(i) The Department Quality Control staff shall verify the records maintained at site by contractor and the third party quality control agency. The filed quality control staff have to check 25% of works such as pipes, laying, jointing, testing including pumping machinery and record independently.

(ii) Wherever the Third Party Quality Control agency is not appointed, the department Quality Control staff have to issue the quality certificates for releasing payment to the contractor during construction and other completion.

62.4 Third Party Quality Control Agency

(i) The Third Party Quality Control agency or PMC should posses all the Testing facilities as per agreement and conduct independent testing toassure the quality of work. They should also verify 10% of the tests being done by the Contractor independently.

(ii) The third party quality control agency has to submit the reports and records to the Engineer-in-Charge vide appendix "E".

62.5 Recording of measurements and certifying payments to the Contractor.

(i) Measurements are to be recorded by the contractor in the Measurement Book and LF Books.

(ii) The measurement book and LF book are to be issued by the concerned Executive Engineer duly certified and numbered.

(iii) Field Engineer have to verify and record
   a) 1/3rd of pre levels taken by Contractor.
   b) 100% Levels in case of cut off & foundations.
   c) 25% of intermediate work done levels
   d) 100% for final levels recorded by contractor

(iv) All measurements recorded by the contractor in the M. Books shall be checked to 100% extent by AEs/AEEs.

(v) DEEs, EEs & SEs have to check the above levels and measurements as perstanding codal provisions and orders.

(vi) Wherever quality control agencies are in existence, such agency has to record its findings in M. Books/L.F. Books besides furnishing certificates as prescribed separately.

(vii) The Department QC Staff have to check 25% of the work such as pipes, laying, jointing, testing, concrete work, etc.

(viii) Measurement will be recorded by the contractor for the finished work duly certifying that all tests are conducted and work done by the agency in accordance with specifications and contracts conditions by using the material specified in the contract.

(ix) The contractor shall prepare monthly work bills based on the recorded measurement of work done and submit to the Engineer-in-charge duly signed by them or his authorized signature for arranging

(x) The Engineer-in-Charge shall recommend for release of payment duly ensuring quality certificate by the third party quality control agency / Department quality control staff (in absence of third party quality control).

(xi) **If a PMC is appointed by the Authority, the guidelines shall be followed as per the PMC agreement.**

NOTE: The above guidelines have to be followed duly inter relating with the relevant conditions / clauses of the respective Agreements concluded.

62.6 Reporting procedure for adverse remarks of 3rd party Quality Control Agency and Departmental Quality Control Staff or PMC whichever is applicable.

(i) The third party quality control agency shall submit reports in four sets for specific cases of deficiencies for corrective action to the Engineer-in-charge soon after verification. The sub-standard material shall be rejected and got them removed from the site. In case necessity, Engineer-in- Charge shall arrange to stop the work till the deficiencies are rectified to the satisfaction of the 3rd party Quality control Agency / departmental quality staff / PMC.

(ii) The Engineer-in-Charge shall communicate the above remarks of 3rd party quality control agency to the Contractor for compliance of corrective action.

(iii) The Contractor shall furnish compliance report to the Engineer-in-Charge, who in turn forward the same to the third party quality control agency / department quality control as the case may be for verification.

(iv) Soon after receipt of report on the compliance to the remarks of the third party quality control agency by the Contractor, evidence of compliance of corrective action has to be furnished to the Engineer-in-Charge to proceed with further work.

(v) In addition to the above, the observations made by the third party quality control and the Department quality control staff have to be invariably completed with before the next bill is present for payment and certificate to that effect has to be recorded in bills presented by the Contractor duly countersigned by their field construction staff before making payments.

(vi) On completion of the works, the third party control agency and Department Quality Control staff have to certify that the work has been executed as per design and specifications satisfying intended scope of project as indicated in the agreement before making final payments to the Contractor.

INDEX FOR TECHNICAL SPECIFICATIONS

1. PREAMBLE

These Specifications cover the items of work in structural and non- structural parts of the works coming under Preview of this document. All work shall be carried out in conformation with this. In general, provisions of Indian Standards, Indian Roads Congress Codes and other national standards have been followed. These specifications are not intended to cover the minute details. The work shall be executed in accordance with best modern practices. All codes and standards referred to in these specifications shall be the latest thereof.

2. INCLUSIVE DOCUMENTS

The provision of Special Conditions of Contract, General Conditions of Contract, those specified on the tender as well as execution drawings and notes or other specifications issued in writing by the PMC / Engineer shall from part of these specifications.

3. ORDER OF PRECEDENCE, CLARIFICATION AND INTERPRETATION

When the various specifications and codes referred to in preceding portion are at variance with these specifications and each other the following order of precedence will generally be accepted.

3.1. Special conditions of contract, item wise technical specifications if provided and execution drawings.
3.2. Provisions of general specifications.
3.3. I. S. Codes.
3.4. IRC Codes, M. O. S. T,/ M.O.R.T.H, Specifications etc.

The attention of the contractor is drawn to those clauses of IS codes which require either specification by Engineer or the mutual agreement between the supplier and purchaser. In such cases it is the responsibility of the contractor to seek clarification on any uncertainty and obtain previous approval of the Engineer before taking up the supply/ construction.

4. MEASUREMENT AND PAYMENTS

The methods of measurement and payment shall be as described under various items and in the bill of quantity. Where specific definitions are not given, the methods described in IS 1200 will be followed Should there be any detail of construction or materials which has not been referred to in specification or in the bill of quantities and drawings but the necessity for which may be implied or inferred wherefrom, or which are usual or essential to the completion of the work in the trades, the same shall be deemed to be included in the rates and prices quoted by the contractor in the bill of quantities.

5. UNACCEPTABLE WORK

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc. as specified by the Engineer-in-charge, the cost of repairs will be borne by the contractor. In the event of the work being accepted by giving 'Design Concession', arising out of but not limited to under sizing, under strength, shift in location and alignment, etc. and accepting design stresses in members which are higher than those provided for in the original design or by accepting materials not fully meeting the specifications etc. the contractor will be paid for the works actually carried out by him at the suitable reduced rate of the tendered rates for the portion of the work thus accepted.

6. GENERAL SPECIFICATION

6.1. These specifications are for work to be done, item to be supplied and materials to be used in the works as shown and defined on the drawings and herein to the satisfaction of the Owner/ Architect.

6.2. The workmanship is to be the best possible and of a high standard. The contractor shall take all steps immediately to make up deficiency if any noticed by the Owner / Architect. Use must be made of special tradesmen in all aspects of the work and allowance must be made in the rates for the same.

6.3. The materials to be provided by the contractor shall be in accordance with the samples already got approval from the Owner / Architect by the contractor and in conformity with specification and approved is list of manufacture and brand. The contractor shall produce all invoices, vouchers or receipts for any materials if called upon to do so by the Owner/ Architect.

6.4. A sample of all materials is to be submitted to the Owner/ Architects for their approval before the contractor orders or delivers the material to the site. Samples together with their packing are to be provided free of charge by the contractor and should any materials be rejected they will be removed from the site at the contractor's expense. All samples will be retained by the Owners / Architects for comparison with materials which will be delivered at site. Also the contractor will be required to submit specimen finishes colours, Glass, etc., for approval of the Owners / Architects before proceeding with the works.

6.5. The contractor shall be responsible for providing and maintaining temporary coverage required for the protection of finished work. He is also to clean out all wood shavings; cut ends and other waste from all parts of the works before covering of infillings are constructed.

6.6. Contractor shall maintain uniform quality and consistency in workmanship throughout the execution of the work.

6.7. The contractor shall provide: All materials, labour, maintenance, fixing, carrying, cleaning, and making good, etc. temporary canvas, plastics and any other requisite protection of the works, all the necessary equipments, labour and removal of the same at the completion of the work. The Architect will be the sole judge in deciding as to the suitability of the tools or plants that may be brought on the works by the contractors, for the proper execution of the work.

6.8. The head masons and the supervisors on the works shall always carry with them a two feet rule, a measuring tape (15 mts.) a spirit level, a plumb bob and a square and shall check that the work is being done according to the drawings and specifications. The Architect or its representative will use any OR all measuring instruments / tools belonging to the Contractors in checking the works executed.

6.9. All measuring tapes shall be of steel and scaffolding and ladders that may be required for taking measurements shall be supplied by the Contractors.

6.10. The Contractor shall place at the disposal of the Employer and the Architect and the advice of himself and his firm, and their staff or Foreman of trades or other skilled person employed by him or them for the conduct of the works comprised in the Contract.

6.11. The Contractors are to take care in loading and unloading materials for the works, so that the roads and footpaths are not obstructed, damaged or the traffic impeded, and they must conform with the Police Regulations for carrying, loading and unloading all materials, plant, earth, debris, etc. to and from the buildings.

6.12. The Architect shall have full powers and authority to issue such instructions as to the order of proceeding with or carrying out the work as he may deem necessary for the guidance of the Contractor and contractor shall be bound by such instructions of the Architect or any person authorized by the Architect to give such instructions.

6.13. The levels and measurements of the existing site, as shown in the drawings, are believed to be correct, but the Contractor should verify them for himself. No claim or allowance whatsoever will be entertained hereafter on account of any errors or omission in the description of the site turning out different from what was expected or shown in the drawings.

6.14. All floors, paving, staircase, etc. are to be scrubbed, all glasses to be cleaned on both sides of windows/curtain wall including its members, screens, doors, sky-lights, roof lights, etc., all gulley, gutters, pipe heads, etc. to be cleaned out and the premises left clean, perfect and water tight upon completion. However, a proper care needs to be taken during such cleaning works that the original finishing such as polishing, painting, anodizing, powder coating etc. are not scratched/damaged. In case of any such damage, the contractor shall have to reinstate the same as original as per the instructions of Employer/Architects, without any cost to Employer.

6.15. The Contractor shall work in co-ordination with all electrical, Air-Conditioning/HVAC, Fire Fighting/Detection, Security System and any other contractors working for other works involved in the project and provide all necessary assistance to them for successful completion of the project.

6.16. Any loss or damage caused due to fault or negligence on the part of Contractors labours, staff etc. during working in the premises will be made good by contractor at no extra cost or the damage and repair cost will be reimbursed in full to the Employer.

6.17. The contractor shall be responsible to provide and maintain temporary coverage required for the protection of finished work. He is also required to clean out all wood shavings; cut ends and other waste from all parts of the works before covering of infillings are constructed.

6.18. The contractor shall be responsible for providing and maintaining any boxing or other temporary coverage's required for the protection of dresses or finished work if left un-protected. He is also to clean out all shavings, cut ends and other waste from all parts of the work before coverings or in-fillings are constructed.

6.19. Templates, boxes and moulds shall be accurately set out and rigidly constructed so as to remain accurate during the time they are in use.

6.20. All unexposed surfaces of timber e.g. backing fillets, backs of door frames, cupboard framing, grounds, etc., are to be treated with two coats of approved timber preservative before fixing or covering.

6.21. All the contractors should consider the below mentioned points before quoting for the job.

6.21.1. All vitrified tiles/granite/marble samples to be approved prior to fix the same wherever mentioned.

6.21.2. The expenses for paying Municipal Taxes for dumping materials on/off site, etc. to be borne by the contractor.

6.21.3. Expenses of bearing ward officer's sanction, etc. To be borne by the contractor.

6.21.4. Contractor should be responsible for the security of the materials on site.

6.21.5. Contractor should be responsible for lifting of the material to the respective floors and expenses of the same should be borne by him.

7. GENERAL SPECIFICATIONS FOR MATERIAL AND WORKMANSHIP

7.1. All materials brought on the site of works and meant to be used for the said project site, shall be as per the approved makes mentioned and shall be deposited with architect before the order for the materials is placed with the suppliers / manufacturers and should be prior approved from the Architect before execution.

7.2. The workmanship is to be the best available and of a high standard, use must be made of a special tradesman in all aspects of the work and allowances must be made in the rates for so doing.

7.3. Workmanship: All works shall be to true line, level, plumb and square corners, edges and arises in all cases shall be unbroken and finished neat. Only first class workmanship will be accepted. Contractor shall maintain uniform quality and consistency in workmanship throughout the execution of the work.

7.4. Skilled head masons / tradesman for the respective trades shall be employed by the contractors to check the work in progress and to instruct and extract the right kind of workmanship from the men employed on the works. Instructions given to such Head masons by the Architect or his Representative shall be carried out with a view to get the work executed in a neat and workman like manner, according to the specifications.

7.5. The Architect may order for the inspection of any finished work as he chooses and in a manner he decides, and the contractors shall bear all expenses in this connection. If the results of such inspection prove that the material used and/or workmanship is not of the standard required, the work will be rejected and removed forthwith and be replaced by works of the accepted standard of quality and material. The rejected material must be stored in separate room created to keep such non standard / rejected materials with proper labelling of "REJECTED MATERIAL STORE" and will be there till it gets disposed off from site. This is done to demark the rejected material properly.

7.6. The contractor shall produce all invoices vouchers or receipts for any materials if called upon to do so by the Employer /Architects.

7.7. Samples together with their packing are to be provided free of charge by the Contractor and should any materials be rejected, they will be removed from the site at the Contractor's expense. All samples will be retained by the Employer/Architects for comparison with materials, which will be required to submit specimen finishes of colours, fabrics, etc., for the approval of the Architects before proceeding with the work.

8. STACKING AND STORING OF MATERIALS

8.1. CEMENT

In case cement is received in bags. Cement shall be stored at the work site in a building or a
Shed which is dry, leak-proof and as moisture proof as possible. The building or shed for storage should have minimum number of windows and close fitting doors and these should be kept closed as far as possible.

Cement shall be stored and stacked in bags and shall be kept free from the possibility of any
Dampness or moisture coming in contact with them. Cement bags shall be stacked off the floor on wooden planks in such a way as to keep about 150 mm to 200 mm clear above the floor. The floor may comprise of lean cement concrete or two layers of dry bricks laid on well consolidated earth. A space of 600 mm minimum shall be left all-round between the exterior walls and the stacks. In the stacks the cement bags shall be kept close together to reduce circulation of air as much as possible. Owing to pressure on the bottom layer of bags sometimes 'warehouse pack' is developed in these bags. This can be removed easily by rolling the bags when the cement is taken out for use. Lumped bags, if any should be removed and disposed off.

The height of stack shall not be more than 10 bags to prevent the possibility of lumping up under pressure. The width of the stack shall be not more than four bags length or 3 metres. In stacks more than 8 bags high, the cement bags shall be arranged alternately length-wise and cross-wise so as to tie the stacks together and minimize the danger of topping over. Cement bags shall be stacked in a manner to facilitate their removal and use in the order in which they are received; a label showing date of receipt of cement shall be put on each stack to know the age of cement.

For extra safety during the monsoon, or when it is expected to store for an unusually long period, the stack shall be completely enclosed by a water proofing membrane such as polyethylene, which shall close on the top of the stack. Care shall be taken to see that the waterproofing membrane is not damaged any time during use.

Cement in gunny bags, paper bags and polyethylene bags shall be stored separately.

In case cement is received in drums these shall be stored on plane level ground, as far as possible near the concrete mixing place. After taking out the required quantity of cement, the lid of the drum shall be securely tied to prevent ingress of moisture.

In case cement is received in silos the silos shall be placed near the concrete batching plant. Proper access shall be provided for the replacement of silos.

Different types of cements shall be stacked and stored separately.

8.2. BRICKS

Bricks shall be stacked in regular tiers as and when they are unloaded to minimize breakage and defacement. These shall not be dumped at site.

Bricks stacks shall be placed close to the site of work so that least effort is required to unload and transport the bricks again by loading on pallets or in barrows. Building bricks shall be loaded or unloaded a pair at a time unless palletized. Unloading of building bricks or handling in any other way likely to damage the corners or edges or other parts of bricks shall not be permitted.

Bricks shall be stacked on dry firm ground. For proper inspection of quality and ease in counting the stacks shall be 50 bricks long, 10 bricks high and not more than 4 bricks in width, the bricks being placed on edge, two at a time along the width of the stack. Clear distance between adjacent stacks shall not be less than 0.8 m. Bricks of each truck load shall be put in one stack.

Bricks of different types, such as clay bricks, clay fly ash bricks, fly ash lime bricks, sand lime (calcium silicate) bricks, auto-clave bricks etc. shall be stacked separately. Bricks of different classification and size consideration (such as, conventional and modular) shall be stacked separately. Also bricks of different types, such as, solid, hollow and perforated shall be stacked separately.

8.3. BLOCKS

Blocks are available as hollow and solid concrete blocks, hollow and solid light weight concrete blocks, autoclaved aerated concrete blocks, concrete stone masonry blocks and soil based blocks.

Blocks shall be unloaded one at a time and stacked in regular tiers to minimize breakage and defacement. These shall not be dumped at site. The height of the stack shall not be more than 1.2 m. The length of the stack shall not be more than 3.0 m, as far as possible and the width shall be of two or three blocks.

Normally blocks cured for 28 days only should be received at site. In case blocks cured for less than 28 days are received, these shall be stacked separately. All blocks should be water cured for 10 to 14 days and air cured for another 15 days; thus no blocks with less than 28 days curing shall be used in building construction.

Blocks shall be placed close to the site of work so that least effort is required for their Transportation.

The date of manufacture of the blocks shall be suitably marked on the stacks of blocks manufactured at factory or site.

8.4. FLOOR, WALL AND ROOF TILES

Floor, wall and clay roof tiles of different types, such as, cement concrete tiles (plain, coloured and terrazzo) and ceramic tiles (glazed and unglazed) shall be stacked on regular platform as far as possible under cover in proper layers and in tiers and they shall not be dumped in heaps. In the stack, the tiles shall be so placed that the mould surface of one faces that of another. Height of the stack shall not be more than one metre. During unloading, these shall be handled carefully so as to avoid breakage.

Tiles of different quality, size and thickness shall be stacked separately to facilitate easy removal for use in work. Tiles when supplied by manufacturers packed in wooden crates shall be stored in crates. The crates shall be opened one at a time as and when required for use.
Ceramic tiles and clay roof tiles are generally supplied in cartons which shall be handled with care. It is preferable to transport these at the site on platform trolleys.

8.5. AGGREGATES

Aggregates shall be stored at site on a hard dry and level patch of ground. If such a surface is not available, a platform of planks or old corrugated iron sheets, or a floor of bricks, or a thin layer of lean concrete shall be made so as to prevent contamination with clay, dust, vegetable and other foreign matter.

Stacks of fine and coarse aggregates shall be kept in separate stock piles sufficiently removed from each other to prevent the material at the edges of the piles from getting intermixed. On a large job, it is desirable to construct dividing walls to give each type of aggregates its own compartment. Fine aggregates shall be stacked in a place where loss due to the effect of wind is minimum.

Unless specified otherwise or necessitated by site conditions stacking of the aggregates should be carried out in regular stacks. The suggested sizes for stacks are as follows:

Sl. No.	Material	Size of Stack (in m)		
		Length	Breadth	Height
(i)	Soling stone	5	2	1
	Or			
	Soling stone	5	1	1
(ii)	Coarse aggregates	2	2	1
	Or			
	Coarse aggregates	5	1	1
(iii)	Fine aggregates	2	2	1
	Or			

	Fine aggregates	5	5	1

8.6. FLY ASH

Fly ash shall be stored in such a manner as to permit easy access for proper inspection and Identification of each consignment. Fly ash in bulk quantities shall be stored in stack similar to fine aggregates as specified in to avoid any intrusion of foreign matter. Fly ash in bags shall be stored in stacks not more than 10 bags high.

8.7. STEEL

For each classification of steel, separate areas shall be earmarked. It is desirable that ends of bars and sections of each class be painted in distinct separate colours.

Steel reinforcement shall ordinarily be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. It is desirable to coat reinforcement with cement wash before stacking to prevent scaling and rusting.

Bars of different classification, sizes and lengths shall be stored separately to facilitate issues in such sizes and lengths so as to minimize wastage in cutting from standard lengths.

In case of long storage, reinforcement bars shall be stacked above ground level by at least 150mm. Also in coastal areas or in case of long storage a coat of cement wash shall be given to prevent scaling and rusting.

Structural steel of different classification, sizes and lengths shall be stored separately. It shall be stored above ground level by at least 150 mm upon platforms, skids or any other suitable supports to avoid distortion of sections. In coastal areas or in case of long storage suitable protective coating of primer paint shall be given to prevent scaling and rusting.

8.8. ALUMINIUM SECTIONS

Aluminium sections of different classification, sizes and lengths shall be stored separately, on a level platform under cover. The aluminium sections shall not be pulled or pushed from the stack nor shall be slided over each other, to protect the anodizing layer.

8.9. DOORS, WINDOWS AND VENTILATORS

While unloading, shifting handling and stacking timber or other lingo-cellulosic material based, metal and plastic door and window frames and shutters, care shall be taken that the material is not dragged one over the other as it may cause damage to the surface of the material particularly in the case of decorative shutters. The material should be lifted and carried preferably flat avoiding damage of corners or sides.

Metal and plastic doors, windows and ventilators shall be stacked upright (on their sills) on level ground preferably on wooden battens and shall not come in contact with dirt and ashes. If received in crates they shall be stacked according to manufacturer's instructions and removed from the crates as and when required for the work.

Metal and plastic frames of doors, windows and ventilators shall be stacked upside down with the kick plates at the top. These shall not be allowed to stand for long in this manner before being fixed so as to avoid the door frames getting out of shape and hinges being strained and shutters drooping.

During the period of storage all metal doors, windows and ventilators shall be protected from
Loose cement and mortar by suitable covering such as tarpaulin. The tarpaulin shall be hung loosely on temporary framing to permit circulation of air to prevent condensation.

All timber and other lingo-cellulosic material based frames and shutters shall be stored in a dry and clean covered space away from any infestation and dampness. The storage shall preferably be in well ventilated dry rooms. The frames shall be stacked one over the other in vertical stacks with cross battens at regular distances to keep the stack vertical and straight. These cross battens should be of uniform thickness and placed vertically one above the other. The door shutters shall be stacked in the form of clean vertical stacks over the other and at least 80 mm above ground on pallets or suitable beams or rafters. The top of the stack shall be covered by a protecting cover and weighted down by means of scantlings or other suitable weights. The shutter stack shall rest on hard and level ground.

If any timber or other lingo-cellulosic material based frame or shutter becomes wet during transit, it shall be kept separate from the undamaged material. The wet material may be dried by stacking in shade with battens in between adjacent boards with free access of dry air generally following the guidance laid down in IS 1141.

Separate stacks shall be built up for each size, each grade and each type of material. When
Materials of different sizes grades and types are to be stacked in one stack due to shortage of space; the bigger size shall be stacked in the lower portion of the stacks. Suitable pallets or separating battens shall be kept in between the two types of material.

8.10. ROOFING SHEETS

Roofing sheets shall be stored and handled in such a manner as not do damage them in any
Way.

Plain and corrugated asbestos cement sheets shall be stacked horizontally to a height of not
More than one meter on a firm and level ground, with timber or other packing beneath them. If stacked in exposed position, they shall be protected from damage by the winds. Asbestos cement sheets of same variety and size shall be stacked together. Damage sheets shall not be stacked with sound materials. All damaged sheets shall be salvaged as early as possible.

Corrugated galvanized iron sheets and aluminium sheets shall be stacked horizontally to a height of not more than 0.5 m on a firm and level ground, with timber or other packing beneath them. To protect them from dust and rain water, these shall be covered with tarpaulin or polyethylene sheets.

Plastic sheets and glass reinforced plastic (GRP) sheets shall be stacked under a shed to a
Height of not more than 0.5 m on a firm and level ground with timber or other packing beneath them.

8.11. GYPSUM BOARDS, PLYWOOD, FIBREBOARD, PARTICLE BOARD, BLOCK BOARD, ETC.

These boards shall be stored flat in a covered clean and dry place. Different sizes and types of each of these boards shall be stacked separately. The board shall be stacked on a flat platform on which a wooden frame shall be constructed with 50mm x 25 mm battens in such a way that it will give support to all four edges and corners of the boards with intermediate battens placed at suitable intervals to avoid warping. The boards shall be stacked in a solid block in a clear vertical alignment. The top sheet of each stack shall be suitably weighed down to prevent warping wherever necessary. The boards shall be unloaded and stacked with utmost care avoiding damage to the corners and surface. In case of decorative plywood and decorative boards, the surfaces of which are likely to get damaged by dragging one sheet over another it is advisable that these are lifted as far as possible in pairs facing each other.

8.12. GLASS SHEETS

It is important that all glass sheets whether stored in crates or not shall be kept dry. Suitable
Covered storage space shall be provided for the safe storage of the glass sheets. In removing glass sheets from crates, great care shall be taken to avoid damages. The glass sheets shall be lifted and stored on its long edges against a vertical wall or other support with the first sheet so placed that its bottom edge is 25 mm from the vertical support. The stacks shall be of not more than 25 panes and shall be supported at two points by fillets of wood at 300 mm from each end. The whole stack shall be as close and as upright as possible. The glass sheets of different sizes, thickness and type shall be stacked separately. The distance between any two stacks shall be of the order of 400 mm.

8.13. CAST IRON, GALVANIZED IRON AND ASBESTOS CEMENT PIPES AND FITTINGS

The pipes shall be unloaded where they are required when the trenches are ready to receive
Them. Storage shall be done on firm, level and clear ground and wedges shall be provided at the bottom layer to keep the stack stable.

The stack shall be in pyramid shape or the pipes length-wise and cross-wise in alternate layers. The pyramid stack is advisable in smaller diameter pipes for conserving space in storing them. The height of the stack shall not exceed 1.5 m.

Each stack shall contain only pipes of same class and size, with consignment or batch number marked on it with particulars of suppliers wherever possible.

Cast iron detachable joints and fittings shall be stacked under cover separately from the asbestos cement pipes and fittings.

Rubber rings shall be kept clean, away from grease, oil heat and light.

8.14. UNPLASTICIZED PVC PIPES

The pipe should be given adequate support at all times. Pipes should be stored on a reasonably flat surface free from stones and sharp projections so that the pipe is supported throughout its length. In storage, pipe racks should be avoided. Pipe should not be stacked in large piles, especially under warm temperature conditions as the bottom pipes may distort, thus giving rise to difficulty in jointing. Socket and spigot pipes should be stacked in layers with sockets placed at alternate ends of the stacks to avoid lopsided stacks.

It is recommended not to store pipe inside another pipe.

On no account should pipes be stored in a stressed or bent condition or near the sources of
Heat. Pipes should not be stacked more than 1.5 m high. Pipes of different sizes and classes should be stacked separately. The ends of pipe should be protected from abrasion particularly those specially prepared for jointing either spigot or socket solvent welded joints or shouldered for use with couplings.

In tropical conditions, pipes should be stored in shade. In very cold weather, the impact strength of PVC is reduced making it brittle and more care in handling shall be exercised in wintry condition. If due to unsatisfactory storage of handling a pipe becomes kinked, the damaged portion should be cut out completely. Kinking is likely to occur only on very thin walled pipes.

8.15. WATER

Wherever water is to be stored for construction purposes this shall be done in proper storage tanks to prevent any organic impurities getting mixed up with it.

8.16. OIL PAINTS

All containers of paints, thinners and allied materials shall preferably be stored in a separate
Room on floors with sand cushions. The room shall be well-ventilated and free from excessive heat, sparks of flame and direct rays of sun. The containers of paint shall be kept covered or properly fitted with lid and shall not be kept open except while using. The containers of paints have expiry date marked by the manufacturers, which should be highlighted so as to facilitate use of paint within due period.

8.17. SANITARY APPLIANCES

All sanitary appliances shall be carefully stored under cover to prevent damage. When accepting and storing appliances, advance planning shall be made regarding the sequence of removal from the store to the assembly positions. Supporting brackets shall be so stored as to be readily accessible for use with the appliances.

8.18. OTHER MATERIALS

Small articles like nails, screws, nuts and bolts, door and window fittings, polishing stones, protective clothing, spare parts of machinery, linings, packing, water supply and sanitary fittings, electrical fittings, insulation board, etc, shall be kept in suitable and properly protected store rooms. Valuable small material such as, copper pipes and fittings shall be kept under lock and key.

9. GREEN BUILDING REQUIREMENTS FOR CIVIL INTERIOR CONTRACTOR

Section includes general requirements, submittals and execution procedures for compliance with USGBC (United States Green Building Council) for the project to obtain LEED Green Interior Design and Construction 2009 Gold rating at a minimum of 60 points.

Documentation mentioned below shall not be limited to what is mentioned in the Technical specifications below. The Contractor to submit any other certificates / documents as when required

9.1. GENERAL REQUIREMENTS AND SUBMITTALS

9.1.1. To provide the total materials cost (excluding labour). Provide a tabulation of each recycled/regional/ rapidly renewable /certified wood materials used using the master material sheet.

9.1.2. To reuse salvaged, refurbished or used building materials for 5%/10% of total materials cost, excluding cost of furniture and furnishings. Vendor's certificate to support the amount of reuse content within materials to be provided. Provide photographs of building materials in pre-modified condition, if the said materials are to be reused at the same project site. Provide cost of comparable material available in the local market (replacement value) for all materials to be reused.

9.1.3. To reuse salvaged, refurbished or used furniture and furnishings for 30% of total value of new and reused furniture and furnishings used on the project. Vendor's certificate to support the reuse content of the materials to be provided. Provide photographs of furniture and furnishings in pre-modified condition, if the said materials are to be reused at the same project site. Provide cost of comparable products available in the local market (replacement value) for all furniture and furnishings to be reused.

9.1.4. To use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10%/20% of the total value of the materials in the project. Listing of all materials having recycled content and manufacturer's / vendor's certificate to be provided to show the percentage of post consumer and post industrial

recycled content.. Provide cost of each item containing post consumer and/or post industrial content and total cost of items containing recycled content.

9.1.5. To use a minimum of 20% of building materials that are manufactured regionally within a radius of 500 miles (800kms) from the project site. Of the regionally manufactured materials at least 50% of them used in the project must be extracted, harvested or recovered as well as manufactured within 500 miles of the project site. Listing of all materials that are regionally manufactured, listing of all materials that are regionally extracted, harvested or recovered and vendor's certificates/ manufacturer's certificates providing distance of manufacturing plant location/extraction, harvesting or recovery location from the project site for all the regional materials to be provided. recycled content. Provide cost of each item that has been regionally manufactured and/or regionally extracted, harvested or recovered.

9.1.6. To utilize rapidly renewable materials (materials made from plants which have less than 10-year harvesting life cycle such as bamboo, MDF, linoleum, wool etc.) for 5% of the total value of building materials. Vendor's certificate/ manufacturer's product data to support material life cycle period to be provided. Provide listing of all items and cost of each item that is rapidly renewable.

9.1.7. At least 50% of the wood used in the project must be certified by the Forest Stewardship Council (FSC) .A narrative indicating the list of materials/components/products claimed as FSC certified including product type, manufacturer, and appropriate entity's COC (chain of custody) certification number needs to be attached. Provide listing of all items and cost of each item that is FSC certified.

9.1.8. The VOC (volatile organic compound) content of adhesives and sealants used on the interior of the building must be less than VOC content limits mentioned below. A list of all the adhesives and sealants used for the project is to be submitted along with the manufacturer's certificate supporting the VOC content.

Architectural Applications	**VOC Limit(g/l minus water)**
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Wood Flooring Adhesives	100
Rubber Floor Adhesives	60
Sub floor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove base adhesives	50
Structural Glazing Adhesives	100

Multipurpose Construction Adhesives	70

Substrate Specific Application	**VOC Limit(g/l minus water)**
Metal to Metal	30
Porous Material(except wood)	50
Plastic Foams	50
Wood	30
Fibreglass	80

Specialty Application	**VOC Limit(g/l minus water)**
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Top and Trim Adhesive	250
Contact Adhesive	80
Special purpose Contact Adhesive	250
Structural wood member adhesive	140
Sheet applied rubber lining operations	850
Sealants	**VOC Limit(g/l minus water)**
Architectural	250
Non Membrane Roof	300
Roadway	250
Single-ply roof membrane	450
Other	420
Sealant Primers	
Architectural, nonporous	250

Architectural, porous	775
Other	750
Aerosol Adhesives	
General purpose mist spray	65% VOC's by weight
General purpose web spray	55% VOC's by weight
Special purpose aerosol adhesives (all types)	70% VOC's by weight

9.1.9. Architectural paints and coatings used in the interior of the building should not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993. A list of all the paints and coatings used in the project is to be submitted along with the manufacturer's certificate not exceeding the prescribed VOC limit mentioned below.

9.1.10. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates used in the interior of the building should not exceed the VOC content limit of 250g/L established in Green Seal Standard GS-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.

9.1.11. Clear wood finishes, floor coatings, stains, primers and shellacs applied to interior elements must not exceed the VOC content limits established in SCAQMD (South Coast Air Quality Management District, Rule 1113, Architectural Coatings, effective January 1, 2004.

9.1.12. A list of all the architectural paints, coatings, anti-corrosive or anti-rust paints, clear wood finishes, floor coatings, stains, primers and shellacs used for the project is to be submitted along with the manufacturer's certificate complying with the VOC content limit.

Paints	**VOC Limit(g/l minus water)**
Non Flat	150 g/L
Flat(Mat)	50 g/L
Anti Corrosive/anti rust	250 g/L

Coatings (whichever applicable)	**VOC Limit(g/l minus water)**
Gloss	250
Semi-Gloss	250
Flat	250
	VOC Limit(g/l minus water, minus exempt compounds)
Bond breakers	350

Clear wood finishes	350
Varnish	350
Sanding	350
Lacquer sealer	680
Clear brushing lacquer	680
Concrete – curing compounds	350
Concrete – curing compounds for roadways and bridges	350
Dry-fog coatings	400
fire proofing exterior coatings	450
Clear fire-retardant coatings	650
Pigmented fire-retardant coatings	350
Flats	250
Floor coatings	420
Graphic arts(sign) coatings	500
Industrial maintenance (im) coatings, High temperature (im) coatings,	420
Zinc-rich im primers	420
Japans/faux finishing coatings	700
Magnesite cement coatings	600
Mastic coatings	300
Metallic Pigmented coatings	500
Multicolour coatings	420
Nonflat coatings	250
Nonflat high gloss	250
Pigmented lacquer	680
Pre-treatment wash primers	780
Primers, sealers, under coaters	350

Quick-dry enamels	400
Quick-dry primers, sealers, under coaters	350
Recycled coatings	250
Roof coatings	300
Aluminium roof coatings	500
Bituminous roof primers	350
Preventive coating for rust	420
Clear shellac	730
Pigmented shellac	550
Specialty primers	350
Stains	350
Interior Stains	250
Swimming pool coatings - repair	650
Swimming pool coatings - other	340
Traffic coatings	250
Waterproofing sealers	400
Waterproofing concrete, masonry sealers	400
Wood preservatives – below ground	350
Other	350
Low solids coating	27 parts per billion

9.1.13. Concrete, wood, bamboo and cork floor finishes such as sealer, stain and finish must meet the requirements of SCAQMD (South Coast Air Quality Management District) Rule 1113, Architectural Coatings, effective January 1, 2004. Tile setting adhesives and grout must meet SCAQMD Rule 1168 as of July 1, 2005 and rule amendment date of January 7, 2005. A list of all floor finishes used for the project is to be submitted along with the manufacturer's certificate

providing compliance with VOC content limit.

9.1.14. All carpet and carpet cushion installed in the building interior must meet the testing and product requirements of the CRI (Carpet and Rug Institute) Green Label Plus program. All carpet adhesive must have less than 50g/L VOC. A list of the different carpet types and adhesive used for the project is to be submitted along with the manufacturer's certificate confirming CRI Green Label Plus compliance and compliance of VOC content of carpet adhesive.

9.1.15. All hard surface flooring must be certified by an independent third-party as Floor score standard compliant.

9.1.16. Composite wood and agrifiber products used on the interior of the building must contain no added urea formaldehyde resins. Composite wood and agrifiber products are defined as particleboard, medium density fibreboard (MDF), plywood, wheat board, strawboard, panel substrates and door cores. A list of all the composite wood materials used in the project should be submitted along with the manufacturer's certificate supporting that the materials contain no urea formaldehyde resins.

9.1.17. All furniture and seating are Green guard Indoor Air Quality Certified. Provide a list of all furniture and seating in the project along with manufacturer's certificate showing Green guard Indoor Air Quality seal

9.1.18. If task lighting is provided at workstations, provide a list of number of task lights and product data of the luminaries and lamp type used.

9.1.19. If individual thermal controls are provided in the project, submit a list of number of controls and product data of the controls used.

9.1.20. For USGBC LEED Interior buildings it is mandatory to provide water fixtures which will reduce water consumption in buildings by 20% than the water use baseline. To reduce water consumption in buildings by 20% than the water use baseline, water closets specified on the project must have dual flush valves and not consume more than 3litres per half flush and 4.8 litres per flush. Urinals specified on the project must not consume more than 3.0 litres per flush. Faucets must not consume more than 1.98 litres per minute at pressure of 60psi. Commercial prerinse spray valves must not consume more than 4.8 litres per minute (no pressure requirement). Shower heads must not consume more than 7.5 litres per minute at a pressure of 80 pounds per square inch. Provide a listing of the number of the total number of fixtures and product data mentioning water consumption.

9.1.21. In order to obtain six, eight or eleven points – refer to water consumption requirements as mentioned in the table below. Provide a listing of the number of the total number of fixtures and product data mentioning water consumption.

Commercial fixture	20% (mandatory)	30%(6 points)	35%(8 points)	40%(11 points)
Water closet (litres per flush)	3.0/4.8	4.2	3.9	3.6
Urinals (litres per flush)	3.0	2.6	2.4	2.2
Restroom faucets (litres per minute) at a pressure of 60 pounds per square	1.98	1.3	1.2	1,1

inch.				
Prerinse spray valves (litres per minute – no pressure requirements)	4.8	4.2	3.9	3.6
Showerheads (litres per minute) at a pressure of 80 pounds per square inch.	7.5	6.6	6.1	5.6

9.2. CONSTRUCTION WASTE MANAGEMENT

Develop a waste management plan that results in recycling of 50%/75% of waste generated during construction, calculated either by weight or volume of total waste generated by the work. Materials that maybe included are aerated concrete blocks, brick masonry, wood trim, composite wood products, agrifiber boards, gypsum board, metals, piping electrical conduit and packaging such as paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates and plastic packaging. Provide separate garbage areas or containers to separate concrete or brick masonry, paper, plastic, metals, gypsum board, plywood, flooring and carpet on the project site.
Submit waste management report consisting of material category, total quantity of waste in kgs, tons or cubic metre, quantity of waste recycled and quantity of total waste Provide receipt of each batch of disposal with weight or volume mentioned on the receipt. Use same units of measure throughout waste management plan.

1) Housekeeping
2) After construction, the entire work area (including walls, ceilings, floors, etc.) should be cleaned.
3) Building materials should be protected from weather and stored in a clean, dry area prior to unpacking for installation. Pay close attention to absorptive materials such as drywall and ceiling tile.
4) All coils, air filters, and fans should be cleaned before performing testing and balancing procedures and especially before conducting baseline air quality tests
5) No food or drink should be permitted in construction areas. An area away from the construction area has to be designated as a break/lunch area.
6) Scheduling
7) Specify construction sequencing to reduce absorption of VOC's by materials that act as sinks or contaminant sources
8) Complete applications of wet and odorous materials such as paints, sealants and coatings before installing "sink" materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings

10. MATERIAL SPECIFICATIONS

10.1. GENERAL

The contractor under this contract commits himself to use best quality material and assume full responsibility for the quality of all material incorporated or brought for incorporation in the work. The work shall be executed in accordance with the best engineering practice and as per instruction of Architect. All materials shall confirm to respective Indians Standards.
Contractor must allow in his rates for all the wastage in all the materials.

10.2. CEMENT

All types and brands of cement as mentioned in the approved makes list can be used and these shall be subjected to the approval of the Engineer-in-charge.

10.2.1. All cement used for the work shall be ordinary Portland cement or such other cement as may be permitted by the Engineer-in-charge. Portland cement shall comply with requirements of the latest issue of IS 269. High alumina cement, rapid hardening cement and Portland Slag cement etc. can be used only when permitted by the Engineer-in-charge. Such cements shall be in accordance with relevant IS codes. Portland Pozzolana cement when permitted by the Engineer-in-charge shall conform to IS 1489.
10.2.2. Cement which has remained in bulk storage at the mill for more than 6 months, or which has remained in bags at the dealer's storage for over 3 months, or which has been stored at project site for more than 3 months shall be re-rested before use. Cement shall also be rejected if it fails to conform to any of the requirements of these specifications.
10.2.3. The Cement to be used in the work shall be of grade not less than Grade 43 which shall be got approved by the Engineer –in-charge.
10.2.4. The following other types of cement may be used in works if specified or with prior approval of the Engineer in Charge in writing purpose. Specialist literature shall be consulted for guidance regarding use of these types of cement.
10.2.4.1. 43 Grade ordinary Portland cement conforming to IS 8112
10.2.4.2. 53 Grade ordinary Portland cement conforming to IS 12269 (to be used only for RCC works on specific written approval from the Engineer-in-charge)
10.2.4.3. Portland slag cement conforming to IS 455
10.2.4.4. Portland pozzolana cement (fly ash based) conforming to IS 1489 (Part-
10.2.4.5. Portland pozzolana cement (calcined clay based) conforming to IS 1489 (Pt –2)
10.2.4.6. Sulphate resisting Portland cement conforming to IS 12330
10.2.4.7. Fly ash when used for partial replacement of cement, shall conform to the requirements of IS: 3812 (part I)-1966.

10.3. FINE AGGREGATES

Fine aggregates shall consist of natural sand, manufactured sand, or an approved combination thereof and shall conform to IS: 383. The grading zone of sand proposed for use shall be supplied by the contractor and got approved by the Engineer-in-charge.

The sand shall be of siliceous material, sharp, hard, strong and durable and shall be free from adherent coatings, clay, dust, alkali, organic material, deleterious matter, lumps, etc. Either natural or manufactured sand shall be prepared for use by such screening or washing, or both, as necessary, to remove all objectionable foreign matter. Natural sand shall be washed, unless specific written authority is given by the Engineer-in-charge to use sand that meets specifications and standards of cleanliness without washing. The cost of screening and washing must be borne by the contractor. The fine aggregate shall be taken from a source approved by the Engineer-in-charge.

Some times Sand is obtained from crushed stone screening but often contains a high percentage of dust and clay. It tends to be flaky and angular. This type produces harsh concrete and should be avoided. Sea sand should not be used unless approved by the EIC. If approved, the required treatment shall be done at the contractor's cost.

Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain any appreciable amount of clay, Sand shall not contain harmful impurities such as iron, pyrites, coal particles, lignite, mica shale or similar laminated material, alkali, and organic impurities in such form or quantities as to affect the strength of durability of concrete or mortar. Also it should not contain any material liable to attack the steel reinforcement.

10.4. WATER

Water shall be potable. Fresh, clean and free from impurities and should be from an approved source. Contractor can provide and maintain sufficient storage accommodation for the water as and where directed by Architect. Water for mixing cement mortar or concrete shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and races of oil, acid and injurious alkali, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence. Sea water shall not be used. Water fit for drinking shall generally be found suitable for mixing cement mortar. Water fit curing mortar or concrete shall not be too acidic or alkaline. It shall have pH value above 6. Sea water shall not be used for curing purpose.

10.5. BRICKS

Bricks shall be of regular and uniform size, shape and colour, uniformly well burnt throughout but not over burnt. They shall have plane rectangular faces with parallel sides and sharp straight and right angled edges. They shall be free from cracks or other flaws. They shall have a frog of 10 mm. depth on one of their flat faces.

They shall give a clear metallic ringing sound when struck. They shall show a fine grained, uniform homogeneous and dense texture on fracture and be free from lumps of lime, laminations, cracks, air holes, soluble salts causing efflorescence or other defects which may in any way impair their strength, durability, appearance or usefulness for the purpose intended. They shall not have any parts under-burnt. They shall not break when thrown on the ground on their flat face in a saturated condition from a height of 60 cm.

Size of bricks

(a) The size of the conventional bricks may vary from 8 3/4" x 4 3/16" x 2 5/8" to 9" x 4 1/4" x 3". Only bricks of one standard size, shall be used on one work unless specially permitted by the Engineer. The following tolerances are permitted in the standard conventional size adopted on a particular work:
Length - plus or minus 3 mm (about 1/8")
Breadth - plus or minus 1.5 mm (about 1/16")
Depth - plus or minus 1. 5 mm (about 1/16")
(b) When metric bricks are used they shall comply with I. S: 1077 - 1976.

Absorption

After immersion in water, absorption by weight shall not exceed 20% of the dry weight of the brick when tested according to IS: 1077-1976.

Compressive Strength

The load to crush the brick when dry shall not be less than 50 Kg/sq.cm. and when thoroughly soaked shall not be less than 35 Kg/sq.cm. Please see table given below for details

Class Designation (N/Sq.mm)	**AVERAGE COMPRESSIVE STRENGTH**			
	NOT LESS THAN		**LESS THAN**	
	N/Sq.mm	**Kgf/Sq.cm**	**N/Sq.mm**	**Kgf/Sq.cm**
10 (100)	10	100	12.5	125
7.5 (75)	7.5	75	10	100
5 (50)	5	50	7.5	75
3.5 (35)	3.5	35	5	50

10.6. COARSE AGGREGATE

This shall be machine crushed from hard (granite) trap stone, grading of aggregate shall be within the limits to produce a dense mix. And shall conform to IS: 383 and IS: 515; mix will work into position without segregation and without excessive quantity of water being required it also shall be strong and durable and shall be free any clay films and other adherent/coating. It shall be washed with clean water if required by the Architect.

This shall be well graded between the limit as specified in the items of the work and the grading tests shall be carried out. Aggregates shall be screened. If required by Architect to obtain proper proportion to his approval. The quality shall confirm to IS: 383-1970.

10.7. SCAFFOLDING

Scaffolding shall be double and shall be erected with steel sections or pipes of adequate strength so as to be safe for construction operations. The contractor shall take all measures to ensure the safety of the work and working people. Any instructions of the Engineer in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to properly or injury to persons resulting from ill erected scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach to every part of the work. Overhead work shall not be allowed.

10.8. TIMBER

Timber shall be considered as well seasoned in case its moisture free. Timber shall be of quality as specified in BOQ and well seasoned. It shall have uniform colour, be free
from defects such as cracks, dead knots, soft spongy spots and waves of injurious open shakes. Grains shall be reasonably straight. The individual hard and sound knot shall not be larger than 6 sq. cm. The aggregate area of all knots shall not exceed 0.5% area of a piece. All timber shall be treated with chemical wood preservatives and be kiln seasoned to IS 1141 and conform to IS 287 for moisture content. Maximum permissible limit shall be +3% for average moisture content of all samples from a given lot and +5% for individual sample of the given lot. This is applicable when thickness of timber is more than 50 mm. Small size tolerance shall be + 2% and +3% respectively. Timber used shall be treated with a 10 years guaranteed and approved anti-termite treatment. Wood work in contact with masonry of concrete shall be painted with hot bitumen coal tar before being placed in position. Timber received at site shall be marked and stamped for approval prior to being used at site. All timber shall be finished to required dimension and texture prior to being treated for chemical preservation.

Timber is classified as under :

(i) Teak wood

(ii) Deodar wood

(iii) Non-coniferous timbers other than teak

(iv) Coniferous timber other than deodar.

The timber shall be free from decay, fungal growth, boxed heart, pitch pockets or streaks on the exposed edges, splits and cracks. The timber shall be graded as first grade and second grade on the basis of the permissible defects in the timber. For both the grades, knots should be avoided over a specified limit.

Teak Wood (Tectona Grandis)

It is of outstanding merit in retention of shape and durability. The heart wood is one of the most naturally durable woods of the world. It usually remains immune to white ant attack and insect attack for very long periods. It is, however, not always immune from fungus attack (rot). Taken as a whole, good quality teak is very durable, it is relatively easy to saw and work. It can be furnished to a fare surface and takes polish well. It is generally used for making furniture and all important timber construction.

Superior Class Teak Wood such as Balarsha, Malabar and Dandeli : Individual hard and sound knot shall not be more than 12 mm in diameter and the aggregate area of all the knots shall not exceed one half per cent of the area of the piece. It shall be close grained.

Deodar Wood (Cedrus Deodars)
It is the strongest of the Indian conifers. Its weight and strength is 20% per cent less than teak. It is easy to saw and works to a smooth finish. It is not, however, a suitable wood for polish or paint work as the oil in the wood and especially near knots, always seeps through such finishes and discolours them. It is used for house building, furniture and other construction work. It is also suitable for beams, floors, boards, posts, window frames and light furniture etc.

Sal Wood (Shoera Robusta)
Sal is about 30 per cent heavier than teak, 50 per cent harder, and about 20 to 30 per cent stronger. In shock resistance it is about 45 per cent above teak. Its heart wood is a naturally durable wood, and usually remains immune to attack by white ants and fungi for a long period, while its sapwood is very perishable and should not be used. Well dried sal is not a really easy wood to saw and work. It is a rough constructional wood than a carpentry timber. No individual hard and sound knot shall exceed 25 mm in diameter and the aggregate area of all the knots shall not exceed 1% of the area of the piece. It can be used for a variety of purposes, such as for beams, rafters, flooring, piles, bridging, tool handles, picker arms and tent pegs, etc.

Kail Wood (Pinus Roxburghie)
Kail Wood is not a very durable wood. But it is easy to saw and work and usually very popular in workshops. It can be brought to a fine smooth surface, but is more suitable for paint and enamel finishes than for polish work. It is useful for joinery works, constructional work, light furniture and house fitments

At least 50% of wood to be FSC (Forest Stewardship Council) certified Forests certified to be in compliance with the standards endorsed by the Forest Stewardship Council (FSC).
Products milled or otherwise altered by manufacturers certified to be in compliance with the standards endorsed by the Forest Stewardship Council (FSC).

10.9. FLUSH DOORS

Flush doors shall be of factory finished kiln seasoned timber, of solid core construction with frame, lock rail and well balanced backings and shall be faced with high quality commercial or teak veneering as specified. The flush doors shall be specified make and thickness as specified in the BOQ/Drawings, with matching teak/veneer wood lipping glued and machine pressed along with core. The lipping to be finished in melamine polish, unless other wise specified in the BOQ/Drawings

10.10. BLOCK BOARD

These boards are used for panelling on wall surface or door shutters, shall be grade I exterior grade, which is of the following types :
i) Type I block boards, decorative type. These are block boards with ornamental veneers on one side or on both sides.
ii) Type II block boards, commercial type. These are block boards with faces of commercial timber. The block boards grade I shall have been bonded with B.W.R. (Boiling Waterproofing) type synthetic resin adhesive.

10.11. PARTICLE BOARD

The particle board used for the panelling in door shutters, wall cladding, etc. shall be FPS (Flat Pressed Single layer board) or FPTH (Flat Pressed Three layer board) type. It shall have been bonded with B.W.R. (boiling Waterproofing) type synthetic resin adhesive. The shrinkage in thickness and length of particle shall not exceed 5 percent.

Types of particle boards :

a) Flat pressed particle board :

This is manufactured my mixing wood particles of pre determined sizes and shapes with synthetic resins of Phenol formaldehyde or urea formaldehyde types and curing and pressing in a parallel platen hot press of the usual multiplayer types but may be pressed in a continuous band type of press. The applied pressure is perpendicular to the plane of the board which orientates the particles mainly with the larger dimension parallel with the plane of the board.

b) Single layer particle board :

A board made of one uniform layer or particles and resin mix and predominantly of uniform texture and strength in the whole depth of the board.

c) Three layer particle board :

A particle board made of three layers of particles and resin mix, usually with finer and thinner particles for the top and bottom layers and coarser and bigger particles for the core layer. Resin content in a three layer board is usually higher in the face layer than in the core layer leading to a sandwich construction with stronger and denser skin.

10.12. PLYWOOD

Plywood for general purpose shall be of three grades, namely, BWR, WWF and CWR, depending upon the adhesives used for bonding the veneers. The plywood used for panelling for door shutters, wall cladding, etc. shall be BWR grade and shall not be less than 10mm thickness for two or more panel shutters and 12mm thickness for single panel shutters. The thickness in case of wall cladding/false ceiling etc., all not be less than 6mm. The thickness of all veneers shall be uniform, within a tolerance of ± 5%.

Requirements of thickness of face and core veneers shall be as follows:

i) In 3-ply boards, up to 5mm thick, combined thickness of the face veneers shall not exceed twice the thickness of centre ply.

ii) In multiple boards, the thickness of any veneer shall not be more than thrice the thickness of any other veneer.

iii) The sum of the thickness of the veneers in one direction shall approximate to the sum of the thickness of veneers at right angles to them and shall not be greater than 1.5 times the sum, except for 3 ply as specified above.

The thickness of plywood boards shall be specified as under :

BOARD	THICKNESS
3 ply	3mm, 4mm, 5mm
5 ply	6mm, 8mm, 9mm
7 ply	9mm, 16mm, 19mm
9 ply	13mm, 16mm, 19mm
11 ply	19mm, 22mm, 25mm

10.13. HARD BOARD

Hard boards are generally classified into the following three types according to their method of manufacture, density and other related mechanical and physical properties :

Medium hard board :
A homogeneous fibre building board having a density exceeding 480 kg/M^3 but not exceeding 800 kg/M^3.

Normal hard board :
Same as above, but having density exceeding 800 kg/M^3, but not exceeding 1200 kg/M^3.

Tempered hard board :
Hard board further treated in the course of manufacture to increase its density, strength and water resistance is tempered hard board. The hard board used for panelling of door shutters, wall cladding, false ceiling, etc. shall be of tempered quality. The thickness of hard board panelling shall not be less than 12mm dia in case of single panel shutter and 10mm in the case of two or more panel shutters. The hard boards shall be regular and unless otherwise specified, shall have square edges. The length of the two diagonals of the board shall not differ by more than ± 3mm per metre length of the diagonal. The tolerance in length, width shall be ± 3mm and on thickness ± 0.3mm. The boards shall be of uniform thickness subject to tolerance as above. They shall be free from warp. The surface shall be flat, free from cracks and lumps and of normal colour. At least one face shall be smooth.

10.14. GLASS

The glass shall be reasonably free from blisters, stains, scratches and bubbles, so as not to disturb the visibility through the glass. The glass shall be of good and durable quality conforming to IS:1761-1960 The glass shall be special selected / selected ordinary quantity of approved make as specified and it shall be free from bubbles, flaws specks, waves, air holes, distortion , scratches or other defects. The glasses in bulk quantities shall be brought to site in Makers original packing and makers guarantee shall be predicted if called for by the Engineer-in-charge. The glass shall be required thickness as mentioned in the items of schedule of quantities and / or shown in drawing. In case of windows, the beading shall be anodized aluminium beading of channel section as per sizes mentioned in the drawing. The junction of the beadings shall be mitre jointed. Irregular shaped or circular glass shall be measured as smallest rectangular area from which the irregular or circular pane can be cut. Glass panes shall be fixed by wooden beading having mitred joints. A thin layer of clear silicon sealant shall be applied between glass panes and the beading. Fixing of glass panes with simple putty and beads shall not be permitted.

10.15. INSULATING BOARD

Insulating board tile for suspended ceilings and walls shall be as specified and approved and shall be fix according to manufacturer's instruction.

10.16. HOLDFASTS FOR DOORS AND WINDOWS

Holdfasts for steel or timber frame shall be as per specified makes.

10.17. NAILS ETC.

Nails and staples shall be of hard drawn galvanised wire and shall be of specified makes.

10.18. BOLTS NUTS ETC

Bolts, Nuts, and holdfast, shall be of mild steel painted with Bitumen based paints as specified before fixing. The threads of bolts, nuts and washers shall be truly fitting and shall be painted with zinc chromate before fitting the nuts.

10.19. SCREWS

Screws shall be of make as approved and specified.

10.20. PAINTS

Filler, primer enamels, paints and various and external finishing application to cement plaster shall be of an approved best quality, property brand similar shall be bituminous based. Distemper shall be either water bound or oil bound as stated in the schedule of quantities. These shall be approved brand in sealed drums of the packages.

10.21. SPECIAL MATERIALS

If materials of a particular brand are specified in the schedule of quantities these shall be procured accordingly from approved manufactures. These shall include materials like bitumen, bituminous compounds, waterproofing compounds and hardening compounds, special paints acoustic and insulation boards and other finishing materials. The responsibility for the use of these materials lies with the contractor and he should avail himself of the necessary guarantee as may be required by the architect and give the same to the Architect.

10.22. MDF

MDF/HDF is Medium Density And High Density Fibre board, with board densities ranging from 700 Kgs to 1000 Kgs per cubic meter. The range of MDF/HDF includes Plain Medium Density Fibre Board, Laminated Medium Density Fibre Board, Plain High Density Fibre Board, Laminated High Density Fibre Board for Flooring, etc. The thickness of the board range from 6 mm to 25 mm and board size of 8 ft. x 4 ft.

Sr. No.	Properties	Specification	
		Grade I	Grade II
1	Bulk Density Kg/M^3)	600 - 900	600 - 900
2	Density Variation (Max0 Percent	±10	±10
3	Moisture Content (%)	5 – 10	5 – 10
4	Variation From Mean Moisture	±3	±3
5	Water Absorption (%) Max		
	a. After 2 hours soaking	6	9
	b. After 24 hours soaking	12	18
6	Thickness swelling (Max) Percent, 2 Hours	4	7
7	Modulus of Rupture (Min) N/mm^2		
	a. Up to 20mm Thickness	28	28
	b. Above 20mm Thickness	25	25
8	Modulus of Elasticity (Min) N/mm^2		
	a. Up to 20mm Thickness	2800	2800
	b. Above 20mm Thickness	2500	2500
9	Tensile Strength perpendicular to the surface (Min) N/mm^2		
	a. Up to 20mm Thickness	0.8	0.7
	b. Above 20mm Thickness	0.7	0.6
10	Tensile Strength perpendicular to the surface (Min) N/mm^2		
	a. After Accelerated water resistance test	0.25	Not applicable
	b. After Cyclic Test	0.4	
11	Screw Holding (Min), N		
	a. Face	1500	1500
	b. Edge	1250	1250
12	Abrasion resistance test (Min) in number of revolution		
	a. Type I	1000	1000
	b. Type II	450	450
	c. Type III	250	250
	d. Type IV	75	75
13	Resistance to steam	Should pass	Should pass
14	Resistance to cracks	Should pass	Should pass
15	Resistance to Cigarette Burn	Should pass	Should pass
16	Resistance to stain	Should pass	Should pass

10.23. TILES

Plain cement tiles, chequered tiles, mosaic tiles, shall conform to IS 1237. For neutral shade tiles grey cement shall be used. Tiles shall be compacted by mechanical vibration and hydraulically pressed. It shall be of choice shade and shall have desired pattern of chop distribution. The sizes of chips and proportion of chips to cement in Terrazzo or mosaic floor shall be as specified in IS 1237. The size and thickness of tiles shall be as approved by the Architect. White or coloured glazed tiles shall comply with IS 777. It shall be from an approved manufacturer and shall be flat and true to shape. They shall be free from cracks, crazing, spots, chipped edges and corners. The glazing and colour shall be of uniform shade and unless otherwise the tile shall have an average thickness of 5.50 mm or as given in the BOQ.

SPECIFICATIONS FOR CERAMIC TILES

Characteristics	**CEN standards, ISO standards and Indian standards**	**Method of Testing**
Deviation in Length	Max. +/- 0.5%	EN-98 / ISO-10545-2/ IS : 13630 (Part-1)
Deviation in Thickness	Max. +/- 0.5%	EN-98 / ISO-10545.2/ IS : 13630 (Part-1)
Wedging Warpage	Max. +/- 0.5%	EN-98 / ISO-10545.2/ IS : 13630 (Part-1)
Square ness	Max. +/- 0.6%	EN-98 / ISO-10545.2/ IS : 13630 (Part-1)
Water Absorption	3-6%	EN-99 / ISO-10545.3/ IS : 13630 (Part-3)
Scratch Resistance (moh`s Scale)	Min. 5	EN-101/IS:13630 (Part-13)
Abrasion Resistance	As per the abrasion class indicated by the manufacturer	EN-154 / ISO-10545.7/ IS : 13630 (Part-II)
Crazing Resistance	In conformity with the norms	EN-105 / ISO-10545.11/ IS : 13630 (Part-9)
Chemical Resistance	Resistant to all acids all alkalies (except Hydrofluoric Acid and its compounds)	EN-122 / ISO-10545.13/ IS : 13630 (Part-8)
Bending Strength	>=220 Kgs./cm^2	EN-100 / ISO-10545.4/ IS : 13630 (Part-6)
Thermal Shock	Resistant to 10 Cycles	EN-104 / ISO-10545.9/ IS : 13630 (Part-5)

SPECIFICATIONS FOR VITRIFIED TILES

Property	International Std. ISO 13006 / EN 176 Group Bla	Method of Testing
Deviation in length	+/- 0.6%	EN 98
Deviation in thickness	+/- 5%	EN 98
Straightness of sides	+/- 0.5%	EN 98
Rectangularity	+/- 0.6%	EN 98
Surface flatness	+/- 0.5%	EN 98
Surface quality (%)	A minimum of 95% of the tiles shall be defects that would impair a major area of tile n_1=30, Ac_1=1, Re_1=3	- free from visible the appearance of
Flexural Strength	> 27 N/mm^2	EN 100
Breaking Strength	1113 N	ASTM C-648
Water Absorption	<0.5%	EN 99
Density (g/cc)	>2	DIN 51082
Mohs hardness	>6	EN 101
Abrasion Resistance	< 204 mm^3	EN 102
Stain Resistance	Resistant	ISO 10545-14
Chemical Resistant	No damage	EN 106
Colour Resistant	No damage	DIN 51094
Thermal Expansion	< 9 x 10-6	EN 103
Moisture Expansion	Nil	ISO 10545-10
Thermal Shock Resistant	No damage	EN 104
Glossiness	-	Gloss meter
Skid Resistance Coefficient friction)	> 0.4	ASTM C-1028

10.24. GLASS WOOL INSULATION

Fibre glass wool insulation should be made of fine, long, inorganic glass fibres bonded by high temperature resin and should be energy conserving with sound insulating properties. It should be suitable for applications ranging from 195^{0}C to 230^{0}C.

Chemical Stability : It should be chemically inert. The application should not cause or accelerate corrosion. It should also be rot proof and odourless.

Fire Safety : It should be non-combustible in accordance with BS 476 Part 4, 1970. incombustible low fire propagation extremely low spread of flame (class 1 BS 476 Part 7) non emission of dense smoke and toxic gases (low toxicity index 0.86) non depletion of oxygen (high oxygen index 70%)

The Glasswool should possess high insulation values by virtue of its low fibre diameter, consistent fibre distribution and homogeneous density. This should be reflected in glasswool's low thermal conductivity, which meets the requirement of IS:8183 and BS:3958:Part 5.
Thermal Conductivity Values in W/m.K

Mean Temperature	**Density in kg/m^3**			
	16	**24**	**32**	**48**
10^{0}C	0.035	0.031	0.03	0.027
25^{0}C	0.038	0.033	0.032	0.03
50^{0}C	0.043	0.039	0.035	0.033
100^{0}C	0.057	0.047	0.043	0.04

Acoustical Insulation Values

Specification	**Average N. R. C.**
(Density x Thickness)	**Frequency Range 100Hz - 6200 Hz**
16 kg/m^3 **x** 50mm	0.93
24 kg/m^3 **x** 50mm	0.96
32 kg/m^3 **x** 50mm	0.96

10.25. FLEXIBLE PLYWOOD

Wherver flexi-ply is used the thickness should be in multiples of 6 mm or 8 mm. It can mould and bend into any shape without chipping, cracking, peeling or staining. It should have a bend radius as low as 25 mm.

CHARECTERISTICS	**ISI SPECIFICATIONS**
Moisture Content	5% - 15%
Flammability	> 30 minutes
Flamed penetration	15 minutes per 6mm
Rate of burning	Weight loss approx. 30-70% - 20 minutes
Retention of preservative	6 kg per cum

10.26. GYPBOARD PLAIN

A Gypsum panel is composed of a non-combustible gypsum core encased in a strong, smooth-finish paper on the face side and a natural-finish paper on the back side. The face paper is folded around the long edges to reinforce and protect the core, and the ends are square-cut and finished smooth. The long edges of the panels are available in a choice of designs (including tapered), allowing joints to be reinforced and concealed with approved joint treatment system

Application:- Suitable for most applications where normal fire, structural performance and acoustic levels are specified

Board colour:- Grey face paper, Brown reverse side paper

Standards and certification:- IS 2095 - Part l, 1996

Thermal Conductivity : 0.16 (W/m°K)

Moisture Content : Should be less then 2% in accordance with BS 2972.

Water Absorption : Should be less then 2% in accordance with BS 2972.

10.27. LAMINATES

PROPERTY	TEST METHOD PART 2	PROPERTY OR ATTRIBUTES	UNITS	TEST REQUIREMENTS	TEST
Thickness	4	Maximum variation	mm	0.1	0.04
Warping	5	Maximum warp	mm	120	0.15
Resistance to surface wear	6	Wear resistance	Revs(min)	>150	200
			IP FP	>350	600
Resistance to immersion in boiling water	7	Mass increase	%[max]	10	5.46
		thickness	%[max]	12	4.11
		appearance	Rating	4	5
Resistance to dry heat	8	Appearance other finish	Rating	4	4
Dimensional stability at elevated temperatures	9	Dimensional change	%CM	1.05	0.7
			%M	-0.55	0.3
Resistance to impact by small diameter ball	11	Spring face	M(min)	>20	>20

Resistance to cracking	13	Susceptibility	Rating(not less than)	4	5
Resistance to scratching	14	Load	n(min)	>2.0	7
Resistance to staining	15	Appearance Group 1 and 2	Rating(not less than)	5	5.5
		Group 3 and 4		3	5,5.4,5
Resistance to colour change in xenon arc light	16	Wool standard	min	6	>6
Resistance to cigarette burns	18	Appearance	Rating(not less than)	Brand A 3	3
				Brand B 3	4
				Brand C 3	4
Resistance to steam	24	Appearance	Rating((not less than)	3	5

Product conformity
British European standard – BS EN 438, American NEMA LD – 3, FIRA England, BS EN-476 part 7, Warrington Research UK, IS -2046 BIS (Bureau of Indian Standards)

Care and maintenance
Cleaning should be carried out with a soft moist cloth and warm soap solution. Do not use detergents containing abrasive particles or excess soda. Care and maintenance instructions do not apply to the range of metallic patterns series as they are very sensitive.

Note
Samples presented are indicative of colour, pattern and surface finish but not the actual thickness. All metallic patterns series are recommended for vertical applications only. Information and samples for special cabinet liners, phenolic boards, special purpose compact laminates and post forming laminates are available on request. Phone / fax /email for larger samples of your choice.

11. POST CONSTRUCTION ANTI-TERMITE TREATMENT

11.1. STAGE 1

Treatment to wall and floor junction : Holes of 12mm diameter 18-20 inches apart will be drilled along the inner junction of wall and floor at depth of 6''on the entire ground and 4” on the first floor premises. Termiticide solution will be injected under pressure into these holes to create barrier against termites. If heavy infestation is noticed on 2nd and above floors the same treatment will be carried out on that particular floor. Mode of measurement will be Carpet area on Ground and 1st floor only

11.2. STAGE 2

Treatment to wooden fixtures : Holes of 12mm diameter will be drilled at the base of wooden-fixtures such as window frames and doorframes adjoining the flooring and termiticide solution will be injected. This treatment will be carried out on all floors (except basements/Terrace). An oil-based termiticide will be sprayed on all the woodwork infested by the termites within the premises. Special care will be taken in case furniture attached to the wall as the termites can easily attack them. Drilling will be carried out at the base of all such fixture and termiticide solution will be injected The rate for this treatment to be included in Stage 1, no separate measurements for the same will be done

Holes drilled in the floors, walls or wood work sides will be sealed with white cement mixed with matching pigment by the contractor with the above tender items without any extra payment. Damaged parts of the wood work, plaster , masonry will be made good by the Contractor.
Work carried out should be guaranteed for a period for 5 years on the requisite stamp paper.
Contactor has to use approved brand conforming IS-8944 latest version.
The treatment will be carried out as per latest version of IS- 6313 (Part III)

Chemical used for anti-termite treatment are insecticides with a persistent action and are highly poisonous. This chemical can have an adverse effect upon health when absorbed through the skin, inhaled as vapours or spray mists or swallowed.
The containers having emulsifiable concentrates shall be clearly labelled and kept securely closed in stores so that children or pet cannot get at them. Storage and mixing of concentrates shall not be done near any fire source or flame. Persons using these chemical shall be warned that absorption though skin is the most likely source of accidental poisoning. Particular care shall be taken to prevent skin contact with concentrates and prolonged exposure to dilute emulsion shall also be avoided. After handling the concentrates or dilute emulsion. Workers shall wash themselves with soap and water and wear clean clothing, especially before eating. In the event of severe contamination, clothing shall be removed at once and the skin washed with soap and water. If chemical has splashed into the eyes, they shall be flushed with plenty of soap and water and immediate medical attention shall be sought.
Care should be taken in the application of chemicals to see that they are not allowed to contaminate wells or springs which serve as source of drinking water.

11.3. TREATMENT FOR EXISTING BUILDING: POST CONSTRUCTION TREATMENT

Chemicals : Any one of the following chemicals conforming to relevant Indian Standards in water emulsion may be used for soil treatment in order to protect a building from termite attack

Chemical with Percent	Relevant Indian Standards	Concentration by weight (Active ingredient)
Chlorpyrifos 20EC	IS 8944	1.0
Lindane 20EC	IS 632	1.0

These chemicals are available in concentrated form in the market and concentration is indicated on the sealed containers. To achieve the specified percentage of concentration, chemicals should be diluted with water in required quantity before it is used. Graduated containers shall be used for dilution of chemicals with water in the required proportion to achieve the desired percentage of concentration. For example, to dilute chemical of 20% concentration, 19 parts of water shall be added to one part of chemical for achieving 1% concentration. Oil or kerosene based solution of chlorpyrifos 20 EC or Lindane 20 EC, 1.0 percent (by weight) concentration is useful for treatment of wood. Engineer-in-charge shall procure the chemical of required concentration in sealed original containers directly from the reputed and authorized representative. Chemical shall be kept in the custody of the Engineer-in-charge or his authorized representatives and issued for use to meet the day's requirements. Empty containers after washing and concentrated chemical left unused at the end of the day's work shall be returned to the Engineer-in-charge or his authorized representative.

11.4. SAFETY PRECAUTIONS

Chemical used for antitermite treatment are insecticides with a persistent action and are highly poisonous. This chemical can have an adverse effect upon health when absorbed through the skin, inhaled as vapours or spray mists or swallowed. The containers having emulsifiable concentrates shall be clearly labeled and kept securely closed in stores so that children or pet cannot get at them. Storage and mixing of concentrates shall not be done near any fire source or flame. Persons carrying out chemical soil treatments should familiarize themselves and exercise due care when handling the chemicals whether in concentrated or in diluted form. After handling the concentrates or dilute emulsion, worker shall wash themselves with soap and water and wear clean clothing especially before eating and smoking. In the event of severe contamination, clothing shall be removed at once and the skin washed with soap and water. If chemical has splashed into the eyes, they shall be flushed with plenty of soap and water and immediate medical attention shall be sought. The use of chemical shall be avoided where there is any risk of wells or other water supplies becoming contaminated.

Once the termites have an Ingress into the building, they keep on multiplying and destroy the wooden and cellulosic materials, and as such it becomes essential to take measures for protection against termites.

Measures described below are necessary for the eradication and control of termites in existing building. To facilitate proper penetrations of chemical in to the surface to be treated, hand operated pressure pump shall be used. To have proper check for uniform penetration of chemical, graduated containers

shall be used. Proper check should be kept so that the specified quantity of chemical is used for the required area during the operation. Chemical treatment for the eradication and control of sub-terranean termites in existing building shall be done as per IS 6313 (Part III). Treatment shall be got done only from the approved specialized agencies using the chemical procured directly by the Engineer-in-Charge from reputed and authorized dealers.

11.5. TREATMENT ALONG OUTSIDE OF FOUNDATIONS

The Soil in contact with the external wall of the building shall be treated with chemical emulsion at the rate of 7.5 litres per square metre of vertical surface of the sub-structure to a depth of 300 mm. To facilitate this treatment, a shallow channel shall be excavated along and close to the wall face. The chemical emulsion shall be directed towards the wall at 1.75 litres per running metre of the channel. Rodding with 12 mm diameter mild steel rods at 150 mm apart shall be done in the channel.If necessary, for uniform dispersal of the chemical to 300 mm depth from the ground level. The balance chemical of 0.5 litre per running metre shall then be used to treat the backfill earth as it is returned to the channel directing the spray towards the wall surface. If there is a concrete or masonry apron around the building, approximately 12 mm diameter holes shall be drilled as close as possible to the plinth wall about 300 mm apart, deep enough to reach the soil below and the chemical emulsion pumped into these holes to soak the soil below at the rate of 2.25 litres per linear metre. In soils which do not allow percolation of chemicals to desired depth, the uniform disposal of the chemical to a depth of 300 mm shall be obtained by suitably modifying the mode of treatment depending on site condition. In case of RCC foundations the soil (backfill) in contact with the column sides and plinth beams along with external perimeter of the building shall be treated with chemical emulsion at the rate of 7.5 litres/sqm of the vertical surface of the structure. To facilitate this treatment, trenches shall be excavated equal to the width of the shovel exposing the sides of the column and plinth beams upto a depth of 300 mm or upto the bottom of the plinth beams, if this level is less than 300 mm. The chemical emulsion shall be sprayed on the backfill earth as it is returned into the trench directing the spray against the concrete surface of the beam or column as the case may be.

11.6. TREATMENT OF SOIL UNDER FLOORS

The points where the termites are likely to seek entry through the floor are the cracks at the following locations:

(a) At the junction of the floor and walls as result of shrinkage of the concrete;
(b) On the floor surface owing to construction defects;
(c) At construction joints in a concrete floor, cracks in sections; and
(d) Expansion joints in the floor.

Chemical treatment shall be provided in the plinth area of ground floor of the structure, wherever such cracks are noticed by drilling 12 mm holes at the junction of floor and walls along the cracks on the floor and along the construction and expansion joints at the interval of 300 mm to reach the soil below. Chemical emulsion shall be squirted into these holes using a hand operated pressure pump to soak the soil below until refusal or upto a maximum of one litre per hole. The holes shall then be sealed properly with cement mortar 1:2 (1 cement: 2 coarse sand) finished to match the existing floors. The cement mortar applied shall be cured for at least 10 days as per instruction of Engineer-in-charge.

11.7. TREATMENT OF VOIDS IN MASONRY

The movement of termites through the masonry wall may be arrested by drilling holes in masonry wall at plilnth level and squirting chemical emulsions into the holes to soak the masonry. The holes shall be drilled at an angle of 45 degree from both sides of the plinth wall at 300 mm intervals and emulsion squirted through these holes to soak the masonry using a hand operated pump. This treatment shall also be extended to internal walls having foundations in the soil. Holes shall also be drilled at wall corners and where door and window frames are embedded in the masonry or floor at ground. Emulsion shall be squirted through the holes till refusal or to a maximum of one litre per hole. Care shall be taken to seal the holes after the treatment.

11.8. TREATMENT AT POINTS OF CONTACT OF WOOD WORK

The wood work which has already been damaged beyond repairs by termites shall be replaced. The new timber shall be dipped or liberally brushed at least twice with chemical in oil or kerosene. All existing wood work in the building which is in contact with the floor or walls and which is infested by termites, shall be treated by spraying at the points of contacts with the adjoining masonry with the chemical emulsion by drilling 6 mm holes at a dowonward angle of about 45 degree at junction of wood work and masonry and squirting chemical emulsion into these holes till refusal or to a maximum of half a litre per hole. The treated holes shall then be sealed. Infested wood work in chaukhats, shelves, joints, purlins etc., in contact with the floor or the walls shall be provided with protective treatment by drilling holes of about 3 mm diameter with a downward slant to the core of the wood work on the inconspicuous surface of the frame. These holes should be at least 150 mm centre to centre and should cover in entire frame work. Chemicals shall be liberally infused in these holes. If the wood is not protected by paint or varnish two coats of the chemicals shall be given on all the surfaces and crevices adjoining the masonry.

11.9. TREATMENT OF ELECTRICAL FIXTURES

If infestation in electrical fixture (like switch boxes in the wall) is noticed, covers of the switch boxes shall be removed and inside of such boxes shall be treated liberally with 5 per cent Malathion dusting powder. The covers of the switch boxes shall be refixed after dusting.

11.10. FREE SERVICE GUARANTEE

The Contractor shall note that termite-proofing work is subject to a free service guarantee from the date of completion of the treatment. The Contractor shall give an undertaking in writing that during the **5 (FIVE)** years guarantee period any infestation of subterranean termites will be eradicated and necessary treatment carried out to prevent re-infestation, free of cost to the Employer.

Contractors must ensure that the work is done through a professional pest control operator who is a member of the National Pest Control Association of USA, Indian Pest Control Association or other recognized professional body. A list of termite control jobs successfully undertaken for Government Departments, Statutory bodies or large private organizations are to be provided to prove that they are capable of handling anti-termite work.

11.11. MODE OF MEASUREMENT

The Mode of measurement for all the above steps will be Carpet area of the floor. The rate quoted by the Contractor The rate shall include the cost of labour and all other inputs (including concentrated chemical) involved in all the operations described above including drilling, refilling and making good the holes.

12. MORTARS

12.1. LIST OF BUREAU OF INDIAN STANDARD CODES

S. No.	I.S. No.	Subject
1	IS 269	Specification for 33 grade ordinary Portland cement
2	IS 383	Specification for coarse and fine aggregate from natural source for concrete.
3	IS 455	Specification for Portland slag cement.
4	IS 460 (Part I)	Specification for test sieves: wire cloth test sieves.
5	IS 650	Specification for standard sand for testing of cement
6	IS 1269	Specification for 53 grade ordinary Portland cement
7	IS 1344	Specification for calcined clay Pozzolana.
8	IS 1489	Specification for Portland pozzolana cement
9	IS 1542	Specification for sand for plaster
10	IS 1727	Methods of Test for Pozzolana materials
11	IS 2116	Specification for sand for masonry mortar.
12	IS 2250	Code of practice for preparation and use of masonry Mortar.
13	IS 2386 (Pt-I)	Method of test for aggregate for concrete (Particle size and shape)
14	IS 2386 (Pt-II)	-Do- Estimation of deleterious materials and organic impurities
15	IS 2386 (Pt-III)	-Do- Specific gravity, density, voids, absorption and bulking.
16	IS 3025	Method of sampling and test for water
17	IS 3406	Specification for masonry cement.

18	IS 3812 (Part I)	Specification for fly ash for use as pozzolana in cement mortar and concrete
19	IS 3812 (Part II)	Specification for fly ash for use as admixture in cement mortar and concrete
20	IS 4031 (Part I) to (Part XIII)	Method of Physical test for hydraulic cement
21	IS 4032	Method of chemical analysis of Hydraulic cement.
22	IS 8041	Rapid hardening Portland cement.
23	IS 8042	Specification for white cement
24	IS 8043	Hydrophobic Portland cement
25	IS 8112	Specification for 43 grade ordinary Portland cement
26	IS 11652	Woven HDPE sacks for packing cement
27	IS 11653	Woven polypropylene sacks for packing cement
28	IS 12174	Jute synthetic union bags for packing cement

12.2. GENERAL

Desirable properties of mortars for use in masonry are:

(a) Workability
(b) Water retentivity
(c) Rate of stiffing
(d) Strength
(e) Resistance to rain penetration
(f) Durability

12.3. MATERIALS

12.3.1. Water

Water used for mixing and curing shall be clean and free from injurious quantities of alkalis, acids, oils, salts, sugar, organic materials, vegetable growth or other substance that may be deleterious to bricks, stone, concrete or steel. Potable water is generally considered satisfactory for mixing. The Ph value of water shall be not less than 6. The following concentrations represent the maximum permissible values: (of deleterious materials in water).
(a) Limits of Acidity: To neutralize 100ml sample of water, using phenolphthalein as an indicator, it

should not require more than 5ml of 0.02 normal NaOH. The details of test shall be as given in IS 3025 (part 22).
(b) Limits of Alkalinity: To neutralise 100ml sample of water, using mixed indicator, it should not require more than 25ml of 0.02 normal H2SO4. The details of tests shall be as given in IS 3025 (part 23).
(c) Percentage of Solids: Maximum permissible limits of solids when tested in accordance with IS 3025 shall be as under:
Organic 200mg/ litre
Inorganic 3000 mg/ litre
Sulphates 400 mg/ litre
Chlorides 2000 mg/ litre. For concrete not containing embedded steel and 500 mg. /litre. For reinforced concrete work.
Suspended matter 2000 mg/ litre
The physical and chemical properties of ground water shall be tested along with soil investigation and if the water is not found conforming to the requirements of IS 456-2000; the tender documents shall clearly specify that the contractor has to arrange good quality water for construction indicating the source.

Water found satisfactory for mixing is also suitable for curing. However, water used for curing shall not produce any objectionable stain or unsightly deposit on the surface.
Sea water shall not be used for mixing or curing
Water from each source shall be tested before the commencement of the work and thereafter once in every three months till the completion of the work. In case of ground water, testing shall also be done for different points of drawdown. Water from each source shall be got tested during the dry season before monsoon and again after monsoon.

12.3.2. Cement

The cement used shall be any of the following grades and the type selected should be appropriate for the intended use.

(a) 33 grade ordinary Portland cement conforming to IS 269.
(b) 43 grade ordinary Portland cement conforming to IS 8112.
(c) 53 grade ordinary Portland cement conforming to IS 12269. (Only for RCC and specialized applications)
(d) Rapid hardening Portland cements conforming to IS 8041.
(e) Portland slag cement conforming to IS 455.
(f) Portland Pozzolana cement (fly ash based) conforming to IS 1489 (Part 1).
(g) Portland Pozzolana cement (calcined clay based) conforming to IS 1489 (part 2).
(h) Hydrophobic cement conforming to IS 8043
(i) Low heat Portland cement conforming to IS 12600.
(j) Sulphate resisting Portland cement conforming to IS 12330
(k) White cement conforming to IS 8042

Different types of cement shall not be mixed together. In case more than one type of cement is used in any work, a record shall be kept showing the location and the types of cement used.

Compressive Strength:
Compressive strength requirement of each type of cement for various grades when tested in accordance with IS 4031 (part 6) shall be as under:

Sample	**Strength in N/mm^2 not less than for**		
Age at testing	**Gr. 33**	**Gr.43**	**Gr. 53**
72 + 1 hr	16	23	27
168 + 2 hrs	22	33	37
672 + 4 hrs	33	43	53

Setting Time:
Setting time of cement of any type of any grade when tested by Vicat apparatus method described in IS 4031 shall conform to the following requirement:
(a) Initial setting time: Not less than 30 minutes
(b) Final setting time: Not more than 600 minutes

Supply:
The cement shall be packed in jute sacking bags conforming to IS 2580, double Hessian bituminized (CRI type) or woven HDPE conforming to IS 11652. Woven polypropylene conforming to IS 11653, jute synthetic union conforming to IS: 12174, or any other approved composite bags, bearing the manufacturer's name or his registered trade mark if any, with grade batch no. and type of cement, with date of manufacturing of batch of cement. Every delivery of cement shall be accompanied by a producer's certificate conforming that the supplied cement conforms to relevant specifications. These certificates shall be endorsed to the Engineer-in-Charge for his record.
Every consignment of cement must have identification marks on packages indicating date of manufacturing grade and type of cement batch no. etc. Cement brought to works shall not be more than 6 weeks old from the date of manufacture.
Effective precautionary measures shall be taken to eliminate dust-nuisance during loading or transferring cement.

Stacking and Storage: **For stacking and storage please refer the relevant conditions as mentioned under the heading of Stacking and storage.**

12.3.3. Fine Aggregate

Aggregate most of which passes through 4.75 mm IS sieve is known as fine aggregate. Fine aggregate shall consist of natural sand, crushed stone sand, crushed gravel sand stone dust or marble dust, fly ash and broken brick (Burnt clay). It shall be hard, durable, chemically inert, clean and free from adherent coatings, organic matter etc. and shall not contain any appreciable amount of clay balls or pellets and harmful impurities e.g. iron pyrites, alkalis, salts, coal, mica, shale or similar laminated materials in such form or in such quantities as to cause corrosion of metal or affect adversely the hardening, the strength, the durability or the appearance of mortar, plaster or concrete. The sum of the percentages of all deleterious material shall not exceed 5%. Fine aggregate must be checked for organic impurities such as decayed vegetation humps, coal dust etc. in accordance with the procedure prescribed in Appendix 'A' as given under

APPENDIX A DETERMINATION OF PARTICLE SIZE

In order that the sieves shall not be overloaded, care must be taken to ensure that the maximum sieve loads shown in Table A-4.1 (below) are not exceeded at the completion of sieving.

TABLE A-4.1

I.S. Sieve Designation	***Maximum weight for***	
	45 cm dia sieve kg	***30 cm dia sieve kg***
45 mm	10	4.5
40 mm	8	3.5
31.5 mm or 22.1 mm	6	2.5
20 mm	4	2.0
16 mm or 12.5 mm	3	1.5
10 mm	2	1.0
5.6 mm	1.5	0.75
4.75 mm	1.0	0.50
3.35 mm	-	0.30

The sample weight taken will thus normally require several operations on each sieve. Each sieve should be taken separately over a clean tray or receiver until no more than a trace passes, but in any case for not less than two minutes. Materials should not be forced through the apertures but hand placing is permitted. A light brush should be used with fine sieves. The cumulative weight passing each sieve should be calculated as percentage of the total sample weight to the nearest whole number.

Silt Content: **The maximum quantity of silt in sand as determined by the method prescribed shall not**

exceed 8%. Fine aggregate containing more than allowable percentage of silt shall be washed as many times as directed by Engineer-in-charge so as to bring the silt content within allowable limits for which nothing extra shall be paid.

Grading: **On the basis of particle size, fine aggregate is graded in to four zones. The grading when determined shall be within the limits given in Table 3.1 below. Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron IS sieve, by a total amount not exceeding 5 per cent, it shall be regarded as falling within that grading zone.**

TABLE 3.1
Fine Aggregates *(Clause 3.1.3)*

IS Sieve	***Percentage passing for***			
	Grading Zone I	***Grading Zone II***	***Grading Zone III***	***Grading Zone IV***
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600 microns	15-34	35-59	60-79	80-100
300 microns	5-20	8-30	12-40	15-50
150 microns	0-10	0-10	0-10	0-15

Note 1: For crushed stone sands, the permissible limit on 150 micron sieve is increased to 20 per cent.

Note 2: Allowance of 5% permitted can be split up, for example it could be 1% on each of three sieves and 2% on another or 4% on one sieve and 1% on another.

Note 3: Fine aggregate conforming to Grading Zone IV shall not be used in reinforced cement concrete unless tests have been made to ascertain the suitability of proposed mix proportions.

Note 4: Sand requiring use for mortar for plaster work shall conform to IS 1542 and for masonry work shall conform to IS 2116.

Type and grading of fine aggregate to be used shall be specified. It shall be coarse sand, fine sand, stone dust or marble dust, fly ash and surkhi. Use of sea sand shall not be allowed, unless otherwise specified.

a) Coarse and fine sand shall be river sand. Its grading shall fall within the limits of grading

b) Zone I, II, III, IV of Table 3.1. Grading of sand shall conform to IS 2116 for use in Masonry work.

c) Stone dust shall be obtained by crushing hard stones or gravel. Its grading shall fall within the limits of grading Zone, I, II, or III of Table 3.1.

d) Marble dust shall be obtained by crushing marble. Its grading shall fall within the limits of Grading Zone IV of Table 3.1. Grading of Marble dust for use in Mortar shall be as per following table.

Grading of Marble Dust
Grading of Marble Dust

IS Sieve	***Percentage Passing***
10 mm	100
4.75 mm	95-100
2.36 mm	95-100
1.18 mm	90-100
600 micron	80-100
300 micron	15-50
150 micron	0-15

e) Sand for Masonry Mortar and for Plaster- Sand shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these. Sand shall be hard durable, clean and free from adherent coating and organic matter and shall not contain the amount of clay, silt and fine dust more than specified as under.

Deleterious Material: Sand shall not contain any harmful impurities such as iron, pyrites, alkalis, salts, coal or other organic impurities, mica, shale or similar laminated materials, soft fragments, sea shale in such form or in such quantities as to affect adversely the hardening, strength or durability of the mortar.

The maximum quantities of clay, fine silt, fine dust and organic impurities in the sand / Marble dust shall not exceed the following limits:

(1) Clay, fine silt and fine dust when determined in accordance within IS 2386 (Part II). In natural sand or crushed gravel sand and crushed stone sand - Not more than 5% by mass

(2) Organic impurities when determined in accordance with IS 2386 (Part II) - Colour of the liquid shall be lighter than that indicated by the standard specified in IS 2386 (Part II).

Grading of sand for use in masonry mortar shall be conforming to IS 216 (Table 3.2 below).

TABLE 3.2
Grading of Sand for use in Masonry Mortar and Plaster

Grading of sand for use in masonry mortar		***Grading of sand for use in plaster***	
IS Sieve Designation	***Percentage passing by mass***	***IS Sieve Designation***	***Percentage passing by mass***
10 mm	100	10 mm	100
4.75 mm	100	4.75 mm	95 to 100
2.36 mm	90 to 100	2.36 mm	95 to 100
1.18 mm	70 to 100	1.18 mm	90 to 100
600 micron	40 to 100	600 micron	80 to 100
300 micron	5 to 70	300 micron	20 to 65
150 micron	0 to 15	150 micron	0 to 50

Note: For crushed stone sands, the permissible limit on 150 micron IS Sieve is increased to 20%, this does not affect the 5% allowance as per IS 2386 (Part 1).

Bulking: Fine aggregate, when dry or saturated, has almost the same Volume but dampness causes increase in volume. In case fine aggregate is damp at the time of proportioning the ingredients for mortar or concrete, its quantity shall be increased suitably to allow for bulkage, which shall be determined by the method at the end of the chapter. Table 3.3 gives the relation between moisture content and percentage of bulking for guidance only.

Stacking: Fine aggregate shall be so stacked as to prevent dust and foreign matter getting mixed up with it as far as practically possible. Marble dust in dry condition shall be collected in bags and properly staked so as not to form lumps, suitable arrangements shall be made to protect it from moisture similar to those adopted for stacking of cement bags.

Measurements: As the fine aggregate bulks to a substantial extent when partially wet, measurements shall be taken when the stacks are dry or appropriate allowance made for bulking.

12.3.4. Broken Brick (Burnt Clay) Fine Aggregate

Broken Brick (Burnt Clay) Fine Aggregate, also known as Surkhi, shall be made by grinding well burnt (but not under or over burnt) broken bricks as specified in IS 3068-1986. It shall not contain any harmful impurities, such as iron pyrites, salts, coal, mica, shale or similar laminated or other materials in such form of quantity as to adversely affect hardening, strength, durability or appearance of the mortar.

The maximum quantities of clay, fine silt, fine dust and organic impurities in surkhi (all taken together)

shall not exceed five per cent by weight. The particle size grading of surkhi for use in lime mortars shall be within the limits specified in Table 3.4.

TABLE 3.4

IS Sieve Designation	***Percentage passing (by wt)***
4.75 mm	100
2.36 mm	90-100
1.18 mm	70-100
600 microns	40-100
300 microns	5-70
150 microns	0-15

Stacking: Surkhi shall be stacked on a hard surface or platform so as to prevent the admixture of clay, dust, vegetation and other foreign matter. It shall be also protected from rain and dampness and kept under adequate coverings.

Measurements: Surkhi shall be measured in regular stacks in cubic metres. Alternatively it may be measured by weight when supplied in bags.

12.3.5. Fly Ash

Fly ash is finely divided residue resulting from the combustion of pulverized coal in boilers. Fly ash is the pulverized fuel ash extracted from the flue gases by any suitable process such as cyclone separation or electrostatic precipitation. The ash collected from the bottom of boilers is termed as bottom ash. Fly ash is finer than bottom ash. Siliceous fly ash (ASTM Class F) containing calcium oxide less than 10% by mass is normally produced from burning anthracite or bituminous coal and possesses pozzolana properties. Calcareous fly ash (ASTM Class C) is produced by burning lignite or sub-bituminous coal and contains calcium oxide more than 10% by mass; the content could be as high as 25%. This fly ash has both hydraulic and pozzolana properties. It shall be clean and free from any contamination of bottom ash, grit or small pieces of pebbles. It is obligatory on the part of supplier/ manufacture that the fly ash conforms to the requirements if mutually agreed upon and shall furnish a certificate to this effect to the purchaser or his representative.

Characteristics:

The physical requirements of fly-ash shall be as specified in Annexure 'E' as given below. The chemical properties of fly ash shall be as per IS 3812 (part 1 and 2) depending on the usage.

APPENDIX 'E'
PHYSICAL REQUIREMENTS OF FLY ASH
(Clause 3.1.5 and 3.1.5.1)

Sr. No	***Characteristics Requirement of Fly Ash***	***For use as Pozzolana***	***For use as admixture in Cement Mortar and concrete***
1	*2*	*3*	*4*
(i)	Fineness- Specific surface in m^2/kg by Blaine's permeability method, min	320	200
(ii)	Lime reactivity – average compressive strength in N/mm^2 Min	4.5	-
(iii)	Compressive strength at 28 days in N/ mm^2	Not less than 80 per cent of the strength of corresponding mortar cubes.	-
(iv)	Soundness of autoclave test expansion of specimens, per cent, max	0.8	0.8
(v)	Particles retained on 45 micron IS sieve (wet sieving) in percent maximum	34	50

Stacking: Fly ash shall be protected from dirt collecting on it, for details on stacking, please refer the detailed specifications as mentioned in the stacking of material section in this Tender document.

Measurements: Fly ash shall be measured in regular stacks in cubic metres. Alternatively it may be measured by weight when supplied in bags.

12.4. PREPARATION OF MORTARS AND ITS GRADE

Grade of Masonry Mortar

The grade of masonry mortar will be defined by its compressive strength in N/mm2 at the age of 28 days as determined by the standard procedure detailed in IS 2250.

For proportioning the ingredients by volume, the conversion of weight into volume shall be made on the following basis:

(a) Burnt Clay Pozzolana 860 Kg/cum
(b) Coarse Sand (dry) 1280 kg/cum
(c) Fine sand (dry) 1600 kg/ cum
(d) Fly Ash 590 kg/ cum

For details of grades and criteria for selection of Masonry mortars see Appendix 'F'.

APPENDIX F - CRITERIA FOR SELECTION OF MASONRY MORTARS *(Clauses 3.2.0, 3.2.0.1, 3.2.1.1)*

The selection of masonry mortars from durability consideration will have to cover both the loading and exposure condition of the masonry. The masonry mortar shall generally be as specified below in (a) to (g).

a) In case of masonry exposed frequent to rain and where there is further protection by way of plastering or rendering or other finishes, the grade of mortar shall not be less than 0.7 MM but shall preferably be of grade MM2. Where no protection is provided, the grade of mortar for external wall shall not be less than MM2.
b) In case of load bearing internal walls, the grade of mortar shall preferably be MM 0.702 or more for high durability but in no case less than MM 0.5.
c) In the case of masonry work in foundations laid below damp proof course, the grade of mortar for use in masonry shall be as specified below.
a) Where soil has little moisture, masonry mortar of grade not less than MM 0.7 shall be used. (ii) Where soil is very damp, masonry mortar of grade preferably MM 2 or more shall be used. But in
d) In no case shall the grade of mortar be less than MM 2.
e) For masonry in building subject to vibration of machinery, the grade of mortar shall not be less than MM 3.
f) For parapets, where the height is greater than thrice the thickness, the grade of masonry mortar shall not be less than MM3. In case of low parapets the grade of mortar shall be the same as used in the wall masonry.
  i. The grade of mortar for bedding joints in masonry with large concrete blocks shall not be less than MM 3.
  ii. The compressive strength shall be determined in accordance with the procedure given in IS 2250.
g) While mixing the pozzolana material like fly ash in mortars Ordinary Portland cement only shall be used.

Grade of Masonry Mortar (IS 2250) ***(Clause 3.2.0)***

Sl. No.	*Grade*	*Compressive strength at 28 days in*	*Cement*	*Pozzolana (Fly Ash)*	*Sand*
1	MM 0.7	0.7 to 1.5	1.00	-	8.00
2			1.00	0.4*	10.00
3	MM 1.5	1.5 to 2.0	1.00	-	7.80
4			1.00	0.4*	7.50
5	MM 3	3.0 to 5.0	1.00	-	6.00
6			1.00	0.21	4.20
7			1.00	0.40	7.50
8	MM 5	5.0 to 7.5	1.00	-	5.00
9			1.00	0.40	6.25
10			1.00	0.40	5.00
11	MM 7.5	7.5 and above	1.00	0.20	4.00
12			1.00**	0.40	2.10
13			1.00	-	3.30
14			1.00	-	3.75

Note:

*** Pozzolana of minimum lime reactivity of 4 N/MM^2**

**** This ratio by volume correspondence approximately to cement pozzolana ratio of 0.8:0.2 by weight. In this case, only ordinary Portland cement is to be used (see IS 269). Specifications for ordinary rapid hardening and low heat Portland Cement (Third revision). Note: Compressive strength shall be determined in accordance with the Appendix –A-IS 2550.**

Cement Mortar

This shall be prepared by mixing cement and sand with or without the addition of pozzolana in specified proportions

Proportioning: Proportioning on weight basis shall be preferred taking into account specific gravity of sand and moisture content. Boxes of suitable size shall be prepared to facilitate proportioning on weight basis. Cement bag weighting 50 kg shall be taken as 0.035 cubic metres. Other ingredients in

specified proportion shall be measured using boxes of size 40 x 35 x 25 cm. Sand shall be measured on the basis of its dry volume in the case of volumetric proportioning.

Mixing

The mixing of mortar shall be done in mechanical mixers operated manually or by power as decided by Engineer-in-Charge. Hand mixing will not be allowed under all circumstances.

(a) Mechanical Mixing: Cement and sand in the specified proportions shall be mixed dry thoroughly in a mixer. Water shall then be added gradually and wet mixing continued for at least three minutes. only the required quantity of water shall be added which will produce mortar of workable consistency but not stiff paste. Only the quantity of mortar, which can be used within 30 minutes of its mixing, shall be prepared at a time. Mixer shall be cleaned with water each time before suspending the work.

(b) Hand Mixing: Hand mixing will not be allowed.

Precautions: mortar shall be used as soon as possible after mixing and before it begins to set, and in any case within half hour, after the water is added to the dry mixture.

Cement Fly ash Sand Mortar

This shall be prepared by mixing cement, fly ash and sand in specified proportions. Mixing shall be done in a mechanical mixer (operated manually or by power). Hand mixing will not be allowed under all circumstances.

Proportioning:

Proportioning on weight basis shall be preferred taking into account specific gravity of Fly Ash, sand and moisture content. Boxes of suitable size shall be prepared to facilitate proportioning on weight basis. Cement bag weighting 50 kg shall be taken as 0.035 cubic metres. Other ingredients in the specified proportions shall be measured using boxes of suitable sizes. Sand and fly ash shall be measured on the basis of their dry volume in the case of volumetric proportioning.

Mixing

(a) Mechanical Mixing: Sand and fly ash in the specified proportions shall be mixed dry in a mixer and then the specified quantity of cement shall be added and mixed dry thoroughly. Water shall then be added gradually and wet mixing continued for at least one minute. Water shall be just sufficient to bring the mortar to the consistency of a workable paste. Only the quantity of mortar which can be used within 30 minutes of its mixing shall be prepared at a time.

(b) Hand Mixing: Hand mixing will not be allowed

Precautions: mortar shall be used as soon as possible after mixing and before it begins to set, and in

any case within half hour, after the water is added to the dry mixture.

12.5. TESTS ON MORTAR

12.5.1. TEST FOR SILT CONTENT

The sand shall not contain more than 8% of silt as determined by field test with measuring cylinder. The method of determining silt contents by field test is given below:

A sample of sand to be tested shall be placed without drying in a 200 ml measuring cylinder. The volume of the sample shall be such that it fills the cylinder up to 100 ml mark Clean water shall be added up to 150 ml mark. Dissolve a little salt in the water in the proportion one tea spoon to half a litre. The mixture shall be shaken vigorously, the last few shakes being sidewise direction to level off the sand and the contents allowed to settle for three hours.
The height of the silt visible as settled layer above the sand shall be expressed as a percentage of the height of sand below. The sand containing more than the above allowable percentage of silt, shall be washed so as to bring the silt contents within allowable limits.

12.5.2. BULKING OF FINE AGGREGATES/SAND (FIELD METHODS)

Two methods are suggested for determining the bulking of sand/fine aggregate. The procedure may be suitably varied, if necessary. Both depend on the fact that the volume of inundated sand/fine aggregate is the same if the sand/fine aggregate were dry.
Method -1: Put sufficient quantity of sand loosely into a container until it is about two-third full. Level off the top of the sand and push a steel rule vertically down through the sand at the middle to bottom, measure the height. Suppose this is 'X' cm.

Empty the sand out of the container into another container where none of it is lost. Half fill the first container with water. Put back about half the sand and rod it with a steel rod, about 6 mm in diameter, so that its volume is reduced to a minimum. Then add the remainder and level the top surface of the inundated sand. Measure its depth at the middle with the steel rule. Suppose this is 'Y' cm.
The percentage of bulking of the sand due to moisture shall be calculated from the formula:
Percentage bulking = (X/Y -1) X 100
Method-2: In a 250 ml measuring cylinder, pour the damp sand, consolidate it by staking until it reached the 200 ml mark.
Then fill the cylinder with the water and stir the sand well (the water shall be sufficient to submerge the sand completely). It will be seen that the sand surface is now below its original level. Suppose the surface is at the mark of Yml, the percentage of bulking of sand due to moisture shall be calculated from the formula.
Percentage bulking= (200/Y – 1) x 100

TABLE 3.3

Moisture content % age	*Bulking % age (by volume)*
2	15
3	20
4	25
5	30

13. CONCRETE BLOCK MASONRY

13.1. SCOPE

These specifications cover the use of Concrete Block Masonry for the structural / non structural purposes.

13.2. GENERAL

The provision of the latest Indian Standards listed below form part of these specifications:
All relevant Standards as specified elsewhere in this Volume are also applicable.

IS 269	Specification for ordinary and low heat Portland cement
IS 383	Specification for coarse and fine aggregates from natural sources for concrete.
IS 455	Specification for Portland slag cement
IS 456	Code of Practice for plain and reinforced concrete.
IS 2185 (Part I)	Solid cement concrete blocks.
IS 2572	Code of practice for construction of hollow concrete block masonry.
IS 2645	Specification for integral waterproofing compound.
IS 9103	Specification for admixtures for concrete.

13.3. MATERIALS

13.3.1. Cement

Ordinary Portland cement complying with IS 269 shall be used unless specified. Cement complying with any of the following Indian Standards may be used at the discretion of the Engineer-in Charge: IS 269-1989. 455-1989, 1489-1999, 6909-1990, 8041-1990, 8043-1991. When cement conforming to IS: 269-1989 is used, replacement of cement by fly ash conforming to 1S:3812-1981 may be

permitted up to a limit of 20%. However, it shall be ensured that blending of fly ash with cement is as intimate as possible, to achieve maximum uniformity.

13.3.2. Aggregates

Aggregates shall conform to IS 383. Grading shall be as indicated in IS 383. Fineness modules of the combined aggregates shall be between 3.6 and 4. The aggregates used in the manufacture of block shall be clean and free from all deleterious matter, and shall conform to the requirements of IS:383-1970. Maximum size of the coarse aggregate shall be 10 mm. Sand used in the manufacture of blocks shall be well graded, clean and free from deleterious matter, and shall conform to the requirements of IS: 383-1970. Besides it shall have fine particles 15 to 20% passing 300 micron IS Sieve and 5 to 15% passing 150 micron IS Sieve.

13.3.3. Water

Water conforming to IS 456 and as approved by the EIC shall be used.

13.3.4. Admixtures

Additives or admixtures may be added to the cement or concrete mix conforming to the IS specifications. Admixtures shall be chloride free and melamine polymer based.
Other additives or admixtures not being governed by Indian Standards shall be tested and checked that the same are not detrimental to durability. However any addition shall only be after approval of the EIC.

13.3.5. FLY ASH

Fly ash conforming to IS : 3812 (Part III)-1966* may be used for part replacement of fine aggregate up to a limit of 20 percent for the construction of blocks. This will only be applicable on the written recommendations of the structural consultant and his decision will be final on this matter

13.4. MANUFACTURE

13.4.1. Concrete blocks may be hollow (open or closed cavity) or solid and shall be referred to by its nominal dimension. The term nominal dimension includes the thickness of the mortar joint. All specifications of solid concrete blocks including specifications for actual dimensions, tolerances, sizes, shapes and webs, grades of blocks etc. shall conform to IS : 2185. Blocks may be manufactured either at construction site or in factory on a central casting platform using steel moulds with or without surface vibration for compaction of cement concrete.

13.4.2. Mould: - Moulds shall be fabricated using mild steel plates and mild steel angles for stiffening the plates. The mould shall pc either fixed type (box with four side walls fixed at corners, and top and bottom open) or split type. Split type may be either individual or gang mould. Where the compaction of the concrete is done manually, the mould may be either fixed type or split type. When the compaction of the blocks is done with surface vibrator, the mould shall be only split type (individual• or gang mould).

13.4.3. Concreting

Concrete mix used for blocks shall be pre-designed to give a minimum crushing strength as specified in table 2 given below. Concrete shall be mixed in the mechanical mixer. Blocks shall be moulded, laid and compacted with automatic machines table vibrator. Care shall be taken to see that the mix mould is properly filled up. Block shall be protected until they are sufficiently hardened to permit handling without damage. The cement concrete mix for concrete masonry blocks shall not be richer than one part by volume of cement to 9 parts by volume of combined fine and coarse aggregates, and shall not be leaner than one part by volume of cement to 13 parts by volume of combined fine and coarse aggregates.

13.4.4. In case of blocks where compaction is done manually, concrete mix of medium Consistency (10-12 mm slump) shall be used in order to enable proper compaction and de-moulding. The consistency of the mix should be such that it may cohere when compressed in the hand without free water being visible.

13.4.5. In case of blocks where compaction is done by external vibrator, concrete mix of very low consistency (zero slump) shall be used in order to vibrate and compact the concrete under pressure.

13.4.6. Mixing:-

Concrete shall normally be mixed in a mechanical mixer unless otherwise permitted by Engineer-in-charge. In case of hand mixing 10% extra cement shall be used without any extra payment. Mixing shall be continued until there is a uniform distribution of the materials, and the mass is uniform in colour and consistency.

13.4.7. De-moulding shall be done 5 to 10 minutes after compaction. In case of fixed type mould it shall be pulled up with side handles while pressing down the block with the plate at top with thumb., In case of split type mould, the sides shall be removed first and the partition plates (gang mould) shall be pulled up subsequently.

After de-moulding, the blocks shall be protected until they are sufficiently hardened to permit handling without damage.

13.4.8. Curing and Drying

Blocks shall be cured in the curing yard by keeping them continuously moist for at least 14 days. Steam-cured blocks shall be preferred. Cured blocks shall be allowed to dry for a period of 4 weeks before being used. The blocks shall be allowed to complete their initial shrinkage before they are laid in the wall.

13.4.9. Physical requirements

All blocks shall be sound and free of cracks or other defects. For exposed construction face or faces shall be free of chips, or other imperfections, and the overall dimensions of the blocks shall be in accordance to tolerance as specified. Minimum compressive strength shall be as

per table 2 below , maximum permissible water absorption shall not exceed the limit specified in I.S. : 2185, dimensional variations shall conform to I.S. 2185.
The minimum compressive strength at 28 day being the average of eight blocks, and the minimum compressive strength at 28 days of individual blocks, when tested in the manner described in Appendix B, of IS:12440-1988, shall be as prescribed in Table 2.

TABLE 2 COMPRESSIVE STRENGTH OF CONCRETE STONE MASONRY BLOCKS

Class Designation Compressive Strength (N/mm2)	Minimum average blocks N/mm2	Minimum strength of individual of blocks (N/mm2)
5	5	3.5
6	6	4.2
7	7	5
9	9	6.3
10	10	7.5

For 100 mm wide blocks (for 100 mm thick walls), the minimum strength may be 3.5 N/mm2

13.4.10. Testing
Tests as indicated in Appendices A to F of IS 2185 shall be conducted on samples of units selected according to the sampling procedure given here under to ensure conformity with the physical requirements as specified.

13.4.11. Sampling
A sample of 20 blocks shall be taken from every consignment of 5000 blocks or part thereof of the same size and same batch of manufacture. From these samples, the blocks shall be taken at random for conducting the test.

The blocks shall be taken at regular intervals during the course of work, preferably while being loaded or unloaded. In case samples are to be taken from the stacks, blocks shall be taken at random from across the top of the stacks, the sides accessible and from the interior of the stacks.

The blocks shall be kept under cover and protected from extreme conditions of temperature, relative humidity and wind until they are required for test. The test shall be conducted as soon as the sample has been taken.

13.4.12. Number of Tests
All the 20 blocks shall be checked for dimensions and inspected for visual defects. Out of the 20 blocks, 3 blocks shall be subjected to the test for block density, 8 blocks to the test for compressive strength, 3 blocks to the test for water absorption and 3 blocks to the test for

drying shrinkage and later to the test for moisture movement. The remaining 3 blocks shall be reserved for retest for drying shrinkage and moisture movement if a need arises.

Blocks shall be approved if requirements of conditions mentioned in 11.2 to 11.5 (of IS 2185 (Part I) are satisfied.

The number of blocks with dimensions outside the tolerance limit and / or with visual defects, among those inspected shall not be more than two.

For Block density and compressive strength, the mean value determined shall be greater than or equal to the minimum limit specified in Table 2 of IS 2185 (Part I) and reproduced as Table 27 of Annexure.

For drying shrinkage and moisture movement, all the test specimens shall satisfy the requirements of the test. If one of more specimens fails to satisfy the requirements, the remaining 3 blocks shall be subjected to these tests. All blocks shall satisfy the requirements. Drying shrinkage shall not exceed 0.1 percent.

For water absorption, the mean value determined shall not be more than 10 percent by mass.

13.5. HOLLOW AND SOLID CONCRETE BLOCK MASONRY

Hollow and solid concrete blocks- Shall conform to the requirements of IS: 2185--1979.

Specification for hollow and solid concrete blocks except with regard to the mix of cement concrete and sizes of aggregates shall be as indicated. Hollow blocks shall be sound, free from cracks, broken edges, honey combing and other defects that would interfere with the proper placing of block or impair the strength or performance of construction.

Concrete Block-hollow (open or closed cavity) or solid shall be referred to by its nominal dimensions. The nominal dimensions of concrete block shall be, as follows:

Length 400mm, 500mm or 600mm

Height 200mm or 100 mm

Width 50mm, 75mm,100mm, 150mm, 200mm, 250mm or 300mm

In addition, block shall be manufactured in half lengths of 200mm, 250mm or 300mm to correspond to the full lengths. The maximum variation in the length of the units shall be not more than ±5mm and maximum variation in height and width of unit, not more than ±3mm.

13.5.1. WORKMANSHIP

13.5.1.1. In total dry climate top and sides may be slightly moistened to avoid absorption of water from mortar.

13.5.1.2. Joints shall not be bigger than 10mm and will be perfectly horizontal and vertical. Joints shall be raked 10mm deep while mortar is wet.

13.5.1.3. Cut blocks shall not be used. Special solid pre-cast blocks at site shall be cast well in advance to be used as spacers and to adjust breaking of vertical joints.

13.5.1.4. Cracks in block masonry are due to shrinkage or expansion of blocks or due to settlement, thermal expansion or changes in moisture content in the structural members enclosing the block walls. The following measures are recommended to prevent formation of cracks.

13.5.1.4.1. While curing, the block masonry should be lightly sprinkled with water and not made excessively wet.

13.5.1.4.2. Expansion joints shall be provided in walls exceeding 30 m in length.

13.5.1.4.3. Reinforcement should be provided in the bed joints in block work, one course above and course below windows and above doors in order to distribute the shrinkage/ temperature stresses occurring at the corners of openings, more uniformly throughout the walls.

13.5.1.4.4. R.C.C. band (Patlis) 100 mm thick and width equal to block masonry and having 8 mm dia. two bars with 8 mm dia links @ 300 mm c/c shall be provided at every 1000mm interval in the block masonry. The gap between the topmost layer of block and the soffit of the beam shall be packed by lightly hammering flat pieces of Shahabad/ Kota tiles and then the gaps will be covered by weld mesh before closing them by cement plaster. The weld mesh will be extended at least 150 mm on the R.C.C. beam and 150 mm on block masonry and nailed to them with strong nails.

13.5.1.4.5. Provisions for door and window frames: - A course of solid concrete block masonry shall be provided under door and window openings (or a 10em thick pre-cast concrete sill block under windows). The solid course shall extend for at least 20cm beyond the opening on either side. For jambs of very large doors and windows either solid unit are used, or the hollows shall be filled in with concrete of mix 1:3:6 using 12.5 mm nominal size aggregates.

13.5.1.4.6. Provisions for Roof/ceiling: - The course immediately below the roof slab shall be built with solid blocks: The top of the roof course shall be finished smooth with a layer of cement and coarse sand mortar 1:3, 10mm thick and covered with a thick coat of white wash or crude oil, to ensure free movement of slab.

13.5.1.4.7. Intersecting walls: - When two walls meet or intersect and the courses are to be laid up at me same time, a true masonry bond between at least 50% of the units at the intersection is necessary. When such intersecting walls are laid up separately, pockets with 20mm maximum vertical spacing shall be left in the first wall laid. The corresponding course of the second wall shall be built into these pockets. Fixtures, fittings, etc. shall be built into the masonry in cement and coarse sand mortar 1:3 while laying the blocks where possible. Hold fasts shall be built into the joints of the masonry during laying. Holes, chases, sleeves, openings, etc of the required size and shape shall be formed in the masonry with special blocks while laying, for fixing pipes, service lines, passage of water etc. After service lines, pipes etc are fixed, voids left, if any, shall be filled up with cement concrete 1:3:6 (1 cement 3 coarse sand: 6 stone aggregate 20mm nominal size) and neatly finished.

13.5.2. SCAFFOLDING

Scaffolding shall be **double** and shall be erected with steel sections or pipes of adequate strength so as to be safe for construction operations. The contractor shall take all measures to ensure the safety of the work and working people. Any instructions of the Engineer in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to properly or injury to persons resulting from ill erected scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach to every part of the work. Overhead work shall not be allowed. Block work shall be carried out with double scaffolding only. Making holes of any kind for the purpose of supporting the scaffolding shall not be permitted.

13.5.3. MEASUREMENT

Hollow or solid cement concrete block work shall be measured in Sqm for the specified widths up to 200mm. For widths 200mm and greater than 200mm, the mode of measurement will be in cubic meters

13.5.4. RATES

Rates for concrete block masonry item shall include the following:

13.5.4.1.1. Material and labour, for the completion of items as specified including any centring, shuttering, curing etc.

13.5.4.1.2. Raking out of joints.

13.5.4.1.3. Preparation of the tops and sides.

13.5.4.1.4. Forming and preparing expansion, contraction or construction joints as detailed above or specified in the BOQ or drawings.

13.5.4.1.5. Making holes, openings, etc. for outlets, embedding down take pipes, etc. wherever

necessary during construction and finishing exposed surfaces as per instruction of the EIC.

13.5.4.1.6. Curing and protection as specified.

13.5.4.1.7. Making holes, openings, outlets, etc. embedding pipes, ends of beams, joints, slabs, trusses, sills, etc. whatever required during construction and neatly finishing the exposed surfaces and opening as per instructions of the EIC.

13.6. AUTOCLAVED AERATED BLOCKS/ LIGHT WEIGHT BLOCK MASONRY

Autoclaved Aerated Concrete Blocks or AAC Blocks are concrete products which possess a unique combination of thermal properties like low thermal conductivity and high thermal inertia. AAC Blocks provide thermal insulation through walls.
Autoclaved aerated concrete mixture consisting of quartz sand, lime, cement, proprietary additives, water, and reinforcement.

Technical Data:

Face Size (L X H in mm)	600 x 200		
Wall Thickness (in mm)	100	150	200
Dry Weight (in Kg)	7.8	11.7	15.6
Normal Dry Density (kg/m3)	650	650	650
Thermal Conductivity	0.16	0.16	0.16
Sound Reduction (in decibels)	38-50 db depending on thickness		
Fire Resistance (in hours) for			
NLB (Non load bearing)	4	6	6
LB (load bearing)	2	4	4

Compressive Strength: The light weight concrete block shall have a minimum compressive strength of 35 kg / sq.cm.
Bending Compression: 15 kg / sq.cm.
The mortar used for light weight concrete block shall be as specified in the Schedule of Items; Cement and water used in mortar shall conform to the quality as described in Mortar, whereas sand used for mortar shall be fine screened only. The light weight concrete block masonry should not be used below ground or in plinth. The block masonry work shall be built in stretcher course only. Use of strong mortar with light weight concrete blocks is not advisable, use of compatible mortar is advisable. Lean mortars distribute and accommodate more readily the strains arising from thermal, moisture and chemical changes. According to IS 6041:1985 blocks shall be embedded with a mortar, the strength of which is relatively lower than that of mix used in making of blocks. Cement sand mortar 1:6 or 1:1 : 5 (1 cement : 1 fly ash : 5 sand) shall be used. The mortar shall not be spread so much ahead of the actual laying of the

units that it tends to stiffen and lose its plasticity there by resulting in poor bond. Consistency as per requirement of site must be maintained at the point of laying over bed. Mortar joint shall be struck off flush with wall surface and when the mortar starts stiffening, it shall be compressed tightly to have a key for plastering.

13.6.1. WORKMANSHIP

13.6.1.1. In total dry climate top and sides may be slightly moistened to avoid absorption of water from mortar. These blocks should never be soaked prior to laying in the wall. Only slight wetting is required

13.6.1.2. Joints shall not be bigger than 10mm and will be perfectly horizontal and vertical. Joints shall be raked 10mm deep while mortar is wet.

13.6.1.3. Cracks in AAC block masonry are due to shrinkage or expansion of blocks or due to settlement, thermal expansion or changes in moisture content in the structural members enclosing the block walls. The following measures are recommended to prevent formation of cracks.

13.6.1.4. While curing, the block masonry should be lightly sprinkled with water and not made excessively wet.

13.6.1.5. Expansion joints shall be provided in walls exceeding 30 m in length.

13.6.1.6. Reinforcement should be provided in the bed joints in block work, one course above and course below windows and above doors in order to distribute the shrinkage/ temperature stresses occurring at the corners of openings, more uniformly throughout the walls.

13.6.1.7. R.C.C. band (Patlis) 100 mm thick and width equal to block masonry and having 8 mm dia. two bars with 8 mm dia links @ 300 mm c/c shall be provided at every 1000mm interval in the block masonry. The gap between the topmost layer of block and the soffit of the beam shall be packed by lightly hammering flat pieces of Shahabad/ Kota tiles and then the gaps will be covered by weld mesh before closing them by cement plaster. The weld mesh will be extended at least 150 mm on the R.C.C. beam and 150 mm on block masonry and nailed to them with strong nails.

13.6.1.8. Provisions for Roof/ceiling: - The course immediately below the roof slab shall be built with solid blocks: The top of the roof course shall be finished smooth with a layer of cement and coarse sand mortar 1:3, 10mm thick and covered with a thick coat of white wash or crude oil, to ensure free movement of slab.

13.6.1.9. Intersecting walls: - When two walls meet or intersect and the courses are to be laid up at me same time, a true masonry bond between at least 50% of the units at the intersection is

necessary. When such intersecting walls are laid up separately, pockets with 20mm maximum vertical spacing shall be left in the first wall laid. The corresponding course of the second wall shall be built into these pockets. Fixtures, fittings, etc. shall be built into the masonry in cement and coarse sand mortar 1:3 while laying the blocks where possible. Hold fasts shall be built into the joints of the masonry during laying. Holes, chases, sleeves, openings, etc of the required size and shape shall be formed in the masonry with special blocks while laying, for fixing pipes, service lines, passage of water etc. After service lines, pipes etc are fixed, voids left, if any, shall be filled up with cement concrete 1:3:6 (1 cement 3 coarse sand: 6 stone aggregate 20mm nominal size) and neatly finished.

13.6.2. SCAFFOLDING

Scaffolding shall be **double** and shall be erected with steel sections or pipes of adequate strength so as to be safe for construction operations. The contractor shall take all measures to ensure the safety of the work and working people. Any instructions of the Engineer in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to properly or injury to persons resulting from ill erected scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach to every part of the work. Overhead work shall not be allowed. Block work shall be carried out with double scaffolding only. Making holes of any kind for the purpose of supporting the scaffolding shall not be permitted.

13.6.3. MEASUREMENT

AAC / Light weight block work shall be measured in Sqm for the specified widths up to 200mm. For widths 200mm and greater than 200mm, the mode of measurement will be in cubic meters

13.6.4. RATES

Rates for AAC/Light weight block masonry item shall include the following:

13.6.4.1. Material and labour, for the completion of items as specified including any centring, shuttering, curing etc.

13.6.4.2. Raking out of joints.

13.6.4.3. Preparation of the tops and sides.

13.6.4.4. Forming and preparing expansion, contraction or construction joints as detailed above or specified in the BOQ or drawings.

13.6.4.5. Making holes, openings, etc. for outlets, embedding down take pipes, etc. wherever necessary during construction and finishing exposed surfaces as per instruction of the EIC.

13.6.4.6. Curing and protection as specified.

13.6.4.7. Making holes, openings, outlets, etc. embedding pipes, ends of beams, joints, slabs, trusses, sills, etc. whatever required during construction and neatly finishing the exposed surfaces and opening as per instructions of the EIC.

The light weight concrete block wall of required thickness as described in Schedule of Items shall be constructed with R.C.C. vertical and horizontal stiffeners, of required size at suitable intervals, as directed by the Engineer-in-Charge, or as per drawing. R.C.C. and steel reinforcement shall be included in the rate and will not be measured and paid for separately. The masonry work shall be raised truly in plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The vertical joints should be not more than 12mm thick and shall be fully filled from the top with cement mortar without any void in masonry. All face joints shall be raked out to a minimum depth of 15 mm. by raking tool, during the progress of the work, when the mortar is still green, so as to provide proper key for the plaster or pointing. All fixtures, pipes, outlets of water, holdfasts, of doors, windows, which are required to be built into the block masonry, shall be embedded in mortar or cement concrete, as specified, in correct position, as the work proceeds and as directed by the Engineer-in-Charge. After masonry work is over, the masonry shall be marked with date of construction visible for inspection and curing.

13.7. CAVITY WALL

It is a wall comprising of two leaves, each leaf being built of masonry units and separated by a cavity so as to provide an air space within the wall and tied together with metal ties or bonding units to ensure that two leaves act as one structural unit. The width of the cavity shall not be less than 50 mm and not more than 150 mm. Each leaf of the cavity wall shall not be less than 75 mm. The space between the leaves shall be either left as cavity or filled with non-load bearing insulating and water proofing material. The method of construction of the cavity is the same as mentioned under the head of respective block items

Metal Ties
These may be of galvanised iron, wrought iron, gun metal, brass, copper, stainless steel or any such corrosion resistant metal, made of flats 20 x 5 mm cranked or twisted at their mid point with ends split and fish tailed. The ties shall be built into horizontal bed joints during erection, placed sloping towards the exterior side to prevent water from flowing along it from outer to inner leaf side

Mode of Measurement:-
Both the masonries made for the cavity will be measured as one single wall in Sqm

13.8. GUIDELINES FOR CUTTING CHASES IN THE MASONRY

Guide lines for chases is masonry walls as per Indian Standard BIS:1905 need to be followed. The cutting of chases, recesses etc. should be done without damage to the surrounding masonry. It is desirable to use such tools for cutting which depend upon rotary motion not on heavy impact for cutting action.

1) As far as possible, services should be planned with the help of vertical chases and use of horizontal chases should be avoided

2) Vertical chases shall not be closer than 2 m in any stretch of wall and shall not be located within 34.5 cm of an opening or within 23 cm of a cross wall that serves as a stiffening wall for stability. Width of a vertical chase shall not exceed thickness of wall in which it occurs

14. BRICK WORK

14.1. TERMINOLOGY

These specifications cover the use of Brick Masonry for the structural purposes.

Bond
The arrangement of the bricks in successive courses to tie the brick work together both longitudinally and transversely is known as Bond. The arrangement is usually designed to ensure that no vertical joint of one course is exactly over the one in the next course above or below it, and there is greatest possible amount of lap.

Bed Joint
Horizontal joint in brick work or masonry is called as Bed Joint.

Closer
Any portion of a brick used in constructing a wall, to close up the bond next to the end brick of a course.

Coping or Weathering
The cover applied over or the geometrical form given to a part of structure to enable it to shed rain water.

Corbel
A cantilever projecting from the face of a wall to form a bearing is known as Corbel.

Cornice
Horizontal or ornamental feature projecting from the face of a wall is known as Cornice

Course
A layer of bricks including bed mortar is known as a course.

Cross joint
A joint other than a bed joint normal to the wall face is called as cross joint.

Efflorescence

A powdery incrustment of salts left by evaporation is known as Efflorescence. This may be visible on the surface or may be below surface. In the latter case, this is termed as crypto Efflorescence.

Header
A brick laid with its length across the wall is a Header.

Indenting
The leaving of recesses into which future work can be bonded is called as Indenting.

Jamb
The part of the wall at the side of an opening is known as a Jamb.

Joint
A junction of bricks is a joint.

Jointing
The operation of finishing joints as the masonry work proceeds is known as jointing.

Pier
A thickened section forming integral part of the wall placed at intervals along the wall primarily to increase the stiffness of the wall or to carry a vertical concentrated load is a pier. The thickness of a pier is the overall thickness including the thickness of the wall, or when bonded into one leaf of a cavity wall the thickness obtained by treating this leaf as an independent wall

Pillar
Pillar means a detached masonry support. This can be rectangular, circular, elliptical etc. In case of rectangular pillar, the breadth shall not exceed three times the thickness and thickness itself shall not exceed more than thrice the length of brick.

Quoin
An external corner in brick work, the term may also denote the brick used to form the quoin.

Scaffolding
A temporary erection of timber or steel work used in the construction, alteration, demolition or repairs of a building to support or to attend of the hoisting or lowering of workmen, their tools and materials. Scaffoldings are of two types, namely single and double scaffoldings. Single scaffolding consists of a row of verticals connected to wall by horizontal supported on and tied to the structure. Double scaffolding consists of two rows of verticals secured or leashed together with horizontal and diagonal bracings forming essentially a structure independent of the building. It may also connect to the structure at convenient points for the sake of better stability.

Sill
A brick work forming the lower boundary of door or window opening

Spandrel
The space between the haunches and the road decking of an arch is known as a Spandrel.

Stretcher
A brick laid with its length in the direction of the wall is a Stretcher.

String course
A horizontal course projecting from a wall usually introduced at every floor level or windows or below parapet for imparting Architectural appearance to the structure and also keeping off the rain water is a String Course.

Template
A pattern of sheet metal used as a guide for setting out specific section and shape is a Template.

Toothing
Bricks that are left projecting in alternate courses to bond with future work is known as toothing.

Wall joint
A joint parallel to the wall face is a Wall joint.

14.2. GENERAL

The provision of the latest Indian Standards listed below form part of these specifications:

IS: 1077	Specifications for common burnt clay building bricks
IS: 1200	Measurement for Building works
IS: 1725	Specifications for solid cement blocks used in general building construction.
IS: 1905	Code of practice for structural safety of buildings Masonry walls.
IS:2116	Sand for masonry mortars.
IS:2180	Specification for heavy duty burnt clay building bricks
IS:2185	Specification for concrete masonry units: Hollow and solid concrete blocks.
IS:2212	Code of practice for brick work.
IS:2222	Specification for burnt clay perforated building bricks.
IS:2250	Code of practice for preparation and use of masonry mortar.
IS:2691	Specification for burnt clay facing bricks.
IS:3115	Specification for lime based blocks.

IS:3414	Code of practice for design and installation of joints in buildings.
IS:3466	Specification for masonry cement.
IS:3861	Method of measurement of plinth, carpet and rent able areas of buildings.
IS:3952	Specification for burnt clay hollow blocks for walls and partitions.
IS:4098	Specification for lime-pozzolana mixture
IS:4139	Specification for sand lime bricks
IS:4441	Code of practice for use of silicate type chemical resistant mortars.
IS:4442	Code of practice for use of sulphur type chemical resistant mortars.
IS: 5495	Size and shape for fire bricks

Other I.S. Codes not specifically mentioned here but pertaining to the use of bricks for structural purposes forms part of these specifications.

14.3. MATERIALS

14.3.1. Bricks

Bricks shall be of regular and uniform size, shape and colour, uniformly well burnt throughout but not over burnt. They shall have plane rectangular faces with parallel sides and sharp straight and right angled edges. They shall be free from cracks or other flaws. They shall have a frog of 10 mm. depth on one of their flat faces.

They shall give a clear metallic ringing sound when struck. They shall show a fine grained, uniform homogeneous and dense texture on fracture and be free from lumps of lime, laminations, cracks, air holes, soluble salts causing efflorescence or other defects which may in any way impair their strength, durability, appearance or usefulness for the purpose intended. They shall not have any parts under-burnt. They shall not break when thrown on the ground on their flat face in a saturated condition from a height of 60 cm.

Bricks used in the masonry may be of the following type.

14.3.1.1. The Common Burnt Clay Bricks shall conform to IS:1077 and shall be hand moulded or machine moulded. They shall be free from nodules of free lime, visible cracks, flaws warp age and organic matter, have a frog 100 mm in length 40 mm in width and 10 mm to 20 mm deep on one of its flat sides. Bricks made by extrusion process and brick tiles may not be provided with frogs. Each brick shall be marked (in the frog where provided) with the manufacturer’s identification mark or initials.

14.3.1.2. Fly Ash Lime Bricks (FALG Bricks) : The Fly Ash Lime Bricks (FALG Bricks) shall conform to IS 12894. Visually the bricks shall be sound, compact and uniform in shape free from visible

cracks, warp age, flaws and organic matter. The bricks shall be solid and with or without frog on one of its flat side. Fly ash shall conform to IS 3812. Note: This item will be operated only for load bearing structure up to 2 storeys and for non-load bearing walls 23 centimetres thick for multi-storeyed buildings. Bottom ash used as replacement of sand shall not have more than 12% loss on ignition when tested. Sand: Deleterious materials, such as clay and silt in the sand shall preferably be less than 5%. Lime: Lime shall conform to class 'C' hydrated lime of IS 712. Additives: Any suitable additive considered not detrimental to the durability of bricks may be used.

14.3.1.3. Clay Fly Ash Bricks: The clay fly ash bricks shall conform to IS 13757. The bricks shall be sound, compact and uniform in shape and colour. Bricks shall have smooth rectangular faces with sharp and square corners. The bricks shall be free from visible cracks, flaws, warp age, nodules of free lime and organic matter, the bricks shall be hand or machine moulded. The bricks shall have frog of 100 mm in length 40 mm width and 10 to 20 mm deep on one of its flat sides. If made by extrusion process may not be provided with frogs. Fly Ash shall conform to grade I or grade II of IS 3812.

14.3.1.4. Calcium Silicate Bricks: The bricks shall conform to IS 4139. The Calcium silicate bricks shall be sound, compact and uniform in shape. Bricks shall be free from visible cracks, warp age, organic matter, large pebbles and nodules of free lime. Bricks shall be solid and with or without frog. The bricks shall be made of finely grounded sand siliceous rock and lime. In addition limited quantity of fly ash conforming to IS 3812 may be used in the mix. These bricks are also known as Fly Ash Sand Lime bricks in the construction industry.

14.3.1.5. Tile Brick: The bricks of 4 cm height shall be moulded without frogs. Where modular tiles are not freely available in the market, the tile bricks of F.P.S. thickness 44 mm (1-3/4") shall be used unless otherwise specified.

14.3.1.6. Brick Bats: Brick bats shall be obtained from well burnt bricks.

14.3.1.7. Mechanized Autoclave Fly Ash Lime Brick: These bricks shall be machine moulded and prepared in plant by appropriate proportion of fly ash and lime. The autoclave fly ash bricks shall conform to IS 12894. Visually, the bricks shall be sound, compact and uniform shape, free from visible cracks, warp age and organic matters. The brick shall be solid with or without frog, and of 100/80 mm in length, 40 mm width and 10 to 20 mm deep one of its flat side as per IS 12894. The brick shall have smooth rectangular faces with sharp corners and shall be uniform in shape and colour. Fly ash shall conform to IS 3812 and lime shall conform to class 'C' hydrated lime of IS 712.

14.3.2. Size of bricks

14.3.2.1. The brick may be modular or non-modular. Sizes for both types of bricks/tiles shall be as per Table 6.1. While use of modular bricks/tiles is recommended, non-modular (FPS)

bricks/tiles can also be used where so specified. Non-modular bricks/tiles of sizes other than the sizes mentioned in Table 6.1 may also be used where specified.

TABLE 6.1

Type of Bricks/ Tiles	*Nominal Size mm*	*Actual Size mm*
Modular Bricks	200 x 100 x 100 mm	190x90 x90 mm
Modular tile bricks	200 x 100 x40 mm	190x90 x40 mm
Non-modular tile bricks	229 x 114x44 mm	225 x 111 x 44 mm
Non-modular bricks	229 x 114 x70 mm	225 x 111 x 70 mm

14.3.2.2. When metric bricks are used they shall comply with I. S: 1077 - 1976.

Classification

Bricks/Brick tiles shall be classified on the basis of their minimum compressive strength as given below

TABLE 6.2

Class Designation	*Average compressive strength*			
	Not less than		*Less than*	
	N/mm2	*Kgf/cm2*	*N/mm2*	*Kgf/cm2*
12.5 (125)	*12.5*	*125*	*15*	*150*
10 (100)	10	100	12.5	125
7.5 (75)	7.5	75	10	100
5 (50)	5	50	7.5	75
3.5 (35)	3.5	35	5	50

14.3.3. Absorption

After immersion in water, absorption by weight shall not exceed 20% of the dry weight of the brick when tested according to IS: 1077-1976.

14.3.4. Mortars

Cement and sand shall be mixed in specified proportions given on the drawings. Cement shall be proportioned only by weight, by taking its unit weight as 1440 kg per cubic metre and the sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

The mixing shall be done intimately in a mechanical mixer unless hand-mixing is specifically permitted by the Engineer-in-charge. If hand mixing is done, the operation shall be carried out

on a clean watertight platform and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes. The mortar remaining unused after that period or mortar, which has partially hardened or is otherwise damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away. In case of cement mortar that has stiffened because of evaporation of water the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency, but this re-tempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.
Necessary tests to determine compressive strength of the mortar, for consistency of the mortar and its water retentively shall be carried out in accordance with IS-2250. The frequency of testing shall be one cube for every 2 cubic metre of mortar prepared subject to a minimum of 3 cubes for a day's work.

14.4. CONSTRUCTION

14.4.1. Soaking of Bricks

Bricks shall be soaked in water for a minimum period of one hour before use and ideally be soaked 24 hours prior to use in masonry, so that they will be saturated and will not absorb water from the mortar. When bricks are soaked they shall be removed from the tank sufficiently in advance so that at the time of lying they are skin-dry. Such soaked bricks shall be stacked on a clean place where they are not spoil by dirt, earth, etc,

14.4.2. Laying of Bricks

Bricks shall be laid in English Bond unless otherwise specified. For brick work in half brick wall, bricks shall be laid in stretcher bond. Half or cut bricks shall not be used except as closer where necessary to complete the bond. Closers in such cases, shall be cut to the required size and used near the ends of the wall. Header bond shall be used preferably in all courses in curved plan for ensuring better alignment.

Note: Header bond shall also be used in foundation footings unless thickness of walls (width of footing) makes the use of headers impracticable. Where thickness of footing is uniform for a number of courses, the top course of footing shall be headers.

All loose materials, dirt and set lumps of mortar which may be lying over the surface on which Brick work is to be freshly started, shall be removed with a wire brush and surface wetted. Bricks shall be laid on a full bed of mortar, when laying, each brick shall, be properly bedded and set in position by gently pressing with the handle of a trowel. It’s inside face shall be buttered with mortar before the next brick is laid and pressed against it. Joints shall be fully filled and packed with mortar such that no hollow space is left inside the joints.

The walls shall be taken up truly in plumb or true to the required batter where specified. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in the alternate course shall come directly one over the other. Quoin, Jambs and other angles shall be properly plumbed as the work proceeds. Care shall be taken to keep the perpends properly aligned within following maximum permissible tolerances:

(a) Deviation from vertical within a storey shall not exceed 6 mm per 3 m height.

(b) Deviation in verticality in total height of any wall of building more than one storey in height shall not exceed 12.5 mm.

(c) Deviation from position shown on plan of any brick work shall not exceed 12.5 mm.

(d) Relative displacement between loads bearing wall in adjacent storeys intended to be vertical alignments shall not exceed 6 mm.

(e) A set of tools comprising of wooden straight edge, Masonic spirit levels, square, 1 meter rule line and plumb shall be kept on the site of work for every 3 masons for proper check during the progress of work.

All quoins shall be accurately constructed and the height of brick courses shall be kept uniform. This will be checked using graduated wooden straight edge or storey rod indicating height of each course including thickness of joints. The position of damp proof course, window sills, bottom of lintels, top of the wall etc. along the height of the wall shall be marked on the graduated straight edge or storey rod. Acute and obtuse quoins shall be bonded, where practicable in the same way as square quoins. Obtuse quoins shall be formed with squint showing three quarters brick on one face and quarter brick on the other.

The brick work shall be built in uniform layers. No part of the wall during its construction shall rise more than one meter above the general construction level. Parts of wall left at different levels shall be raked back at an angle of 45 degrees or less with the horizontal. Toothing shall not be permitted as an alternative to raking back. For half brick partition to be keyed into main walls, indents shall be left in the main walls. All pipe fittings and specials, spouts, hold fasts and other fixtures which are required to be built into the walls shall be embedded, as specified, in their correct position as the work proceeds unless otherwise directed by the Engineer-in-Charge.

Top courses of all plinths, parapets, steps and top of walls below floor and roof slabs shall be laid with brick on edge, unless specified otherwise. Brick on edge laid in the top courses at corner of walls shall be properly radiated and keyed into position to form cut corners as directed by the Engineer in Charge. Where bricks cannot be cut to the required shape to form cut corners, cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) equal to thickness of course shall be provided in lieu of cut bricks.

Bricks shall be laid with frog (where provided) up. However, when top course is exposed, bricks shall be laid with frog down. For the bricks to be laid with frog down, the frog shall be filled with mortar before placing the brick in position.

In case of walls one brick thick and under, one face shall be kept even and in proper plane, while the other face may be slightly rough. In case of walls more than one brick thick, both the faces shall be kept even and in proper plane.

To facilitate taking service lines later without excessive cutting of completed work, sleeves (to be paid separately) shall be provided, where specified, while raising the brick work. Such sleeves in external walls shall be sloped down outward so as to avoid passage of water inside.

Top of the brickwork in coping and sills in external walls shall be slightly tilted. Where brick coping and sills are projecting beyond the face of the wall, drip course/throating (to be paid separately) shall be provided where indicated.

Care shall be taken during construction that edges of jambs, sills and projections are not damaged in case of rain. New built work shall be covered with gunny bags or tarpaulin so as to prevent the mortar from being washed away. Damage, if any, shall be made good to the satisfaction of the Engineer-in-Charge.

Vertical reinforcement in the form of bars (MS or high strength deformed bars or thermo mechanically treated bars as per direction of Engineer-in-Charge)), considered necessary at the corners and junction of walls and jamb opening doors, windows etc. shall be encased with cement mortar not leaner than 1:4 (1 cement : 4 coarse sand), or cement concrete mix as specified. The reinforcement shall be suitably tied, properly embedded in the foundation and at roof level. The dia. of bars shall not be less than 8 mm and concrete grade shall be minimum 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size).

In retaining walls and the like, where water is likely to accumulate, weep holes, 50 to 75 mm Square shall be provided at 2 m vertically and horizontally unless otherwise specified. The lowest weep hole shall be at about 30 cm above the ground level. All weep holes shall be surrounded by loose stones and shall have sufficient fall to drain out the water quickly.

Note: Work of providing loose stone will be payable extra.

Work of cutting chases, wherever required to be made in the walls for housing G.I. pipe, CI pipe or any other fixtures shall be carried out in various locations as per guidelines given below:

(a) Cutting of chases in one brick thick and above load bearing walls.

(i) As far as possible services should be planned with the help of vertical chases. Horizontal chases should be avoided.

(ii) The depths of vertical chases and horizontal chases shall not exceed one-third and one-sixth of the thickness of the masonry respectively.

(iii) When narrow stretches of masonry (or short length of walls) such as between doors and windows, cannot be avoided they should not be pierced with openings for soil pipes or waste pipes or timber joints, etc. Where there is a possibility of load concentration such narrow lengths of walls shall be checked for stresses and high strength bricks in mortar or concrete walls provided, if required.

(iv) Horizontal chases when unavoidable should be located in the upper or lower one-third of height of storey and not more than three chases should be permitted in any stretch of a wall. No continuous horizontal chase shall exceed one meter in length. Where unavoidable, stresses in the affected area should be checked and kept within the permissible limits.

(v) Vertical chases should not be closer than 2 m in any stretch of a wall. These shall be kept away from bearings of beams and lintels. If unavoidable, stresses in the affected area should be checked and kept within permissible limits.

(vi) Masonry directly above a recess, if wider than 30 cm horizontal dimension) should be supported on lintel. Holes in masonry may be provided up to 30 cm width and 30 cm height without any lintel. In the case of circular holes in the masonry, no lintel need be provided for holes up to 40 cm in diameter.

(b) Cutting of chases in half brick load bearing walls.

No chase shall be permitted in half brick load bearing walls and as such no recessed conduits and concealed pipes shall be provided with half brick thick load bearing walls.

(c) Cutting of chases in half brick non-load bearing wall:

Services should be planned with the help of vertical chases. Horizontal chase should be provided only when unavoidable.

14.4.3. Joints

The thickness of joints shall not exceed 10mm and this thickness shall be uniform throughout.

14.4.4. Joining with existing structure

When fresh masonry is to be placed against existing surfaces of structures, these shall be cleaned of all loose material, roughened and wetted as directed by the Engineer-in-charge so as to affect a good bond with the new work.

14.4.5. Curing

Green work shall be protected from rain by suitable covering. Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. The top of the

masonry work shall be left flooded with water at the close of the day. During hot weather all finished or partly completed work shall be covered or wetted in such manner as will prevent rapid drying of the brick work.

14.4.6. Scaffolding

The scaffolding shall be sound and strong to withstand all loads likely to come upon it and will be double or single as is warranted for the particular work. The holes, which provide resting space for horizontal members, shall not be left in masonry under one metre in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good with 1:4:8 cement concrete.

14.4.7. Condition of Equipment

All equipment used for mixing or transporting mortar and bricks shall be clean and free from set mortar, dirt or other injurious foreign substances.

14.4.8. Finishing of Surfaces

For a surface which is to be subsequently plastered or pointed the joints shall be squarely raked out to a depth of 15mm while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

14.5. MEASUREMENT FOR PAYMENT

14.5.1. Brick work shall be measured in cubic metres unless otherwise specified-. Any extra work over the specified dimensions shall be ignored. Dimensions shall be measured correct to the nearest 0.01m i.e. l cm. Areas shall be calculated to the nearest 0.01 Sqm and the cubic contents shall be worked out to the nearest 0.01 cubic metres

14.5.2. No deductions or additions shall be done and no extra payment made for the following-
Note: Where minimum area is defined for deduction of an opening, void or both, such areas shall refer only to opening or void within the space measured.

14.5.3. Ends of dis-similar materials{that is, joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps, etc.; up to 0.l m2 in section;

14.5.4. Opening up to 0.l m2 in area

14.5.5. Wall plates, bed plates, and bearing of slabs, Chajja and the like, where thickness Does not exceed. 10cm and bearing does not extend over the full thickness of wall;

14.6. RATE

The contract unit rate for brick work shall include the cost of all labour, materials, tools and plant, scaffolding and other expenses incidental to the satisfactory completion of the work as described herein above and as shown on the drawings. The rate for work shall also include:

(i) Dewatering required for completing this item and till the mortar of masonry pointing and plastering is properly set

(ii) watering the masonry and

(iii) cleaning the site round the brick-work so as to restore the area to its original condition.
The rate for work shall also include full compensation for using specially moulded bricks on the face of walls with batter and provision of weep holes.

All other specifications under Brick Work for Construction and Measurements will be applicable.

14.7. TESTS FOR BRICK WORK

14.7.1. TEST FOR DIMENSIONAL TOLERANCE

Procedure
All the blisters, loose particles of clay and small projections shall be removed from the surface of bricks. Each specimen of 20 bricks shall then be arranged upon a level surface successively as indicated in Fig. A, B and C of Para A-4 below in contact with each other and in straight line. The overall length of the assembled bricks (20 Nos) shall be measured with a steel tape sufficiently long to measure the whole row at one stretch.

Tolerance
The actual dimensions of bricks when tested as described in A-2 shall be within the following limits per 20 bricks.

Modular Bricks

Length 3720 to 3880 mm (3800 ± 80 mm) Width 1760 to 1840 mm (1800 ± 40 mm) Height 1760 to 1840 mm (1800 ± 40 mm) for 90 mm high brick 760 to 840 mm (800 ± 40 mm) for 40 mm high brick

Non-Modular Bricks

For class 10
Length (4520 to 4680) mm (4600 ± 80 mm) Width (2240 to 2160) mm (2200 ± 40 mm) Height (1440 to 1360) mm (1400 ± 40 mm) for 70 mm high bricks (640 to560) mm (600 ± 40 mm) for 30 mm high bricks

For other classes Length (4320 to 4680) mm Width (2130 to 2310) mm Height (1340 to 1460) mm for 70 mm high bricks (840 to 920) mm for 44 mm high bricks

Criteria for Conformity
A lot shall be considered conforming to the requirements of dimensions and tolerances if all the groups of bricks are tested to meet the specified requirements.

14.7.2. TEST FOR COMPRESSIVE STRENGTH

Specimen
Five whole bricks shall be taken from the samples as specimens for this test. Length and width of each specimen shall be measured correct to 1 mm.

Apparatus
The apparatus consists of compression testing machine, the compression plate of which shall have a ball seating in the form of portion of a sphere the centre of which shall coincide with the centre of the plate.

Procedure
Pre-conditioning: The specimen shall be immersed in the water for 24 hours at 25 to 29 C. Any surplus moisture shall be allowed to drain at room temperature. The frog of the bricks should be filled flush with mortar 1:3 (1 cement: 3 clean coarse sand of grade 3 mm and down) and shall be kept under damp jute bags for 24 hours, after that these shall be immersed in clean water for three days.

After removal from water, the bricks shall be wiped out of any traces of moisture.

Actual Testing: Specimen shall be placed with flat faces horizontal and mortar filled face upward between three 3 ply plywood sheets each of thickness 3 mm and carefully centred between plates of the testing machine. Plaster of Paris can also be used in place of plywood sheets to ensure a uniform surface.

Load shall be applied carefully axially at uniform rate of 14 N/mm^2 per minute till the failure of the specimen occurs.

Reporting the Test Results
The compressive strength of each specimen shall be calculated in N/mm^2 as under:

$$\text{Compressive Strength} = \frac{\text{Maximum load at failure (in N)}}{\text{Area of Specimen (in sq mm)}}$$

In case the compressive strength of any individual brick tested exceeds the upper limit of the average compressive strength specified for the corresponding class of brick, the same shall be limited to the upper limit of the class specified in 6.1.2 for the purpose of calculating the average compressive strength. Compressive strength of all the individual bricks comprising the sample shall be averaged and reported.

Criteria for Conformity
A lot shall be considered having satisfied the requirements of average compressive strength if the average compressive strength specified in 6.1.2 for the corresponding class of brick tested is not below the minimum average compressive strength specified for the corresponding class of bricks by more than 20 per cent.

14.7.3. TEST FOR WATER ABSORPTION

No. of Specimen
Five whole bricks shall be taken from samples as specimen for this test.

Apparatus
A balance required for this test shall be sensitive to weigh 0.1 percent of the weight of the specimen.

Procedure

Pre-conditioning: The specimen shall be allowed to dry in a ventilated oven at a 110°C to 115°C till it attains a substantially constant weight. If the specimen is known to be relatively dry, this would be accomplished in 48 hours, if the specimen is wet, several additional hours may be required to attain a constant weight. It shall be allowed to cool at room temperature. In a ventilated room, properly separated bricks will require four hours for cooling, unless electric fan passes air over them continuously in which case two hours may suffice.

The cooled specimen shall be weigh (W_1) a warm specimen shall not be used for this purpose.

Actual Testing: Specimen shall be completely dried before immersion in the water. It shall be kept in clean water at a temperature of 27°C ± 2°C for 24 hours. Specimen shall be wiped out of the traces of water with a damp cloth after removing from the water and then shall be weighed within three minutes after removing from water (W_2).

Reporting the Test Results

The water absorption of each specimen shall be calculated as follows and the average of five tests shall be reported.

Water Absorption $\underline{(W_2-W_1) / W_1 x100}$

Criteria for Conformity

A lot shall be considered having satisfied the requirements of water absorption if the average water absorption is not more than 20% by weight.

14.7.4. APPENDIX D TEST FOR EFFLORESCENCE

No. of Specimen

Five whole bricks shall be taken as specimen for this test.

Apparatus

Apparatus required for this test shall be a shallow flat bottom dish containing distilled water.

Procedure (actual testing)

The brick shall be placed vertically in the dish with 2.5 cm immersed in the water. The room shall be warm (18ºC to 30ºC) and well ventilated. The bricks should not be removed until it absorbs whole water. When the whole water is absorbed and the brick appears to be dry, place a similar quantity of water in that dish and allow it to evaporate as before. The brick shall be examined after the second evaporation.

Reporting the Test Results

The rating to efflorescence in ascending order shall be reported as 'NIL', 'SLIGHT', 'MODERATE', 'HEAVY' or 'SERIOUS' in accordance with the following :

(a) *NIL:* When there is no perceptible deposit of efflorescence.

(b) *SLIGHT:* When not more than 10 per cent of the area of the brick is covered with a thin deposit of salts.

(c) *MODERATE:* When there is heavier deposit and covering up to 50% of the area of the brick surface but unaccompanied by powdering or flaking of the surface.

(d) *HEAVY:* When there is a heavy deposit of salts covering 50% or more of the brick surface but unaccompanied by powdering or flaking of the surface.

(e) *SERIOUS:* When there is heavy deposit of salts, accompanied powdering and/or flaking of the surface and tending to increase in the repeated wetting of the specimen.

Criteria for Conformity

A lot be considered having satisfied the requirements of efflorescence if for 4 out of the specimen of 5 bricks, the rating of efflorescence is not beyond "Moderate".

15. WATERPROOFING

15.1. SCOPE

These specifications cover the requirements of various waterproofing treatments for waterproofing various components of structures. The specifications cover the detailed procedure adopted.

15.2. CODES TO BE FOLLOWED

IS 6494 Code of Practice for waterproofing of Underground Water Reservoir
IS 2645 Indian Standard Specifications for integral cement waterproofing

15.3. WATERPROOFING COATINGS

SUMMARY

Section Includes: Furnishing of all labour, materials, services and equipment necessary for the supply and installation of waterproofing systems (as described in the BOQ) to concrete substrates, above-grade, on either dry or wet side of substrates, as indicated on drawing and as specified herein.

REFERENCES

A. Applicable Standards: The following standards are referenced herein.

1. American Society for Testing Materials (ASTM)
2. Army Corps of Engineers (CRD)
3. NSF International (NSF)
4. Bureau of Indian Standard (IS) - 2720

SYSTEM DESCRIPTION

Acrylic Polymer-Modified Flexible Cementitious Membrane / Coating: having UV resistance, underground ground-chemical resistance, and high melting points, flexible and elastic with high adhesive strength. The membrane shall be reinforced with a layer of non-woven polyester fabric of minimum 30 g/Sqm. The Acrylic Polymer-Modified Flexible Cementitious Membrane / Coating shall be protected with a subsequent protective cementitious layer of concrete screed / plaster in thickness as specified in the BOQ. The total coating thickness shall be as specified by the manufacturer's technical literature but not less that 1.5 mm and shall be applied in 2 - 3 coats.

15.4. QUALITY ASSURANCE

Manufacturer: Provide products of manufacturer with no less than 20 years experience in manufacturing the waterproofing materials offered by them for the required work. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.

Specialized Executing Waterproofing Agency: Specialized Executing Waterproofing Agency shall be experienced in the installation of the offered waterproofing materials as demonstrated by previous successful installation, and shall be approved by the manufacturer in writing.

Pre-Installation Conference: Prior to installation of waterproofing, conduct meeting with waterproofing agency, Architect/Engineer, owner's representative, and waterproofing manufacturer's representative to verify and review the following:

1 Project requirements for waterproofing as set out in Contract Documents.

2 Manufacturer's product data including application instruction.

3 Substrate conditions, and procedures for substrate preparation and waterproofing installation.

Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

15.5. DELIVERY, STORAGE

Delivery: Deliver packaged waterproofing materials to project site in original undamaged / unopened containers / pallets, with manufacturer's labels and seals intact. Shall be approved by the PM. Material delivered shall be accompanied by manufacturer's certificate for quality parameters and date of manufacture / expiry.

Storage: Material shall be stored in dry, well ventilated and covered storage.

PROJECT CONDITIONS

A. Compliance: Comply with manufacturer's product data regarding condition of substrate to receive waterproofing, weather conditions before and during installation, and protection of the installed waterproofing system.

15.6. GUARANTEE

Manufacturer's Guarantee: Manufacturer shall provide standard product guarantee executed by authorized company official. Term of guarantee shall be 10 years from Date of Substantial Completion.

Guarantee of the Specialised Executing Waterproofing Agency: The specialized Executing Waterproofing Agency shall guarantee the waterproofing installation against defects caused by faulty workmanship or materials for a period of 10 years from Date of Substantial Completion. The guarantee will cover the surfaces treated and will blind the agency to repair, at his expense, any and all leaks through the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake, tornado and hurricane. The guarantee shall read as follows.

Guarantee: The agency guarantees that, upon completion of the work, surfaces treated with offered waterproofing material will be and will remain free from water leakage resulting from defective workmanship or materials for a period of 10 years from Date of Substantial Completion. In the event that water leakage occurs within the guarantee period from such causes, the agency shall, at his sole expense, repair, replace or otherwise correct such defective workmanship or materials. Agency shall not be liable for consequential damages and the agency's liability shall be limited to repair, replacement or correcting of defective workmanship or materials. Agency shall have no responsibility with respect to water leakage or other defects caused by structural failure or movement of the structure, or any other causes beyond the Agency's control. The contractor to submit the guarantee for the entire terrace along with the expansion joints on requisite stamp paper

E. Source Quality: Obtain proprietary waterproofing products directly from the manufacturer.

F. Other Civil Materials related with waterproofing : Cement, screened river sand, brick-bats, aggregates, integral waterproofing compounds, etc. required for screeds, protective toppings and plasters shall conform to the pertaining IS standards (IS 269, IS 8112, IS 13286, IS 383, IS 2645, IS 12118 and IS 3495). The Consultants / PM shall demand the conformance of these materials from the Specialised Executing Waterproofing Agencies / civil contractor from time to time and they shall have to produce test reports / documents to prove the conformance of these materials with their applicable standards, without any argument.

15.7. EXECUTION

EXAMINATION

15.7.1. Site Visit: Prior to waterproofing installation, arrange visit to project site with waterproofing manufacturer's representative. Representative shall inspect and certify that

concrete surfaces are in acceptable condition to receive waterproofing treatment.

15.7.2. Verification of Substrates: Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are compatible with waterproofing treatment.

15.7.3. Examination for Defects: Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance to manufacturer's product data and 3.02 below.

PREPARATION

15.7.4. Concrete Finish: Concrete surfaces to receive waterproofing treatment shall be free from scale, excess form oil, laitance, curing compounds and foreign matter. Horizontal surfaces shall have a rough wood float, smooth or broom finish, as required by the waterproofing material manufacturer.

15.7.5. Surface Preparation: Smooth surfaces (e.g. where steel forms are used) or surfaces covered with excess form oil or other contaminants shall be washed, lightly sandblasted, water blasted, or acid etched with muriatic acid (as necessary) to provide a clean absorbent surface. Surfaces to be acid-etched shall be saturated with water prior to application of acid.

15.7.6. Repair of Defects: Surface defects shall be repaired in accordance with manufacturer's instructions as follows:

15.7.6.1. Form Tie Holes, Construction Joints, cracks: Chip our defective areas in a 'U' shaped slot 25 mm wide and a minimum of 25 mm deep. Clean slot of debris and dust. Soak area with water and remove excess surface water. Apply a polymer modified cementitious bonding coat of approved material to the slot. Then fill cavity with a non-shrink, waterproof, cementitious grout / mortar, while the bonding coat is tacky. Compress tightly into cavity using pneumatic packer or block and hammer. Where the concrete is defective, do injection grouting with high pressure (140 psi) grouting machine using cement admixed with non-shrink grouting admixture.

15.7.6.2. Rock Pockets, Honeycombing or Other Defective Concrete: Rout out defective areas to sound concrete. Remove loose materials and saturate with water. Remove excess surface water and apply a polymer modified cementitious bonding coat of approved material to the area. While the bonding coat is still tacky, fill cavity to surface level with non-shrink grout. Where the concrete is defective, do injection grouting with high pressure (140 psi) grouting machine using cement admixed with non-shrink grouting admixture.

15.8. APPLICATION

A. Construction Joints: Apply cementitious bonding material in slurry form to joint surfaces between concrete pours, just prior to pouring fresh concrete. Moisten surfaces prior to the bonding coat application. Where joint surfaces are not accessible prior to pouring new concrete, consult manufacturer for application procedure.

B. Coves (vata): Make a minimum 4 inch (diagonal) cove / vata at all 90^0 interfaces in concrete surfaces where waterproofing is carried out, without fail.

C. Surface Application: After repairs, surface preparation, treatment of construction joints, cracks, honeycombs, tie-holes, etc., have been completed in accordance with manufacturer's product data and as specified herein, apply / provide the waterproofing material as specified in the manufacturer's technical and application data sheet to concrete surfaces. Application rates, thicknesses and locations shall be as indicated in the drawing. When brushing, work slurry well into surface of the concrete, filling surface pores and hairline cracks. When spraying, hold nozzle close enough to ensure that slurry is forced into pores and hairline cracks. When torching, uniformly burn the surface when overlapping, to ensure that the membrane adheres uniformly.

Sandwich (Topping) Application: When treated structural slabs are to receive a concrete or other topping, place the topping only after the initial curing period of the material being used, is completed. Lightly pre-water when rapid drying conditions exist.

15.9. CURING

A. General:
For cementations materials: Begin curing as soon as the applied waterproofing material has hardened sufficiently so as not to be damaged by a fine spray. Cure the treatment with water as per the manufacturer's instructions. In warm climates, more-than-normal curing duration may be necessary to prevent excessive drying of coating.
For liquid applied membranes / Pre-fabricated membranes: natural air curing for duration as described in the manufacturer's technical data sheet.

B. Air Circulation: Do not lay plastic sheeting directly on the waterproofing coating as air contact is required for proper curing. If poor circulation exists in treated areas, it may be necessary to provide fans or blown air to aid in curing of waterproofing treatment.

C. Water-holding Structures: For concrete water-holding structures such as swimming pools, reservoirs, water treatment tanks and wet wells, cure the waterproofing system for a minimum of three days and then allow the waterproofing system to set for 7 days before filling structure with liquid. For structures holding hot or corrosive liquids, cure waterproofing treatment for three days and allow to set for 15 days before filling.

D. Protection: During the curing period, protect the treated surfaces from damage by wind, sun,

rain and temperatures below 2^0 C. If plastic sheeting is used for protection, it must be raised off the waterproofing coating to allow sufficient air circulation.

15.10. BRICK BAT COBA

Brick bat of size 25 mm to 115 mm out of well burnt bricks shall be used for the purpose of brick bat coba. The brick bats shall be properly dampened for six hours before laying. Brick bats shall be laid to required slope/gradient over the base coat of mortar leaving 15-25 mm gap between two bats. Cement mortar 1:5 (1 blended cement: 5 coarse sand) shall be poured over the brick bats and joints filled properly. Under no circumstances dry brick bats should be laid over the base coat. The haunches/gola at the junction of parapet wall and the roof shall be formed only with brick bat coba as directed by the Engineer in Charge

In case the brick bat coba is laid on the base coat immediately on initial set there will be no necessity of applying cement slurry over the base coat before laying the brick bat coba. However, if the brick bat coba is to be laid on the subsequent day, cement slurry prepared as described under shall be applied over the top surface of the base coat, then only the brick bat coba shall be laid.

Cement Slurry
The quantity of water required to prepare the slurry with 2.75 kg. of blended cement to be painted over an area of 1 sqm. Depending upon the area of surface that has to be covered, the required quantity of slurry should be prepared using 2.75 kg. blended cement + water per sqm. area to be covered, taking particular care to see that only that much quantity of slurry shall be prepared which can be used within half an hour of preparation i.e. before the initial setting time of cement. The prepared slurry shall be applied over the dampened surface with brushes very carefully, including the joints between the floor slab and the parapet wall, holes on the surfaces, joints of pipes, masonry/concrete etc. The application of the slurry should continue upto a height of 300 mm on the parapet wall and also the groove as directed. The slurry should also be applied upto a height of 150 mm over pipe projections etc.

Application of Slurry over Brick Bat Coba
After two days of curing of brick bat coba cement slurry prepared as mentioned earlier shall be applied on the surface of brick bat coba The application of slurry shall be the same as described earlier which should cover the haunches/gola, and the remaining small portion of parapet wall and also inside the groove as shown in the figure.

Laying Finishing Layer (Protective Coat)
Immediately on applying the cement slurry over the surface of the brick bat coba and when the slurry applied is still green, a protective coat of 20 mm thick layer of cement plaster, without leaving any joints shall be applied with cement mortar 1:4 (1 blended cement: 4 coarse sand) over the entire fibre glass cloth including the haunches/gola and the small portion on the parapet wall. The groove in the parapet wall over the haunches shall also be filled neatly packing the mortar firmly in the groove.
The surface of the finishing layer (protective coat) shall be neatly finished with cement slurry. The finished surface shall be allowed to dry for a while and then to be kept ready to take on finishes.

Curing and Testing the Treatment
The entire surface thus treated shall be flooded with water by making kiaries with weak cement mortar, for a minimum period of two weeks.

15.11. WATERPROOFING METHODOLOGY

Floor area and walls: -
Cleaning the surface thoroughly.
Chasing open the cracks, honey combs if any, same shall be grouted with waterproof cement slurry admixed with cebex-100@225gm /bag of cement up to full saturation using gravitational pressure wherever required
Providing and applying flexible polymer modified Cementitious water proof coating consist of Ni-o-pol acrylic polymer admixed with cement in equal proportions(1:1) in 2 coats Or Sika Top seal 107 1.5 to 2.00kg/Sqm in 2 coats to the floor and on the wall up 1m hts Or as specified at site above FFL(interval between each coat shall be 4 hours) .
Allow to Sprinkle curing for 24 hours.
Providing and laying 25mm thick water proof screed in Cement Mortar 1:3 admixed with proofsol @ 1 kg/bag of cement coving at the junction, troweled and compacted.
Curing and pond checking for 7days.before starting plumbing work.
Brick Bat coba as mentioned above on floors
Tiling work

16. PLASTERING

16.1. SCOPE

These specifications cover the use of plastering for masonry and RCC work, pointing for brick and stone masonry work.

16.2. IS CODES

The provision of the latest revisions of the following IS codes shall form a part of this specification to the extent they are relevant.

IS: 269	Specification for ordinary rapid hardening and low heat Portland cement
IS: 712	Building Lines
IS: 1200 (Part XII)	Method of measurement of building and Civil Engg. Works - Plastering and Pointing
IS: 1542	Specification for sand for plaster
IS: 1630	Mason's Tools for Plaster work and pointing work.
IS: 1661	Code of practice for application of cement lime plaster finishes
IS: 10067	Material Constants for Building Works

Other I. S. Codes, not specifically mentioned here, but pertaining to plastering work, form part of these specifications.

16.3. GENERAL

16.3.1. Cement Mortar

Cement mortar shall have the proportion of cement to sand as specified and shall comply with relevant clauses of Cement Mortar specifications.

16.3.2. Cement:

Cement shall conform to IS: 269 Ordinary Portland cement shall be used. The weight of ordinary Portland cement shall be taken as 50 kg per bag. The Contractor shall ensure that the cement is of sound and requiring quality before using it. Any cement which has deteriorated caked or which has been damaged shall not be used. The specifications covered under the section Concrete' shall be applicable in addition.

16.3.3. Water:

Water for mixing cement mortar or concrete shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and races of oil, acid and injurious alkali, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence. Sea water shall not be used. Water fit for drinking shall generally be found suitable for mixing cement mortar. Water fit curing mortar or concrete shall not be too acidic or alkaline. It shall have pH value above 6. Sea water shall not be used for curing purpose.

16.3.4. Fine Aggregate

All fine aggregate shall conform to IS: 383 - 1963 and relevant portion of IS: 515-1959. Sand shall be clean, well graded, hard, strong, durable and gritty particles free from injurious amounts of dust, clay, kankar nodules, soffit or flaky particles, shale, alkali, salts, organic matter loam mica or other deleterious substances and shall be approved by the Engineer-in-charge. The maximum size of particles shall be limited to 5 mm (about 3/16"). If the fine aggregate contains more than 4 per cent of clay, dust or silt, it shall be washed.

The fine aggregate for cement mortar for masonry and first coat of plaster should generally satisfy the following grading:

IS Sieve	Percentage by wt. passing sieve
4.75 mm	100
2.36 mm	80 - 95
1.18 mm	70 - 90
600 microns	40 - 85
300 microns	5-50
150 microns	0 - 10

The fineness modulus shall not exceed 3.00.

The fine aggregate for cement mortar for fine joints of ashlars masonry, pointing and second coat of plaster may have the following grading:

IS Sieve	Percentage by wt. passing sieve
4.75 mm	100
2.36 mm	80 - 95
1.18 mm 7	0 - 90
600 microns	40 - 85
300 microns	5-50
150 microns	0 - 10

The fineness modulus shall not exceed 1.6 IS: 2116 - 1980 shall generally apply for sand for plaster. The fine aggregate should be stacked carefully on a clean, hard surface so that it will not get mixed up with deleterious foreign materials.

16.3.5. Scaffolding,
Scaffolding shall be erected with steel sections or pipes of adequate strength so as to be safe for construction operations. The contractor shall take all measures to ensure the safety of the work and working people. Any instructions of the Engineer-in-charge in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to properly or injury to persons resulting from ill erected scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach to every part of the work. Overhead work shall not be allowed.

16.3.6. Tools and Accessories
Tools and accessories used in plaster work shall conform to IS: 1630. All tools shall be cleaned by scrapping and washing at the end of each day's work or after use. Metal tools shall be cleaned after each operation. All tools shall be examined to see that they are thoroughly cleaned before plastering is begun.

16.3.7. Programme of work in relation to plastering
The programme of other building operations before, during and after plastering shall be according to the instructions contained in clause 9 of IS: 1661.

16.3.8. General Precaution in plastering
All general precautions as specified in IS. 1661, Clause 9, shall be taken and preparation of the background shall be done as laid down in IS: 1661, Clause 13. Care shall be taken to see that other parts of the work or adjacent works are not damaged while plastering.

16.3.9. Preparatory work

All joints in the face work that is to be plastered shall be raked out to depth equal to not less than the width of the joints or as directed by the Engineer. The raking shall be done taking care not to allow by chipping of masonry. In new work the raking out shall be done when the mortar in the joints is still green. Smooth surfaces of concrete, old plaster, etc. must be suitably roughened to provide necessary bond for the plaster. All dirt, soot, oil paint or any other material that might interfere with satisfactory bond shall be removed. In the case of stone masonry, scrubbing on the walls to receive the plaster shall not be more than 12 mm (1 ½"). The surface to be plastered shall be cleaned and scrubbed with fresh water and kept wet for 6 hours prior to plastering. It shall be kept damp during the progress of the work. The plastering shall not be commenced unless the preparatory work is passed in writing by the Engineer-in-charge.

In hand mixed mortar, cement and sand in the special proportions shall be thoroughly mixed dry on a clean impervious platform. Fresh and clean water as specified above shall be added gradually and thoroughly mixed to form a stiff plastic mass of uniform colour so that, each particle of sand shall be completely covered with a film of wet cement. The water cement ratio may be as under or as directed by the Engineer-in-charge.

Cement Ratio per 50 kg of cement	**Sand**	**Water-Cement**	**Qty of Water (Litres)**
1	1	0.25	12.5
1	1-1/2	0.28	19
1	2	0.3	15
1	2-1/2	0.35	17.5
1	3	0.4	20
1	4	0.53	26.5
1	5	0.6	30
1	6	0.7	35
1	8	0.9	45

Machine mixed mortar shall be prepared in an approved mixer. Water cement ratio shall be as per hand mixed mortar. The mortar so prepared shall be within 30 minutes of adding water should be used in the work. The mortar remaining unused after that period mortar which has partially hardened or is otherwise damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away.

16.3.10. Gauges

Patches of plaster 15cm x 15cm shall be put on about 3 m apart as gauges to ensure even plastering in one plane.

16.3.11. Workmanship

<u>Plastering:</u>

In all plaster work the mortar shall be firmly applied with somewhat more than the required thickness and well pressed into the joints and on the surface and rubbed and levelled with a flat wooden rule to give required thickness. Long straight edges shall be freely used to give perfectly plane and even surface. All corners must be finished to their true angles or rounded as directed by the Engineer-in-charge. The surface shall be finished to plane or curved surface as shown on the plan or directed by the Engineer-in-charge, and shall present a neat appearance. The mortar shall adhere to the masonry surface intimately when set and there should be no hollow sound when struck. Cement plastering should be done in squares or strips as directed. Plastering shall be done from top downward.

First or Backing Coat

The first coat of the specified thickness shall be applied as described above. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon weather conditions. The surface shall not be allowed to dry during this period.

16.4. PLASTERING TO CEILING

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 shall be poke marked with a pointed tool at spacing of not more than 50 mm centres, the pokes being made not less than 3 mm deep, 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.

Cement plaster to ceiling shall be 6 mm thick finished / not finished with a floating coat of neat cement and thick coat of lime wash on top of walls for bearing of slabs.

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 the wooden straight edge 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 above shall apply.

16.5. ROUGH COAT CEMENT PLASTER WITH CEMENT MORTAR

16.5.1. Base Coat

The first coat of plaster shall be of cement mortar of 1:4 mix and applied according to the relevant provisions of IS: 1661 Clause 14. 1. The finished thickness of the first coat shall be 12 mm for brick masonry or concrete surface and 15 mm for rubble stone masonry. The plaster shall be laid by throwing the mortar (by using a strong whipping motion) on the prepared surface with a trowel in a uniform layer, and pressed to form a good bond. The surface shall be roughened.

16.5.2. SCAFFOLDING

Scaffolding shall be erected with steel sections or pipes of adequate strength so as to be safe for construction operations. The contractor shall take all measures to ensure the safety of the work and

working people. Any instructions of the Engineer-in-charge in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to properly or injury to persons resulting from ill erected scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach to every part of the work. Overhead work shall not be allowed.

16.6. MESH TO WALLS

16.6.1. GI Chicken Mesh

GI Chicken mesh of 20 gauge as approved shall be used over junctions of concrete and masonry or two dissimilar materials about 150mm wide fixed with GI wire nails etc. as directed by the in charge/Architect. GI Plaster Mesh should be made out of galvanized iron coils of nominal thickness 0.35m with hot dip zinc coating of 120gms/square meters. The GI plaster mesh should be manufactured out of coils of varying widths, which depends upon the width of the required finished product. G.I Plaster Mesh is used for avoiding cracks between wall column joints, wall beam joints, plastering of electrical conduits etc. Chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go. For providing and fixing chicken wire mesh with U nails payment shall be not be made separately.

16.6.2. PVC Plaster Mesh:

PVC Plaster mesh should be made from Polypropylene products and should possess good chemical and heat resistance. They should be semi rigid with good impact strength, appearance and are easily welded. The thickness of mesh to be 0.9mm

16.7. MEASUREMENTS

Length and breadth shall be measured correct to a cm and its area shall be calculated in square metres correct to two places of decimal.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves, or open joints in brick work.

The measurement of wall plaster shall be taken between the walls or partitions (the dimensions before the plaster shall be taken) for the length and from the top of the floor or skirting to the ceiling for the height. Depth of coves or cornices if any shall be deducted.

The following shall be measured separately from wall plaster.

(a) Plaster bands 30 cm wide and under
(b) Cornice beadings and architraves or architraves moulded wholly in plaster.

(c) Circular work not exceeding 6 m in radius.

Plaster over masonry pilasters will be measured and paid for as plaster only.

Exterior plastering at all heights shall be measured together. Patch plastering (in repairs) shall be measured as plastering new work, where the patch exceed 2.5 Sqm. extra payment being made for preparing old wall, such as dismantling old plaster, raking out the joints and cleaning the surface. Where the patch does not exceed 2.5 Sqm in area it shall be measured under the appropriate item under sub head 'Repairs to Buildings.'

Deductions in measurements, for opening etc. will be regulated as follows:

No deduction will be made for openings or ends of joists, beams, posts, girders, steps etc. up to 0.5 Sqm in area and no additions shall be made either, for the jambs, soffits and sills of such openings. The above procedure will apply to both faces of wall.

Deduction for opening exceeding 0.5 Sqm but not exceeding 3 Sqm each shall be made for reveals, jambs, soffits sills, sills, etc. of these openings.
(i) When both faces of walls are plastered with same plaster, deductions shall be made for one face only.
(ii) When two faces of walls are plastered with different types of plaster or if one face is plastered and other is pointed or one face is plastered and other is unplastered, deduction shall be made from the plaster or pointing on the side of the frame for the doors, windows etc. on which width of reveals is less than that on the other side but no deduction shall be made on the other side. Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be.
(iii) For opening having door frame equal to or projecting beyond thickness of wall, full deduction for opening shall be made from each plastered face of wall.
For opening exceeding 3 Sqm in area, deduction will be made in the measurements for the full opening of the wall treatment on both faces, while at the same time, jambs, sills and soffits will be measured for payment.

In measuring jambs, sills and soffits, deduction shall not be made for the area in contact with the frame of doors, windows etc.

16.8. RATE

The rate shall include the cost of all labour and materials involved in all the operations described above.

16.8.1. Providing GI Chicken mesh 20 gauge or PVC mesh (whichever is mentioned in the BOQ), over lapping to a width of 150 mm at the junctions of masonry and concrete works on either side and including tying in position by using suitable nails / clamps / screws and as directed etc. complete at all levels

16.8.2. Forming of drip mould/ bands, grooves of sizes as required etc,. wherever grooves are to be provided horizontally/ vertically for in accordance with the drawings.

16.8.3. Cost of All material and labour
16.8.4. Hacking concrete surfaces to be plastered or rendered
16.8.5. Preparation of surfaces by raking out joints, wetting the surface etc.,
16.8.6. Work at all heights, levels and situations.
16.8.7. Washing floors, cleaning glass and leaving premises clean and tidy after the plastering is done. Disposing off the debris outside the site
16.8.8. Curing the same.
16.8.9. Providing necessary scaffolding, ladder, platform for any height and depth and removing the same after the work is completed
16.8.10. Neat finishing of junctions of plaster and skirting
16.8.11. Screening and washing approved fine aggregates

17. POP PUNNING / GYPSUM PLASTER

17.1. GYPSUM PLASTER TO WALLS

GYPSUM UNIVERSAL PLASTER (Base coat), a gypsum based material in a handy application can be applied over any normal background in not more than one coat, depending on evenness or the back ground. Smooth finish and good impact strength are its virtue.

Gyplaster base coat plaster is a calcium sulphate hemihydrate plaster with additives including light weight aggregate to improve plasters handling workability and application. It attains early strength and is free from shrinkage cracks. The thickness of the plaster should be a maximum of 13 mm on uneven background but should not exceed 10 mm or less than 5 mm on a level and even background.

The setting time of plaster is approximately 30 minutes after the application, depending upon suction of background. The setting progresses evenly and gradually until the surface is hard enough to receive a final stroke of a trowel, at approximately 45 to 60 minutes.

The coverage is approximately 65 to 75 sq.m. per 1000 kg at 13 mm thickness.

For application of gyplaster, the wall is first marked vertically at 1220 mm centres, then checked with straight edge, or line (preferably aluminium square tube) centres to find the high spots which are used as guide for level to be set.

The background should be suitably wetted with a brush 5-10 minutes before plastering to displace the trapped air and for a good plaster contact with the surface. Four points (by putting plaster with flat surface) are fixed in level and plumb to each corner of the wall to determine the thickness of the plaster required to be done.

40 mm wide strips of plaster are fixed. Then the points are applied vertically, in level and plumb of both ends of the wall.

These vertical strips are then made with plaster at even 1220 (or 1550 mm) centres on the entire area of the wall, to ensure level and plumb of the strips, to be in line.

The plaster is applied to surface of the wall with a trowel to required thickness and finish the surface by setting straight edge (sq. tube) horizontally by them placing on the vertical strips already fixed above, with firm pressure.

A tight coat is applied then turned back with the same batch material to fill out to required thickness.

A featheredge should be used to straighten the plaster to a reasonable plane, whilst at the same time filling in any slacks or hollows when the plaster has stiffened sufficiently, further ruling out the feather edge is necessary to achieve a flat surface.
As the plaster stiffens progressively, further flattening and paring should be carried out with a spatula. When the plaster is sufficiently formed, the surface should be soaked lightly with a sponge float and light application of water if necessary to raise the flat and bring the surface to a suitable condition for finishing.
Closing in with the trowel should commence as soon as plaster starts to set, followed by a final trowel at the appropriate time.
Overpolishing should not be done at any cost.
Decoration and final finish should be delayed until the plaster work has dried out thoroughly.

Precautions:
a. Tools and water used in mixing must be clean and free from set plaster and other impurities.
b. Set plaster shorten the setting time and thus reduces the strength of plaster which sets.
c. Surfaces should be protected from weather and should be reasonably wetted 5-10 minutes before plastering so that the plaster holds on the background satisfactorily.
d. Fittings and plugging of all kinds should be done before proceeding to plaster.
e. Openings, chases or other apertures for cable conduits and other's should be cut before plastering.
f. Background to be plastered should be thoroughly brushed with broom to remove dust and loose mortar.
g. Once a mix has started to set, it should not be retempered neither should be a fresh gauging be mixed with an old one.

Background surface should be reasonably dry and protected from the weather. The suitability of a particular background for plastering should be considered in relation to its length, suction, bonding properties, shrinkage or thermal movement characteristics, water and soluble salt content. The high suction of certain backgrounds (like concrete block masonry) should be adjusted by sprinkling water. Plaster is not supposed to isolate dampness and this is not suitable for use in continuously damp or humid conditions. During application of Gyplaster in hot or dry conditions, care should be taken to ensure that rapid loss of water is avoided. The reason is that Gyplaster requires a proportion of the mixing water in order to set and achieve full strength. If the water is dried off too rapidly then the strength of the plaster will be impaired. Once set and fully dry, it is suitable for use in situation where the inside temperature is 50 de. C maximum.
Universal plaster attains early strength during the drying process and the plaster work does not suffer from inherent shrinkage cracks. Whilst the finished surface can be intended by impact, the natural resilience of set plaster prevents more serious damage.
Tubular service conduits should be chased into the background wherever possible. The following precautions should be taken in order to minimise any risk of subsequent plaster cracking or rust staining over service runs.
1. Conduit of minimum permissible dimensions should be used.
2. High spots in the background should be chiselled if possible.

3. The undercoat plaster thickness specified should be sufficient to cover the extreme protrusions of the conduit by at least 5 mm.
4. Service routes should avoid door frames, ground, etc.
5. Service piping, conduits, fixing clips and other metallic objects should be adequately protected by galvanizing, painting or applying a thicker layer of lacquer in order to protect if from rusting.
6. At junctions of different materials (like concrete blocks and RCC columns/ beams) a fibre mesh shall be applied prior to the application of the plaster to avoid cracks at a later date.

Gyplaster universal shall be mixed in a clean mixing bucket using clean water. Plastic buckets can be used to avoid rust staining from metal containers

17.2. POP PUNNING TO WALLS

The plaster of Paris shall be of the calcium-sulphate semi-hydrate variety. Its fineness shall be such that when sieved through a sieve of IS sieve designation 3.35 mm for 5 minutes the residue left on it after drying shall be not more than 1% by weight. It shall not be too quick setting. Initial setting time shall not be less than 13 minutes. The average compressive strength of material determined by testing 5 cm cubes after removal from moulds, after 24 hours and drying in an oven at 40 degree C till weight of the cubes is constant, shall not be less than 84 kg per square metre.
The material will be mixed with water to a workable consistency. Plaster of Paris shall be applied to the underside of the laths over the rabbit wire mesh in suitable sized panels and finished to a smooth surface by steel trowels. The plaster shall be applied in such a manner that it fully fills the gaps between the laths and the thickness over the laths is as specified in the description of the item. The joints shall be finished flush to make the ceiling in one piece. The finished surface shall be smooth and true to plane, slopes or curves as required.
All other details to be same as the application of gypsum plaster mentioned above

18. FLOOR FINISHES

19.

FLOOR FINISHES

19.1. SCOPE

These Specifications covers flooring, skirting, dado or cladding works using different types of stone/ slabs/ tiles as detailed hereunder:

19.2. GENERAL

The provision of the latest revisions of the following IS Codes shall form a part of this specification to the extent they are relevant:

IS: 269	Specification for ordinary, rapid hardening and low beat Portland cement.

IS: 383	Specification for coarse and fine aggregate from natural sources for concrete
IS: 777	Specification for glazed earthenware tiles.
IS: 1200 Part XI	Method of measurements for Building and Civil Engg. Works, paving, floor finishes, dado and skirting.
IS: 1237	Specification for cement concrete flooring tiles.
IS: 1443	Code of practice for laying and finishing of cement concrete flooring tiles.
IS-. 2541	Code of practice for use of lime concrete' in buildings.
IS: 2571	Code of practice for laying in situ cement concrete flooring
IS: 10067	Material Constants in Building Work

Other I.S Codes not specifically mentioned here, but pertaining to Floor Finishes form part of these specifications.

19.3. INDIAN PATENT STONE FLOORING

19.3.1. Materials

19.3.1.1. Cement concrete:

The cement concrete shall generally conform to specifications for ordinary concrete. The coarse aggregates shall be carefully selected, sufficiently tough and hard stone pieces broken in a manner that will provide particles of approximately cubical shape affording good interlocking. The maximum size of coarse aggregate shall be 12 mm. The fine aggregate shall consist of properly graded particles. The proportion of mix shall be M15 or as mentioned in the BOQ. The least amount of mixing water that will produce a workable mix and will allow finishing without excessive trovelling shall be used. Generally a water cement ratio of 0.5 should suffice.

19.3.2. Workmanship

The sub-grade in all cases shall be formed to proper levels and slopes, well compacted and cured. The top surface shall be kept slightly rough.

The surface of the sub-grade shall be cleaned off all loose materials and moistened immediately before laying the concrete floor. The concrete flooring shall be laid in alternate bays not exceeding 6.25 Sqm (about 64 sf.ft) each. The edge of each panel into which the floor is divided should be supported by flat bars of steel or wood duly oiled to prevent sticking. Their depth shall be the same as that proposed for the finished floor as mentioned in the item. The bars should be removed before filling in the adjoining panels. At least 48 hours shall elapse before the concreting in the adjacent bays is commenced.

The concrete shall be laid immediately after mixing. While being placed the concrete shall be vigorously sliced and spaded with suitable tools to prevent formation of voids or honey comb pockets. The concrete shall be brought to the specified levels by means of a heavy straight edge resting on the side

forms and drawn ahead with a sawing motion in combination with a series of lifts and drops alternating with small lateral shifts. While concreting the adjacent bays care shall be taken to ensure that the edges of previously laid bays are not broken by careless or hard tamping.
Immediately after laying the concrete, the surface shall be inspected for high or low spots and any needed correction made up by adding or removing the concrete. After striking off the surfaces to the required grade concrete shall be compacted with a wooden float. The blows shall be fairly heavy in the beginning but as consolidation takes place, light rapid strokes shall be given to complete the ramming. The floating shall be followed by steel trovelling after the concrete has hardened sufficiently to prevent excess of fine material from working to the surface, The finish shall be brought to a smooth and even surface free from defects and blemishes and tested with straight edges. No dry cement or mixture of dry cement and sand shall be sprinkled directly on the surface of the concrete to absorb moisture or to stiffen the mix. After the concrete has been thoroughly rammed and has dried sufficiently to allow rendering to be worked up, surface shall be rendered with a thin coat of 1:1 cement mortar with fine sand and uniformly floated. If so directed by the Engineer-in-Charge, approved mineral colour pigment conforming to appendix-B of IS 657 shall be added to the cement mortar to give the required colour and shade to the flooring. When the cement mortar rendering is sufficiently stiff, lines shall be marked on it with strings or by any other device to give the appearance of tiles 30 x 30 cm or of any other size laid diagonally or square as directed by the Engineer-in-Charge. The junctions of floor and walls shall be rounded off if so directed, without any extra payment.
After the concrete in the bays has set, the joints of the panels shall be filled with cement cream or with suitable bitumastic compound as shown on the drawings or directed by the Engineer-in-Charge. Vertical edge of the bays shall be neatly marked on the surface of the concrete with a pointed trowel after filling the joints.

19.3.3. Finishing:
When the rendering is somewhat stiff, neat cement may be sprinkled on sparingly through a paper pot on the surface and rubbed lightly to give smooth polished ordinary cement coloured surface. If coloured flooring is required by the Engineer-in-Charge the approved coloured cement shall be used. Surface shall be protected from direct sun when it is green.

19.3.4. Curing:
Curing shall start on the next day after finishing and shall be continued for 14 days.

19.4. CEMENT CONCRETE FLOOR WITH METALLIC HARDENER TOPPING

Cement concrete flooring of specified thickness and mix as per 'Itemised Schedule of Quantities' shall be laid as specified under the specification of cement concrete flooring. The top surface shall be roughened with brushes while the concrete is still green and the forms shall be kept projecting up 12mm. Over the concrete surface to receive the metallic hardening compound topping. Metallic concrete hardener topping shall consist of 12mm thick layer of cement hardener of mix 1:2 (1 cement hardener: 2 stone aggregate 6mm nominal size by volume). The metallic concrete hardening compound of approved quality is mixed in the ratio of 1:4 (1 metallic concrete hardener: 4 cement by weight). Concrete hardener shall be fry mixed with cement and then with stone aggregate. The mixture by adding water so obtained shall be laid in 12mm thickness after putting cement slurry on cement concrete under-layer

but within 2 to 4 hours of laying the under-layer. The surface shall be finished smooth and true to slope with steel floats. 3. RCC Floor Slab this shall be of RCC 1:2:4 nominal mix (M15 grade) of thickness 130mm or as indicated otherwise. The slab shall be reinforced with 8 mm MS bars at 200mm. Spacing both ways. The water cement ratio shall be adjusted suitably to provide a Slump of not more than 35mm. The flooring shall be laid in continuous panels of about 3 metre width dummy joints at every 6 metre length and full depth transverse expansion joints at every 30 to 40 metres. The expansion joints shall be filled with compressible pre-moulded joint filler such as Choksi or other approved make. The floor slab shall be laid in a workmanlike manner by workers skilled in this trade. Proper slopes and levels as indicated shall be maintained. Shuttering to sides of panels shall be of steel channels only. Concrete shall be vibrated after pouring with needle type vibrators. The work shall be measured and paid for as per IS 1200 inclusive of form work. Reinforcement shall be measured and paid for separately.

19.5. MARBLE STONE SLAB / GRANITE STONE SLAB/LIMESTONE FLOORING

19.5.1. Material

Machine cut marble stone / granite stone slabs shall be of thickness as specified in the item description. Colour shall be uniform and the slabs free from all defects. Tiles used at site shall be machine-cut. The slabs shall be made from selected stock, which are hard, sound, homogeneous and dense in texture and free from flaws, angles and edges shall be true, square, and free from chipping and surface shall be plane. The slabs shall preferably to machine cut the required dimensions. Tolerance of +- 5mm in dimensions and +- 2mm in thickness will be allowed.

In machine-cut tiles, edges shall be protected from any damage in transit. No breakage shall be permitted. All edges shall be sharp, perfectly rectangular. Edges shall be pencil-rounded and polished for exposed corners and faces.

Uniformity of size shall generally be maintained for the flags used in any one room. The stone flags shall be without any soft veins cracks or flows and shall have a uniform colour. They shall have even natural surfaces free from broken flakes on top and shall be true and square to ensure uniform width of joint. Samples of stone slabs to be used shall be got approved by the Engineer-in-charge and the slabs to be used shall conform to the approved sample.

The slabs would be cut by Gang saw and the lubricant for cutting will be water only.

Multiple Blade cutters should be used for cutting large sizes/blocks .

Polishing /Honing should be done by ‘21 Head polisher’

Packing of stones - Packaging should be done with following steps:

a) Base will be wooden planks.

b) Over it , there would be Thermocol sheet.

c) Vertically, perimeter will be a wooden box

d) First sheet of Thermocol sheet would be put.

e) Stone slab will be placed vertically

f) Thermocol sheet would be put on the other side of slab

g) Another stone slab would be placed.

Quantities/lots have to be blocked based on the following parameters:

a) Colour Consistency

b) Tonal Range

c) Cutting direction (it should be along the length)

19.5.2. Tolerances

The following tolerances shall be allowed in the dimension of blocks, slabs and tiles:

Length	**Tolerance**
Blocks	
Width	+ 2 per cent
Thickness	+ 2 per cent
Length	+ 2 per cent
Slabs	
Width	+ 2 per cent
Thickness	+ 2 per cent
Length	+ 3 per cent
Tiles	
Linear dimension	+ 3 per cent
Thickness	+ 2 per cent

The sizes other than those mentioned above may be provided as directed by the Engineer and nothing extra shall be payable on this account.

19.5.3. PHYSICAL PROPERTIES

The physical properties of marble for blocks, slabs and tiles and method of tests are mentioned below

Characteristic	**Marble**		**Granite**	
	Marble Requirements	**Method of test**	**Granite Requirement**	**Method of test**
(1) Moisture absorption after 24 hrs immersion in cold	Max. 0.4%	IS 1124	Max. 0.50% by weight	IS 1124
(2) Hardness	Min. 3	Mhos scale	-	-
(3) Specific Gravity	Min. 2.5	IS 1122	Min. 2.6	IS 1122

19.5.4. Bedding

Bedding shall be of cement-sand-mortar mix in a ratio of 1:4 unless specified otherwise in the BOQ/drawings. The base of cement or lime concrete shall be laid and compacted to a reasonably true plain surface and to the required slopes and level. The amount of water added shall be the minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Before spreading mortar, the sub-floor or base shall be cleaned off all dirt, scum or laitance and of loose material and then well wetted without forming any pools of water on the surface. In case of R.C.C floors, the top shall be left a little rough. The mortar shall then be evenly and smoothly spread over so much area as will be covered with slabs within half an hour. The thickness of the mortar bedding shall not be less than 12 mm and not more than 35 mm.

19.5.5. Laying

Laying of marble /granite stone slab flooring shall be as follows:-

Before laying, the stone slab shall be thoroughly wetted with clean water. Neat cement grout (pigmented to match the shade of the stone slab) of honey like consistency shall be spread on the mortar bed over as much areas as could be covered with the slabs within 15 to 20 minutes. Each stone slab shall be gently tapped with a wooden mallet till it is firmly and properly bedded. If there is a hollow sound on gentle tapping of the slabs such slabs shall be removed and reset properly. The joints shall be as thin as possible and limited to 2mm at the maximum. The stone slab shall be laid so as to give continuous parallel long joints with cross joints at right angles to them. The edges of the adjoining slabs shall be in one plane. Where the slabs cover open edges of floor or window sills the edges shall be neatly rounded off.

Laying shall start after due consideration is given to following points and approved by the Engineer-in-charge.

Base concrete or the RCC slab on which the slabs are to be laid shall be cleaned, wetted and mopped.

The bedding for the slabs shall be with cement mortar 1:4 (1 cement : 4 coarse sand) or as given in the description of the item.

The average thickness of the bedding mortar under the slab shall be 25 mm and the thickness at any place under the slab shall be not less than 12 mm.

The slab to be paved shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible.

Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off. The flooring shall be cured for a minimum period of seven days.

The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Joint thickness shall not be more than 1 mm.

19.5.6. Polishing and Finishing

The day after the tiles are laid all joints shall be cleaned of the grey cement grout with a wire brush or trowel to a depth of 5 mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with grey or white cement mixed with or without pigment to match the shape of the topping of the wearing layer of the tiles. The same cement slurry shall be applied to the entire surface of the tiles in a thin coat with a view to protect the surface from abrasive damage and fill the pin holes that may exist on the surface.

The floor shall then be kept wet for a minimum period of 7 days. The surface shall thereafter be grounded evenly with machine fitted with coarse grade grit block (No. 60). Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped. It shall then be covered with a thin coat of grey or white cement, mixed with or without pigment to match the colour of the topping of the wearing surface in order to fill any pin hole that appear. The surface shall be again cured. The second grinding shall then be carried out with machine fitted with fine grade grit block (No. 120).

The final grinding with machine fitted with the finest grade grit blocks (No. 320) shall be carried out the day after the second grinding described in the preceding Para or before handing over the floor, as ordered by the Engineer-in-Charge.

For small areas or where circumstances so require, hand grinding/polishing with hand grinder may be permitted in lieu of machine polishing after laying. For hand polishing the following carborundum stones, shall be used:

1st grinding — coarse grade stone (No. 60)
Second grinding — medium grade (No. 80)
Final grinding — fine grade (No. 120)

In all other respects, the process shall be similar as for machine polishing.

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square metre sprinkled with water and rubbed hard with a ‘namdah’ block (pad of woollen rags). The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished. The finished floor shall not sound hollow when tapped with a wooden mallet.

19.5.7. Measurement

Measurement shall be done in square metres. Steps and risers for specified width and height shall be measured in running metres or as detailed in BOQ. Rates shall include costs for all labour, material, cutting, dressing, polishing of exposed faces and edges, wastage etc. including dry laying in pattern, providing dividing strips, special cut pieces of various sizes to create the pattern as shown in the drawing and polishing to required standard etc. No extras shall be permitted on any account.

19.5.8. Coating :

Before laying all limestone/Marbles/Italian Marble and only those Granite exposed to external agencies to be treated with UV resistant, water resistant coat, fungus resistant coats having low VOC and all laying and applying specifications as per manufacturer’s specifications

The coating should be high performance natural look solvent based penetrating sealer with a unique formulation designed for the protection of all porous to dense tile, stone and grout surfaces. The product should be formulated for resistance against oil, water, alkalis, acids, staining and freeze-thaw damages. The coating should function on the surface of the substrate, it penetrates and forms a invisible barrier so that it prevents moisture and stains from entering the substrate, but it remains permeable to vapours letting the substrate to breath
and keeping their characteristics unchanged. It is effective for interior and exterior applications. It is UV transparent, resists acid rain and will not alter the natural colour of the substrate.

APPLICATION:

a. Read entire label, Datasheet and MSDS before using.

b. The surface to be sealed must be clean, dry and free from dust. Ensure area is well-ventilated during application and until the surface is dry.

c. Mask the neighbouring areas not intended to seal.

d. Test on a small hidden area before coating entire surface to determine the desired results.

e. Apply an even coat using sponge, brush, and paint pad or cotton towel. Not to be diluted. Do not spray or aerosol.

f. Allow the sealer to penetrate 10 -20 minutes.

g. Excess sealer remaining on the surface must be wiped (buffed) using absorbent paper or cotton towels or with buffing machine. Use White buffing pad only.

h. A second coat to be applied after 30-45 minutes after first coat application. For very porous surfaces a third coat may be required.

i. 3-5 minutes after the final application, wipe the entire surface with dry cotton towels or start buffing to remove excess sealer.

j. If any excess sealer dried on the surface and formed residue, apply a thin coat of the sealer and wipe with cotton towel immediately.

k. A full cure is achieved after 48-72 hours. Foot traffic may begin in 24 hours.

l. Clean the tools using soap water immediately after each use.

19.5.9. MARBLE STONE / OTHER STONE SLAB FLOORING FOR TREADS:

The method of laying, bedding etc. for marble / other stone flooring in treads shall be similar to that for marble stone slab / granite stone slab flooring as specified in 4.0 above. Chamfering/Bull nosing of the treads shall be done as mentioned in the BOQ. All edges after rounding/chamfering will be machine mirror polished as directed.

19.5.10. SKIRTING / DADO OR CLADDING OF POLISHED STONE SLAB:

The backing for skirting / dado or cladding shall be cement plastered mentioned in the item**,** 12 mm to 20 mm thick and this plastering shall be done in a single coat. Thickness of joints shall not exceed 1.5 mm. Final polishing may be done by rubbing. The top of skirting or dado shall be jointed neatly with the plaster above as directed. The joints between the two slabs shall be filled with neat white cement and matching coloured pigment grout of appropriate consistency. All cutting joints to be in 45^0 machine cut, only for the staircase

19.5.11. MEASUREMENT

Flooring shall be measured in Square Metres correct to two places of decimal while the individual dimensions shall be measured correct to one centimetre before laying skirting, dado or wall plaster. No deduction shall be made nor extra paid for any opening in the floor area up to 0. 1 Sqm. Nothing extra shall be paid for use of outlines nor for laying the floor at different levels in the same room. Treads of stairs and steps without nosing shall also be measured under flooring.

Unless otherwise mentioned in the BOQ, Risers of steps, skirting, cladding and dado shall be measured in square metres correct to two places of decimal. Length shall be measured in centimetre along finished face of the riser, skirting, cladding or dado correct to a centimetre. Height shall be measured from the finished level of tread or floor to the top.

19.6. JOINTS IN FLOORING

19.6.1. Joints:

Joints shall be provided in flooring to take care of expansion and contraction due to variations in temperature. In addition, construction joints shall also be provided in case of compulsory break in continuity of slabs due to the close of day's work and the commencement of the same the next day. The location and type of joints provided shall be as shown in the drawing or as directed by Engineer-in-charge. The edge of the slab at all joints shall be rounded with an edging tool having radius not greater than 6mm. It should be carefully ensured by proper vibration, that concrete at joints is free from honeycomb.

19.6.2. Transverse Joints .

Transverse joints shall be expansion, contraction or construction joints and shall be provided as shown in the drawing or as directed by Engineer-in-charge. They shall be at right angles to longitudinal joint surface of the floor. Contraction and expansion joints shall be continuous from edge to edge.

19.6.3. Transverse Expansion Joints :

These joints shall be provided at an interval or spacing of 30 m. They shall be pre moulded type and shall extend the entire width of the pavement and form sub-base to 25mm below the surface of the pavement. The gap width for this type of Joint shall be approximately 20 to 25mrn. The filler shall be held accurately in place during the placing of the concrete by a metal bulkhead, a metal channel cap or other approved method, Load transfer is effected through a system of reinforcement called dowel bar. Dowel bars are embedded and kept fixed in concrete at one end and is kept free to expand or contract by providing a thin coating of bitumen over it. Metal cap is provided at this end to offer a space of about 25mrn for movement during expansion.

19.6.4. Transverse Contraction Joints

These joints shall be provided at an interval on spacing of 10m, depending upon the type of aggregates. They shall be placed as shown in the drawing or as directed by the Engineer-in-charge. They shall be constructed by forming in the surface of the slab, a slot not less than 6mm wide and having a depth equal to one fourth depth of the concrete slab. This slot may be formed such as by pushing into

concrete a flat bar or the web of a 'T' bar and keeping the slot open or any manner approved by the Engineer-in-charge. It shall be filled flush with top surface by using approved sealant.

19.6.5. Longitudinal Joints

Longitudinal joints, parallel to longer side of floor slab shall be of plain type and shall be formed by placing the concrete against the faces of the slabs concreted earlier. The faces of the old concrete shall be painted with bitumen before placing fresh concrete.

The bar shall be used at longitudinal joints and they shall be of the dimensions and at spacing as shown in drawing or as directed by the Engineer-in-Charge. Tie bars shall be fairly well supported so as not to be displaced during construction operations.

19.7. GLAZED TILE FLOORING AND DADO

19.7.1. Glazed tiles shall, unless otherwise indicated, be 150mm x 150mm x 6mm thick in size and of best quality, Indian make obtained from approved sources. Glazed tiles shall be pure white or of colour as indicated. The tiles shall be sound hard, well and evenly glazed, free from twist, with fine and sharp edges. Different makes of tiles shall be brought for approval and samples of tiles shall be first got approved by the Engineer-in-charge and all the tiles which shall be used in the work shall strictly conform to the approved sample otherwise all the tiles will be rejected. The surface to be laid for flooring or dado shall be thoroughly hacked; joints of masonry raked cleaned of all mortar scales, concrete lumps, loose materials, etc., and washed to remove mud, dirt, etc., from the surface. Unless and until the surface is approved by the Engineer-in-charge, the flooring or dado shall not be started. The prepared surface shall be thoroughly drenched with water. The glazed tiles and all specials shall be soaked in water for a minimum period of 6 hours before use.

19.7.2. Flooring:

A bedding of 20 mm thick (unless otherwise specified) cement mortar 1:3 shall be laid evenly to levels or slope as directed. The tiles shall then be laid on the bedding with a backing of thin cement paste. All tiles shall truly and evenly set and pressed in position to obtain a uniform plane surface. The tiles shall be close jointed and all joints shall be uniform and run in perfect straight lines. The joints shall be staggered or continuous as directed. The other specials like, corner angles, elephant foots, bull eyes etc. shall be used at the proper places whenever required and as directed. The entire finished surface shall be thoroughly cleaned to remove all cement stains etc. The joints shall be kept wet for 7 days.

19.7.3. Dado:

The prepared surface shall be plastered with cement mortar 1:3 to get bedding of 12mm thick. The plastered surface shall be even uniform and true to plumb. The tiles shall be fixed in position with a backing of cement paste. All tiles shall be evenly set and pressed in position to a true plane surface. The specifications for workmanship regarding joints, specials, cleaning, pointing, curing etc. shall be exactly similar to tile flooring. The flooring and dado shall be finally cleaned with diluted hydrochloric acid and water to produce a clean white and shining surface.

Measurement shall be for the actual area. The dimensions shall be taken on the glazed tiled surface. The rate shall include for all specials such as comer angles, elephant foots, bulls eyes etc. The unit of measurement shall be 1 Sqm. If the tile manufacturer specifies the use of adhesives for dado, the Contractor to use the same at no extra cost to the Client

19.8. CERAMIC TILES /VITRIFIED TILES FLOOR AND DADO

19.8.1. Ceramic tiles shall be 300mm x 300mm x 7mm thick in size or as mentioned in the BOQ, Vitrified tiles to be 600x600x10mm thick/900 x 900 x 12mm / 1000 x 1000 x 12mm or as specified in the Item and of best quality, Indian make obtained from approved manufacturer. The tiles shall be sound, hard, well and evenly treated, free from twist, with fine and sharp edges. Sample of the tiles shall be first got approved by the Engineer-in-charge in case of the Contractor's supply and all the tiles which shall be used in the work shall strictly conform to the approved sample otherwise all the tiles will be rejected. The surface to be laid for the flooring or dado shall be thoroughly hacked, joints of masonry racked, cleaned of all mortar scales, concrete" lumps, loose materials, etc. and washed to remove mud, dirt, etc. from the surface. Unless and until the surface is approved by the Engineer-in-charge, the flooring and dado shall not be started. The prepared surface shall be thoroughly drenched with water.

19.8.2. Flooring

A bedding 20 mm thick (unless otherwise specified) of cement mortar 1:3 shall be laid evenly to levels or slope as directed, The tiles shall then be laid on the bedding with a backing of thin cement paste. All tiles shall be truly and evenly set and pressed in position to obtain a uniform plane surface. The tiles shall be closed jointed and ail joints shall be uniform and run in perfect straight lines. Joints shall be filled with matching cement paste. Entire finished surface shall be thoroughly cleaned to remove all cement stains, etc. The joints shall be kept wet for 7 days. Epoxy joints can also be used as a substitute for cement paste.

When tile flooring is to be laid over the existing flooring without dismantling old flooring it can be laid with adhesive. The old flooring shall be thoroughly cleaned and checked for undulations, if any shall be rectified with cement mortar 1:3 (1 cement: 3 coarse sand). Old cement concrete surface shall be hacked and cleaned off to have proper bond with the old surface. High polymer modified quick set tile adhesive (conforming to IS 15477) shall be thoroughly mixed with water and a paste of zero slump shall be prepared so that it can be used with in 1.5 to 2 hours. It shall be spread over an area not more than one Sqm at one time. Average thickness of adhesive shall be 3 mm The adhesive so spread shall be combed using suitable trowel. Tiles shall be pressed firmly in to the position with slight twisting action checking it simultaneously to ensure good contact gently being tapped with wooden mallet till it is properly backed with adjoining tiles. The tiles shall be fixed within 20 minutes of application of adhesive. The surplus adhesive from the joints, surface of the tiles shall be immediately cleaned. The surface of the flooring shall be frequently checked during laying with straight edge of above 2m long so as to attain a true surface with required slope. Where spacer lugs tiles are provided these shall be filled with grout

with lugs remaining exposed. Where full size tile cannot be fixed these shall be cut (sawn) to the required size and edges rubbed smooth to ensure straight and true joints. Tiles which are fixed in floor adjoining to wall shall enter not less than 10 mm under plaster, skirting or dado.

19.8.3. Dado:-

The prepared surface shall be plastered with cement mortar 1:3 to get a bedding of 12mm thick. The plastered surface shall be even, uniform and true to plumb. The tiles shall be fixed in position with a backing of cement paste or water proof adhesive of approved manufacturer as specified in the item. All tiles shall be evenly set and pressed in position to a true plane surface. The specifications for workmanship shall be exactly similar to tile flooring. The joints shall be filled with matching cement paste or with joint filler material of approved manufacturer as specified in the item. If the tile manufacturer specifies the use of adhesives for dado, the Contractor to use the same at no extra cost to the Client

19.9. TWIN GRANITE/MARBLE STONE FRAMES

19.9.1. Bedding shall be of grey cement-paste with minimum cement consumption of 0.21 bags per Sqm. Of applied area, unless specified otherwise in the BOQ/drawings. The base of cement shall be compacted to a reasonably true plain surface and to the required and level. The amount of water added shall be the minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Before spreading paste, the sub- base shall be cleaned off all dirt, scum or laitance and of loose material and then well wetted without forming any pools of water on the surface. The paste shall then be evenly and smoothly spread over so much area as will be covered with slabs within half an hour. The thickness of the paste shall not be less than 6 mm and not more than 12 mm.

The joints shall be cleaned and properly grouted with a neat paste of white cement with minimum cement consumption of 0.55 kg per Sqm

The proportion of mortar bedding shall be 1:4 , unless and otherwise prescribed any other proportion and shall be as per IS 2116-1965 , as applicable to non-reinforced masonry work.

The adhesion of two slab frames overlay shall be ensured with araldite or approved Ardex endure / Latecrete adhesive.

19.9.2. Laying

Laying of marble /granite stone slab frame shall be as follows :-

Before laying, the stone slab shall be thoroughly wetted with clean water. 20mm thick marble slab / tiles shall be fixed with polymer modified cement adhesive or cement paste (as per BOQ) Each stone slab then shall be gently tapped with a wooden mallet till it is firmly and properly bedded. If there is a hollow sound on gentle tapping of the slabs such slabs shall be removed and reset properly. The joints shall be as thin as possible and limited to 2mm at the maximum. Unless and until detailed in the BOQ or Drg, exposed edges of window sills/door frames, the edges shall be neatly rounded off.

Laying shall start after due consideration is given to following points and approved by the Engineer-in-charge.

The vertical surface for frame cladding work should be rough, fairly in plumb and in right angles with each other, Concealed plumbing and electric conducting shall be complete before the execution of frame cladding work.

Check all the right angles of the corners of bath/W.C. /toilet or pantry area. Please ensure that the plaster is in plumb.

Check the level of the wooden Patti with spirit level before commencing the cladding work.

After the frames are laid, surplus cement slurry from the joints shall be cleaned. The following day the joints shall again be cleaned, washed and wire brushed.

In case not specified in the Drawing or BOQ, and if the projection is not recommended, 6mm groove to be provided at the junction of the wall and stone frame.

Polishing and grinding shall be completed on the surfaces and edges before the laying of the stone frames. At first the grinding shall be with rough stone of grade 48 to 60. All chips shall be visible and grinding shall be uniform. It shall be cleaned with water. All pin-holes and opened out joints shall be grouted with matching coloured cement grouts supplied by the tile manufacturer. It shall be cured for a period of 7 days by keeping it moist.

Second coat cutting/grinding shall be done with carborandum stone of grade 120. The same procedure as for the first coat shall be repeated till curing is completed.

The final cutting/grinding shall be with a fine stone of 220-320 grade and shall be done with ample water.

Oxalic acid powder shall be spread 33 gm/Sqm. and polished by machine fitted with Hessian bobs. The floor shall then be washed, cleaned and dried with a soft cloth or linen. They should be hand polished by using rubbing stone.

In case of wax polishing, wax polish shall be applied to the surface. It shall be rubbed with machine. Then clean saw-dust shall be spread over the slab and rubbed with polishing machine. This will remove wax, leaving a glossy surface underneath.

19.9.3. Rates:

Apart from other factors mentioned elsewhere in this contract , the rate shall include for the following:

19.9.3.1. All labour, materials(except for Client supplied ones), equipments, cleaning of the sub-base, laying mortar bed and adhesives, grout, fixing marble slabs as specified above and making up the joints.

19.9.3.2. Transportation of material / equipment

19.9.3.3. Any cutting and wasting if required

19.9.3.4. Mouldings and edge polishing

19.9.3.5. All adhesives, grouts and mastic sealants etc.

19.9.3.6. Curing

19.9.3.7. Cleaning the floor and surrounding areas all stains, etc.

19.10. CAR PARK SYSTEMS

19.10.1. PROPOSED SPECIFICATION

The following details the requirements for a Polyurethane seamless lightweight multi- layered system comprising of primers and protective coatings incorporating a full blinded wearing course.

19.10.2. TURNING CIRCLES, DRIVEWAYS and PARKING BAYS

- Mechanically prepare the surface
- Prime the surface with water based epoxy as per manufacturer's specifications
- Fully blind the surface with Silica Aggregate 25/30 at the rate of 2.00 kg/m2.

19.10.3. SUBSTRATE REQUIREMENTS AND SURFACE PREPARATION

All new concrete surfaces, a minimum twenty - eight days old, shall be shot Blasted or mechanically grinded to remove any laitance, dust and open up the pores of concrete for primer penetration.

The moisture content in the floor should not exceed 5%. This will be checked by the contractor prior to laying the CAR PARK system

Deep hollows, indents or other unacceptable defects in concrete surfaces to be made good, prior to the application of the CAR PARK System as directed by the Engineer-in-charge

Brickwork, dense concrete blocks, etc, shall be flush pointed with defects made good by the client

19.10.4. EXPANSION JOINTS

Expansion joints specified by the Architect/ Engineer-in-charge shall be installed by others in accordance with manufacturer's instructions.

19.10.5. TURNING CIRCLES, DRIVEWAYS and PARKING BAYS

19.10.6. PRIMING

All dust and debris to be removed prior to primer application.
Apply a coat of approved primer to prepared concrete surfaces at a coverage rate of 0.30kg/m2. Allow to become tack free 6- 8 hours or overnight.

19.10.7. BASE COAT

Apply a high build coat of approved make to the primed at a coverage rate of 0.50kg/m2 or as per manufacturer's specifications

19.10.8. ANTI-SLIP WEARING SURFACE

Apply a full blinding of SILICA AGGREGATE 25 – 30 immediately cast into wet film. (Approx 2.00kg/m2).
Allow to cure for 6- 8 hours or overnight.
Vacuum or sweep blinded surface to remove all non - bonded aggregates.

Apply two coats CAR PARK SYSTEM at a coverage rate of 0.60kg/m2 at an inter coat interval of 4-6 hours.
Allow to cure overnight.
Applying Isle marking coat on the surface as per the client's drawing and requirements.
TRAFFICKING
24 hours shall be allowed for opening completed areas to foot traffic and 72 hours for vehicular traffic.

19.11. IPS WITH NON METAL HARDNERS

Cement concrete flooring of specified thickness and mix as per 'Itemized Schedule of Quantities' shall be laid as specified under the specification of cement concrete flooring. The top surface shall be roughened with brushes while the concrete is still green and the forms shall be kept projecting up 12mm. Over the concrete surface to receive the metallic hardening compound topping.

The non metal hardeners shall be as per the manufacturer's specifications. All installation procedure, mixing, laying procedure shall be as per manufacturer's specifications

19.12. KOTA FLOORING

19.12.1. Kota Stone Slabs

The slabs shall be of selected quality, hard, sound, dense and homogeneous in texture free from cracks, decay, weathering and flaws. They shall be hand or machine cut to the requisite thickness. They shall be of the colour indicated in the drawings or as instructed by the Engineer-in-Charge.
The slabs shall have the top (exposed) face polished before being brought to site, unless otherwise specified. The slabs shall conform to the size required. Before starting the work the contractor shall get the samples of slabs approved by the Engineer-in-Charge.

19.12.2. Dressing

Every slab shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth so that a straight edge laid along the side of the stone shall be in full contact with it. The sides (edges) shall be table rubbed with coarse sand or machine rubbed before paving. All angles and edges of the slabs shall be true, square and free from chippings and the surface shall be true and plane.
The thickness of the slab after it is dressed shall be 20, 25, 30 or 40 mm as specified in the description of the item. Tolerance of ±2 mm shall be allowed for the thickness. In respect of length and breadth of slabs Tolerance of ± 5 mm for hand cut slabs and ± 2 mm for machine cut slabs shall be allowed.

19.12.3. Preparation of Surface and Laying

Base concrete or the RCC slab on which the slabs are to be laid shall be cleaned, wetted and mopped.
The bedding for the slabs shall be with cement mortar 1:4 (1 cement : 4 coarse sand) or as given in the description of the item.
The average thickness of the bedding mortar under the slab shall be 25 mm and the thickness at any place under the slab shall be not less than 12 mm.
The slabs shall be laid in the following manner:

Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar is allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per Sqm. The edges of the slab already paved shall be buttered with grey cement with or without admixture of pigment to match the shade of the Kota slabs as given in the description of the item.

The slab to be paved shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible. Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off. The flooring shall be cured for a minimum period of seven days. The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Joint thickness shall not be more than 1 mm.

19.12.4. Polishing and Finishing

The day after the tiles are laid all joints shall be cleaned of the grey cement grout with a wire brush or trowel to a depth of 5 mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with grey or white cement mixed with or without pigment to match the shape of the topping of the wearing layer of the tiles. The same cement slurry shall be applied to the entire surface of the tiles in a thin coat with a view to protect the surface from abrasive damage and fill the pin holes that may exist on the surface.

The floor shall then be kept wet for a minimum period of 7 days. The surface shall thereafter be grounded evenly with machine fitted with coarse grade grit block (No. 60). Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped. It shall then be covered with a thin coat of grey or white cement, mixed with or without pigment to match the colour of the topping of the wearing surface in order to fill any pin hole that appear. The surface shall be again cured. The second grinding shall then be carried out with machine fitted with fine grade grit block (No. 120).

The final grinding with machine fitted with the finest grade grit blocks (No. 320) shall be carried out the day after the second grinding described in the preceding Para or before handing over the floor, as ordered by the Engineer-in-Charge.

For small areas or where circumstances so require, hand grinding/polishing with hand grinder may be permitted in lieu of machine polishing after laying. For hand polishing the following carborundum stones, shall be used:

1st grinding — coarse grade stone (No. 60)
Second grinding — medium grade (No. 80)
Final grinding — fine grade (No. 120)

In all other respects, the process shall be similar as for machine polishing.

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square metre sprinkled with water and rubbed hard with a ‘namdah’ block (pad of woollen rags). The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished. The finished floor shall not sound hollow when tapped with a wooden mallet.

19.13. THRESHOLD

Thresholds will be of two types

1) In 19mm thick pre-polished Granite
2) In 20mm thick polished Kota

The method of laying the thresholds is the same as that of flooring.
Granite and Kota threshold should have 6mm chamfer on one side / full round nosing which will be mirror polished as per the instructions of the Engineer-in-charge.

19.14. PANTRY / HAND WASH COUNTER

19.14.1. Necessary chases to be made in the wall for supporting the backing materials

19.14.2. Machine cut Cudappa stone slabs used shall be of 25 mm thickness, colour shall be uniform and the slabs free from all defects. Or 19mm marine ply wood to be used instead of Cudappa (as specified in the BOQ)

19.14.3. Slabs shall be either machine cut at factory in required sizes or cut by machine at site. In all cases no damaged stone shall be used in the work.

19.14.4. Vertical stones and stones of shelf shall be machine polished on both sides while the top slab shall be polished on one side i.e. underside, while top surface shall be kept rough for better adhesion with granite top.

19.14.5. All edges shall be sharp, perfectly rectangular and the exposed edges shall be pencil rounded and machine polished.

19.14.6. Assembly of toilet counter shall be done as per detail given by Architect or Engineer complete to all details and dimensions.

19.14.7. Vertical pieces shall be in perfect plumb on all sides while horizontal slab shall be in perfect level.

19.14.8. All joints and in fill layer shall be filled with cement sand mortar of mix 1:4 (1 cement : 4 sand) and properly cured.

19.14.9. Granite top used shall be of approved quality and shade. Thickness shall be about 20 mm and all slabs shall be machine cut.

19.14.10. All slabs preferable shall be from same mines and granite blocks / rocks to ensure uniformity of colour and quality.

19.14.11. Cutting and polishing shall be by machine only at factory. No damaged piece shall be used.

19.14.12. All edges shall be sharp, perfectly rectangular and the exposed edges shall be pencil rounded and polished.

19.14.13. Granite top shall be laid over cement mortar bed of about 20 mm thickness of mix cement mortar 1:4 (1 cement : 4 sand). Prior to laying of mortar bed the top of Cudappa stone base shall be scrapped clean and washed thoroughly. In case Granite is to be laid on ply backing, the same to be done by means of approved Adhesive from Roff or Ardex Endura or Latecrete

as per the manufacturer's specifications

19.14.14. Mortar bed shall be laid and neat cement slurry with cement paste shall be spread over the mortar bed and clear granite slab shall be laid and fixed to perfect level over it.

19.14.15. Joints shall be as thin as possible and limited to 1-2 mm maximum. The joints shall be wiped off for excess cement slurry and cleaned prior to grouting with matching coloured cement grout.

19.14.16. Granite facia Patti shall be fixed by using anchor fasteners and epoxy based adhesives of approved type by the Engineer.

19.14.17. Work shall be protected and cured for at least 7 days. The timber props on braces shall be left in place as per instruction / recommendations of adhesive manufacturer.

19.14.18. The sink / wash basin of specified size and make shall be fixed by cutting of Cudappa stone base and the joints on top with granite shall be filled with silicon sealant of approved make and colour.

19.14.19. Measurements shall be in running meters or as mentioned in BOQ.

19.14.20. Rate shall include all materials, wastage, labour, grout, sealant, adhesives, anchors, protection, curing etc. complete. Sink/ wash basin shall be paid separately

19.14.21. The cost to include storage below the counter if mentioned in the BOQ

19.15. CORIAN / ACRYLIC SOLID SURFACE COUNTER

Corian is a solid, non-porous surfacing material homogeneously composed of ±1/3 acrylic resin (also known as PolyMethyl MethAcrylate or PMMA), and ±2/3 natural minerals. These minerals are composed of Aluminium TriHydrate(ATH) derived from bauxite, an ore from which aluminium is extracted.

INSTALLATION

Joints :

To minimise material and facilitate installation, corner joints should be made square (butt) rather than mitred. All Corian joints should be reinforced. The edges to be joined should be straight, smooth and clean. Joints should only be made with "Joint Adhesive for DuPont Corian". Make cutouts with a router equipped with a sharp 9.5 mm diameter (minimum) carbide bit. Corners of a cutout must be rounded to 5 mm radius and edges smoothed, top and bottom, all around a cutout. L- and U- shaped corners need smooth, 13 mm radius inside corners

Sealants and Adhesives:

Corian is compatible with many commercially available caulks and sealants. However, a specially developed FDA-listed silicone sealant sold by DuPont or its distributors should be used to achieve the best performance and colour match. The base for the counter should be in 19mm marine ply backing or as mentioned in the BOQ. Vertical panels of Corian should be installed over suitable substrates, most probably marine-grade plywood. Use "Silicone Sealant" for DuPont Corian® whenever low flamespread is required. In other cases, light coloured elastic polyurethane adhesive or Type I (ANSI A 136.1-1967) elastic solventbased spread mastic adhesives may also be used. DO NOT USE WATERBASED ADHESIVES. Install worktops on perimeter framing support (without added substrate) using small amounts of silicone sealant. For making joints in

worktops, repairs and custom edges, "Joint Adhesive for DuPont Corian®" is required. When used in accordance with manufacturer's instructions, it provides a smooth and inconspicuous joint. Repairs, while sound and fully functional, can be expected to be slightly visible. Joint Adhesive is available wherever Corian® is sold. Joint Adhesive can also be used to add decorative inlay designs into horizontal and vertical

20. FALSE CEILING

GYPSUM FALSE CEILING

20.1.1. Scope of work:
The work envisaged under these specifications refer to supplying and fixing in position Gypsum (Plaster board) false ceiling at any floor, any location and at any height.

20.1.2. Materials

20.1.2.1. Gypsum Boards :-
Plain plaster board should be of thickness as specified in the BOQ.It should b suitable for Interior applications and should follow the standards and specifications as mentioned in IS 2095, Part 1. The Thermal Conductivity of the plaster board should be 0.16 (W/m°K). The longitudinal edge of the Gyp board shall be of tapered / square edges, so as to have flush joints while fixing. Handling and transporting of Gyp board shall be done carefully and as recommended by the manufacturers. The board should always be kept in a dry and covered place sheltered from rain and to avoid dampness from flow, they should be supported on wooden battens which should not be more than 45cm apart on a flat surface. The material shall be stacked in piles of smaller heights and should not be stacked on edges. Gyp board which have deformed due to poor stacking should not be used. Cutting of board should be made in faced side of the board by means of retractable knife or by using a normal saw and the edges of the boards shall be planned using proper files.

20.1.2.2. MR grade Gypsum Boards :-
MR grade plaster board should be of thickness as specified in the BOQ. This is the moisture resistant gypsum plasterboard with water repellent additives in the core and paper liners. It should be suitable for Interior applications and should follow the standards and specifications as mentioned in IS 2095, Part 1. The Thermal Conductivity of the plaster board should be 0.16 (W/m°K). The longitudinal edge of the Gyp board shall be of tapered / square edges, so as to have flush joints while fixing. Handling and transporting of Gyp board shall be done carefully and as recommended by the manufacturers. The board should always be kept in a dry and covered place sheltered from rain and to avoid dampness from flow, they should be supported on wooden battens which should not be more than 45cm apart on a flat surface. The material shall be stacked in piles of smaller heights and should not be stacked on edges. Gyp board which have deformed due to poor stacking should not be used. Cutting of board should be made in faced side of the board by means of retractable

knife or by using a normal saw and the edges of the boards shall be planned using proper files.

20.1.2.3. GI frame works:- The system consists of G.I. frame work suspended from the soffit of the RCC ceiling. The following G.I. components shall be used for grid work.

20.1.2.3.1. Ceiling section which is the main supporting section to fix plasterboard 80 x 26 x 51 x 3660mm having ribbed surfaces

20.1.2.3.2. Perimeter Channel used to Fix around walls / partitions having Dimensions in (mm) as 20 x 28 x 30 x 3660mm

20.1.2.3.3. Intermediate Channel which is used to Primary section to support the ceiling section having Dimensions in (mm) as 15 x 45 x 15 x 3660

20.1.2.3.4. Ceiling Angle used to provide suspensions from the structural soffit having Dimensions in (mm) as 25 x 10 x 3660mm

20.1.2.3.5. Connecting clips of 2.64 mm dia.

20.1.2.3.6. Soffit cleat 22X37mm

20.1.2.3.7. Anchor fasteners 6 mm

All the G.I. components shall be of approved make. The G.I. grid work system shall be suspended from the soffit of RCC ceiling using anchor fasteners of 6mm of approved type and make and connected to soffit cleats and ceiling angle by means of necessary nuts, bolts and washers etc.

20.1.2.4. Methodology

20.1.2.4.1. Providing and fixing suspended G.I. frame work

20.1.2.4.2. Providing and fixing one layer of 12.5 mm Gypboard over this frame work.

20.1.2.4.3. Jointing the board flush, applying two coats of primer suitable for Gypboard

20.1.2.4.4. Making necessary cut out for light fitting, A.C. grills diffusers and other necessities. The work shall include horizontal, vertical and inclined surfaces depending upon the various requirements.

20.1.2.4.5. Gypsum Board of plain or MR series 12.5 mm manufactured by Saint Gobain India Gyproc or equivalent from the approved makes list shall be used. The Gyp board shall conform to IS 2095. Gypsum boards shall be of specified thickness and of specified finish shall be screw fixed to the under side of false ceiling grid system with 12.5 mm dia dry wall screw @ 230 mm C/C by drilling machine. Joints in the board shall be finished flush with fillers, finisher and primer as per manufactures recommendation to give a seamless finish.

20.1.2.4.6. Perimeter channels are levelled at the required position of the finished ceiling line and fixed to the wall at 610 mm centre with the screws and nylon plugs. The remaining G.I. grid component are installed to form a regular grid suspended from the soffit of RCC slab using soffit cleats ceiling angle and anchor fasteners as specified. Extra frame for various cut-outs of different shapes, light fittings, AC grills, diffusers, smoke detectors and other necessities have to be provided frame work has to be made with perimeter channel of specified size and shall be suitably supported. The line and level of the grid work has to be checked for perfection and prior clearance of the grid work has to be checked for perfection and prior clearance of the grid work has to be obtained from the Engineer-in-charge before the placement of Gyp board.

20.1.2.4.7. The Gyp board are fixed with bound edges at right angles to ceiling section with all joints staggered. All joints of Gyp board have to be fixed on ceiling section. The Gyp boards are screwed to the ceiling section and perimeter channels with Gyp board dry wall screws with joints staggered. Spotting of screws and jointing are then carried out according to recommendations of Saint Gobain India Gypsroc or equivalent make to give a flush and smooth joint.

20.1.2.4.8. Necessary door openings of hinged type of suitable sizes has to be provided with a suitable frame work for control valves and for access above false ceiling / AC duct boxing at not extra cost. Joints at horizontal, vertical and inclined surfaces shall be suitably strengthened with additional G.I. frame work as required. Finally the boards are jointed and finished so as to have a flush look which includes fling and finish gin the tapered and square edges of the board with a jointing compound, paper tape and two coats of primer suitable for gyp board (all as per recommended practices of Saint Gobain Indian Gyproc or equivalent). The rate shall includes providing all materials, erecting, suspending, G.I. grid work, jointing the boards, providing required cut-outs and open able doors and painting including providing necessary fittings and fixtures etc. complete as per the specifications and all other activities related to the completion of the above job.

20.1.2.4.9. Details of A.C. grills, diffusers, and recessed type electrical fittings to be erected in false ceiling will be as per specifications and as shown in drawings. The quantities indicated are approximate and is likely to vary depending upon the site conditions.

20.1.2.5. Workmanship:-

Finishing ceiling shall be at the correct plans and present a pleasing and uniform appearance free from sags, wraps, figures or damaged joint exposed grid etc. shall be in true lines and symmetrically placed in manner shown on drawings or as recommended by manufacturers. All the cut out for light fixtures, diffusers etc. shall be exact dimensions and in exact locations as shown in respective drawings. All works in this section shall be performed in an efficient manner by installers approved by the manufacturers.

20.1.2.6. Mode of Measurement

Measurements will be made on flat plan area basis in Sq.m calculated to 3 places of decimal. Length and breadth shall be measured corrected to a cm. No deduction shall be made for cut-outs made for A.C. grills, diffusers, electrical fittings, smoke detectors etc.

20.1.2.7. Rates:

Rate to be inclusive of providing and fixing of angle beads at external angles to achieve straight line finish and protection from normal impacts. Rate to be also inclusive of providing and fixing of edge bead essential for the exposed edge of the Gypboard at the cut-outs for tube lights or any other such unprotected core. Rate to be inclusive of making of Cut- outs for Light fittings, grills, diffusers etc. All the rates shall be inclusive of all level differences / coves, etc. as per design and supply - installation of full system with necessary fixtures and fasteners when made to merge with different type of ceiling. Scaffolding is to be included in the rate and will not be paid separately

20.2. CALCIUM SILICATE FALSE CEILING

20.2.1.1. Scope of work:

The work envisaged under these specifications refer to supplying and fixing in position Calcium silicate false ceiling at any floor, any location and at any height.

20.2.1.2. Materials

Calcium silicate Board

Properties / Sizes	Units	Values
Thickness	mm	6.8, 10 and 12
Length	mm	1220, 1830 and 2440
Width	mm	1220
Density	Kg/m^3	900
Compressive strength	Kg/Cm^2	225
Tensile strength	Kg/Cm^2	60
Bending strength	Kg/Cm^2	100
Impact strength	J/m^2	1700
Young's modulus	Kg/Cm^2	265
Flexural streng	Kg/mm^2	10- Longitudinal, 5.5- Transverse
Fire Protection		
a) Non combustibility		Non-combustible according to BS 476: part 4-1970
b) Surface spread of flame		Class 1 to BS 476: part 4-1970 Part -7-1971
c) Ignitibility		P' NOT EASILY IGNITABLE as per BS476:Part 5-1968
d) Fire Propagation		Fire propagation index I = 4.0 as per BS 476:Part 6-1981
Fire Resistance		60 - 240 minutes
Sound Insulation	dB	39 - 52 decibles
Thermal Conductivity-K	W/mK	0.15
Thermal resistance-R	m^2K/w	0.04/0.05/0.006/0.08 for 6 /8/ 10/12mm thick boards respectively
Moisture Content	%	Under 15%
Shrinkage Dimension (dry-saturated)	%	0.10%

Length change in water	%	0.15%
Biological	-	No fungus growth
Alkalinity	pH	10

Metal framed suspended ceiling comprises of G.I perimeter channel having 0.55 mm thickness, two unequal flanges of 20 and 30 mm and web of 27 mm is fixed to surrounding walls /Partition using nylon sleeves and screws at 450 mm centres. Then intermediate channel (0.91mm thick) having two equal flanges of 15 mm each and a web of 45 mm is suspended from the soffit at 1220 mm centre with ceiling angle of width 25 mm x 10 mm x 0.55 mm thick, fixed to soffit with G.I cleat and steel expansion fasteners. Ceiling section of 0.55 mm thickness having knurled web of 50.5 mm and flanges of 26 mm each with lips of 10.5 mm are then fixed to the intermediate channel with connecting clips across to the Intermediate channel, at 457 mm centers. 8 mm thick square/tapered edge Hilux Calcium Silicate Boards are then screw fixed across the ceiling sections with 25 mm long self drilling and tapping screws having Phillips head with under head cutter, at 200 mm centres through the Hilux Calcium Silicate Board fillets.

20.2.1.3. Jointing and Finishing

The joints of the face boards are finished with specially formulated jointing compound and 48 mm wide fibre tape to provide seamless finish. Cement primer (Oil based) to be provided on entire surface before putty / painting.

Note:

G.I. perimeter channel and supporting materials are to be provided to make any opening for light fittings, diffusers etc. and should be supported properly to maintain the integrity of the ceiling, and should not be charged extra.

20.2.1.4. Methodology

20.2.1.4.1. Providing and fixing suspended G.I. frame work

20.2.1.4.2. Providing and fixing one layer of 12mm / 8mm Calcium silicate over this frame work. The thickness should be as per the BOQ

20.2.1.4.3. Jointing the board flush, applying two coats of primer suitable for Calcium silicate board

20.2.1.4.4. Making necessary cut out for light fitting, A.C. grills diffusers and other necessities. The work shall include horizontal, vertical and inclined surfaces depending upon the various requirements.

20.2.1.4.5. Calcium silicate of thickness as indincated in the BOQ should be manufactured by Hilux or equivalent from the approved makes list shall be used.

20.2.1.4.6. Perimeter channels are levelled at the required position of the finished ceiling line and fixed to the wall at 610 mm centre with the screws and nylon plugs. The remaining G.I. grid component are installed to form a regular grid suspended from the soffit of RCC slab using soffit cleats ceiling angle and anchor fasteners as specified. Extra frame for various cut-outs of different shapes, light fittings, AC grills, diffusers, smoke detectors and other necessities have to be provided frame work has to be made with perimeter channel of specified size and shall be suitably supported. The line and level of the grid work has to be checked for perfection and prior clearance of the grid work has to be checked for perfection and prior clearance of the grid work has to be obtained from the

Engineer-in-charge before the placement of Gyp board.

20.2.1.4.7. The Calcium silicate board are fixed with bound edges at right angles to ceiling section with all joints staggered. All joints of Calcium silicate board have to be fixed on ceiling section. The boards are screwed to the ceiling section and perimeter channels with dry wall screws with joints staggered. Spotting of screws and jointing are then carried out according to recommendations of Ramco Hilux or equivalent make to give a flush and smooth joint.

20.2.1.4.8. Necessary door openings of hinged type of suitable sizes has to be provided with a suitable frame work for control valves and for access above false ceiling / AC duct boxing at not extra cost. Joints at horizontal, vertical and inclined surfaces shall be suitably strengthened with additional G.I. frame work as required. Finally the boards are jointed and finished so as to have a flush look which includes fling and finish gin the tapered and square edges of the board with a jointing compound, paper tape and two coats of primer suitable for calcium silicate board (all as per recommended practices of Ramco Hilux or equivalent). The rate shall includes providing all materials, erecting, suspending, G.I. grid work, jointing the boards, providing required cut-outs and open able doors and painting including providing necessary fittings and fixtures etc. complete as per the specifications and all other activities related to the completion of the above job.

20.2.1.4.9. Details of A.C. grills, diffusers, and recessed type electrical fittings to be erected in false ceiling will be as per specifications and as shown in drawings. The quantities indicated are approximate and is likely to vary depending upon the site conditions.

20.2.1.5. Workmanship:-

Finishing ceiling shall be at the correct plans and present a pleasing and uniform appearance free from sags, wraps, figures or damaged joint exposed grid etc. shall be in true lines and symmetrically placed in manner shown on drawings or as recommended by manufacturers. All the cut out for light fixtures, diffusers etc. shall be exact dimensions and in exact locations as shown in respective drawings. All works in this section shall be performed in an efficient manner by installers approved by the manufacturers.

20.2.1.6. Mode of Measurement

Measurements will be made on flat plan area basis in Sq.m calculated to 3 places of decimal. Length and breadth shall be measured corrected to a cm. No deduction shall be made for cut-outs made for A.C. grills, diffusers, electrical fittings, smoke detectors etc.

20.2.1.7. Rates:

Rate to be inclusive of providing and fixing of angle beads at external angles to achieve straight line finish and protection from normal impacts. Rate to be also inclusive of providing and fixing of edge bead essential for the exposed edge of the Gypboard at the cut-outs for tube lights or any other such unprotected core. Rate to be inclusive of making of Cut- outs for Light fittings, grills, diffusers etc. All the rates shall be inclusive of all level differences / coves, etc. as per design and supply - installation of full system

with necessary fixtures and fasteners when made to merge with different type of ceiling. Scaffolding is to be included in the rate and will not be paid separately

20.3. MINERAL FIBRE BOARD CEILING

GENERAL SPECIFICATION

Providing and Fixing Mineral Fibre Acoustical Suspended Ceiling System with approved edge tiles with 15 mm Exposed Grid / 24mm Grid / Silhoutte grid (as per BOQ)

The tiles should have Humidity Resistance (RH) of 99%, NRC as per BOQ, Light Reflectance >85%, Thermal Conductivity k = 0.052- 0.057 w/m K, Colour White, Fire Performance Class 0/Class1 (BS 476 Part 6and7) in module size of 600 X 600 mm or as per BOQ with Bio Block coating on the face of the tile, suitable for Green Building application, with Recycled content of 63%.
The grid should be of approved make with 15mm/24mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm and 600 mm Cross Tees . The T Sections have a Galvanizing of 120 grams per M2 and passed through 500 hrs of Salt test.
The Tile and Grid system used together should carry a 15 year warrantee.

INSTALLATION: To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit using approved suspension system (specifications below) at 1200mm maximum centre. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall.
Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees.
Perimeter trim to be approved make wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centres.

SUSPENSION SYSTEM accessories manufactured and supplied by approved make and consisting of Anchor Fasteners with Vertical Hangers made of Galvanised steel of size 26 x 26 x 25 x 1.2mm with a Galvanised Thickness of 80grm/ sq.m, A pre Straightened Hanger wire of dia – 2.68 mm of 1.83 m length., thickness of 80 g/sq.m and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanised spring steel for 2.68 mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

At least 15 years limited warranty on the assembled system when installed to manufacturer’s specifications and maintained under an AMC programme
The cost should include the cost of making mock-ups of the ceiling if directed by the Architect / Engineer in charge. The rate to also include the cost of demolishing / removing the mock up if not approved
Shop drawings shall be prepared for all suspended ceiling work by the Contractor. The shop drawings shall show the entire installation system, including framing around light fixtures, ducts, grilles, access

panels, etc. Shop drawings shall be submitted to the Engineer for approval. It will be the responsibility of the Contractor to co-ordinate with all the service Contractor's doing work in ceilings, to incorporate appropriate suspension systems free of ducts, pipes, cable trays etc.

20.4. MINERAL FIBRE BOARD CEILING WITH PERIMETER TRIMS 150mm

The tiles should have Humidity Resistance (RH) of 95%, NRC 0.90, Light Reflectance >88%, Thermal Conductivity k = 0.032 w/m K, Colour White, Fire Performance Class 0/Class 1 (BS - 476) in module size of 600mm x 600mm x 15mm with facing of white scrim tissue of 320 gsm and 45 gsm formaldehyde free fibre tissue backing, suitable for Green Building application, with Recycled content of 65%.

20.4.1. GI Planks of micro look (150x1200mm):

The tiles should have Humidity Resistance (RH) of 100%, Light Reflectance >70%, Colour Global White, Fire Performance Class 0/Class 1 (BS - 476) in module size of 150mm x 1200mm x 0.5mm thick hot-dipped galvanised post-coated steel. The grid should be of approved make with 15mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner (with 150mm slots) and 1200 mm cross tees. The T Sections have a Galvanizing of 120 grams per M^2 and passed through 500 hrs of Salt test.
The Tile and Grid system used together should carry a 15 year warrantee.

PERIMETER TRIMS ALONG EDGES AS SHOWN IN THE DRAWINGS SHOULD BE INCLUDED IN THE RATE

20.4.2. INSTALLATION:
To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit using approved suspension system (specifications below) at 1200mm maximum centre perpendicular to the direction of 'Zone'. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at alternating intervals of 1200 and 150mm centre to form a 'Zone' (to carry the services) module of 150mm width across the main runners. The 'Zone' shall be accessed through the 1200x1200mm void the separates two adjacent 'Zones'. Perimeter trim to be approved make wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centres. Large panels tiles and 'Zone' planks shall be placed in the respective positions

20.4.3. SUSPENSION SYSTEM
Accessories should be manufactured and supplied by a vendor in the approved makes list and consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanised steel of size 26 x 26 x 25 x 1.2mm with a Galvanised Thickness of 80grm/ sq.m, A pre Straightened Hanger wire of dia – 2.68 mm of 1.83 m length., thickness of 80 g/sq.m and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanised spring steel for 2.68 mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner. The grid should be of "approved" make with 15mm wide T - section flanges colour white having rotary stitching on all T

sections i.e. the Main Runner (with 150mm slots) and 1200 mm cross tees. The T Sections have a Galvanizing of 120 grams per M2 and passed through 500 hrs of Salt test. The Tile and Grid system used together should carry a 15 year warrantee. Services including light fixtures, AC diffusers shall be of approved vendors with global white colour finish and edge detail match with the rest of the ceiling

Measurements will be made on flat plan area basis in Sqm calculated to 3 places of decimal. Length and breadth shall be measured corrected to a cm. No deduction shall be made for cut-outs made for A.C. grills, diffusers, electrical fittings, smoke detectors etc.

At least 10 years limited warranty on the assembled system when installed to manufacturer's specifications and maintained under an AMC programme

20.5. ALUMINIUM BAFFLE CEILING

SUBMITTALS

Product Data: Manufacturer's published literature, including specifications.

B. Shop Drawings, showing:
1. Reflected Ceiling Plan(s): Indicating screen metal ceiling layout, ceiling mounted items and penetration locations.
2. Suspension System, Carrier and Component Layout.
3. Details of system assembly and connections to building components.

C. Samples; submit:
1. Screen ceiling panels: Minimum 8 inch (200 mm) piece of each type and finish.
2. Colour samples: Manufacturer's standard colours (finishes) for Architect's selection.
3. Suspension system components and mouldings/trim.

D. Quality Assurance/Control Submittals:
1. Test Reports: Certified reports from independent agency substantiating structural compliance to wind loads and other governing requirements.
2. Certificates:
a. Data substantiating manufacturer and installer qualifications.
b. Certified data attesting fire rated materials comply with specifications.
3. Manufacturer's Instructions: Detailed installation instructions and maintenance data.

QUALITY ASSURANCE

A. Manufacturer/Installer Qualifications:

1. Provide screen metal ceiling system components produced by a single manufacturer with a minimum 3 years experience in actual production of specified products and with resources to provide consistent quality in appearance and physical properties, without delaying the work.
2. Provide suspension system and associated components produced by a single manufacturer, as recommended by the screen ceiling system manufacturer, to provide compatible components for a complete screen metal ceiling system installation.
3. Perform installations using a firm with installers having no less than 3 years of successful experience on projects of similar size and requirements.

B. Regulatory Requirements:
1. Fire Rating Performance Characteristics: Install system to provide a flame spread of 0 - 25, and smoke developed 50 or less, complying with certified testing to ASTM E 84.
2. Structural Criteria: Install and certify system to comply with structural and wind uplift requirements of governing codes.
3. Installation Standard for Suspension System: Comply with ASTM C 636.

C. Mock-Up: Prior to beginning installation erect a mock-up section, minimum 10 feet x 10 feet, where directed, using all system components.

D. Pre-installation Conference: Conduct a conference, prior to start of installation, to review system requirements, shop drawings, and all coordination needs.

FABRICATION
A. Suspension System: Form and fabricate into a {one directional pattern with fixed V/U-shaped carriers spaced at (60 inch on centre at interior installations) and suspend from the building structure.} {two directional framing pattern with pivot T-shaped carriers spaced 48 inch on centre and cross tee runners at 48 inch on centre suspended from the building structure.}

B. Panels: Form edges to snap into carriers with a positive action. {Overlap continuous runs of panels 4 inches in (fixed carrier) (pivot carrier) applications.}

C. Fixing Clips: Use fixing clips at all exterior, moveable carrier and pivot carrier applications.

EXECUTION

EXAMINATION
A. Examine areas receiving screen metal ceiling system for conditions that might adversely affect the installation.
B. Verify that all work above ceiling system has been satisfactorily completed prior to start of ceiling installations.
C. Do not start ceiling installations until all unsatisfactory conditions affecting ceiling systems have been corrected.

PREPARATION
A. Provide layouts for inserts, clips and other support items required to be installed by other trades. Furnish inserts, clips and related items to other trades in a timely manner to preclude construction delays.
B. Coordinate with other trades for proper installation of inserts and related items.
C. Verify ceiling layouts by actual field measurements.
1. Establish ceiling layout to balance borders and minimize out-of-square conditions.

INSTALLATION
A. Install screen metal ceiling system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the work.
B. Suspension System Installation:
1. Install suspension system to comply with requirements of ASTM C636.
2. Support hangers securely from building structure using wires directly attached to structure, or to inserts or other devices with eye-screws, by looping and wire-tying.
3. At exterior locations, install wind uplift (compression) struts and expansion joints at spacing to comply with structural calculations of an approved registered engineer.
C. Install ceiling panels perpendicular to carriers.
D. Install ceiling panels and trim pieces with neat, tight joints and to comply with approved details.
1. Scribe and cut panels as necessary to fit at borders and other penetrations to comply with manufacturer's instructions.
E. Install air distribution devices and lighting fixtures at indicated locations.
1. Support devices and fixtures from building structure above, independent from ceiling suspension system.

ADJUST AND CLEAN
A. Adjust components to provide uniform tolerances.
B. Replace all ceiling panels that are scratched, dented or otherwise damaged.
C. Clean exposed surfaces with non-solvent, non-abrasive commercial type cleaner

20.6. METAL MODULAR CEILING

TILES:-
Size: 600 x 600 mm
Thickness: 0.5 mm
Light reflectance (%): 85
Humidity resistance (% RH): Not affected by humidity
Fire reaction: Class O/Class 1 BS 476
Fire resistance(hour): 1
Perforation: Micro Perforation

GRID :

False Ceiling Grid should be in galvanized steel sections with white pre-coated exposed surface. 3600mm long Main Tee of size 34mm x 24mm x 0.35mm shall be suspended with G.I. wire or rod at 1200mm cc. 1200mm long pre punched Cross Tee of size 25mm x 24mm x 0.33mm shall be locked in the Main Tee at every 600mm c/c. 600mm long Sub Cross Tee of size 25mm x 24mm x 0.33mm shall be locked to the Cross Tee of 1200mm. The periphery of wall shall have Wall Angles of size 19mm x 19mm x 0.45 mm. The Cross Tee shall have an over-ride at both ends to avoid swivel moments of Cross Tee.

INSTALLATION GUIDE:

Modular ceilings are among the last equipments to be installed at the site because it is a pre-finished product. Therefore, the building is expected to be in suitable condition, with regard to humidity, cleanliness etc., before installation of modular ceiling begins.

The installation site is expected to be fully enclosed and all wet work should be completed beforehand and dried. All installations (ducting, insulation etc.) must be installed before laying the T-Grid system and ceiling tiles.

Levelling: Sufficient information shall be clearly indicated on the drawings to enable the ceiling module and setting out points in each ceiling area applicable to all relevant trades to be established early. The ceiling height in each area shall be marked in relation to the elevation bench marks and then transferred by means of water level.

Top fixings: The suitability of the site will be verified before installing the suspension system.

The top fixings are best installed with the T-grid system as this will maintain the dimensional integrity.

Hangers: When the hangers cannot be installed at the recommended dimensions, an appropriate suitable sub grid will be installed based on the site dimensions. Hangers to be installed will be vertical or nearly vertical and shall not press against insulation covering ducts or pipes. If hangers have to be fixed diagonally to avoid obstructions the horizontal force shall be offset by bracing.

Main Runners: Levelling of the main runners shall be done with the supporting hangers. This will prevent downward movement when tiles are loaded. To ensure proper levelling, any bending of the material will never be undertaken. The main runners shall be suspended by means of a GI wire of 2/2.5mm diameter or 4mm rod at every 1.2m and not more than 150mm from the spliced joints. The last hanger at the end of each main runner should not be more than 450mm from the adjacent wall.

Hanger Wires: The loops shall be sharply bent and tightly wrapped to prevent vertical movement of the runner within the loop, wherever it passes through the main runner. The wire shall be wrapped around itself a minimum of the full turns within a 3 inches length.

Cross Tees: Cross tees are installed on the main runners in a right angle. The 1200mm long Techno Cross Tee is attached to two main T section. Then the 600mm long Techno Cross T is filled between 2 sections of 1200 cross T's.

Wall Angle: The wall angles are neatly joined around the corners. The straight line wall angles shall be completely in line. The wall angles shall be firmly screwed to the wall at every 300mm.

Installation: To comprise of 3000 mm long 'carrier bars' manufactured and supplied by the manufacturer to be spaced at 1200mm maximum centres securely anchored to the structural soffits by 6mm/8mm threaded rods. The last hanger at the end of each carrier bar should not be greater than 600mm from

the adjacent wall. Tiles should be clipped on to the special locking arrangement provided in the carrier bar from below.

Perimeter trims to be of approved make wall angles of white colour secured to walls at 450mm maximum centres.

20.7. WOODEN FINISHED MODULAR CEILING

Providing and Fixing of Approved make Wooden finish Suspended Ceiling System with 24 mm EXPOSED GRID.
The tiles Wenge/ U S Maple / Beech / Maple finish should have Humidity Resistance (RH) of 70%, , Fire Performance Class 2(BS - 476) in module size of 600mm x 600mm x 12mm. The grid should be of "Approved make" make with 24mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner and stabilizer bars with a web height of 43mm and a load carrying capacity of 23.78 Kgs/M2. The T Sections have a Galvanizing of 120 grams per M2 and passed through 500 hrs of Salt test.

INSTALLATION: To comprise main runner spaced at 600mm centres securely fixed to the structural soffit using Approved make suspension system (specifications below) at 600mm maximum centre and not more than 150mm from spliced joints. Main runners should be fixed in the direction depending on desired direction of grains.
Stabilizer bars (600mm wide) with notches to be placed over the main runners in a direction perpendicular to it spaced at not more than 1500mm. The tiles to be inserted matching the SL2 edges into the flange of the main runner.
Perimeter trim to be Approved make wall angles, secured to walls at 450 mm maximum centres.

APPROVED MAKE SUSPENSION SYSTEM accessories manufactured and supplied by Approved make World Industries consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanised steel of size 26 x 26 x 25 x 1.2mm with a Galvanised Thickness of 80grm/ sq.m, A pre Straightened Hanger wire of dia – 2.68 mm of 1.83 m length., thickness of 80 g/sq.m and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanised spring steel for 2.68 mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

21. PANELLING AND BOXING

21.1. ACOUSTICAL PANELLING

The acoustic boards to be used for panelling should be of approved make. They shall be cladded with fabric. The installation work of this Section shall be performed by an authorized applicator, licensed by the manufacturer. Install materials in accordance with manufacturer's instructions, and comply with governing regulations, fire resistance rating requirements, as indicated, and industry standards applicable to the work. The technical details for the board to be as per the following

Tech Primer		
No	**Description**	**Materials Specifications**
1	Thickness (mm)	As per BOQ
2	Size (mm)	Width 600 / Length up to 2400
3	Core	Sound Smooth / SoundSynth
4	Nominal Density (Kg/m3)	400 to 500
5	Weight (Kg/m2)	up to 25
6	Edge	Square with long edges Kerfed
7	NRC / STC	Up to 0.9
8	Fire	Class I
9	Moisture Resistance (%)	RH 90
10	Light Reflectance (%)	As per manufacturer's specifications
11	Warranty	10 years
12	Installation	As per manufacturer's specifications
13	Colour	As per Architect's sample
14	Maintenance	As per manufacturer's specifications

FABRIC

Fabric should be non-woven, needle-punched, chemically-free, thermally-bonded, multi-purpose acoustical fabric which is highly durable with exceptional performance and has been specially developed for the Acoustic panels.

The following are the specifications for the fabric

- 100% polyester
- Safe, non-toxic
- Recyclable, environmentally-friendly
- UV stable - resistant to fading
- Moisture-resistant - rot-resistant, stain resistant
- Durable - infinite product life
- Does not fray or zipper when cut
- Density 400 gsm

21.2. PLY PANELLING AND BOXING

21.2.1. Frame work: -

Timber panels shall be preferably made of timber of larger width. The minimum width and thickness of a panel shall be 150 mm and 15 mm respectively. When made from more than one piece, the pieces shall be joined with a continuous tongue and groove joint, glued together and reinforced with metal dowels. The grains of timber panels shall run along the longer dimensions of the panels. The panels shall be designed such that no single panel exceeds 0.5 square metre in area. The timber shall be planed smooth

and accurate to the full dimensions, rebates, rounding, mouldings, as shown in drawings, before assembly. Grounds shall be provided where so specified. Timber shall consist of second class T.W. or any other wood as mentioned in the BOQ, with dimensions as per BOQ, fixed over the wall, with 50mm long wood screws. The rate should include a coating of anti-termite solution on all unexposed surfaces of wooden frame work.

21.2.2. Plywood /Plywood Boards

Plywood boards are formed by gluing and pressing three or more layers of veneers with the grains of adjacent veneers running at right angles to each other. The veneers shall be either rotary cut or sliced and shall be sufficiently smooth to permit an even spread of glue. Face veneers may be either decorative on both sides or one side commercial and the other decorative. Plywood shall be of BWP grade or BWR grade as per IS 303.

Adhesive: Adhesive used for bonding BWP grade of plywood boards shall be BWP type synthetic resins conforming to IS 848 .

The thickness of all veneers shall be uniform, within a tolerance of ± 5 per cent. Corresponding veneers on either side of the centre one shall be of the same thickness and species. The requirements of thickness and core veneers shall be as follows:

a) In 3 ply boards upto 5 mm thick. The combined thickness of the face veneers shall not exceed twice the thickness of centre ply.
b) In multiply boards, the thickness of any veneer shall not be more than thrice the thickness of any other veneer.
c) The sum of the thickness of the veneers in one direction shall approximate to the sum of the thickness of the veneers at right angle to them and shall not be greater than 1.5 times this sum except for 3 ply as specified in (a).

Thickness :Plywood boards are available in thickness ranging from 3 to 25 mm. Tolerance in thickness shall be ± 10% for boards upto and including 5 mm; ± 7% for boards from 6 to 9 mm and ± 5% for boards above 9 mm thickness. The boards shall be of uniform thickness and the surfaces of the boards shall be sanded to a smooth finish.

Moisture content of the plywood boards when tested in accordance with IS 1734 (Part 1) shall not be less than 5 per cent and not more than 15 per cent.

Testing: One sample for every 100 sqm or part thereof shall be taken and testing done as per IS 303. However, testing may not be done if the total requirement of plywood boards is less than 30 sqm. All the samples tested shall meet the requirements of physical and mechanical properties of plywood boards specified in IS codes

21.2.3. Particle Boards

Particle boards shall be of medium density and manufactured from particles of agro waste, wood or lignocellulose i.e. material blended with adhesive and formed into solid panels under the influence of heat, moisture, pressure etc. The particle boards shall be flat pressed three layered or graded and of Grade-I as per Table 1 of IS 3087. Both surfaces of the boards shall be sanded to obtain a smooth finish and shall conform to IS 3087.

Adhesives : Adhesives used for bonding shall be BWP type synthetic resin conforming to IS 848.

Thickness and Tolerance : Thickness of particle boards shall be as specified. Tolerance in thickness shall be ± 5% for boards upto and including 25 mm thick and ± 2.5 per cent for boards above 25 mm thickness. Each board shall be of uniform thickness.

Testing : One sample for every 100 sqm or part thereof shall be taken and testing done as per IS 3087. However, testing may not be done if the total requirement of particle boards in a work is less than 30 sqm. All the samples tested shall meet the requirement of physical and mechanical properties of particle boards specified in relevant IS code

21.2.4. Veneered Particle Boards

Veneered Particle Boards with core of FPT-1 or graded board Grade-I particle board (IS 3087) with commercial or general purpose veneer (Type-1) or decorative veneers on both faces or with decorative veneer on one face and commercial /general purpose veneers on the other Type-2. Face veneers are bonded using adhesives under the influence of heat and pressure.

Adhesives : The adhesive used for bonding veneers shall be BWP or BWR type conforming to IS 848 for grade I veneered particle board.

Thickness & Tolerance : Veneered particle boards are available in various thickness 6, 10, 12, 20, 25, 30, 35, 40, 45 & 50 mm.

Tolerance in thickness shall be ± 5%.

Testing : One sample for every 100 sqm or part thereof shall be taken and testing done as per IS 3097. However, testing may not be done if the total requirement of veneered particle boards in a work is less than 30 sqm. All the samples tested shall meet the requirements of physical and mechanical properties of veneered particle boards as under:

Type of face veneers, thickness of veneered particle boards and adhesive used for bonding shall be as specified. Unless otherwise stated, exterior grade veneered particle boards with BWP type synthetic resin adhesive shall be used.

21.2.5. Veneered Decorative Plywood

Decorative plywood shall be of two grades namely BWR and MR Decorative Plywood shall be of two types. Type I and type 2 and shall conform to IS 1328.

Requirement of Type-I Veneered decorative plywood shall be as under:

Open slits checks or open joints not more than 150 mm in length and 0.5 mm in width shall be permissible provided the same are rectified with a veneer insert bounded with synthetic resin adhesive,

as the case may be and further provided that the insert matches with the surrounding veneer in colour as well as figure.

a) The decorative veneered surface shall be free from torn grain, dead knots discolourisation and sapwood.
b) The decorative veneered surface shall be selected for figure, texture, colour and grain etc. It shall be free from all manufacturing and wood defects except to the Engineer-in-charge All veneers shall be matched or mismatched to achieve a decorative effect in colour figure and grain.

Adhesive : The adhesive for bonding veneers shall be MR and BWR type synthetic resin adhesive conforming to IS 848 for MR and BWR grade veneered decorative plywood respectively.
Dimensions and Tolerances:

The dimensions of plywood boards shall be as follows:

- 2400 mm x 1200 mm
- 2100 mm x 900 mm
- 100 mm x 1200 mm
- 1800 mm x 900 mm
- 1800mm x 1200mm

Thickness: The thickness of veneer shall be 3 mm, 4 mm,
Note: Any other dimensions (length, width and thickness) as agreed to between the manufacturer and the purchaser may also be used.

Finish : The decorative plywood shall be uniform in thickness within the tolerances limits specified.
Sampling and Criteria for Conformity : The method for drawing representative samples and criteria for conformity shall be as per IS 7638.
Tests: Boards shall be subjected to following tests

i. :Moisture content: Decorative veneered plywood of either type when tested in accordance with IS 1734 (Pt. I) shall have a moisture content not less than 5 per cent and not more than 15 per cent.
ii. Water Resistance Test : Three test specimen of size 250 mm x 100 mm shall be prepared for each of the boards selected and submerged in water at 62 +2° C for a period of 3 hours and dried for 8 hours at a temperature of 65 + 2oC and then followed by two more cycles of soaking and drying under same conditions described above. Decorative Veneered plywood of either type shall not show delamination or blister formation.

Marking : Each plywood bound shall be legibly and indelibly marked or stamped with the following on the face of board near one corner.
Indication of the source of manufacture
Year of manufacture
Batch no.
Type of plywood
Criteria for which the plywood has been lablled as ECO mark

The decorative veneered plywood may also be marked with standard BIS certification mark.

21.2.6. Marine Plywood

Marine plywood shall be generally conforming to IS 710. Selection of timber species for manufacture of plywood shall be as prescribed in IS 710 and as far as possible a single species of timber shall be used. Adhesive : The adhesive used for bonding the veneer shall be of the hot press synthetic resin, phenol formaldehyde type (BWP) and shall conform to IS 848. Extender shall not be added to the adhesive by the plywood manufactures. Fillers, if used, shall not exceed 10 percent by mass of solid content of the glue.

The thickness of any board shall not exceed the number of pieces multiplied by 2.5 mm. The two face veneers in finished board shall be of the same nominal thickness.

Tolerances : The following tolerances in the nominal size of finished boards shall be permitted.

Dimension	Nominal Size	Tolerance
Length	Upto 120 cm.	+ 3 mm
	Above 120 cm.	+ 6 mm
Width	Upto 90 cm.	+ 3 mm
	Above 90 cm	+ 6 mm
Thickness	Upto 4 mm	+ 10 per cent
	Above 4 mm	+ 5 per cent

Sampling : The method of drawing representative samples and criteria for conformity shall be as prescribed in IS 7638.

Tests : Test pieces cut from each of board as specified shall be subjected to following tests.

Moisture content

Glue adhesive in dry state

Water resistance test.

Tensile strength

Mycological test

Retension of preservative.

These tests shall be carried out as specified in IS 710.

Marking : Each plywood board shall be legibly and indelibly marked or stamped with following particulars along with such other marks as the purchaser may stipulate at the time of placing order.

- Manufacturer’s name, initials or recognized trade mark, if any.
- Year of manufacturing.
- Abreviation indicating the species of timber used in each ply as indicated in col. 3 of Table – 1 and 2 of IS 710.
- Batch number

BIS Certification Marking : The plywood board may also be marked with the standard mark, governed by the BIS Act,1986.
Tender Sample, Inspection and Acceptance: Where samples are required to be tendered, three samples each not less than 90 x 60 mm in size shall be submitted by the supplier, and these samples, if the tender is accepted shall constitute the standard as regards the type of timber, quality and finish.

21.2.7. Fire Retardant Plywood

Fire retardant plywood shall generally conform to IS 5509. The plywood to be given fire retardant treatment shall conform to BWR grade of IS 303 to be able to stand pressure impregnation.Plywood for treatment shall be clean, free from oil or dirt patches on the surface and at a moisture content not exceeding 15 percent. In case of veneered decorative plywood care shall be taken that colour of the solution does not spoil to decorative surface.
For Eco-mark the plywood shall conform to the requirements of Eco-mark specified in IS 303.
Fire Retardant Treatment : This shall be either pressure impregnation or soaking treatment as per IS 5509.
Choice of Treatment : The choice of treatment may be left to the manufacturer of plywood as per fire resistant requirements prescribed in IS 5509. The purchaser should however, specify whether plywood is to be treated with fire retardants only or with fire retardants and preservatives.
The recommended retention of fire retardant chemicals for different hazards like interior or exterior use not subject to leaching by rain and water is of the order of 50 kg/m3.
Conditioning after Treatment : The plywood after treatment shall be conditioned to suitable equilibrium moisture content of not more than 20 per cent.
Dimension and Tolerances shall conform to IS 2049. The tolerance of thickness shall conform to IS 303.
Sampling : The method of drawing representative sample and the criteria of conformity shall be as prescribed in IS 7638.
Test Specimen and Number of Tests: From each of fire retardant plywood selected as above the following test specimens shall be cut from portions 150 mm away from the edges for tests specified as under:

- For Flammability : Six test specimens 125 mm x 125 mm in full thickness of material from each sample.
- For Flame Penetration : Three test specimens 125 mm x 125 mm in full thickness of material from each sample.
- For Rate of Burning : Three test specimen 100 mm x 12.5 mm in full thickness of material from each sample.

Test Requirements and Other Tests

i. Moisture Content : Shall not exceed 20%.
ii. Flammability : When tested as per IS 1734, time taken for second ignition shall not be less than 30 minutes.
iii. Flame Penetration : When tested as per IS 1734, time taken for flame penetration shall not be less than 15 minutes for every 6 mm thickness.
iv. Rate of Burning : When tested as per IS 1734, the time taken to lose weight from 30 per cent to

70 per cent shall not be less than 20 minutes.

Marking : Each board shall be legibly and indelibly marked near the edge with the following:

- Manufacturer's name, his initials or his recognized trade mark, if any.
- Year of manufacture
- Type of treatment
- Criteria for which the plywood has been labeled as ECO mark.

BIS Marking : Each board may also be marked with standard mark governed by the BIS Act, 1986.

21.2.8. Decorative Thermosetting Synthetic Resin Bonded Laminated Sheets

Scope : Decorative thermosetting synthetic resin bonded laminated sheets shall generally conform to IS 2046. This material is intended for interior use and is not intended for load bearing applications.

Terminology : For the purpose of this standard, the definition given under para 2 of IS 1998 shall apply.

Types : The material shall be of two types namely:-

(a) Type 1- Having only one side bearing decorative surface the other side being roughened or given an appropriate treatment to promote adhesion to the base. This type shall generally be used, unless specified otherwise.

(b) Type 2- Having both sides bearing the decorative surface, the two sides may be different in colour or pattern or both.

Requirements

(i) Appearance : The types of surface finish of decorative and reverse side, edge finish, colour and pattern shall be as agreed to between the purchaser and the supplier. The sheets shall be reasonably free from local deformation.

Note : Since sheets may vary slightly in colour and appearance, it is recommended that sheets for any one scheme may be matched.

(ii) Flatness : For nominal thickness 1.5 mm – when a sheet is tested for flatness in accordance with the method given in Appendix –C of IS 2046, the height above the flat surface at the edge of full manufactured and trimmed width shall nowhere exceed 150 mm.

(iii) Tolerance to nominal thickness : The departure from nominal thickness of sheet at any point, shall not exceed the value given below:

Nominal Thickness	Tolerance
Upto 1.5 mm	+ 0.25 mm

(iv) Straightness of edges of rectangular finished panels, resistance to dry heat, resistance to boiling water, resistance to staining, gross breaking strength, packing and marking, sampling and criteria for conformity etc. shall be as per IS 2046.

21.2.9. WALL LINING

Specified timber shall be used, and it shall be sawn in the direction of the grains. Sawing shall be truly straight and square. The timber shall be planed smooth and accurate to the full dimensions, rebates,

roundings, and mouldings as shown in the drawings made, before assembly. Patchings or plugging of, any kind shall not be permitted except as provided.

Grounds

Grounds shall be provided where so specified. These shall consist of first class hard wood plugs or the class of wood used for fabricating the frames, of trapezoidal shape having base of 50 × 50 mm and top 35 × 35 mm with depth of 5.0 cm and embedded in the wall with cement mortar 1:3 (1 cement : 3 fine sand) and batten of first class hard wood or as specified of size 50 × 25 mm or as specified, fixed over the plugs with 50 mm long wood screws. The plugs shall be spaced at 45 to 60 centimetres centre to centre, depending upon the nature of work. The battens shall be painted with priming coat, of approved wood primer before fixing.

21.2.10. Panelling

Material : This panelling shall be decorative or non-decorative (Paintable) type as per design and thickness specified by the Engineer-in-Charge, of 2nd class teak wood, FPT-1 or graded wood prelaminated particle board or as specified in item.

Ornamental Work : The ornamental wood work shall be painted on the back with priming coat of approved wood primer before fixing the same to the grounds with screws, which shall be sunk into the wood work and their tops covered with putty. The ornamental work shall be made true and accurate to the dimensions shown in the working drawings. The fixing shall be done true to lines and levels. The planks for wall lining shall be tongued and grooved, unless otherwise specified.

Measurements : Length and breadth shall be measured correct to a cm. Wall panelling such as teakwood panelling and block panelling, plain lining, and plain skirting each shall be measured separately in square metre nearest to two places of decimal. The moulded work shall be measured in cm running metre i.e. in running metres stating the girth in cm. The sectional periphery (girth) of moulding excluding the portion in contact with wall shall be measured in cm correct to 5 mm and length in metre correct to a cm.

Rate : The rate includes the cost of materials and labour required for all the operation described above. Length and breadth shall be measured correct to cm. Wall panelling such as T.W. panelling, block board, plain lining, plain skirting each shall be measured separately in square metre nearest to two places of decimal. The moulded work shall be measured in running length. ONLY SEEN AREA IS TO BE PAID. ANY PART WHICH IS HIDDEN IN THE BOXING WILL NOT BE MEASURED AND PAID. The rate shall include the cost of materials and labour required for all the operations described above.

21.3. MIRROR PANELLING AND TOILET MIRROR

The item includes providing bevelled or plain edges glass mirror with or without frame of size as mentioned in the schedule including fixing.

MATERIAL: Glass mirror shall be 6mm thick plate glass unless specified with silvered polish and protective coat of copper sulphate. Backing shall be provided with marine plywood of thickness as specified in the BOQ. Edges to be bevelled or machine polished as per BOQ

FIXING: Glass mirror shall be fixing to proper line and level as indicated in drawing with Mirror studs or mirror head screws as per BOQ, and making good the wall to the original condition after fixing the glass mirror etc.

THE RATE INCLUDES FOR:

1. Glass mirror with plywood backing, all studs, screws, bolts etc.
2. All necessary labour, material and the use of tools.

MODE OF MEASUREMENT: The measurement shall be for unit square meter of each, unit of glass mirror as specified in the schedule.

22. SHUTTERS AND DOORS

22.1. SCOPE

The specifications refer to wood work in general including carpentry and joinery work in the building.

22.2. GENERAL

The provision of the latest revisions of the following I.S. codes shall form a part of these specifications.

IS 205	Specifications for non-ferrous metal butt hinges
IS 287	Recommendation for maximum permissible moisture content of timber used for different purposes.
IS 303	Specification for plywood for general purpose.
IS 362	Specification for parliamentary hinges
IS 419	Specification for putty for the use on window frames
IS 883	Code of practice for design of structural timber in building.
IS 1003	Specification for Timber panelled and glazed shutters Part II - Window and ventilator shutters.
IS1200	Method of measurement of building and Civil Part XXI Engineering Works - Wood Work and Joinery.
IS:1341	Specification for steel butt hinges
IS:1658	Specification for Fibre Hard Boards
IS: 1761	Specification for transparent sheet glass for glazing and framing purposes.
IS: 3087	Specification for wood particle boards (medium density for structural timber in building)

Other I.S. codes not specifically mentioned here, but pertaining to wood work and joinery form part of these specifications.

22.3. MATERIALS

22.3.1. Sawn Timber

Timber is classified as under :

(i) Teak wood

(ii) Deodar wood

(iii) Non-coniferous timbers other than teak

(iv) Coniferous timber other than deodar.

The timber shall be free from decay, fungal growth, boxed heart, pitch pockets or streaks on the exposed edges, splits and cracks. The timber shall be graded as first grade and second grade on the basis of the permissible defects in the timber. For both the grades, knots should be avoided over a specified limit.

Teak Wood (Tectona Grandis)
It is of outstanding merit in retention of shape and durability. The heart wood is one of the most naturally durable woods of the world. It usually remains immune to white ant attack and insect attack for very long periods. It is, however, not always immune from fungus attack (rot). Taken as a whole, good quality teak is very durable, it is relatively easy to saw and work. It can be furnished to a fare surface and takes polish well. It is generally used for making furniture and all important timber construction.

Superior Class Teak Wood such as Balarsha, Malabar and Dandeli : Individual hard and sound knot shall not be more than 12 mm in diameter and the aggregate area of all the knots shall not exceed one half per cent of the area of the piece. It shall be close grained.

Deodar Wood (Cedrus Deodars)
It is the strongest of the Indian conifers. Its weight and strength is 20% per cent less than teak. It is easy to saw and works to a smooth finish. It is not, however, a suitable wood for polish or paint work as the oil in the wood and especially near knots, always seeps through such finishes and discolours them. It is used for house building, furniture and other construction work. It is also suitable for beams, floors, boards, posts, window frames and light furniture etc.

Sal Wood (Shoera Robusta)
Sal is about 30 per cent heavier than teak, 50 per cent harder, and about 20 to 30 per cent stronger. In shock resistance it is about 45 per cent above teak. Its heart wood is a naturally durable wood, and usually remains immune to attack by white ants and fungi for a long period, while its sapwood is very perishable and should not be used. Well dried sal is not a really easy wood to saw and work. It is a rough

constructional wood than a carpentry timber. No individual hard and sound knot shall exceed 25 mm in diameter and the aggregate area of all the knots shall not exceed 1% of the area of the piece. It can be used for a variety of purposes, such as for beams, rafters, flooring, piles, bridging, tool handles, picker arms and tent pegs, etc.

Kail Wood (Pinus Roxburghie)

Kail Wood is not a very durable wood. But it is easy to saw and work and usually very popular in workshops. It can be brought to a fine smooth surface, but is more suitable for paint and enamel finishes than for polish work. It is useful for joinery works, constructional work, light furniture and house fitments

All wood to be FSC (Forest Stewardship Council) certified Forests certified to be in compliance with the standards endorsed by the Forest Stewardship Council (FSC).
Products milled or otherwise altered by manufacturers certified to be in compliance with the standards endorsed by the Forest Stewardship Council (FSC).

22.3.2. Glazing materials

Glass Panels:

Unless otherwise specified, glass panes used in glazed or panelled and glazed shutters, shall be of good quality glass of thickness not less than 2 mm for panes up to 0.1 Sqm in area not less than 3 mm for glass panes of area larger than 0.1 Sqm with a tolerance of 0.2 mm in both cases. The glass shall be free from flaws such as specks, bubbles, smoke waves, air holes, etc. and shall conform to the relevant IS : 1761.
Unless otherwise specified, glass panes used in shutters of bath room and lavatories shall be frosted and of thickness as mentioned above and shall be free from any flaws.
Where so specified, special quality glass such as plate glass, pin heads glass, wired glass, float glass etc. shall be used. They shall conform to relevant IS standards as regards quality.

Putty for glazing in wooden frames of doors and windows

Putty shall be prepared by mixing one part of white lead with three parts of finely powdered chalk and then adding boiled linseed oil and mixing the whole thing into a homogeneous stiff paste. It shall be free from impurities like dust, grit, etc. and shall conform to IS : 419.

22.3.3. Fittings

The item of wood work of joinery generally includes fittings such as hinges and screws for fixing of door shutters and is explicitly so mentioned in the item.
Hinges - Hinges shall be of iron, brass, aluminium or any other material as specified. They shall present a neat appearance and shall operate smoothly. All hinges shall be of steel and their riveted heads shall be well formed and smooth. Hinges shall be of the type specified and shall conform to the relevant Indian Standard Specifications.

22.3.4. Framing

Framed woodwork includes all sawing, cutting, planning, jointing framing, supply and use of straps, bolts holdfasts, nails treenails, spikes, screws etc. necessary for framing and fixing. Framing and trussing are to be done in the best possible manner. Holes of correct size shall be drilled before inserting screws.

Driving in or starting the screws with hammer is prohibited. All screws shall be dipped in oil before being inserted in the wood. The kind of nails and screws shall be subject to the approval of the Engineer-in-charge.

22.3.5. Scaffolding

The Contractor shall provide all labour, scaffolding ladders and tackle necessary for hoisting and fixing woodwork in position and afford facilities for its inspection during construction. The Contractor shall be responsible for the safety of the work, workmen and for any action or compensation that may arise in this connection.

22.3.6. Iron Work

All iron work connected with woodwork which is going to be embedded in masonry shall before erection, receive two coats of hot coal tar. If it is to be painted, it shall be given the first two coats on the ground before being fixed in position and the third coat after erection in position.

22.3.7. Precautions against Fire

During the progress of work all shavings, cutting and other rubbish shall be cleared away as the work progresses and all precautions shall be taken against fire.

22.3.8. Inspection

All woodwork shall be inspected and passed by Engineer-in-charge before being put into actual position. In no case the woodwork shall be painted or otherwise treated before it is inspected and approved by the Engineer-in-charge. After approval it shall have the primary coat of paint put on or otherwise treated before being fitted in position. The subsequent coats of paint or other finish shall be applied after the woodwork is fixed in position.

22.3.9. Defective Work

If within three months after the work is completed any undue shrinkage or bad workmanship is discovered the Contractor shall forthwith replace or refix the same to the satisfaction of the Engineer-in-charge, without extra charge.

22.3.10. Moisture Content

Control on moisture content of timber is necessary to ensure its proper utility in various climatic conditions. For specifying the permissible limit of moisture content in the timber the country has been divided into four climatic zones. In each of the zones, maximum permissible limit of moisture content of timber for different uses, when determined in accordance with the shall be as per Table 9.2.

TABLE 9.2 Maximum Permissible Moisture Content of Timber

Sl.No.	*Use*		*Max Moisture Content Percent*		
		Zone	*Zone*	*Zone*	*Zone*

		I	*II*	*III*	*IV*
1.	Beams, Rafters and Posts	12	14	17	20
2.	Doors and windows				
	(a) 50 mm and above thickness	10	12	14	16
	(b) Thinner than 50 mm	8	10	12	14
3.	Flooring strips	8	10	10	12
4.	Furniture and Cabinet making	10	12	14	15

Tolerance on Moisture Content : Average Moisture content of all the samples from a lot shall be within + 3 per cent and moisture content of individual samples within + 5 per cent of maximum permissible moisture content specified in Table 9.2. These tolerance are the absolute values over the percentage moisture content for Sl. No. 1 and 2 of Table 9.2. No tolerance on moisture content is permitted for Sl. No. 3 and 4 of Table 9.2.

Seasoning of Timber

The process of drying timber under controlled conditions is called seasoning of timber. Timber shall be either air seasoned or kiln seasoned and in both cases moisture content of the seasoned timber shall be as specified in Table 9. 2 above unless otherwise specified, air seasoned timber shall be used. Kiln seasoning of timber, where specified, shall be done as per IS 1141 in a plant approved by Engineer-in-charge.

Preservation of Timber

Preservative treatment does not improve basic properties of timber but gives varying degree of protection against deterioration due to attacks by fungi, termites, borers and marine organisms. Preservative treatment, where specified, shall be done using Oil type, Organic solvent type or Water-soluble type preservative. Oil type preservatives shall be used if the timber is not required to be polished or painted. Before preservative treatment, the timber shall be sawn and seasoned. All surfaces exposed after treatment, except due to planing, shall be thoroughly brushed with the preservation before jointing. Preservative treatment of timber shall be done as per IS 401 in a plant approved by the Engineer-in-Charge.

22.4. WORKMANSHIP

Wood Work, Wrought, Framed and Fixed

General:

The work shall be carried out as per detailed drawings and/or as directed by the Engineer-in-charge. The wooden members of the frame shall be planed smooth and accurate to the full dimensions. Rebates, rounding, mouldings, etc. as shown in the drawing shall be done before the members are joined into

frames. Where wood work is not exposed to view as in the case of frames for false ceiling, however, no planning is required to be done unless specified expressly as rough timber work.
Note: The work wrought shall mean 'planed'.
Jointing in timber frames must be made carefully and accurately. They shall be strong, neat and shall fit without edging or filling. The joints shall be pinned with hard wood or bamboo pins of 10 to 15 - dia after the members of the frame are pressed together in a suitable vice-mechanism
The door and window frame shall have rebate to house the shutters and the depth of such rebate shall be 1.25 cm. 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 any warp or bow. 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 ± 2 mm shall be permitted in the specified finished dimensions of timber sections in frames.
Wood work shall be painted, oiled, polished or otherwise treated as specified. All portions of timber abutting against masonry or concrete portion of building shall be coated with boiling coal tar or other type of approved wood preservatives primer, before placing them in final position.
Before any surface treatment is applied in the wood work shall be got approved by the Engineer-in-Charge. 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 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.

Fixing in Position:
The frames shall be fixed only after acceptance by the Engineer-in-Charge. In case of door frames without sills, the vertical members shall be buried in floor for the full thickness of the floor and the door frame shall be temporarily braced at the sill level so as to prevent warping or distortion of frame during construction. The frames shall be got approved by the Engineer-in-Charge before being painted, 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 holdfasts or metallic fasteners as specified Hilti or equivalent make. 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 suitably strutted and wedged in order to prevent 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 not be measured and paid for separately.

Panelled, Glazed or Panelled and Glazed Shutters:

General

The work shall be carried out as per detailed drawing. The wooden members shall be planed smooth and accurate. They shall be cut to the exact shape and sizes without patching or plugging of any kind. Mouldings, rebates, rounding, etc. shall be done, as shown in the drawing, before the pieces are assembled into the shutter.

Joinery work:

The thickness of the styles and rails shall be as specified in the item of work. The minimum thickness of panels shall normally be 15 mm where the clear width of panel is not more than 300 mm and 20 mm where the clear width of the panel is more than 300 mm. However, where the Engineer-in-Charge so considers lesser thickness up to 12 mm and 15 mm respectively may be allowed by him instead of 15 mm and 20 mm specified above. Solid wood panel for door and window shutters shall be made out of one or more strips of timber planks of not less than 125 mm width. it is preferable to use strips of not more than 200 mm width to reduce chances of warping, splitting or other defects. The timber strips shall be joined together with continuous tongued and grooved joints, glued together and reinforced with metal dowels. The grooving of the solid panel shall normally run along the longer dimensions of the panel unless otherwise directed. The corners and edges of panels shall be finished as shown in the drawing and these shall be feather tongued into styles and rails. Sash bars shall have mitres joints with the styles.

Styles and rails of shutters shall be made out of single piece. Lock and intermediate rails exceeding 200 mm in width if permitted by the Engineer-in-charge may be made out of one or more pieces of timber but the width of each pieces shall not be less than 125 mm. Where more than one piece of timber is used, they shall be joined with a continuous tongued and grooved joint glued together and reinforced with metal dowels (rust proof) at regular intervals of 20 cm or pinned with not less than three 40 mm rust proof pins of the lost head type.

The tendons shall pass clear through styles. The styles and rails shall have a 12 mm groove to receive the panel.

In case the double shutters the rebate at the closing junction of the two shutters shall be of depth not less than 2 cm.

Shutters shall not be painted or otherwise treated before these are passed by the Engineer-in-Charge and fixed in position.

Glazing:

The glazing work shall be done in accordance with the specification given separately elsewhere.

Hold Fasts

Hold fasts used for fixing doors and window frames shall be made of 40 x 3 mm flat iron and 40 cm long. It shall have two holes on one end for fixing to frame with long screws, and at the other end, the flat iron shall be split and bent at right angles in the opposite direction. The hold fast shall be tightly fixed to the frame by means of bolts, the bolt hole in frame being plugged suitably and finished neat. The hold fast shall be embedded into masonry by concrete block of 200 x 250 x 400 mm size.

22.5. MEASUREMENTS

Unless otherwise specified in the BOQ, Woodwork and joinery work shall be measured in cubic meters. Length and width of unfinished opening shall be measured to the nearest 0.01 m.
Volume shall be worked out correct up to 3rd place of decimal of a Cum. All work shall be measured net as fixed, that is, no extra allowance in measurement shall be made for shape, joints, etc. However, where the dimensions as fixed exceeds the specified dimension (as per drawing, etc.) only the specified dimensions(s) shall be measured and where one or more dimension of the piece as fixed is less than the fixed dimension the actual dimension shall be measured, without prejudice to the right of the Engineer-in-Charge to reject the piece and order replacement of such pieces.
It shall include:
i) Supply of specified species of timber sawn to requisite sizes without any defect, wrought, framed and fixed in position with the required standard of workmanship including supply-and-fixing of fixtures, straps, bolts, hold-fasts, spikes, nails, screws, etc. applying contractors glue or other jointing materials, coal tarring embedded parts, glazing and supplying and fixing of all specified fittings.
ii) All material, labour, scaffolding, use of equipment etc. for framing, fixing and completing the item as specified.

22.6. FLUSH DOOR SHUTTER

General
The door shall be of flush type solid core with single or double shutter as the case may be.

Shutters
Flush door shutters shall have a solid core and may be of the decorative or non-decorative (Paintable type as per IS 2202 (Part I). Nominal thickness of shutters may be 25, 30 or 35 mm. Thickness and type of shutters shall be as specified.

Width and height of the shutters shall be as shown in the drawings or as indicated by the Engineer-in-Charge. All four edges of the shutters shall be square. The shutter shall be free from twist or warp in its plane. The moisture content in timbers used in the manufacture of flush door shutters shall be not more than 12 per cent when tested according to IS 1708.
Core: - The core of the flush door shutters shall be a block board having wooden strips held in a frame constructed of stiles and rails. Each stile and rail shall be a single piece without any joint. The width of the stiles and rails including lipping, where provided shall not be less than 45 mm and not more than 75 mm. The width of each wooden strip shall not exceed 30 mm. Stiles, rails and wooden strips forming the core of a shutter shall be of equal and uniform thickness. Wooden strips shall be parallel to the stiles. End joints of the pieces of wooden strips of small lengths shall be staggered. In a shutter, stiles and rails shall be of one species of timber. Wooden strips shall also be of one species only but it may or may not be of the same species as that of the stiles and rails. Any species of timber may be used for core of flush door. However, any non-coniferous (Hard wood) timber shall be used for stiles, rails and lipping.
Face Panel:- The face panel shall be formed by gluing, by the hot-press process on both faces of the core, either plywood or cross-bands and face veneers. The thickness of the cross bands as such or in the plywood shall be between 1.0 mm and 3.0 mm. The thickness of the face veneers as such or in the

plywood shall be between 0.5 mm and 1.5 mm for commercial veneers and between 0.4 mm and 1.0 mm for decorative veneers, provided that the combined thickness of both is not less than 2.2 mm. The direction of the veneers adjacent to the core shall be at right angles to the direction of the wooden strips. Finished faces shall be sanded to smooth even texture. Commercial face veneers shall conform to marine grade plywood and decorative face veneers shall conform to type I decorative plywood in IS 1328.

Lipping:- Lipping, where specified, shall be provided internally on all edges of the shutters. Lipping shall be done with battens of first class hardwood or as specified of depth not less than 25 mm. For double leaved shutters, depth of the lipping at meeting of stiles shall be not less than 35 mm. Joints shall not be permitted in the lipping.

Rebating:- In the case of double leaves shutters the meeting of stiles shall be rebated by 8 mm to 10 mm. The rebating shall be either splayed or square type as shown in drawing where lipping is provided. The depth of lipping at the meeting of stiles shall not be less than 30 mm.

Opening for Glazing:- When required by the purchaser opening for glazing shall be provided and unless otherwise specified the opening for glazing shall be as per drawings. The bottom of the opening shall be at a height as shown in the drawings. Opening for glazing shall be lipped internally with wooden batten of width not less than 25 mm. Opening for glazing shall be provided where specified or shown in the drawing.

Tolerance:- Tolerance on width and height shall be + 3 mm and tolerance on nominal thickness shall be ± 1.2 mm. The thickness of the door shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm when measured at any two points.

Adhesive:- Adhesive used for bonding various components of flush door shutters namely, core, core frame, lipping, cross-bands, face veneers, plywood etc. and for bonding plywood shall conform to BWP type, phenol formaldehyde synthetic resin adhesive conforming to IS 848.

Tests

Samples of flush door shutters shall be subjected to the following tests:

End Immersion Test

Knife Test

Glue Adhesion Test

Fixing:- For side hung shutters of height up to 1.2 m, each leaf shall be hung on two hinges at quarter points and for shutter of height more than 1.2 m, each leaf shall be hung on three hinges one at the centre and the other two at 200 mm from the top and bottom of the shutters. Top hung and bottom hung shutters shall be hung on two hinges fixed at quarter points of top rail or bottom rail. Centre hung shutter shall be suspended on a suitable pivot in the centre of the frame. Size and type of hinges and pivots shall be as specified. Flap of hinges shall be neatly counter sunk into the recesses cut to the exact dimensions of flap. Screws for fixing the hinges shall be screwed in with screw driver and not hammered in. Unless otherwise

specified, shutters of height more than 1.2 mm shall be hung on butt hinges of size 100 mm and for all other shutters of lesser height butt hinges of size 75 mm shall be used. For shutter of more than 40 mm thickness butt hinges of size 125 × 90 × 4 mm shall be used. Continuous (piano) hinges shall be used for fixing cup-board shutters where specified. Fittings shall be provided as per schedule of fittings decided by Architect Cost of providing and fixing shutter shall include cost of hinges, door closer, handle, lock and necessary screws for fixing the same. The fittings shall conform to specifications laid down under the hardware list which is coming up in the document later. Where the fittings are stipulated to be supplied by the Client free of cost, screws for fixing these fittings shall be provided by contractor and nothing extra shall be paid for the same.

Measurements:- Length and width of the shutters shall be measured to the nearest cm in closed position covering the rebates of the frames but excluding the gap between the shutter and the frame. Overlap of two shutters shall not be measured. The overall openings to be measured in case the doors are paid in Nos

22.7. FIRE RATED / GENERAL PURPOSE STEEL DOOR

A. SCOPE

This specification covers the design, supply of materials, manufacture and installation of factory made type fire rated steel doors with 1 (one) Hour or 2 (two) Hours fire rating / General purpose Steel Door of approved make with different rating as per the requirements with all accessories, hard wares, iron Mongery, fastening materials and including installation of door with hard wares in position.

B. GENERAL REQUIREMENTS

The Nominated sub Contractor shall furnish all materials, labour, operations, equipment, tools and plant, scaffolding and incidentals necessary and required for the completion of metal work in connection with steel doors, as called for in the drawings, specifications and bill of quantities which cover the major requirements only. Anything called for in the tender documents shall be considered as applicable to the items of work concerned. The supply and installation of additional fastenings (Metal expansion Shields), accessory features and other items not specifically mentioned, but which are necessary to make a complete functioning installation shall form a part of this contract.

All metal work shall be free from defects, impairing strength, durability and appearance and shall be of the best quality for purposes specified made with structural properties to withstand safety strains, stresses to which they shall normally be subjected to. All Hard ware fittings and Accessories shall be of high quality and as specified and as approved by the Employer / OE and PMC.

The Nominated sub Contractor shall strictly follow, at all stages of work, the stipulations contained in the Indian Standard Safety Code and the provisions of the safety code and the provision of the safety rules as specified in the General Conditions of the Contract for ensuring safety of men and materials.

Any approval, instructions, permission, checking, review, etc. whatsoever by the Employer / OE and PMC, shall not Relieve the Nominated sub Contractor of his responsibility and obligation regarding adequacy, correctness, completeness, Safety, strength, quality, workmanship, etc.
The Nominated sub Contractor shall submit the Shop drawing for all works including all details, and after check by his own Engineer. The Nominated sub Contractor shall not commence the work before obtaining prior and final approval for shop drawings incorporating the changes, if any, instructed by the Employer / OE and PMC. Such prior approval shall not relieve the Nominated sub Contractor from his responsibility of correctness of design, workmanship and material errors and omissions, if any.

C. CODES AND STANDARDS

All standards, specifications, acts, and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.

List of certain important Indian Standards, Acts and Codes applicable to this work is given below. However, the applicable standards and codes shall be as per this but not limited to the list given below:

IS : 277	Galvanized steel sheet (plain and corrugated) of GPL Grade Z 120 coating.
IS: 3614 Part 1 and 2/ BS 476 Part 20 and 22	Metallic and non-metallic fire check doors - Resistance test and Performance criteria.
BS 7352 /BS EN 1935	Specification of Hinges

D. HOLLOW METAL FIRE DOOR / GENERAL PURPOSE DOOR WITH IN FILL MATERIAL AS PER MANUFACTURER'S SPECIFICATION.

a) Fire door shall be 1 Hour / 2 hour fire rated and door quality shall be approved by CBRI and the door should be tested to conform the Performance Criteria as per IS: 3614 and should meet the requirements of CBRI. General purpose Door shall be as per Manufacturer's specification.
Unless otherwise specified, the door shall be provided to the height of 2100 mm. If the height specified as above 2100 mm and up to 3000 mm height, the options would be:

i. A man operation door up to 2100 mm high shall be provided with a removable / fixed panel on top as below: (i.e. above 2100 mm level as below).

ii. Fire Door: Fully flush double skin steel panel construction to a total thickness of 46 mm.

iii. General purpose Door: Fully flush double skin steel panel construction to a total thickness of 46 mm or fixed Glazing Panel on the top with Single / Double glass panel.

b) The construction and finish of panel above 2100 mm level shall be designed similar to that of a

shutter in case of flush panel in order to match the exterior finish.

c) DOOR FRAME:

i. Material :

Frame shall be manufactured by using Galvanized steel sheets complying with latest IS 277. Galvanized coating shall be GPL grade Z 120 coating.

ii. Profile:

Fire Door and General Purpose door frame profile shall be as given below:

I. Fire Door - 2 Hour rating: Double rebate profile of size 143 x 57 mm (+/- 0.3) with bending radius of 1.4 mm.
II. Fire Door - 1 Hour rating: Single rebate profile of size 100 x 57 mm (+/- 0.3) with bending radius of 1.4 mm.
III. General Purpose Door: Single rebate profile of size 100 x 57 mm (+/- 0.3) with bending radius of 1.4 mm.

iii. Manufacture :

Frame shall be fabricated from galvanized steel sheet to the thickness specified below and to the specified profile and dimensions:

I. Fire Door - 2 Hour rating : 16 Gauge or 1.6 mm thick.
II. Fire Door - 1 Hour rating : 18 Gauge or 1.25 mm thick.
III. General Purpose Door : 18 Gauge or 1.25 mm thick.

Frames fabricated at factory shall be in knock down form with butt joints for bolted assembly at site or as per manufacturer's Specification.

iv. Preparation:

Frames shall be provided with 3 mm thick back plates on all jambs with provision for anchor bolt fixing to wall openings.
Frames shall be provided with hinge plates 3 mm thick pre-drilled to receive approved type and make of hinges for screw mounted fixing.
Frames shall have factory finish-pre-punched cut outs to receive specified type and make of hardware and iron Mongery. All cut outs including hinge plates, strike plates to have mortar guard covers from inside to prevent cement, dust ingress into cut outs at the time of grouting of the frame.
Frames shall have reinforcement pads for fixing of door closer, locks and handles at appropriate location as per manufacturer's details.
Frames shall have plug-in type rubber silencer not less than 2 mm dia on the strike jambs for single shutter frames and on the head jambs for double shutter frames.

d) DOOR SHUTTER:

i. Material:

Shutter shall be manufactured with double skins press formed by using Galvanized steel sheets complying with latest IS 277. Galvanized coating shall be GPL grade Z 120 coating.

ii. Profile:

Shutters should be press formed with double skins in such a way to get 46 mm thick double skin hollow door with lock seam joints at stile edges.

Fire Door and General Purpose door frame profile shall be as given below:

I. Fire Door - 2 Hour rating : 18 Gauge or 1.25 mm thick.
II. Fire Door - 1 Hour rating : 20 Gauge or 0.80 mm thick.
III. General Purpose Door : 20 Gauge or 0.80 mm thick.

Shutters shall have no visible screws or fasteners on both face and internal reinforcement shall be provided at top, bottom and stile edges for desired fire rating.

iii. In Fill Material:

Shutters shall be provided with honeycomb paper core as infill material and to be bounded to the inner faces of the shutter or as per Manufacturer's specification. Door should have been tested with Infill material proposed by the manufacturer and the same should have been approved by CBRI.

iv. Preparation:

Shutters shall be provided with factory prepared and with pre-punched cut-outs and reinforcement pads to receive the approved type and make of Hardware and Iron Mongery. The shutter should have an interlocking arrangement at this stile
edges for flat surface on either side.
Shutters shall have pre-drilled hinge plates with hinge guard covers.
Shutters with locks to have concealed lock box with lock fixing brackets with pre-tapped holes and screws.
Shutter shall have reinforcement pad at appropriate location to receive the locks, Door closer, Panic Bar, etc as per the approved type and make of Hardware and all as per manufacturer's design and conforming to Standards.
Necessary provision / fixing arrangements shall be provided in the shutter as well as in the frame to receive / fix the Electromagnetic latch, Electromagnetic contact for hooters with reinforcement pads and in such a way to connect the same to the card access control system / IBMS. Fixing Details of the above latches shall be provided in coordination with IBMS agency.

Vision panel shall be provided as given below:

a) Fire rated Door (1 Hour / 2 Hour) - Provide Borosilicate single clear toughened glass of approved equivalent make to the thickness of 6 mm to with stand two hours fire rating.

b) General purpose Door - Provide Single / Double clear toughened glass of approved equivalent make to the thickness of 5 mm to the specified size and as per Manufacturer specification. Glass to be fixed with clip on frames for square and rectangular vision panels and with spin turned rings for circular vision panels. One side adhesive Glazing tape shall be provided in the frame to fix the vision panel glass in position and ensuring the stability of the fixing.

e) Finish – Frame and Shutter:

i) Surface of the frame and shutter shall be cleaned suitably and thoroughly with solvents and as per manufacturer's specification.
ii) Apply Zinc etch primer coating as shop coat to receive additional coat of primer and top coats.
iii) Apply stove zinc phosphate primer (35 microns DFT) as additional coat.
iv) Apply as finish coat and finish the surface neatly with thermo setting polyurethane paint (35 microns DFT) of approved colour and make.

f) PACKING

i) Individual frames members and individual shutters to be wrapped and protected with self adhesive Peel-off Polythene sheets or Co extruded PE film to a minimum thickness of 60 Microns, with low tack adhesive and with abrasion resistant for a minimum period of 6 months and UV resistant capability.

ii) Individual frames members and individual shutters to be packed in an individual card board boxes and to be sealed with Identification numbers.

iii) All frames and shutters shall be marked with identification number in such a way install the door according to the door schedule.

g) STORAGE

Frames shall be stacked flat and shutters shall be stacked vertically on wooden runners and suitably covered as per the manufacturer's instructions to prevent rust and damage.

h) INSTALLATION

FRAME:

i) Door frames should be assembled adjacent to the place of installation as per the Manufacturer's specification. Frames are not allowed for transporting in an assembled condition. If the manufacturer is desired to transport the frames in an assembled condition, the frames should be designed suitably and adequate packing to be given prior to transport in order to avoid any damage, bending etc during transport. If any defects found during the installation, such frames will be summarily rejected and will

not be allowed to use.

ii) After assembly it is to be ensured that all threaded preparations / joints are covered by using 15 x 10 self adhesive sponge strips at the back of the frame to prevent penetration of grouting mortar into screw threads. The head member of assembled frame shall be positioned against jambs ensuring correct alignment and secured using M 8 x 20 mm long plated Stainless steel bolts together with nuts spring and flat washers. Frames to be assembled at site with aid of roofing bolts and the protective film shall not be removed during installation.

iii) Assembled frame shall be kept in position within the opening by means of bracing. In order to correctly position the frame against finished floor level or equalize on adjustable floor anchors where specified, suitable strength PVC nylon shim shall be used under jambs. The frame shall be checked for square ness, alignment, twist etc. with carpenters bevel and plumb.

iv) A tie rod shall be fixed to the frame during installation to ensure the correct dimensions between the frame rebates and the same may be removed after installation.

v) Where fixing the frame is necessitated, the required gap between frame and jambs shall be created to accommodate the PVC nylon shims in such a way to maintain the uniform frame level.

vi) Methodology to be followed during the installation of the frames:

i) Site survey shall be conducted to ensure the opening size and reveal the correct opening size prior to installation of the frames.
ii) Place the frame in position, brace, level etc.
iii) Mark all positions of fixings anchors on the wall / lintel.
iv) Remove frame and drill wall to appropriate fastener or anchor bolts size.
v) Place and fit rod anchor shells metal expansion bolts into the wall.
vi) Place and fit jamb spacer bracket into back of frame profile.
vii) Reposition the frame back into opening and realign.
viii) Lightly tighten the CSK HD machine screws into shells.
ix) Check the position of the nylon shims placed behind frame to ensure the uniform gap between the frame and jamb.
x) Slowly fasten the screws continually by checking the plumb, square ness etc. and finally ensure that the frames are not deformed while tightened.
xi) After fixing the frame in position, the frame shall be pressure grouted with cement slurry 1:3 ratio or filling the pre- cast solid block core to the frame profile as approved. The surface after grouting shall be neatly cleaned and to be ensured that there is no scratch in the door frames after grouting.
xii) Back fill the frame through holes provided and insert plug in type nylon plugs after cleaning the surface. Nylon plugs shall be provided to suit the frame finish and colour.
xiii) Gap between the frame and masonry surface shall be grouted with cement slurry and sealed with Intumscent sealant of approved make, if called for in the Bills of quantities.

SHUTTER:

i) Fix all the hardware to the door shutter like hinges, flush bolts, bolts, Mortise locks, Dead lock, handle, Push plate, Door closer, Door stoppers, etc. with the appropriate SS screws and bolts supplied.

ii) The shutter is to be then fixed in to the installed frame and align the shutter to match the hardware to the cut-outs in the frame. Tighten the hinge screws.

iii) Clean the door jamb rebate surfaces of all dust, oil etc.

iv) Affix self-adhesive 'FLAT' seal on the door frame rebates, on hinge jambs, strike jambs, head member, sill etc and affix 'FLAT' seal in the shutter by using self adhesive EPDM smoke seal 'FLAT' type (Polyethylene cross linked foam of size 2 mm thick and 12.5 mm width) of Monarch Make and as indicated by the manufacturer and if specifically called for in the bills of quantities.

HARDWARE SCHEDULE:
Refer the Hardware Schedule enclosed along with BOQ.

i) TESTING / INSPECTION and GURANTEE:

During the process of manufacturing the Door by the agency, successful vendor shall arrange an inspection of the factory by the representative of Employer/OE and PMC/LA within the quoted rate. After installing the door, the Nominated sub Contractor shall test the performance of the Door Frame and Shutter in the presence of the Employer / OE and PMC. The doors shall be smoothly operable under all ambient conditions. All control, hardwares and locking devices shall give fault free performance.
A successful bidder shall arrange a test for one door with the specified hardware and place the door for testing in exactly the same way as fixed at site. The Employer / OE and PMC at random basis will select the door during the process or end of the manufacture and conduct the test at an approved laboratory in the presence of the representative of Employer / OE and PMC within the quoted rate and ensure that the door shall comply with the set out criteria.
Provide a Guarantee certificate and Test certificate for the tested door in an acceptable format in a stamped paper.

22.8. 2 HOUR NON METAL FIRE RATED DOOR

2 Hours fire Non Metal fire rated doors system duly tested for integrity and Insulation as per the IS:3614 part 2 and BS:476 part 20 at FRL CBRI Roorkee with standard heating conditions as specified in IS:3809 - 1979 and BS:476 part 20 and 22 1987 to achieve the required integrity and insulation (I.e. to restrict the heat radiation, temperature rise on the non fire side to the maximum of 140 degree Celsius above the ambient temperature on the
unexposed surface of the shutter), Framework to be in Seasoned hardwood (Moisture contain limited to 18%) frame of section 150mm X 75mm with 1 nos. of approved make Intumenscent strip to take care of

Hot smoke size of 20mm X 2mm cancelled in the grove of the frame with fixing arrangements of 3 nos. of G.I. hold fast 225mmX20mmX4mm with split end on either side and wall grouted with cement concrete mix 1:3;6 adjustable lugs with split end tail to each jamb alternatively approved make Anchor Fastener, including 4 nos. of stainless steel ball bearing hinges of SS 304 quality of size 102mmX102mmX3mm thick to capable of taking load up to 120 Kg of the shutter with SS pin, lock strike plate, shock absorbers as specified and 56mm thick single leaf shutter made out of perimeter railing of Seasoned Red Marenti hard wood (Moisture contain limited to 18%) of size 100mmX30mm and 2 nos. of 9mm thick Promina – 60 board duly HOT PRESSED with 4mm Commercial / Marine Ply to get the require surface for Laminate/ Veneer/ Paints with 30mm thick Non–combustible Fire Retardant compound and Fire Intumenscent Seal of size 20mm x 2mm mounted in the grooves in the shutter on all sides except bottom with 10mm thick teak wood beading on all side and Intumenscent sealant is used to seal the gaps between Promina-60 Board and shutter beading. The fire Doors with frame will be as per IS:3614 part 4 and BS:476 part 20 at FRL CBRI Roorkee with standard heating conditions as specified in IS:3809 - 1979 and BS:476 part 20 and 22 1987 all complete to the entire specification with the certified copy of the valid Test Certificates

22.9. TRAP DOOR

The trap Door should be of size as mentioned in the drawings. It should be made from 19mm marine grade plywood and finished in 1mm thick approved shade laminate on the exposed side and balancing laminate, 0.8mm thick on the underside. The edges to be in finished in 6mm thick teakwood lipping and finished in approved melamine polish. The framework should be as mentioned in the drawings. The cost should include hardware like a hatch using self-adjusting clasping springs, with a lock and hinge mechanism that is integrated in the frame corners and concealed. The system should be equipped with round cylinder lock / square bolt / lock, designed for profile cylinders Product / system. Item should include all accessories, fitments, man and material, correct installation procedure, necessary cutting in False ceiling strictly with unit template and finishing, cleaning complete.

Method and workmanship
The location of the trap door to be neatly located, surrounding surface cleaned of all dust and grime. The location and outline of the trap door should be neatly marked. This should strictly be the cut-line, any opening larger or smaller than this is not technically appropriate and may lead to malfunctioning of the Trap door. The self tapping screws provided for in the unit packing and the corresponding raul-plugs to be strictly used. Only the indicated number of screw holes and their indicated positions should be followed. The trap door is a system designed to rest on false ceiling Gypsum board. Any installation damages to false ceiling can be touched up with gypsum plaster. Post installation finishing involves neat painting touch-up to the vicinity, with masking tapes on the Trap door rim.

Working Platform and Safety
A local portable ladder of sufficient stoutness and stability should be used for reaching out to the false ceiling.

Making good
Post installation inspection should follow sufficient drying of paint and removal of masking tapes & fine touch-up if need be.

Mode of Measurement and payment
Mode of measurement should be in Sqm. Architect/Consultant certified completed units to be eligible for measurement for payment.

22.10. DOOR HARDWARE

Mortise Latch

1) Shall carry manufacturer's warranty of 1 year
2) Euro Mortise Passage Latch - Inside and Outside shall be opened by handle at all times
3) Shall comply with EN12209-1 and BS 5872 Standards
4) Shall be Tested for 5,00,000 cycles
5) Shall be suitable for wooden, metal and fire doors (latch functions) with 60mm standard back set
6) Shall be suitable for doors of thickness range 30mm to 50mm
7) Latch bolt, Deadbolt, Faceplate shall be made of Stainless Steel
8) Shall have Satin Stainless Steel finish
9) As an option locks may be Fire tested to GB7633 standards, CNACL certified, AS 130.4-2005 Standard
10) Euro Mortise Lock - Outside – Shall be opened by handle when unlocked. Lever shall withdraw latch bolt. Key shall lock or unlock bolt, key shall withdraw latch bolt. Inside – Shall be opened by handle when unlocked. Lever shall withdraw latch bolt. Key shall lock or unlock bolt, key shall withdraw latch bolt.
11) Euro Mortise Deadbolt - Outside - Bolt shall be locked or unlocked by key or turn. Inside - Bolt shall be locked or unlocked by key or turn
12) Euro Mortise Night latch – Outside – Latch bolt shall be withdrawn by key or turn. Inside – Latch bolt shall be withdrawn by key or turn.
13) Euro Mortise Privacy Lock – Outside – Shall be opened by handle except when bolt is thrown by turn knob from inside. Bolt may be unlocked from outside by coin or screwdriver by operating the slotted emergency button. Inside – Shall be opened by handle except when bolt is thrown by inside turn knob.

Euro Cylinder –

1) Shall carry manufacturer's warranty of 1 yr
2) Shall be of 5 pin Euro Double Cylinder
3) Shall be suitable to be used with Euro Profile Mortise Locks
4) Shall have C4 Key Profile, 70mm length and have 3 keys
5) Shall have Satin Chrome Finish

Euro Single Cylinder with Thumb turn –

1) Shall carry manufacturer's warranty of 1 yr
2) Shall be of 5 pin Euro Single Cylinder with Turn
3) Shall be suitable to be used with Euro Profile Mortise Locks
4) Shall have C4 Key Profile
5) Shall be of 65mm length
6) Shall have 3 keys
7) Shall have Satin Chrome Finish

Tubular Lever Handle –

1) Shall carry manufacturer's warranty of 1 yr
2) Tubular Lever on Rose shall be with Euro Profile Escutcheon
3) Shall be made of Stainless Steel Grade 304
4) Shall have Satin Stainless Steel Finish
5) Shall be tested for corrosion resistance in accordance with AS 2331.3.1 Neutral Salt
6) Spray Test

Euro Profile Escutcheon or Rose –

1) Shall carry manufacturer's warranty of 1 yr
2) Euro Profile Rose material
3) Stainless Steel Grade 304
4) Satin Stainless Steel Finish
5) Tested for corrosion resistance in accordance with AS 2331.3.1 Neutral Salt Spray Test

Entrance Handle –

1) Shall carry manufacturer's warranty of 1 yr
2) Shall be tubular Back to Back Pull Handle
3) Shall have spigots to suit 10 – 12mm thick glass doors as well as spigots to suit aluminium and timber doors up to 50mm thick
4) Shall be made of 304 grade stainless steel construction suitable for use in external environments
5) Shall have Satin Stainless Steel Finis

Cylindrical lever –

1) Shall carry manufacturer's warranty of 1 yr
2) Shall be suitable for semi commercial applications such as apartments and offices

3) Back set shall be 60mm standard. Extension tubes shall be available for 127mm back set
4) Latch bolt shall be of Stainless Steel
5) Shall suit door thickness of 35-46mm
6) Shall have standard T Strike
7) Shall have Satin Stainless Steel finish
8) Shall have field changeable handing
9) Shall be successfully tested up to 4 hours on fire door assemblies in accordance with Australian Standards AS-1905 Part 1, fire resistant door sets

Patches –

1) Shall carry manufacturer's warranty of 1 yr
2) Shall be suitable for doors with maximum weight 80Kgs and maximum width 1100mm
3) Shall have Satin Stainless Steel Finish

Door stop/ Security door chain/ door guard / other door accessories–

1) Shall carry manufacturer's warranty of 1 yr
2) Shall be made of 304 Grade Stainless Steel
3) Shall have Satin Stainless Steel finish

Hinges–

1) Shall carry manufacturer's warranty of 1 yr
2) Stainless Steel Ball Bearing Button Tip Hinge
3) Shall be suitable for interior / exterior doors
4) Shall be with two ball bearings
5) Shall be manufactured of 304 Stainless Steel
6) Shall be with Fixed Pins of Standard Imperial Hole pattern
7) Shall be of size as per manufacturer's specifications
8) Finish shall be Satin Stainless Steel

Kick Plates–

This shall be of brass (finished bright or chromium plated or oxidised) bronze, stainless steel, aluminium or as specified. Aluminium kicking plates shall be anodised and the anodic coating shall not be less than grade AC-10 of IS 1868. It shall be made from a plate of minimum thickness 3.0 mm & 1.5mm in case of stainless steel. Shape of the plate shall be as specified. This shall have bevelled or straight edges and shall be fixed by means of counter sunk or rounded screws of the same material and finish as that of the

plate. The shape and pattern shall be according to the drawings and as approved by the Engineer-in-Charge.

23. PAINTING

SCOPE

These specifications cover the use of paints for the plastered and concrete surfaces. It also includes the painting of wood and metal surfaces. The paint to be low VOC. Conventional paints contain Volatile Organic Compounds (VOC), which are petroleum-based solvents that evaporate from paint films while the paint is drying. These compounds are the unpleasant solvent fumes that may trigger respiratory reactions including asthma and breathing discomfort, when using conventional paints. They also contribute to greenhouse gas emissions.
Traditional oil based paints (also known as alkyd enamels) have a solvent level of approximately 50% or more. This means that for every four-litre can of enamel, two litres go straight into the atmosphere, compounding the “Greenhouse Effect”. Conventional water-borne paints have a solvent level of around 7%, so obviously using water-borne paints is a far more environmentally responsible option.
Additives classified as VOC’s are included to achieve some of the positive attributes of paint, such as good coverage, easy application and wash ability. The challenge for manufacturers, is delivering the quality of paint finish customers have come to expect, whilst reducing the overall environmental impact of each tin.
Low VOC paints, stains and varnishes use water as a carrier instead of petroleum-based solvents. As such, the levels of harmful emissions are lower than solvent-borne surface coatings. These certified coatings also contain no, or very low levels, of heavy metals and formaldehyde. The amount of VOC's varies among different "low-VOC" products, and is listed on the paint can or MSDS. Paints and stains, to meet EPA standards. must not contain VOC’s in excess of 200 grams per litre. Varnishes must not contain VOC’s in excess of 300 grams per litre.
As a general rule, low VOC paints marketed by reputable paint manufacturers usually meet the 50 g/L VOC threshold**.** Paints with the Green Seal Standard (GS-11) mark are certified lower than 50 g/L**.**
Low VOC paints will still emit an odour until dry. If you are particularly sensitive, make sure the paint you buy contains fewer than 25 grams/litre of VOC's

23.1. GENERAL

The provision of the latest revisions of the following IS: Codes shall form a part of this specification.

IS: 63	Whiting for Paints Ready mixed paint, brushing, grey filler, for Enamels, for use over primers.
IS: 426	Specification for paste filler for colour coats.
IS: 428	Specification for Distemper, Oil Emulsion, and colour as required.

IS: 710	Marine Plywood
IS: 1200 (Part XIII)	Method of Measurement of Building and Civil Engg Works - White Washing, colour washing, distempering and other finishes.
IS: 1477 (Part 1)	Code of practice for painting of ferrous metals in buildings Pre-treatment
IS: 1477 (Part 11)	Code of practice for finishing of ferrous metals in buildings. Painting
IS: 2338 (Part 1)	Code of practice for finishing of wood and wood based materials Operations and workmanship for finishing.
IS: 2338 (Part 11) :	Code of practice for finishing of wood and wood based materials, Schedule
IS: 2395 (Part 1) :	Code of practice for painting concrete masonry and plaster surfaces. Operation and workmanship
IS: 2395 (Part 11)	Code of practice for painting concrete, masonry and plaster surfaces. Schedule.
IS: 159	Specification for ready mixed paint, brushing, acid resistant.
IS: 2524 (Part 1)	Code of practice for painting of non-ferrous metal in buildings Pre-treatment
IS: 2524 (Part ll)	Code of practice for painting of non-ferrous metal in buildings Painting
IS: 3140	Code of practice for painting asbestos cement buildings:
IS: 5410	Specification for cement paints, colour as required.

Other IS Codes not specifically mentioned here, but pertaining to painting form part of these specifications.

23.2. MATERIALS

Materials shall strictly conform to the relevant IS: Specifications.

23.3. OIL-BOUND DISTEMPERING

23.3.1. Preparation of Surfaces:
Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is dry.

23.3.2. Primer Coat:
The primer where used as on undercoated surfaces shall be alkali resistance primer or distemper primer as specified in the item. These shall be of the same manufacture as of oil bound distemper. If the wall surface plaster has not dried completely alkali resistance primer shall be applied before distempering

the walls. But if the distempering is done after the wall surface is dried completely, distemper primer shall be applied.

23.3.3. Application:
Primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil bound distemper or paint is applied.

23.3.4. Preparation of oil bound distemper:
The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer. Only sufficient quantity of distemper required for days work shall be prepared.

23.3.5. Application of distemper coat:
After the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the printing coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed to immediately by vertical which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit the proper drying of the preceding coat.
The finished surface shall be even and uniform without patches, brush marks, distemper, drops, etc. Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished **in** one operation and no work shall be started in any room, which cannot be completed the same day.
15 cm. double bristled distemper brushes shall be used. After each day's work, brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

23.4. WATER PROOF CEMENT PAINT

23.4.1. Preparation of Surfaces:
The surfaces shall be thoroughly wetted with clean water before the water proof cement paint is applied.

23.4.2. Preparation of Paint:
Portland cement paints are made readily by adding paint power to water and stirring to obtain a thick paste which shall then be diluted to a brush able consistency. Generally equal volumes of paint powder and water make a satisfactory paint. In all cases the manufacturer's instructions shall be followed. The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thicken, affecting flow and finish.
The lids of cement paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement paint rapidly becomes air set due to its hydroscopic qualities.

23.4.3. Application of Paint:

No painting shall be done when the paint is likely to be exposed to a temperature of below 7 degree within 48 hours after application.

When weather conditions are such as to cause the paint to dry rapidly, work shall be carried out in the shed as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

To maintain a uniform mixture and to prevent segregation the paint shall be stirred frequently in the bucket.

For undecorated surfaces, the surface shall be treated with minimum two coats of water-proof cement paint. Not less than 24 hours shall be allowed between two coats and the second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather the preceding coat shall be slightly moistened before applying the subsequent coat.

The finished surface shall be even and uniform in shade without patches, brush marks, paint drops, etc. Cement paints shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free of excessively heavy brush marks. The laps shall be well brushed out.

23.4.4. Curing

Painted surfaces shall be sprinkled with water two or three times a day. This shall done between coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the sprinkling of water say about 12 hours after its application.

23.5. PLASTIC EMULSION PAINTING ON WALL AND CEILING

23.5.1. General

Plastic emulsion paints are not suitable for application on external wood and iron surfaces and surfaces which are liable to heavy condensation and are to be used generally on masonry or plastered surfaces. Suitable primer as per manufacturer shall be provided.

23.5.2. Paint

Plastic emulsion paint of approved brand and manufacture and of the required shade shall be used.

23.5.3. Preparation of Surface

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is dry.

23.5.4. Application

The number of coats shall be as stipulated in the item. The paint will be applied in the usual manner with brush or roller. The paint dries by evaporation of the water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time of drying varies from one hour on absorbent surfaces to 2 to 3 hours on non-absorbent surfaces.
The thinning of emulsion is to be done with water and not with turpentine. Thinning with water will be particularly required for the undercoat which is applied on the absorbent surface. The quantity of thinner to be added shall be as per manufacturer's instructions. The surface on finishing shall present a flat velvety smooth finish. If necessary more coats will be applied till the surface presents a uniform appearance.

23.5.5. Precautions

Old brushes if they are to be used with emulsion paints, should be completely dried of turpentine or oil paints by washing in warm soap water. Brushes should be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.

23.5.5.1. In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.

23.5.5.2. Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.

23.5.5.3. Washing of surfaces treated with emulsion paints shall not be done within 3 to 4 weeks of application.

23.5.6. Other Details :

These shall be as per specification for "Painting" as far as they are applicable.

23.6. RESIN BASED THERMO PLASTIC PAINT (DECORATIVE AND PROTECTIVE FINISH)

Materials: resin based thermo plastic paint such as sandtex matt or other equivalent approved manufacture, colour and shade shall only be used.
Preparation of surface and general: the specifications for painting (general) described herein before shall hold good as far as they are applicable.
Protective coatings: on surfaces such as ferrous metals, brass, copper and phosper bronze, a protective coating of suitable bituminous compound or chromate red oxide should be given. New wood should be treated with a leafing grade aluminium primer or water based acrylic emulsion primer. The surfaces with algae growth thoroughly cleaned down to remove as much growth as possible and effective solution of stabilized house hold bleach (calcium hypochlorite) of approved quality with approximate 35% chlorine

content @ 2 Kgs. Per 50 litres (or as per manufacturers recommendations) should be used to treat the surfaces. On chalky or friable surfaces after removing the loose materials by stiff brushing or scraping the surface should be treated with one coat of advanced solvent based materials such as snow sol stabilizing solution or other approved equivalent with white spirit.

Application: the ready mix sandtex matt or other equivalent approved resin based there plastic paint shall be applied on clean and wetted surfaces by means of brushes or roller. The solution shall be kept well stirred during the period of application. To avoid direct heat of the sun, the paint shall be applied on the side in shade. On rough and textured, one under coat of cement based paint such as snocem or other equivalent shall be applied before application of undiluted sandtex matt finish coat. In case of application of two coats of sandtex matt at normal temperatures, the first one shall be diluted by addition of 25% water and the second coat direct. In extremely hot environs, the second coat shall be diluted @ 2.5 litres of water to 20 litres of paint or as directed. Painting with resin based thermo plastic shall be carried out generally as per manufacturer's specifications.

Other details:

The specification for painting (general) mentioned herein before shall hold good as far as they are applicable. Snow sol stabilized solution shall not be applied over bitumen. Snow sol stabilized solution treated surfaces shall be left unpainted for more than 2 (two) days. Gypsum based materials shall not be used for filling of exterior cracks while preparation of surfaces.

23.7. BEES WAXING OF POLISHING WITH READYMADE WAX POLISH (NEW WORK)

Materials: The polishing shall be done with bees waxing prepared locally or with readymade wax polish of approved brand and manufacture, as stipulated in the description of item. Where bees waxing are to be prepared locally, the following specifications for the same shall apply:

Pure bees wax free from paraffin or steering adulterants shall be sued. Its specific gravity shall be 0.965 to 0.969 and melting point shall be 630 C. The polish shall be prepared from a mixture of bees wax, linseed oil, turpentine and varnish in the ratio of 2:1.5:1:05 by weight. The bees wax and boiled linseed oil shall be heated over a slow fir. When the wax is completely dissolved, the mixture shall be cooled till it is just warm and turpentine and varnish added to it in the required proportions and the entire mixture shall be well stirred.

Preparation of Surface : Preparation of surface will be as mentioned herein under painting with the exception that knotting, holes and cracks shall be stepped with a mixture of fine saw dust formed of ht wood being treated, beaten, beaten up with sufficient bees wax to enhance cohesion.

Application: The polish shall be applied evenly with a clean soft pad of cotton cloth in such way that the surface is completely and fully covered. The surface is then rubbed continuously for half an hour. When the surface is quite dry, a second coat shall be applied in the same manner and rubbed continuously for one hour or until the surface is dry. The final coat shall then be applied and rubbed for two hours (more if necessary) until the surface has assumed a uniform gloss and is dry showing no sign stickiness. The final polish depends largely on the amount of rubbing which should be continuous and with uniform pressure with frequent changes in the direction.

Other details: The specifications for painting (general) as mentioned herein before shall hold good as far as they are applicable.

23.8. FRENCH SPIRIT POLISHING (ON NEW WORK WITH A COAT OF WOOD FILLER)

Polish: Pure shellac varying from pale orange to lemon yellow colour, free from resin or dirt shall be dissolved in methylated spirit at the rate of 140 gm. Of shellac to 1 litre of spirit. Suitable pigment shall be added to get the required shade.

Preparation of surface: The surface shall be cleaned. All unevenness shall be rubbed down smooth with sand paper and well dusted off. Knots if visible shall be covered with a preparation to red lead and glue size laid on while hot. Holes and indentations on the surface shall be stopped with glazier's putty. The surface shall then be given a coat of wood
Filler made by mixing whiting (ground chalk) in methylated spirit the surface shall again be rubbed down perfectly smooth with glass paper and wiped clean.

Application: The number of coats of polish to be applied shall be as described in the item.
A pad of wooden cloth covered by fine cloth shall be used to apply the polish. The pad shall be moistened with the polish and rubbed hard on the wood, in a series of overlapping circles applying the mixture sparingly but uniformly over the entire area to give an even level surface. A trace of linseed oil on the face of the pad facilitates this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cotton cloth, slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

Measurement, Rate and other details: These shall be as for painting (general) mentioned herein before as far as they are applicable.

23.9. COLOURLESS LACQUER POLISH

Polish
Nitro cellulose lacquer polish of approved brand manufacture and finish shall be used.

Preparation of Surface
The surface shall be cleaned and all unevenness shall be rubbed down smooth with suitable grade sand paper and well dusted. Knots if visible shall be made good as per the direction of the OWNER'S ENGINEER / Architects. Holes and indentation on the surface shall be stopped with glaziers putty. The surface then shall be given a coat of ready made ragging wood filler and allowed to dry for maximum 4 hours. The surface again shall be rubbed down perfectly smooth with suitable emery paper and wiped clean. There after a finishing touch up with ragging wood filler is to be given and allowed to dry. To receive the polishing the surface is again rubbed down smooth.
Application

Nitro cellulose sealer coat of approved manufacturer shall be applied strictly as per the manufacturers specification. The polish shall be applied with a sprayer at suitable pressure and viscocity as recommended by the manufacturer, and allowed to dry for 4 to 6 hours and rubbed down with suitable grade emery. The surface shall be again sprayed with 3 of NC lacquer (3 wet on wet coat). Finally the surface shall be given wax polishing by using rubbing compound.

23.10. MELAMINE POLISH

Glossy / Matt

Apcolite Natural Wood finish clear glossy / matt is a premium quality melaminised coating specially formulated as a protective and decorative finishing clear coating for wood.

Flash point : Above 14 degree C (57° F)

TECHNICAL DATA

Method of application	Brushing at 25-30 seconds by Ford Cup B4 at 30 degree C.
	Spraying at 20-25 seconds by Ford Cup at 30 degree C.
Thinner recommended	Brushing - Thinner 106
	Spraying - Thinner 124
Thinner intake	20-25% by volume
Mixing ratio	Base to hardener in 10:1 by volume
Drying Time	8 hours
	Surface dry - less than 30 minutes
	Hard dry 16-20 hours
Recoating period	Overnight
Finish	25 microns film thickness smooth and glossy / matt

Sand the surface along the grains with Emery Paper No.180 or with a suitable grade sand paper. Brush the surface free of loose dust. Fill the wood using Apcolite Wood Filler. Remove excess filler immediately after applications. Allow 2-3 hours of drying, before sanding with Emery Paper No.240 or 280. If desired, apply Apcolite Natural Wood Finish upto 20% by volume and apply by spraying after Sealer Coat. In application by ragging allow a drying time of 5-10 minutes in between coats and 30-60 minutes before over coating with finish coats. Apply a coat of Apcolite Natural Wood Finish Clear Sealer. After overnight drying, smooth sand with Emery Paper No.320 and wipe the surface free of loose dust. Apply Apcolite Natural Wood Finish Clear Glossy / Matt as follows. Ensure that the surface to be coated is free from loose matter. Apcolite Natural Wood Finish Clear Glossy / Matt is a two component system consisting of base and hardener. These should be mixed in the recommended ratio. The two components should be mixed in a glass, plastic or enamelled container. Allow the mixture to stand for

30 minutes and then apply by brushing or spraying using the recommended thinner for consistency adjustment. The mixture of base and hardener should be used within 8 hours.

23.11. CONSUMPTION OF PAINT FOR DIFFERENT PAINTING ITEMS

Sl no.	Brief description of painting work	Consumption per 10 Sqm. Of net
A	**Oil bound distemper on plastered surfaces:**	
1	Cement primer (one coat)	0.91 litres
2	Two finishing coats	1.60 kg
3	Three finishing coats	2.4 kg
B	**Flat oil paint to plastered surfaces:**	
1	Cement primer (one coat)	0.91 litres
2	Cement primer (two coats)	1.82 litres
3	Two finish coats	1.72 litres
C	**Acrylic emulsion paint:**	
1	Cement primer (one coat)	0.91 litres
2	Two finishing coats (two coats)	0.87 litres
3	Three finish coats	1.30 litres
D	**Cement paint (old surface):**	
1	Two coats on sand faced plastered surface	4.10 kg
2	Two coats on rough cast plastered surface	7.70 kg
E	**Cement paint (old surface):**	
1	Two coats on sand faced plastered surface	4.50 kg
2	Two coats on rough cast plastered surface	8.50 kg
F	**Enamel paint to wood / steel:**	
1	Wood primer (one coat)	0.90 litres
2	Steel primer (one coat)	0.75 litres
3	Two finishing coats on wood	1.40 litres
4	Two finishing coats on steel	1.35 litres
G	**Flat oil paint to wood /steel work:**	
1	Wood primer (one coat)	0.90 litres
2	Steel primer (one coat)	0.75 litres
3	Two finishing coats on wood	1.70 litres
4	Two finishing coats on steel	1.70 litres

H	**External painting with flat oil paint:**	
1	Cement primer (one coat)	1.00 litres
2	Two finishing coats	1.74 litres
I	**Re-painting old painted surfaces:**	
1	Two coats of emulsion paint	0.86 litres
2	Two coats of flat oil paint	1.59 litres
3	Two coats of enamel paint	1.35 litres

(The consumption give is indicative only. Please check the respective vendors for more details and accurate figure. No escalation will be paid on account of increase in the consumption of paint)

23.12. MEASUREMENT

Painting on plastered or concrete surface shall be measured as for plastering. Painting on wooden or metal surfaces shall not be measured separately and is deemed to be included in the respective item for wood and MS respectively.

IS 1200 shall be followed for measuring all painting

24. PLUMBING AND SANITARY

24.1. GENERAL

Providing and fixing GI pipes and GI specials of approved ISI make cut to required lengths as per site conditions. The lines shall be concealed and protected using 1 coat of anti corrosive paint. The chasing of walls should be done as per the layout and should be filled with cement mortar. The pipes of various diameter should be used as specified in drawings, BOQ etc. The open lines shall be finished with 1 coat of primer and 2 coats of enamel paint. Both the lines shall be anchored to the wall using proper GI clamps. The lines shall be pressure tested to a maximum of 11 Kgs / sq.cm. for any leakage.

All sanitary ware shall generally conform to IS: 2556 Part I to XV unless stated otherwise.

All sanitary ware and CP fittings shall be new and of approved make, type and colour. All samples of materials with catalogues shall be submitted and got prior approved before use. Approved samples along with other approved materials shall be neatly displayed on a board and such a display board of samples shall always be in exhibition in the site office.

In cases where the materials are supplied by the clients, all such materials shall be inspected and received in good condition and thereafter, it will be totally under the safe custody of the tenderer/contractor till they are handed over satisfactorily after installation, testing and commissioning.

Wherever multiple choices of fixtures are mentioned, the final choice will be as per the joint decision taken by the client and the architect.

Indian W.C

Indian W.C pan shall be Madurai / Orissa pattern in white vitreous chinaware size as specified in the schedule of work. Each W.C shall be provided with a 100 mm dia vitreous chinaware P or S trap with or without vent horn, as required.

The water closet shall be provided with an exposed or concealed type C.P brass flush valve or flushing cistern as specified in the schedule of work. Flush valves shall have a suitable flow regulating facility. Discharge connection to the W.C shall be by means of approved type of flush bend.

Foot rests

Indian W.C shall be provided wherever specified, with a pair of vitreous china foot rests at proper distance (where specified) on either side of the W.C.
Foot rests shall be set in cement mortar 1:2 mix. Edges shall be finished neatly with white cement.

Orissa W.C

Orissa W.C shall be in white glazed vitreous chinaware of size specified. The W.C shall be provided with a 100 mm white vitreous chinaware P or S trap with or without vents as required.

Each W.C shall be provided with an exposed or concealed type brass flush valve or flushing cistern generally as for Indian W.C.

European W.C

European W.C shall be wash down or siphonic, floor or wall mounted in white glazed vitreous chinaware with integral P or S trap as required. Wall hung W.C shall be supported by C.I or G.I floor mounted chair. The W.C shall be provided with an exposed or concealed type brass flush valve or flushing cistern as specified in the schedule of work.

Each W.C shall be provided with a solid plastic seat. The seat shall be fixed to the W.C with CP brass or S S pillar bar hinges. Rubber buffers shall be provided for the cover.

Urinals

Urinals shall be as specified in the BOQ / drawings in white glazed vitreous chinaware of size as per the approved product number of approved make / brand.

Urinals shall be provided with:

I) spreader
ii) CP dome waste
iii) CP P-trap with unions.
iv) CP wall flange and pipe.

All exposed pipes and fittings shall be of C.P brass. The urinals shall be fixed with C.P brass screws.

Urinal flushing shall be through one of the following methods as specified in the schedule of work:
i) Small urinal flush valve with push button.
ii) Auto flush valve with DC long life battery or AC supply.

Auto flush shall be concealed in wall and flush pipe shall be of copper or G.I except the exposed parts which shall be C.P brass.

Waste pipe for urinals shall be any one of the following :-

a) G.I pipes, heavy quality as per I.S 1239
b) Lead pipes
c) Copper pipes
d) HDPE pipes as per IS 4984

as specified in the schedule of work or shown on drawings.

Urinal partitions shall be white glazed vitreous chinaware complete with CP brass screws, anchor fasteners etc. as required.

Lavatory Basin

Lavatory basins shall be ivory glazed vitreous china or poly marble or any other material and of size, shape and type specified in the schedule of work.

Each basin shall be complete with:
i) C.I or galvanized steel supporting brackets and clips as required.
ii) CP waste and overflow.
iii) Pop-up waste or rubber plug with CP chain as specified.
iv) CP P-trap with cleanout, unions, CP pipe to wall and wall flange
v) CP control angle valve/s with CP connections.
vi) Mixing or CP fittings as specified.

Sinks

The sink shall be of size specified in with glazed vitreous chinaware or stainless steel AISC 304 as specified.

Each sink shall be complete with:

i) C.I or galvanized steel brackets and clips as required.
ii) Waste fitting with brass / rubber plug and chain.
iii) P-trap with clean out, unions, CP pipe to wall and wall flange.
iv) CP control valve/s with CP connections.
v) Mixing or CP fittings with spout as specified.

Mirrors

Mirrors shall be of approved make and sample and should be plate glass electro coated copper 6 mm thick and should be clear, distortion-less (at all angles) non-wavy. The size shall be as specified in the schedule of work.

Mirrors shall be provided with backing of 12 mm thick marine plywood fixed with CP brass semi round headed screws and cup washers or CP brass clamps as specific or instructed by Architect.

Semi Circular Channels

The channels shall be in white glazed vitreous chinaware with or without dead ends. They shall be laid to proper lines and levels and shall be set in a bed of 12mm thick cement sand mortar 1:2. The joints shall be finished with white cement paste and finished neat.

Towel rods and racks

They shall be of approved make and size as specified in schedule. The towel rod shall be provided with a pair of CP brass brackets fixed to the wall with CP brass screws with round head, using cup washers, screwed on to fill-plugs embedded in wall. The brackets shall be of concealed type.

Soap trays

The soap trays shall be of white glazed vitreous chinaware or stainless steel and of size specified in schedule.

Soap trays shall be fixed flush with the finished wall surface (tile surface) by cutting recess in wall and set in cement mortar 1:2. The wall surface shall be reinstated to original condition.

Soap Solution dispensers

They shall be chromium plated brass with CP brass brackets and CP brass cap. They shall be of approved make. They shall be fixed to the wall with CP brass screws, screwed on to fill-plugs embedded in wall.

Toilet paper roll holder

Toilet paper roll holder shall be of white glazed vitreous chinaware or stainless steel of size specified in schedule. It shall be of recessed type with wooden rod with spring at one end for holding the paper roll. The rate shall include cutting recess in the wall, fixing the holder with cement mortar 1:2 and rectifying the wall surface to original conditions.

Installation of Sanitary ware

All sanitary ware and CP fittings shall be installed in accordance with the interior requirements. Neat workmanship and maintaining exact position and level of each fixture shall be the sole objective of the installation. Care shall be taken to fix inlet and outlet pipes at correct positions. Faulty positioning shall be made good without any damage to the finished floor or wall tiling and any damage to the finished surfaces shall be made good at the tenderer / contractor's cost.
In order to ensure quality of workmanship and compliance with interior requirements, one or two mock-up installations shall be done and got approved. Fixtures used in the mock-up may be reused with the approval of the Architect.
All fixing accessories like bolts, nuts, brackets etc. may be supplied along with the ware as defined in the mode of measurement and schedule of work. All such accessories shall be CP brass or galvanized or stainless steel as approved by the Architect. All exposed pipes and bends shall be of CP brass.

The Indian W.C shall be fixed in level in a neat manner. The W.C and trap shall be set in brick bat 1:2:4 concrete mix. Joints between W.C and flush pipe shall be made with a putty or white lead and linseed oil and caulked well or with approved rubber joints. The joint between W.C and trap shall be made with 1:1 cement mortar and shall be rendered leak proof.

The Orissa W.C shall be fixed in level in a neat manner. The W.C and trap shall be set in brick bat concrete 1:2:4. Joint between W.C and flush pipe shall be made with putty of white lead in linseed oil and caulked well or with approved rubber joint. Joint between W.C and trap shall be made with 1:1 cement sand mortar and shall be rendered leak proof.

Wall-hung European W.C shall be mounted on C.I chairs which are fixed to the wall and floor using Anchor fasteners. The bolts and nuts used for fixing the chairs shall be stainless steel and the fixing bolts for the W.C and chairs could be CP brass or stainless steel. Floor-mounted W.C shall be fixed with Anchor fasteners using stainless steel bolts and nuts. The gap between the WC and floor or wall shall be neatly sealed with water proof non-hardening sealant of approved colour. The sealant should not extrude beyond the foot print or WC outline.

All W.C's shall be aligned and levelled with the floor and wall tiles so as to present an integrated look. Utmost care and skill shall be exercised to achieve a good installation in keeping with the interior designs.

Urinals shall be fixed to the wall using Anchor fasteners and stainless steel bolts and nuts. The urinals shall be held in line and level according to the interior designs and tile modules. Partitions, wherever required shall be provided, shall also maintain line and level as shown on drawings. Supply spreader and drain piping and P-trap shall be of CP brass and installed in a neat manner. No unseemly bends or wooden support pieces shall be permitted.

Wall-mounted lavatory basins and sinks shall maintain line and level as specified by the interior drawings and also with the tile modules. The supply connections shall be of CP brass from the angle

stop valves to the pillar taps or single level fixture and shall display good workmanship. Drain connections shall have a CP P-trap with unions and exposed CP drain pipe and a wall flange. In the case of counter mounted basins and sinks, extreme care shall be taken to provide independent and adequate support for the basin and aligning it with the opening in the counter slab. Supply and drain connections shall be same as that for the wall mounted basins. The crevices between basin and wall or counter shall be neatly sealed with a non-hardening sealant of approved colour.

All accessories like the mirror, soap trays etc shall be neatly fixed as per interior designs. Good workmanship is the essence of all sanitary installation for achieving the interior design objectives.

Cast Iron Pipes and Fittings

Cast iron pipes shall be of 'LA' class conforming to IS 1536 suitable for lead jointing with spigot and socket joints and if flanged, they shall be of 'A' class conforming to IS 1537. Pipes shall be in maximum lengths available.
Fittings shall conform to IS 1538. Spigot-sockets shall be suitable for lead jointing.

Pipe Installation

Shop drawings for the routing of pipes shall be prepared generally on the basis of layout drawings issued. The shop drawings shall reflect the site conditions, structural beams and columns, obstructions by way of any construction elements or any other service pipes, ducts etc. The drawings should clearly indicate openings required in brick or concrete walls, drain valves at low points, air valves at high points, isolating valves, if any, and invert levels at every 15m intervals. The drawings should also indicate typical details of hangers, supports, brackets etc. After approval of the drawings, pipe routes shall be marked with a distinct colour of paint on the site and got it approved by the Architect.

All openings and chases in brick walls shall be made neatly and refilled to a reasonable finish. However, final finishing will be done by the civil contractor. Openings in concrete walls shall, however, be made only with the approval of the Architect. Pipe penetrations, through wall or floor, shall be sealed with an approved fire resistant sealant.

Good workmanship and neat pipe layout are the pre requisites of these specifications. Horizontal pipes shall be truly horizontal with necessary slopes and hangers or supports as specified and shown on drawings. Vertical pipes shall be truly vertical and shall be laid away from the walls at least by 10mm or as required by the Architect. All pipe runs shall be parallel to the ceiling or walls for presenting a neat appearance. Pipes buried in wall shall be laid in machine-made cases with galvanized steel anchors.

All pipes before and after testing shall be protected with wooden or brass plugs to prevent ingress of dust, sand or any extraneous matter.

Pipe supports; hangers and clamps

Pipe supports, clamps, suspenders shall be pre-fabricated and galvanized (after fabrication). Application of support systems shall follow the guidelines in the above specifications. Any other types of support, suspension or clamping to meet the site conditions shall be got approved before use.

All fittings shall be screwed type unless specified otherwise. However, flanged joints shall be provided at the following positions:

i) Pairs of flanges for isolation and removal of equipment.
ii) Mating flanges for equipment flange connections.
iii) Mating flanges for valves, strainers, as the case may be.

EXTERNAL DRAINAGE: Trenches for drainage shall be carried out to the required level only. No refilling will be allowed for the purpose of making up bed of the trenches. Any excess excavation shall not be paid for, and shall be made good with well rammed and consolidated cement concrete M75 at the cost of the contractor, and for which no extra cost will be paid. The trenches shall be filled in and the earth shall be well rammed and properly consolidated. The surplus earth shall be placed or spread elsewhere, or near the site, or carted away free of charge as may be directed by the Architect. The Contractor shall at his own expense and without extra charge make provision for all shoring, pumping, dredging soil or sub soil and bailing out or draining out water or rain water and the trenches shall be kept free of water. When trenches are opened for laying the drainage, water pipes, or any other work and if the depth is over 1.2 M (or even less in low bearing soil) then the sides shall be closely and securely supported by suitable shoring.

24.2. MISCELLANEOUS

MANHOLES : - Manholes shall be circular and of conical shape with internal 600 MM dia opening at the top and internal 1 M to 1.2 M dia depending on the depth at the bottom. The required depth hall be provided at all junctions and change of directions. (Manholes can be rectangular only when the depth is less than 1.5 M. The size shall be 0.9 M x 0.45 M internal measurement) They shall be built in 230 MM brick wall in cement mortar 1:6 with cement plaster 1:4 smooth finish 20 MM thick from inside and rough finished from outside on a base of 230 MM cement concrete M100 projecting 150 MM beyond the brick work on all sides. Proper cement concrete channel shall be provided at the bottom and the branches from various pipes discharged in the channel with easy slope. The top of all the manholes shall be provided with cast iron circular air and water tight frame. In the case of any damage to the covers due to traffic or any other reason during construction or in the maintenance period, they shall be replaced immediately by the contractor at his own cost and if the damage is repeated, the Architects may demand heavier types than what are supplied and the contractor has to comply with the same without asking for extra charges. The frame and covers shall be painted with Black Bitumen Anti-Corrosive paint and space between cover and frame to be filled with bitumen. In deeper manholes, i.e. where depths are more than 1 M necessary cast iron manholes steps shall be provided, cost of which is to be included in the cost of manholes and nothing extra shall be paid.

Portland cement shall be thoroughly mixed dry with sand in the proportion of 1 to 3 with approved water-proofing compound added as per manufacturer's specifications. Water shall be then added gradually to make the mixture homogenous. Cement mortar shall be mixed which can be used within half an hour. The joints between the stones or bricks will be raked out to a depth of 12 MM and the surface shall be thoroughly watered and the mixture of sand and cement applied evenly on all surfaces that needs to be plastered. The surface shall be finished off with a thin layer of cement floating. The plaster work shall be kept thoroughly wet for a period of seven days. Thickness of plaster shall be 20 MM thick.

Stoneware Pipes and Fittings : All the stoneware pipes, bends, gully traps and sewer traps, etc., shall be of the best salt glazed variety, of a uniform thickness, free from air holes, blisters, cracks , hard sound and free from other imperfection and external and internal surfaces shall be smooth and perfectly glazed and perfectly straight. They shall be of best approved Indian make and of approved quality. The diameter mentioned shall be their internal diameter and the thickness. A piece of stoneware pipe after 48 hours immersion in water shall absorb not more than 4 % of its own dry weight. If the Architect for his own satisfaction takes test to determine the yielding point of any or every pipe by any known method in Engineering Practice, the contractor has to pay for the same without demanding extra. The internal diameter of the socket shall be sufficiently large to allow a joint of 6 MM thickness all-round. Joints in stoneware pipe shall be made perfectly air sealed and neatly finished, the spigot and socket should be thoroughly cleaned specially at the inner side of the pipes. Cracked pipes whether at the socket or on the body, shall be rejected. The socket ends of pipes shall always face upstream of effluent flow. The drains shall run in perfectly straight lines between manholes as shown on plans. No trenches shall be filled in until the foundations have been tested and alignment of the drain and connections into and from the manholes and their positions are examined and certified by the local authority and the Architects. The pipes shall be laid in perfect straight line to a desired slope.

While laying drain pipes, the centre of each manhole or water gully must be marked by peg or otherwise as may be determined by the Architects.

The pipes are to be laid beginning at the lower end. No pipe is to be laid until the trenches have been excavated to its required depth as directed by the Architect. All pipes are to be laid perfectly true, both in line and in gradient. The pipes in a trench shall be laid dry and all joints of the pipes must be made thoroughly sound and water tight, and any one of them which may be proved to be leaking, shall be immediately made tight by filling it with water to a height as the Architect may determine. Any additional precautionary measures or appliances that may be found necessary to ensure tightness of the manholes or water gullies and the joints of pipes shall be adopted by the contractor without any extra charge, the responsibility of making them completely water-tight rests upon the contractor. The Architect may inspect the joints after the pipe joints in underground work have thoroughly set, and if he has any doubt, he may require the contractor to cut open and clean away the cement of any joint that he may select and to make good the same at contractor's cost without asking for extra.

Whenever a pipe enters or exits a manhole, brick on edge must be cut to a proper form and laid around the upper half of the pipe so as to form an arch. There shall be a joint of cement mortar 12 MM thick all-

round the pipe between the pipe and the bricks. The ends of all pipes shall be properly built in and neatly finished off with cement mortar. The Gully Traps shall be 150 MM x 100 MM and of best quality. They shall be encased in bricks and cement masonry (1:6) with cement plaster (1:4) forming an inspection chamber with cast iron full size frame and cover 230 MM x 300 MM. The sewer trap of required size shall be installed in the last manhole.

Spigot and socked 150 MM C.I. pipes shall be heavy pattern (weighing not less than 46 Kgs per meter run) for the portion going below the floor and embedded in the walls. These shall be embedded and laid over 150 MM thick cement concrete and laid to a slope and connected to the drain. On no account lime or lime concrete is to come in direct contract with cast iron pipe or fittings.

The pipes shall be carefully laid to the level and gradient shown on the plans and sections and great care shall be taken to prevent any material entering the pipes. The pipe between manholes shall be laid truly in straight line without vertical or horizontal undulations.

Cement shall be slightly moistened and on no account it should be soft or sloppy and it shall be carefully inserted by hand into the joint. When the current has been inserted it shall be punched and caulked in to the joints and more cement added until the space of the joint has been filled completely with tightly caulked cement. The joint shall be finished off neatly outside the socket at an angle of 45 degrees. Any surplus cement projecting inside the joints is to be removed and to guard against any projections sack or gunny bag shall be drawn past each joint after completion. The contractor shall be responsible that each section of pipe is properly cleaned out on completion of the work.

Cast Iron Pipe Work: All cast iron pipes, fittings shall be of approved make and shall conform to IS codes and should be free from flaws, air bubbles, cracks, sand holes and other defects, truly cylindrical and in uniform thickness. They shall not be brittle, but shall allow of ready cutting, chipping and drilling and shall be 10 MM thick, and of the diameter (diameter mentioned shall be the internal diameter) mentioned in the Schedule of Quantities and shall be of the longest length available and shall be fixed against the wall on special iron nails and bobbins fixed to the wall by means of round headed nails painted with two coats of approved paint. All the joints shall be caulked with tarred gasket of hemp or spun yarn and cement mixed with linseed oil to render perfectly air and water tight joint.

150 MM C. I. socket and spigot pipe shall be of the heavy duty (weighing not less than 46 Kg / M run) for the portion going below the floor or embedded in the wall. This shall be laid to slope and shall be encased in cone 300 MM x 300 MM and connected to the Municipal or other drain line.

The C. I. Nahni traps of approved make shall be 115 MM in height and 350 MM long and shall be embedded in the concrete floors with c. c. M-100 all-round. They shall be connected by means of 75 MM lead pipes of specified weight and thickness with thimbles, tail pieces and inspection caps fixed to the lead pipes by lead wiped joints or by 75 MM C. I. Nahni plug bend to suit the thickness of wall. The Nahni trap shall be provided with C. P. brass grating.

The lead used caulking joints of cast iron pipes shall be pure soft pig or bar lead free from all impurities and the rates of pipe shall be inclusive of all that is mentioned above. All vertical soil waste vent pipes shall be arranged straight in manner. The joints in the rainwater pipes shall be filled in with gasket of hemp or spun yarn and cement mixed with linseed oil, For underground usage the thickness and weight of cast iron pope shall not be less than those shown above. All cast iron pipes and fittings shall be treated with two coats of approved compounds to prevent oxidation and two coats of anti-corrosive paint should be applied afterwards.

All cast iron pipes, fittings etc. shall be best E. L. C. and of approved make of the diameter mentioned which shall be their internal diameters. The thickness of the pipes shall be as follows : -

Diameter	**Thickness**
50 MM	3 MM
65 MM	3 MM
75 MM	5 MM
100 MM	5 MM
150 MM	6 MM

Cast Iron soil pieces shall be 100 MM diameter, 5 MM thick, and coated (internally) with Dr. Angus Smith's solution. The fittings for soil pipes shall also be treated similarly. The 100 MM soil pipes shall be in the longest available lengths and shall be fixed to the walls on tapered hard timber 50 MM x 50 MM x 50 MM gutties plugged to the stone or brick-walls or C.I. taper bobbins so as to keep the pipes 20 MM clear of the bricks walls. They shall be with socket and spigot ends, fixed in perfectly vertical and horizontal lines with all necessary fittings. The joints between C. I. pipes shall be filled in with cement mixed with linseed oil, gasket and caulked nicely.

Asbestos Cement Pipe Work: All A.C. pipes, fittings shall be of approved make and conforming to I. S. S. and free from flaws, air bubbles, cracks, sand holes and other defects, truly cylindrical and in uniform thickness. They shall not be brittle, but shall allow of ready cutting, chipping and drilling, and shall be 5 MM thick, and of the diameter (diameter mentioned shall be their internal diameter) mentioned in the Schedule of Quantities and shall be of the longest length available shall be fixed against the wall on special iron nails and bobbins fixed to the wall by means of round headed nails painted with three coats of approved paint. All the joints shall be caulked with tarred gasket of hemp or spun yarn and red lead putty to render perfectly air and water-tight joints.

Lead Pipes: (for soil waste and vent pipes) shall be used only for short branch soil waste or vent connections.

Joints of lead pipes shall solder wiped joints. All joints of fittings shall be made perfectly air and water - tight.
Joints between lead and brass shall be wiped joints. Joints between lead pipe and wrought iron pipes fittings shall be made with heavy soldering ferrules, screwed to the iron pipe fittings.

Joints between lead and cast iron pipes shall be made with soldering or flanged thimbles soldered and caulked with lead in the usual manner.
Cast brass clearing eyes shall be provided at all points, intersection and changes of direction and these shall be secured by means of wiped solder joints.

Rainwater Pipes: Rainwater pipes shall be of Cast Iron conforming in every respect Indian Standards as may be revised up-to-date. They will be maintained perfectly straight from the tip to bottom of the building. The inlet shall be provided with lead connector with C. I. grating of approved design. Rainwater pipes will terminate at 150 MM above ground level by means of a shoe. All the above fixtures shall be included in the rate of rainwater pipes.

Water Supply Pipes and Fittings: All water supply pipes shall be of 'C' class quality and as required by the Bye Laws of Local Corporation or I. S. S.

Water pipes shall be of Galvanized iron specified internal ICs etc. in perfect straight lines, both vertical and horizontal. The pipes in the interior of the building shall be fitted with M. S. seamless fittings and covered with asbestos twine and asbestos magnesia powder and shall be embedded in chases filled in with cement concrete. The pipes laid under the floor shall be painted with bitumen and embedded in concrete. The pipes, where exposed on the surface, shall be coated with aluminium paint as specified. The pipes running underground shall be laid after excavating trenches to a minimum depth of 0.6 M and the trenches shall be refilled after the pipes are laid to position.

These shall be measured in Running Metre and the rate shall be inclusive of all fittings, paint and coverings and cost of crust and chase and filling them with concrete, if inside the building and cost of excavating trenches and refilling, if laid underground.

Inspection chamber to be provided in Brick Masonry of 230 mm thick intercepting trap chamber 90 x 45 centimetre including 1:4:8 cement concrete foundation, 1:2:4 cement concrete channels / half round glazed stoneware pipe channel, salt glazed stoneware intercepting trap with rodding pipe set in 1:4:8 cement concrete block, plastering inside and outside Cast iron lid with frame to be fixed in cement concrete.

25. MISCELLANEOUS

25.1. STAINLESS STEEL RAILINGS

The work shall be carried out as described and as per the drawing.
All rails and other tubular components shall be constructed using the following:

Stainless steel grade AISI, type 316; surface to be 320 grain/grit finish; tubes 1-1/2" (38mm) outside diameter by 5/64" (2 mm) wall thickness.

All posts and other components shall be constructed using the following:

a) Stainless steel grade AISI type 316, surface to be 320 grain/grit finish; posts to be 2” (50 mm) by 1/2” flat bar, finish and final design to be strictly in accordance with d line design guidelines.

b) Stainless steel grade AISI type 316, surface to be bead blasted for: component fittings including handrail attachment support and post attachment components strictly in accordance with d line design guidelines.

c) Fastening bolts to be stainless steel or other high strength material as determined by engineering requirements

Fasteners for railings

a) Anchors shall be fabricated from stainless steel or other materials as determined by engineering requirements with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488.

Fabrication

a. Fabricate railing system for compliance with structural requirements of applicable code.

b. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.

c. Stainless steel tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints

Installation

Installation shall be by **done** a qualified, authorized representative of the manufacturer.

Installation must be in accordance with standard or non-standard, yet applicable details (instructions) included on installation/shop drawings provided by **the manufacturer.**

Install components plumb and in-line, accurately fitted, free from distortion or defects and securely anchored to structure.

Provide anchors, plates, angles, etc., necessary for connecting railings to structure.

Any and all field welding shall be by a certified welder.

Access for anchors that require through bolting either vertically or horizontally to be made available through General Contractor.

Erection tolerances

Maximum variation from plumb shall be 1/4".

Maximum offset from true alignment for every 50-foot of railing shall be 1/4", non-accumulative.

Protection after installation

General contractor to provide protective covering on handrails and guardrails if construction is not yet finished in the area where the railings are installed.

Correction of deficiencies

All deficiencies in work and/or items not meeting specified requirements shall be corrected in order to meet specification requirements at no additional cost to owner.

25.2. M.S. GRILLS/RAILING

Materials :

All structural steel shall conform to IS 226-1963 sections for grills and shall be free from loose mill scales, rusts, pitting or any other defects affecting its strength and durability.

Fabrication :

The grill/railing shall be fabricated to the design and pattern shown in the drawings. All joints shall be made in best workman like manner with slotting and welding as required to the specified size and shape. The edge of the M.S. flats shall be suitably mitred before welding to get the desired shape. The joints shall be filled to remove excess stay after welding screws, nuts, washers, bolts, rivets and any other miscellaneous fastenings devices shall be of steel and shall be provided by the contractor. Manufactured Rails then be fixed in between the posts, balusters, M.S. frame work etc. to correct alignment. Any undulations, bends etc. found shall be rectified by the contractor at his own cost. The complete assembly of railing so fixed shall be firm and there shall not be any lateral movements.

Samples :

Samples of grill and railings shall be submitted for approval of the Engineer-in-charge and to be got approved before taking up for mass fabrication.

Installation:

The approved grills shall be fixed in position where specified and shown in drawings including in masonry walls, teakwood frames, hand railings etc. Any damages to walls, frames etc. caused during fixing the grills shall be made good by grouting with cement mortar/packing /repairing properly at the contractors cost.

Painting :

Painting shall be done as per the specification specified under painting.

Mode of measurement :

The railing shall be measured correct to two decimal places. Only the running length of the railing shall be considered for payment. Individual rails not to be measured separately.

The rate is to include the cost of all materials, labour, transporting, fabricating, installing, scaffolding if necessary, painting, grouting etc. complete.

25.3. TOILET CUBICLES

Toilet cubicles shall be of size as per drawings and BOQ. They should be of approved make and series as approved by the Architect. The following are the additional specifications for the toilet cubicles

Cubicle Size	As per the drawings Received
Quantity	As per BOQ
Thickness of Merino Compact Laminate Board	18 mm
Door Size	As per drawing
Colour of Merino Compact Board	As per Architect’s approval

Standard Accessories Details (Per Cubicle Unit)	Accessories: 1. SS Top Rail (Stainless Steel Grade 304 with Satin Finish) 2. SS Coat Hook with Door Stopper Option (Stainless Steel Grade 304 with Satin Finish) 3. SS Gravity Hinges (Stainless Steel Grade 304 with Satin Finish) 4. SS Latch cum Occupancy Indicator (Stainless Steel Grade 304 with Satin Finish) 5. SS "U" Channel (Stainless Steel Grade 304 with Satin Finish) 6. SS "F" Channel (Stainless Steel Grade 304 with Satin Finish) 7. SS Palm Design Adjustable Foot (Stainless Steel Grade 304 with Satin Finish) 8. SS Screws and Inserts (Stainless Steel Grade 304 with Satin Finish) Rubber Lining for Door Stopper
Special Note: All accessories will be Stainless Steel as per manufacturer's specifications	

25.4. FIRE SEALS

PREAMBLE TO FIRE SEALS

1) A specialised agency is to be appointed to cover all the items under this head

2) Necessary test certificates to be submitted by the vendor and manufacturer to provide fully tested and internationally approved systems for a vast variety of fire stop applications

Fire Barrier mortar

Fire Barrier mortar should have a minimum 2 hours fire rating when tested in accordance with BS 476 part 20 and UL 1479 for horizontal openings in fire rated floors or slabs and vertical openings in walls for passing service shafts. The product shall be age tested for 30 years as per DAFSTB and DIBT standards. The product shall be tested and approved by third party agencies such as UL, FM and LPCB.

This is used for Fire stopping for sealing of Refrigent Service Shaft, Fire Fighting Shaft and Plumbing Shaft and openings in the Wall and Floor penetration.

Fire resistant board system

Fire resistant board system should have a minimum 2 hours fire rating when tested in accordance with BS 476 part 20 for horizontal openings in fire rated floors or slabs and vertical openings in walls for passing service shafts. The fire resistant board system shall comprise of a mineral wool board having a minimum density of 160Kg/m3 coated with an ablative coating at 1mm dft. . The product shall be age tested for 30 years as per DAFSTB and DIBT standards. The product shall be tested and approved by third party agencies such as FM and LPCB.
This is to be used sealing for Electrical Shaft Openings / HVAC Duct Openings.

Fire expanding foam

Fire expanding foam should have a minimum 2 hours fire rating when tested in accordance with BS 476 part 20 and UL 1479 for horizontal openings in fire rated floors or slabs and vertical openings in walls made of concrete/ masonry or Gypsum for passing service shafts. The expanding foam should expand seven times its volume to fill the cavity at the time of dispensing the material. The product shall be age tested for 30 years as per DAFSTB and DIBT standards. The product shall be tested and approved by third party agencies such as UL, FM and LPCB.
For small/ medium size Cable Tray Openings

Sprayable Fire-rated Mastic
Sprayable Fire-rated Mastic should be used in curtain wall joints, edge of slab joints, top of wall joints and expansion joints in Concrete, Masonry and Gypsum to give 2 hours of fire rating when tested as per UL standards. The product is to have up to 50% Movement Capability and Sound Insulation of 55db as per ASTME90.
This product should be suitable for sealing joints in curtain walls

Fire Stop for core cuts

The fire stop System for Slab and Wall Core Cuts shall be as per manufacturer's specification,

The diameter should be as per the site conditions

It should have a minimum 2 hours fire rating when tested in accordance with BS 476 part 20 and UL 1479

Acrylic Intumescent sealants

Acrylic sealants are acrylic in tumescent based materials of putty consistency with excellent adhesive and fire resistance properties. Sealants are used to prevent the spread of fire and smoke through joints and gaps in fire rated walls and floors and around service penetrations. When exposed to the heat Acrylic Sealant expands forming an insulating char thus preventing the passage of fire and smoke. The choice joint sealant shall be determined by the configuration and the requirement for the degree of

movement in substrates. Supply and Installation of System will done by authorized Dealer and Installer The system will be supported by a valid International Test report of the complete system as per BS 476 part 20

26. MODE OF MEASUREMENT

Note: Measurements shall be recorded only up to two digits after decimal point

ITEM	UNITS OF MEASUREMENT
Pest Control	Sqm of Carpet Area and not area of application
Demolition of walls up to 175mm thick (with plaster)	Sqm
Demolition of walls greater than 175mm thick (with plaster)	Cum
Breaking of IPS	Sqm in required thickness
Removal of existing Plaster, tiles, flooring	Sqm
Core cuts	Nos
Making openings in wall	Sqm mentioning the thickness.
POP Punning/Gypsum Punning	Sqm
Gypsum False ceiling	Sqm. Verticals of all heights to be paid separately in Sqm
Modular false ceiling	Sqm as per laid area. No deductions for light fittings
Modular ceiling 1200x1200mm	Sqm. Rate to include band rasters
Trims, Axioms and band rasters	Rmt. Different widths to be paid separately
Double skinned Gypsum Partition	
GI Frame work	Sqm, up to true ceiling
Glass wool insulation	Sqm, up to true ceiling
First Skin of Gypsum	Sqm, up to true ceiling. Running length of the Partition multiplied by the height
Second Skin of Gypsum, ply	Sqm. Mode of measurement to be actual area on both sides
Modular Partition	Sqm. Mode of measurement, up to false ceiling. Rate to include single skin Gypsum above the false ceiling as described in the BOQ
Modular Glass Partition	Sqm. Mode of measurement, up to false ceiling. Rate to include single skin Gypsum above the false ceiling as described in the BOQ.
Panelling and Boxing	Sqm. All portions hidden behind the boxing

	will not be measured. Height of boxing will be not be greater than false ceiling height
Doors	Nos. The rate to include shutter, finishes on shutter, frame, finishes on frames, all hardware like hinges, door closer, vision panel (if applicable), floor spring, locks, handles etc as specified in the Drawings/BOQ
Loose furniture	As per BOQ
Storages	Sqm. ELEVATIONAL area for a specified thickness
Paint	Sqm.
Cavity floor	Sqm for a thickness as specified in the BOQ
Vinyl floor	Sqm. The rate to include skirting
Wooden floor	Sqm
Skirting	Rmt.
Frosted Film	Sqm
Railing	Rmt of the Railing. Individual Pipes not to be paid separately
Wall Paper	Sqm

27. CALIBRATION OF EQUIPMENTS

Contractor must keep the measuring devices to check the products for adherence to the specifications and quality mentioned in the tender documents.

Measuring devices as mentioned below must be kept at site along with the calibration report of the device used:

1. Metal Tape
2. Vernier Calliper
3. Screw Gauge
4. Pressure Gauge

It is the responsibility of the contractor to provide calibration report of each device mentioned above. In case the validity of the certificate expires, then the contractor has to either bring a new device with valid certification or get the old device re-certified through the accreditation agency.

All the measuring devices used at the time of execution for testing and checking of products should be calibrated from **National Accreditation Board for Testing and Calibration, Laboratories Assessed and Accredited Agency.**

28. MODE OF MEASUREMENT

Note: Measurements shall be recorded only up to two digits after decimal point

ITEM	UNITS OF MEASUREMENT
Pest Control	Sqm of Carpet Area and not area of application
Core cuts	Nos
Making openings in wall	Sqm mentioning the thickness.
POP Punning/Gypsum Punning	Sqm
Gypsum False ceiling	Sqm. Verticals of all heights to be paid separately in Sqm
Modular false ceiling	Sqm as per laid area. No deductions for light fittings
Modular ceiling 1200x1200mm	Sqm. Rate to include band rasters
Trims, Axioms and band rasters	Rmt. Different widths to be paid separately
Double skinned Gypsum Partition	
GI Frame work	Sqm, up to true ceiling
Glass wool insulation	Sqm, up to true ceiling
First Skin of Gypsum	Sqm, up to true ceiling. Running length of the Partition multiplied by the height
Second Skin of Gypsum, ply	Sqm. Mode of measurement to be actual area on both sides
Modular Partition	Sqm. Mode of measurement, up to false ceiling. Rate to include single skin Gypsum above the false ceiling as described in the BOQ
Modular Glass Partition	Sqm. Mode of measurement, up to false ceiling. Rate to include single skin Gypsum above the false ceiling as described in the BOQ.
Panelling and Boxing	Sqm. All portions hidden behind the boxing will not be measured. Height of boxing will be not be greater than false ceiling height
Doors	Nos. The rate to include shutter, finishes on shutter, frame, finishes on frames, all hardware like hinges, door closer, vision panel (if applicable), floor spring, locks, handles etc as specified in the Drawings/BOQ
Paint	Sqm.

Skirting	Rmt.
Frosted Film	Sqm
Railing	Rmt of the Railing. Individual Pipes not to be paid separately
Wall Paper	Sqm

APPROVED MAKE LIST

LIST OF APPROVED MAKES /MATERIALS TO BE USED FOR CIVIL WORKS Sl No	ITEM/ MATERIAL	MAKES
1	Cement 43/53 – OPC	`Cement shall be procured from the reputed firms as per Indian Standard Codes/BIS as amended upto date only shall be used duly taking the approval from the Engineer – in – charge of the work (Not below the rank of Executive Engineer) prior to execution Ultratech,Ambuja, Grasim, JK, Binani, Dalmia Cement, Kalburgi Cement
2	Steel	Steel shall be procured from the reputed firms as per Indian Standard Codes/BIS as amended upto date only shall be used duly taking the approval from the Engineer – in – charge of the work (Not below the rank of Executive Engineer) prior to execution .
3	Ready Mix Concrete (RMC)	The contractor has to arrange/establish concrete batching plant for RMC with all testing equipmentsetc.,at site only. No Ready mix concrete shall be used on the work, purchased from the manufacturers or suppliers away from the vicinity of work spot beyond one Km.
4	Flush Door Shutters	Kit ply, Duraboard, Merino Ply Kutti / Anand / Raveela / Subhdwar
5	UPVC Sections	Fenesta/ Rehau /NCL/Aparna
6	UPVC Fixtures for wood and iron works	Fenesta/ Rehau /NCL/Aparna
7	Ceramic Tiles Dadooing Tiles	Johnson / Somani / Kajaria
8	Flooring Tiles	Johnson / Somany / Kajaria

9	ACP Cladding	Alcopanel/ Alcomat/ Alstrong/ Durabuild
10	Structural glazing& Glass	St.Gobain/ Glaverbel
11	M S Tubes	TATA / Khandelwal / Zenith
12	GI Sheets	Jindal / TATA
13	Paints (a) Synthetic enamel paint, Oilbound distemper	ASIAN / NEROLAC/ ICI / BERGER
	b) White primer coat external walls	JK / BIRLA/ ICI / BERGER/ ASIAN
	c) Texture Paint	Spectrum
14	Water Proof Compound	FOSROC / MC Bauchemie / Pidilite /MYK
16	Mortice Locks	Godrej /Dorma / Link / Dorset/ Sobeet

ELECTRIFICATION WORKS

SNo	Materials	Preferred Make
1.	EDO / MDO 3P/4P ACBs	SIEMENS / SCHINDLER / L&T
2.	MCCBs / MCBs / ELCBs (3P / 4p / DP/ SP)	SIEMENS / SCHINDLER L&T Hagar
3.	Analog / Digital Meters	CONZERV
4.	CTs	IMP
5.	Indicating Lamps	TEKNIC
6.	Connectors	Connectwell
7.	650V Grade FR wires	Finolex / Polycab
8.	1.1 KV Power and Control CU / Al Conductor Cables	Polycab
9.	GI Ladder Tray	Approved local make
10.	Earth Pit Material	Approved local make

PLUMBING AND SANITARY WORKS

LIST OF APPROVED MAKES FOR EQUIPMENT & MATERIALS

DIESEL GENERATING SET INSTALLATION

S. No.	Details of Materials / Equipment	Manufacturer's Name
1.	Diesel Generating Engine	Cummins India MTU Friedrichshaten Caterpillar Mitsubishi
2.	Acoustic Enclosure	Jakson S & W TIL Mitsubishi
3.	Alternator	Stamford Leroy Somer Caterpillar Mitsubishi
4.	DG Synchronizing Panel	Electro Allied Products Sterling Generators
5.	Air Circuit Breaker (3/4 Pole)	ABB(E-Max) Larsen & Toubro (U-Power) Schneider Electric (Master Pact NW) Siemens (3WL)
6.	Moulded Case Circuit Breaker (MCCB)	ABB (T – Max) Larsen & Toubro (Dsine) Schneider Electric (Compact NSX/ NS) Siemens (3VL)
7.	Miniature Circuit Breakers (MCB)	ABB Hager (L&T) MDS Legrand Schneider Electric–(Multi 9) Siemens
8.	Power/Aux. Contactor	Schneider Electric Larsen & Toubro ABB Siemens

S. No.	Details of Materials / Equipment	Manufacturer's Name
9.	Protection Relay	
	a. Numeric Type	ABB Areva Larsen & Toubro Siemens
	b. Electromagnetic Type	ABB Areva Larsen & Toubro
10.	Indicating Lamps LED type and Push Button	Larsen & Toubro (ESBEE) Schneider Electric Siemens Vaishno
11.	Overload relays with built in Single Phase preventer	Schneider Electric Larsen & Toubro ABB Siemens
12.	Electronic Digital Meters (A/V/PF/Hz/KW/ KWH) with LED Display	Conzerv (Schneider Electric) Automatic Electric EI Measure Secure
13.	Static Power Meter & Logger (SPML) With RS 485 port	Conzerv (Schneider Electric) Larsen & Toubro EI Measure
14.	PLC	Allen Bradley Siemens Modicon (Schneider Electric)
15.	PVC insulated XLPE aluminium/copper conductor armoured MV Cables upto 1100 V grade	Finolex Gloster KEI Polycab Ravin Cables Grandlay
16.	LT Jointing Kit / Termination	Raychem REPL Safe Kit

S. No.	Details of Materials / Equipment	Manufacturer's Name
17.	Cable Glands Double Compression with earthing links	Baliga Lighting Comet Cosmos
18.	Vibration Isolators	Cori Dunlop Kanwal Industries Corporation Flexionics
19.	Noise Control Silencer / Muffler (Residential Type Silencer)	Intertec Sound Control India
20.	Fiberglass	Owens Corning UP Twiga
21.	Thermometer	Emerald H Guru Taylor
22.	Alarm Annunciator	Advani Oralikon Larsen & Toubro Minilec
23.	Motors (Energy Efficient Class – I)	Kirloskar Bharat Bijlee Siemens ABB
24.	Plug Valve	Audco SKS
25.	GM / Forged brass Ball Valve	RB Italy Zoloto
26.	Check Valve Wafer Type / Dual Plate	Advance Valve Jayhiwa Kirloskar
27.	Flexible Pipe Connections	Flexionics Resistoflex
28.	Pypcoat (AW4) for fuel tank & Burried oil	IWL

	piping	
29.	Oil Flow Meter	Crown Kent Schlumberger
30.	Level Indicator (Oil)	Forbes Marshall
31.	Anchor Fastner	Fisher Hilti Shakti
32.	GI Pipe Fittings	Unik Zoloto M
33.	Welding Rod	ADOR Advani

LIST OF APPROVED MAKE

ELECTRICAL WORK (HT)

SL. NO.	DETAILS OF MATERIAL	NAME OF MANUFACTURERS
1.	Indoor/ Outdoor Oil Filled Transformer :	Areva Intra Vidyut Kirloskar RPG – Raychem Voltamp Schnider ABB
2.	Cast resin dry (EPOXY) type transformer :	Intra Vidyut Kirloskar RPG – Raychem SGB, Germany (DTPL, India) Voltamp Schnider ABB
3.	Vacuum impregnated resin dry type transformer	Voltamp
4.	VCB	ABB (up to 11 KV) AREVA Siemens

		Schneider Electric (Evolis) (Up to 11 kV)
5.	Compact substation: 6.6KV/11 KV	ABB AREVA Schneider Electric Siemens Voltamp (with dry type Transformer only)
6.	Compact HT Switchgear / RMU:	ABB AREVA C&S L&T (TAMCO) Siemens Schneider Electric
7.	Numeric Type Protection Relay	ABB AREVA L & T Schneider Electric Siemens
8.	Potential Transformer	AE Kappa Matrix Pragati
9.	Current Transformer (Cast Resin Epoxy Coated)	AE Kappa Matrix Pragati
10.	Static Power Meter & Logger (Trivector Meters)	AE El Measure Larsen & Toubro Rishabh Secure Schneider Electric(Conzerv) Socomec

11.	Electronic Digital Meter (A/ V/ PF/ HZ/ KWH) with LED Display.	AE El Measure Larsen & Toubro Rishabh Secure Schneider Electric(Conzerv) Socomec
12.	HRC Fuse and Fuse Fitting	GE L & T Siemens
13.	Battery Charger & Batteries	HBL Life AMCO Exide Amar Raja Global (Rocket) Hitachi Max Power Shinkobe
14.	Insulating Mats	Commercial Enterprises DL Miller & Co. Ltd. Premier Polyfilm Ltd. RMG Polyvinyl India Ltd.

LIST OF APPROVED MAKE
(HVAC work)

S.No.	Details of Materials / Equipment	Manufacturer's Name	
		Imported	Indigenous
1	Magnetic Bearing oli free centrifugal turbo core Chiller	Carrier Trane Climaveneta (Mitsubisi Eletric) York (Johnson Control)	
2	Heat pumps	Bluebox Climaveneta Trane York (JCI)	
3	Variable Refrigerant Flow System	Daikin	

		Hitachi	
		Mitsubishi	
		Toshiba	
4	Primary Pump (Split casing/Monobloc) & Condenser Water Pump.	Armstrong	
		TACO	
		Bell & Gosset	
5	Secondary CHW/HW pump with Variable Speed Pumping System including following :		
	Adjustable Frequency Drive	Armstrong	
	Automatic AFD Bypass	TACO	
	Pump Controller / Tertiary loop controller	Bell & Gosset	
	Differential Pressure Sensor /Transmitter		
6	Pressurized Expansion Tank and Air Separator		
			Armstrong
			Grundfoss
			ITT
7	Air Handling Unit	Carrier	
		Edgetech	
		ETA	
		VTS-TF Class I	
	Air Handling Unit accessories such as Corners, Profiles, Hinges, Handles etc		HiraArosio
			VTS-TF Class I
	Cooling Coil for AHU	To be manufactured	Carrier
		by individual supplier	Hi-Tech
		as indicated above	International Coil company
			Nutech
8	Precision AC unit	Blue Box	

		Climaveneta (Mitsubisi Eletric)	
		GEA	
		Stulz	
9	Active under Floor System for Data Centre	Titus	
		Uniflair(Schneider Electric)	
		Trox	
10	Split Unit		Blue Star
	(5 Star as per BEE) / Package Unit		Carrier
			ETA
11	Split Unit (with Refrigerant R-410A/R-407c)	Toshiba	
		Trane	
		York	
12	Fan Coil Unit	Midea	Carrier
		Sinko	Edgetech
		York	VTS
13	Chilled Water Cassette Unit	Carrier	Carrier
		Climaveneta	DAIKIN
		Midea	VTS
		Mitsubishi	
14	Variable Air Volume Box (Unit)	Honeywell	Systemaire
		Titus	Honeywell
		Trox	
15	Cooling Tower	Baltimore	
		GEA Polacel	Bell
		Marley	Marley
			GEA Polacel
16	Centrifugal Fan	KRUGER	Nadi
		NICOTRA	Nicotra
		Flaktwoods	Humidin
		ELTA	
17	Mixed flow fan	Flakt	
		Kruger	
18	Plug fans	NICOTRA/KRUGER	

19	Axial Flow Fan	KRUGER	Kruger
		NICOTRA	Nadi
		Flaktwoods	
		ELTA	Nicotra
20	Inline / Propeller Fan / Roof extractor Fan	Chaysol	Air flow
		Nuaire	Alstom
		Ostberg	Nadi
		ELTA	Lau
		Systemair	
21	JET Ventilation fan for basement carparking	Aerovent	
		Flaktwoods	
		Systemair	
		ELTA	
22	Thermal Heat Recovery Wheel	Flakt Woods	
		Ostberg(Enventus)	
		DRI	
23	Inline UV sterilizer	Arklite	
		Ruks Engineering Ltd.	
		Sterile	
		UV-Lux	
24	Dessicant wheels	Ostberg (Enventus)	
		DRI	
25	PIPES & FITTINGS		
26	M.S. Pipe upto 200 MM Dia.		AST
			Jindal
			Tata Steel
27	MS PIPES above 200 mm dia factory rolled		Jindal
			SAIL
			Welspun
28	Butterfly valve (32 mm and upwards)	KITZ	
		Audco	
		CRI	
		C & R	
29	Butterfly Valve with Actuator		
		Honeywell	
		Kitz	

		Sauter	
		Siemens	
30	Balancing valve (Manual)		Advance Valve
			Navtech
31	Balancing Valve cum flow control (Pressure independent dynamic) valve with modulating actuator for AHUs and FCUs	Siemens	
		Flowcon	
		Honeywell	
		Overtrop (AZV)	
		TA Auto Flow	
32	PICV & Ball valve (upto 32 mm)	Siemens	
		Honeywell	
		KITZ	
		RB	
		Zoloto	
		Rapid Control	
33	Check valve	Kitz	
		Honeywell	
		Advance Valve	
34	Pot / Y Strainer		Emerald
			Sant
35	Pressure Gauge		Fiebig
			H Guru
36	Thermometer		H Guru
			Emerald
			Grundfoss
	Combined pressure/temperature gauge with digital display with BAS compatibility		Grundfoss
37	Ball valve (Fan Coil Unit)	Overtrop	Emerald
			Rapid Control
			Zoloto
38	Ball valve with Y-Strainer	Tiemme	Emerald
	(Fan Coil Unit)	Overtrop	Rapid Control
39	Auto Air Vent Valve	RB	Rapid Control
			Anergy

40	GI Sheet		ESSAR
			Jindal
			Lloyd
			SAIL
			TATA
41	Terminal HEPA filter plenums		Airtech
			AAF synder general
			Fabtech
			Sankalp Enterprise
42	Factory Made Duct		Nuaire Engineers
			Rolastar
			Seven star
			Zeco
43	Factory Made Spiral Duct		Atco
			Karthila Industries
			Seven Star
			Spiral Tubes Pvt. Ltd.
			Western Air Duct
44	Flexible duct		Atco
			Caryaire
			Seven star
			UP Twiga
45	Pre-insulated duct		ALP
			Nutech
			Pai Pal
46	Pipe / duct supports		Diamond
			Hitech
			Seven star
47	Passivation system for hydraulic systems (CHW/CDW/Hot water)		Biocide
			Chemtex
			Airflow
48	Grille/diffuser/dampers		Air Master
			Caryaire
			Dynacraft
			Ravistar
49	Smoke / Fire Damper	Greenheck	
	(Actuator shall be UL listed)	Ruskin	

		Airmaster	
		Caryaire	
		George Rao	
		Ravistar(Systemair)	
50	Sound Attenuator	ELTA	
		Caryaire	
		George Rao	
		Ravistar (Systemair)	
51	Anchor Fastener	Fischer	
		Hilti	
52	Insulation		
	Closed Cell Elastomeric nitrile rubber/EPDM along with adhesive		
		TWIGA	
		Eurobatex – Union Foam	
		A flex	
		K flex	
	Microban Closed Cell Elastomeric nitrile rubber along with adhesive	K flex	
		A flex	
	Cross link polyethylene foam with adhesive	Trocellen	
	Fibreglass (Al. Foil Faced)		Lloyd insulation
			UP Twiga
53	Acoustic insulation		
	a. Fibre glass		Lloyd insulation
			UP Twiga
	b. Nitrile rubber with	K flex	
	Antimicrobial property	A flex	
54	Expanded Polystyrene (TF Quality)		Beardsell
			Coolite
			DEBS Products
55	Extruded Polystrene for Overdeck Insulation	Isoboard	
		Owens Corning	
		Polybond	
		Thermosheild	
56	Premoulded PUF section for pipe support		Lloyd
			Malanpur
57	Protective Coating over Closed Cell		K flex

	Elastomeric – Fibreglass Woven Cloth		Fosters
			Paramount
58	UV Protective coating		K flex
			Paramount
			Polybond
59	Fire Sealant	Birla 3 M	
		OBO Bitterman	
60	Fire Wrap/Board/Paint	Birla 3 M	
		Flamebar	
		Hilti	
		Promat	
	Controls		
61	Three way Modulating / Two way valve / PIBCV for AHU		
		Honeywell	
		Sauter	
		Siemens	
62	Three way / Two way modulating control Valve for FCU	Danfoss (Model: VRG)	
		Honeywell (Model: VC7936)	
		Johnson Control (VG 5400 MC)	
		Schneider (VB-7215-0-4-07/8)	
		Siemens (Model: VVP/VXP 469)	
63	Proportionate Room Thermostat with Digital Temperature Indication for FCU		
		Honeywell (Model: T 6865)	
		Johnson Control	
		Schneider (TA-168-2)	
		Siemens (Model: RDF 340)	
64	Humidistat	Honeywell	
		Invensys	
		Johnson Control	
		Siemens	
65	Safety thermostat for heater		Anergy Controls
66	Dial Thermometer Capillary Type.	Penn	
		Tadington	

67	Flow Switch		Rapid Control
68	Airstat		Rapid Control
	Miscellaneous		
69	Vibration Isolator, Flexible Pipe Connection, Flexible duct connector, Heavy duty pipe support clamp		Cori
			Dunlop
			Easyflex
			Flexionics
			Kanwal Industrial Corporation
			Resistoflex
70	Grooved Pipe Connector	Grinnel Tyco	
		Sharjoint	
		Victaulic	
71	**ELECTRICAL ACCESSORIES**		
A.	**MEDIUM VOLTAGE EQUIPMENT**		
		North side Projects	**Westside Projects**
1	Power Distribution Panel and Motor Control Centre & Air Insulated Bus ducts	Adlec Control System	Accusonic (Pune)
		Advance Panels & Switchgear	Antia Electricals
		KMG Atoz	Arrow Engineers
		SPC Electrotech	Manshu (Pune)
		Sudhir Engineering	Popular Switchgear
		Tricolite	Scoot Engineering
			Smash Electricals
			Sterling & Wilson
		Southside Projects	Zenith Engineering
		Bangalore	
		Dynam	
		Load Controls	**Chennai**
		Lotus Powergear	Electro Alagen
		Elins	Formaplastic Controls
		Power Control Equipments	Ohm Energy
		Pragati Controls	Shanti Electricals
		Kolkata	
		Electro Allied Products	

2	Sandwiched Construction Busduct	Control & Switchgear	
		EAE (IIGM)	
		GE Power Control	
		Henikwon	
		Intraco BKS (Marketed by Larsen & Toubro)	
		Power Plug Malaysia (Marketed By Tricolite)	
		Schneider Electric	
3	Motor	ABB	
		Bharat Bijlee	
		HAVELL	
		Kirloskar	
		Marathon	
		Siemens	
4	Starter	ABB	
		Allen Bradley	
		Kirloskar	
		L & T	
		Schneider	
		Siemens	
5	Variable Frequency Drive (VFD)	ABB	
		Alan Bradley	
		Fuji Electric	
		L&T	
		Siemens	
		Schneider Electric	
		VACON	
6	Air Circuit Breaker (3/4 Pole)	ABB(E-Max)	
		GE Power Controls (M-Pro)	
		Larsen & Toubro (U-Power)	
		Schneider Electric (Master Pact NW)	
		Siemens (3WL)	
7	Moulded Case Circuit Breaker (MCCB)	ABB (T – Max)	
		GE Power Controls (Recod plus)	
		Larsen & Toubro (Dsine)	
		Schneider Electric (Compact NSX/ NS)	

		Siemens (3VL)	
8	Motor Protection Circuit Breaker(MPCB)	ABB	
		GE Power Control	
		Hager (Marketed by Larsen & Toubro)	
		Schneider Electric	
		Siemens	
9	Automatic Transfer Switch (ATS)	ASCO	
		Cummins	
		GE Power Control	
10	Miniature Circuit Breakers (MCB)	ABB	
		Hager (L&T)	
		MDS Legrand	
		Mitsubishi Electrical (DIN rail mounted)	
		Schneider Electric–(Multi 9)	
		Siemens	
11	Residual Current Circuit Breaker (RCCB)	ABB	
		Hager (L&T)	
		MDS Legrand	
		Mitsubishi Electrical (DIN rail mounted)	
		Schneider Electric–(Multi 9)	
		Siemens	
12	Power/Aux. Contactor	ABB	
		Larsen & Toubro	
		Mitsubishi Electrical	
		Schneider Electric	
		Siemens	
13	Change Over Switch	C & S	
		Havells	
		Elcon	
		HPL – Socomec	
		Larsen & Toubro	
14	Control Transformer/Potential Transformers	Automatic Electric	
		Gilbert & Maxwell	
		Matrix	
		Reco	

15	Current Transformer	Automatic Electric	
	(Epoxy Cast Resin)	Gilbert & Maxwell	
		Matrix	
		Reco	
16	Protection Relay		
	a. Numeric Type	ABB	
		Areva	
		Larsen & Toubro	
		Siemens	
	b. Electromagnetic Type	ABB	
		Areva	
		Larsen & Toubro	
17	Indicating Lamps LED type and Push Button	Altos	
		GE Power Controls	
		Larsen&Toubro (ESBEE)	
		Schneider Electric (MG)	
18	Overload relays with built in Single Phase preventer	ABB	
		Larsen & Toubro	
		Mitsubishi Electrical	
		Schneider Electric(Telemechanique)	
		Siemens	
19	a. Electronic Digital Meters (A/V/PF/Hz/KW/KWH) with LED Display	ABB	
		Conzerv	
		L & T	
	b. Dual Energy Meter with centralized metering & billing system	ActarisConserve	
		El Measure	
		Secure	
	c. Prepaid Meters & accessories	Actaris	
		Conzerve	
		Secure	
	d. Electromagnetic Meters	Automatic Electric	
		Rishabh (L&T)	
20	Static Power Meter & Logger (SPML) with RS 485 port	Conzerv	
		El measure	
		Larsen & Toubro	

21	Power Capacitor	ABB	
		Matrix	
		Meher (Larsen & Toubro)	
		Siemens (Epcos)	
22	Autoamtic Power Factor Correction Relay (Numeric Type)	Areva	
		BELUK (Germany)	
		Conzerv	
		Siemens	
23	Thyristerised APFC Control Panel	ABB	
		Meher(Larsen & Toubro)	
		Siemens	
24	PVC insulated XLPE aluminium/copper conductor armoured MV Cables upto 1100 V grade	Finolex	
		Polycab	
		RPG	
25	LT Jointing Kit / Termination	Raychem	
		REPL	
		Safe Kit	
26	Cable Glands Double Compression with earthing links	Baliga Lighting	
		Comet	
		Cosmos	
27	Bimettalic Cable Lug	Comet	
		Cosmos	
		Dowell's (Biller India)	
		Hax Brass (Copper Alloy India)	
28	PVC insulated copper conductor stranded flexible wires (FRLS) -	Anchor	
		Finolex	
		Havells	
		KEI	
		R Rkabel	
29	Mettalic Conduit (ISI approved)	AKG	
		BEC	
		NIC	
		Vimco	
30	PVC Conduit (ISI approved)	AKG	
		BEC	

		Polypack	
		Precision	
31	Industrial Socket		
	Splash Proof	Clipsal	
		MDS Legrand	
		Neptune Balls	
32	Industrial Socket Metal Clad	BCH	
		MDS	
33	Selector Switch, Toggle switch	Kaycee	
		Salzer (Larsen & Toubro)	
34	Timer	ABB	
		Larsen & Toubro	
		MDS Legrand	
		Schneider Electric	
		Siemens	
35	LT Servo Automatic Voltage Stabilizer & Isolation Transformers	Abhishek Electrical	
		Aplab	
		Automatic Electric	
		Recon	
36	Inverter	Luminous	
		Megatech	
		Neel Industrial Corporation	
37	Cable Trays (Factory Fabricated) / Raceways	Asian Ancillary Corporation	
		Elcon	
		Profab Engineer	
		Rico Steel	
		Slottco	
38	Fire Sealant & Fire Retardant Paint	BTHM Engineering	
		Birla 3 M	
		HILTI	
		Promat	
39	230/12 V Step Down Transformer with Built in Isolation Transformer	Talema	
		Volstat	

SCHEDULE T

Annexure-C (Contd)

KOLKATA PORT TRUST

CONCURRENT COMMITMENT(S) OF THE BIDDER (i.e Works In The Hand Of The Bidder AThe Time Of Submission Of Tender Offer)

(To be submitted with Part-I of Offer)

Bidders must fill in the under noted columns.

Sl. No.	Full particulars of works to be executed concurrently by the bidder. (i) Name of work. (ii) Client. (iii) W.O. No. & Date.	Sanctioned Tender Value. (in Rs.)	Completion time as stated in tender.	Name and address to whom reference can be made.
1	(i)			
	(ii)			
	(iii)			
2	(i)			
	(ii)			
	(iii)			
3	(i)			
	(ii)			
	(iii)			
4	(i)			
	(ii)			
	(iii)			

(To be submitted with Part-I of Offer) **Annexure-C(Contd)**

SCHEDULE 'O' SHEET – 1

The Bidders are also requested to furnish the following particulars:-

A) In case of Limited Company -

1) Name of Company :

2) Address of its present registered office. :

3) Date of its incorporation :

4) Full name and address of each of its Directors – any special particulars as to Directors if desire to be stated. :

5) Name, address and other necessary particulars of Managing Agents, if any appointed by the Company. :

6) Copies of Memorandum, Articles of Association (with the latest amendments, if any). :

7) Copies of audited balance sheets of the Company for the last **three years**. :

B) In case of a firm -

1) Name and address of the firm.
2) When business started

3) If registered a certified copy of certificate of registration. :

4) A certified copy of the Deed of Partnership :

5) Full name and address of each of the partners and the interest of each partner in the partnership – any special particulars as to partners if desired to be stated. :

6) Whether the firm pays income tax over Rs.10, 000/- per year :

(To be submitted with Part-I of Offer)

SCHEDULE 'O' SHEET – 2.

C) In case of an Individual:

1) Full name and address of the Bidder any special particulars of the Bidder if desired to be stated. :

2) Name of the father of the Bidder. :

3) Whether the Bidder carries on business in his own name or any other name. :

4) When business was started and by whom. :

5) Whether any other person is interested in the business directly or indirectly, if so, name and address etc. of such persons and the nature of such interest. :

6) Whether the Bidder pays Income Tax over Rs.10, 000/- per year. :

Dated:

(Full signature of Bidder)

(Proforma of Performance certificate/credential of works)

[To be issued on issuing authority's letterhead duly signed with office seal]

1.	Name of the Certifying Authority:	
2.	Name of the work :	
3.	Name of the Contractor :	
4.	Schedule date of commencement and completion of the work as per Work Order :	
5.	Date of actual commencement of work & date of actual completion :	
6.	i) If there is time overrun, whether delay is due to the contractor (Yes/No.): ii) If yes, what is the extent of delay attributable to the contractor :	
7.	Sanctioned Tender value & Actual value executed :	
8.	Quality of work (Excellent/satisfactory/poor) :	
9.	Remarks (If any) :	

ANNEXURE – D

DOCUMENTS TO BE UPLOADED

Scanned copy of the following documents to be uploaded:-

i) GST registration certificate.

ii) Valid Trade Licence (Valid for current period & also for type of work).

iii) Valid Professional Tax Clearance Certificate / Up to date tax payment challan. If this is not applicable, the bidder must submit a declaration in this regard.

iv) Proof of possessing valid Employees' Provident Fund (EPF) Account.EPF Registration Certificate.

v) Proof of being registered with Employees' State Insurance Corporation (ESIC), ESI Registration Certificate

vi) Details of the firm as per Schedule-O (in Part-I) of the tender document duly filled up.

vii) Credentials in the form of copies of Letters of Award of Works along with corresponding Completion Certificates from owners to justify that the intending bidder satisfies the earlier mentioned pre-qualification criteria.

viii) Balance sheet and Profit and Loss account / Trading account for the last 3 (three) financial years (i.e. 2016–2017, 2017-2018 and 2018-2019). The same should be audited as per relevant norms wherever required.

ix) Bank Draft/ Pay Order etc. regarding EMD & Cost of Tender documents / valid NSIC certificate

x) PAN Card

xi) A list of technically qualified and skilled persons would be engaged to supervise and execute the work **(to be mentioned in the letter head of the Firm).**

xii) Self declaration of the bidder that the Bidding Firm has Not been debarred / de- listed by any Govt / Quasi Govt. / Public Sector undertaking in India **(to be mentioned in the letter head of the Firm).**

xiii) Self declaration regarding the proprietor/partner(s)/authorized signatory of the bidding firm (in the case of proprietorship firm /partnership firm /limited company, as the case may be) is/are not associated with any other firm bidding for the same work **(to be mentioned in the letter head of the Firm).**

xiv) A list of works which are in hand at the time of submitting the offer as per the enclosed proforma titled 'Concurrent Commitments of The Bidder' vide 'Annexure-C' (Schedule –T) in Part-I of the tender document.

xv) Undertaking of the tenderer to be submitted as per enclosed Pro-forma (Annexure –D-1) in lieu of submission of signed copies of the full Tender document ,G.C.C,addenda & corrigendum **in the letter head of the Firm.**

xvi) Last page of "Bill of Quantities" & the "Form of Tender" duly filled up (without price quoted) shall be duly signed and stamped by the Bidder.

N. B.-1 The bidder will have to produce the original documents or any additional documents, if asked for, to satisfy the Authorities.

N.B.-2 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements and their **EMD will be forfeited for such action**.

ANNEXURE –D-1

NIT NO. KOPT/KDS/CIV /T/2429/91 DT. 01.11.2019

[DOCUMENT TO BE DOWNLOADED, FILLED IN UNDER BIDDER'S LETTERHEAD, SIGNED, SCANNED AND UPLOADED]
Undertaking to be submitted in lieu of uploading/submitting signed copy of full tender document

Ref. No…… Dated:

The Chief Engineer,
Kolkata Port Trust,
Civil Engineering Department,
15, Strand Road,
Kolkata – 700 001

Dear Sir,

1. We, ……..(Name of Tenderer) have fully read and understood the entire Tender Document, GCC, Corrigendum and Addenda, if any, downloaded from under the instant e-tender and no other source, and will comply to the said document, GCC, Corrigendum and Addenda.

We are submitting this undertaking in lieu of submission of signed copy of the full tender documents GCC, Corrigendum and Addenda.

Yours faithfully,

Signature of Tenderer……

Name: ……..

Designation: ……

Date : ……..

Seal of the tenderer…….

Annexure –E

कोलकाता पत्तन न्यास

Kolkata Port Trust

सिविल इंजीनियरिंग विभाग

CIVIL ENGINEERING DEPARTMENT

१५, स्ट्रैंड रोड, कोलकाता -७००००१

15, Strand Road, Kolkata – 700001

NIT No.: **KOPT/KDS/CIV /T/2429/91** **DT. 01.11.2019**

NOTE: Last Date of Download **of tender documents:** 12.11.2019 **(up to 14-00 hours)**

Tender is due for submission by 3:00 P.M On **12.11.2019**
Tender is to be opened **on 13.11.2019** (After 15.00 Hours)

PRICE BID

****
Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust.

****

Annexure-E (Contd.)

E-TENDER FOR " Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust ***".***

NIT NO : KOPT/KDS/CIV /T/2429/91 DT. 01.11.2019

PRICE BID

TENDER PARTICULARS

EARNEST MONEY	**:**	**Rs. 12,24,000.00 (Rupees Twelve lakh twenty four thousand Only)**
Cost of Tender document (Non-refundable)		**Rs.2950/-(Rupees Two thousand nine hundred fifty only) including @18% GST)**
TIME OF COMPLETION	**:**	**6 (Six) Months**
PERIOD OF DOWNLOAD OF E-TENDER (Both Days Inclusive)		**06.11.2019** to **12.11.2019** (UPTO 14:00 HRS.)
DATE AND TIME FOR PRE-BID MEETING & SITE VISIT	**:**	**No Pre-bid meeting**
LAST DATE OF SUBMISSION OF E-TENDER AND OPENING OF THE TENDER	**:**	**Submission on 12.11.2019 Up to 15:00 hrs.** **Opening on 13.11.2019 After 15:00 hrs.**

कोलकाता पत्तन न्यास

Kolkata Port Trust

सिविल इंजीनियरिंग विभाग

CIVIL ENGINEERING DEPARTMENT

PREAMBLE TO THE BILL OF QUANTITIES

Name of Work: **Revitalization of Clock Tower Jetty near no. 8 work shop, Kolkata Port Trust**

NIT NO: KOPT/KDS/CIV /T/2429/92 DT. 01.11.2019

The Bill of Quantities must be read with the General Conditions of Contract, the Special Conditions of Contract and the Particular Specifications of Work and the Bidder is deemed to have examined the above documents and to have thoroughly familiarise himself with the total scope of work and its mode of execution.

1.2 The quantities given in the Bill of Quantities are approximate only and are given to provide a common basis for tendering. Payment will be made according to the quantities of each item of work actually carried out at the accepted rates as per Order Letter. The measurements of each item of work shall be measured jointly by the Engineer or his Representative.

1.3 General direction and description of work or materials given elsewhere in the contract documents are not necessarily repeated in the description of items in the Bill of Quantities.

1.4 The prices and rates entered by the Contractor in the Bill of Quantities shall be deemed to cover the complete and finished work, inter-alia, all costs and expenses which may be required for successful completion of the works together with all risks, liabilities, contingencies, insurance, octroi, royalties, taxes and obligations imposed or implied by the Contractor.

1.5 Where separate items such mobilisation, demobilisation, temporary works etc., have not been provided in the Bill of Quantities for works required under the Contract, then the cost of such works shall be deemed to have been included in the prices and rates of other items.

1.6 Without affecting the generality of the foregoing provisions, the prices and rates entered in the Bill of Quantities by the Contractor shall include inter-alia, all costs and expenses involved in or arising out the followings:-

1.7 The provision, storage, transport, handling, use distribution and maintenance of all materials, plans, equipment machineries and tools including all costs, charges dues demurrages or other outlays involved in the transportation.

1.8 The provision and maintenance of all his staff and labours and their payments, accommodation, transport, taxes and other requirements.

1.9 Setting out including the location and preservation of survey markers, measurement and supervision.

2.0 The provision, storage, transpsort, use handling, distribution and maintenance of consumable stores, fuel, water and electricity.

2.1 All First Aid, Welfare and safety requirements.

2.2 Damage caused to the works, plants, materials and consumables stores caused by weather.

2.3 Licence, fees and other charges for compliance of Government Acts and Rules that are inforce and applicable.

2.4 The Contractor should be held responsible for the safe custody of materials, machineries etc. at site procured by him or issued to him by the Trustees.

2.5 This being a **item rate tender**, the Bidder shall quote his rates **on line** based on his own analysis .

The Tender Price thus established would be taken for comparative evaluation of E-Tenderers.

2.6 The Contractor shall at all times keep the site and working areas free from all surplus materials, rubbish , other excavated/offensive matter etc. all of which shall be disposed off in a manner to be approved by the Engineer's Representative.

2.7 On completion of the works the contractor shall reinstate and make good at his own expense any property or land which might have been disturbed and/or damaged by his works. He should also clean the site as required during execution and fully clear the site after completion of all the works.

The contractor shall forward any usable materials found during the course of construction at the work site or its vicinity to KoPT stores/yards, dispose off the debris beyond the port area all at his own expenses by his own transport and labour and clean out all part of the work and leave everything clean and tidy to the entire satisfaction of the Engineer, failing which suitable deduction will be made from final bill as per discretion of the Engineer/Engineer's representative.

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कोलकाता पत्तन न्यास

Kolkata Port Trust

सिविल इंजीनियरिंग विभाग

CIVIL ENGINEERING DEPARTMENT

BILL OF QUANTITIES

E-TENDER FOR " Revitalization of Clock Tower Jetty near no. 8 work shop,Kolkata Port Trust ***"*.**

NIT NO : KOPT/KDS/CIV /T/2429/91 DT. 01.11.2019

BILL OF QUANTITIES

Sl. No.	Description of Item	Quantity	Rate	Unit	Amount
	Boat sculpture Water Bodies and Feature wall				
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. (a) All kinds of soil.				
	RC wall for water body	**105.84**	**Cum**		
	RC wall for Feature wall	**5.31**	**Cum**		
2	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. Back filling				
		86.76	**Cum**		
3	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) : Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 Coarse sand) to match the existing floor:With Chlorpyriphos/Lindane E.C. 20% with 1% concentration.	**68.60**	**Sqm**		
4	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:				

	1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)				
	PCC below Foundation	**6.86**	**Cum**		
	PCC below water body	**11.53**	**Cum**		
	PCC below water body	**0.77**	**Cum**		
5	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately).				
	All works upto plinth level				
	Footing	**22.34**	**Cum**		
	Footing for Wall	**2.05**	**Cum**		
	All works above plinth level upto floor V level				
	RC walls	**21.61**	**Cum**		
	Bottom slab	**17.30**	**Cum**		
	RC Feature wall	**6.30**	**Cum**		
6	Centering and shuttering including strutting, propping etc. and removal of form for :				
	Foundations, footings, bases of columns, etc. for mass concrete	**37.24**	**Sqm**		
	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	**144.06**	**Sqm**		
7	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level.				
	Thermo-Mechanically Treated bars of grade Fe-500D or more.	**8768.16**	**kgs**		
8	Plastering on walls				
	20 mm cement plaster of mix :				
	1:4 (1 cement: 4 fine sand)				
	Water body wall	**46.55**	**Sqm**		

	Feature wall	**28.00**	**Sqm**		
9	Providing and fixing Glass mossaic tiles on finished plain wall surface of size 20 mm x 20 mm x 4 mm in all colour, design , fixing in customize design as per direction of Engineer-in- Charge. The glass mosaic tiles to be fixed on the wall surface with the help of approved adhesive applied at the rate of 2.5 kg per sqm and grouting of the same. The rate is inclusive of all operation, material and required pattern approved by Engineer-in-Charge:				
	Water body wall dado	**46.55**	**Sqm**		
	Bottom	**115.30**	**Sqm**		
10	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI- 212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage.				
	For vertical surface two coats @ 0.70 kg per sqm	**46.55**	**Sqm**		
	For horizontal surface one coat @1.10 kg per sqm	**115.30**	**Sqm**		
11	Stone tile (polished) work for wall lining over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and cement slurry @ 3.3 kg/sqm including pointing in white cement complete. 8mm thick Granite of any colour and shade				
	Water body wall	**12.35**	**Sqm**		
	Feature wall	**28.00**	**Sqm**		

	Hardscape,Kerb and Railing works				
12	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)				
	below flooring	**199.50**	**Cum**		
13	**Epoxy Water Proofing :** Providing, mixing and applying bonding coat of approved adhesive on chipped portion of RCC as per specification and direction of Engineer-in-Charge complete in all respect: Epoxy bonding adhesive having coverage 2.20 Sq.m. per Kg of approve make.	1330.00	**Sqm**		
14	Providing and laying flamed finish Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge :				
	Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.	**1330.00**	**Sqm**		
15	**Kerb Stone work** Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)				
	PCC below Kerb	**5.25**	**Cum**		
16	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 coarse sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per	**11.81**	**Cum**		

	direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (Precast C.C. kerb stone shall be approved by Engineer-in-charge).				
17	**Railing** Providing and laying cement concrete in retaining walls, return walls,walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor etc.,	**3.06**	**Sqm**		
18	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-incharge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.).				
	20Kg/Sq.mts	**2992.00**	**Kgs**		
19	**Planter Box :** Brick work with common burnt clay F.P.S. (non-modular) bricks of class designation 7.5 in superstructure above plinth level upto floor V level in all shapes and sizes in Cement Mortat 1:4 (1 cement : 4 course sand)	**20.52**	**Cum**		
20	12 mm Cement plaster of of mix : 1 : 4 (1 cement : 4 fine sand)	**135.40**	**Sqm**		
21	Finishing walls with water proofing cement paint of required shed : New work (2 or more coats applied @ 3.84 Kg/10 Sqm)	**135.40**	**Sqm**		
22	**Demolishing Works - Existing building :** Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge.	90.00	**Cum**		

	Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix)				
23	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.(In cement mortar)				
	Exhibition space area	**66.00**	**Cum**		
24	Demolishing RCC work manualy/by mechanical means including stacking of steel bars and disposal unserviceable materials with 50 meters lead as per direction of Engineer-in-Charge : Columns	**27.54**	**Cum**		
	Beams	**31.05**	**Cum**		
	Staircase	**4.68**	**Cum**		
	Slab	**64.50**	**Cum**		
25	Dismantling doors, windows and clearstory windos (steel or wood) shutter including Chowkhats, architrave, holdfasts etc. complete and stacking within 50 meters lead : Of area 3 Sqm & below	**8.00**	**Nos.**		
	Of area beyond 3 Sqm	**12.00**	**Nos.**		
26	Disposal of dismantled or waste materials by mechanical transport including loading, transporting, unloading to approved municipal dumping ground for lead upto 10 Km for all lifts, complete as per direction of Engineer-in-Charge .	**283.77**	**Cum**		
27	**Civil work for Exhibition centre and Restaurant building** Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. (a) All kinds of soil. **F-1**	**90.09**	**Cum**		
28	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. Back filling	**81.18**	**Cum**		
29	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical	**690.87**	**Sqm**		

	emulsion) : Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 Coarse sand) to match the existing floor:With Chlorpyriphos/Lindane E.C. 20% with 1% concentration.				
30	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size) **F-1**	**2.90**	**Cum**		
	Below flooring	**43.00**	**Cum**		
31	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately). **All works upto plinth level : F-1**	**8.91**	**Cum**		
	F-2	**14.40**	**Cum**		
	F-3	**5.74**	**Cum**		
	All works above plinth level upto floor V level : C1 upto FFL	5.47	Cum		
		1.08	Cum		
	C-1	14.58	Cum		
		2.88	Cum		
	Plinth beams	31.05	Cum		
	Roof Beams	26.27	Cum		
	Roof Beams	6.37	Cum		
	Roof Slab	55.50	Cum		
	OHT Bottom slab	0.90	Cum		
	Walls	1.35	Cum		
		0.68	Cum		
	Top Slab	0.68	Cum		
32	Centering and shuttering including strutting, propping etc. and removal of form for :	84.64	Sqm		

	Foundations, footings, bases of columns, etc. for mass concrete				
	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	27.00	Sqm		
	Suspended floors, roofs, landings, balconies and access platform	379.00	Sqm		
	Lintels, beams, plinth beams, girders, bressumers and cantilevers	562.62	Sqm		
	Columns, Pillars, Piers, Abutments, Posts and Struts	204.60	Sqm		
33	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level. **Thermo-Mechanically Treated bars of grade Fe-500D or more.**	18062.10	Kgs.		
34	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in : **Cement mortar 1:4 (1 cement : 4 coarse sand)**	93.84	Cum		
35	Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level. **Cement mortar 1:3 (1 cement :3 coarse sand)**	72.90	Sqm		
36	Providing and fixing 18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. **Granite of any colour and shade Area of slab upto 0.50 sqm**	13.58	Sqm		
37	Providing edge moulding to 18 mm thick marble stone counters, Vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge. **Granite work**	22.64	Rmt.		
38	Extra for providing opening of required size & shape for wash basin/ kitchen sink in kitchen platform, vanity counter and similar location in marble/ Granite/ stone work, including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.	8.00	Nos.		
39	Providing and fixing factory made P.V.C. door frame of size 50x47 mm with awall thickness of 5 mm, made out of extruded 5mm rigid PVC foam sheet, mitred at corners and joined with 2 Nos of 150 mm long brackets of 15x15 mm	40.80	Rmt.		

	M.S. square tube, the vertical door frame profiles to be reinforced with 19x19 mm M.S. square tube of 19 gauge, EPDM rubber gasket weather seal to be provided through out the frame. The door frame to be fixed to the wall using M.S. screws of 65/100 mm size, complete as per manufacturer's specification and direction of Engineerin- Charge.				
40	Providing and fixing factory made panel PVC door shutter consisting of frame made out of M.S. tubes of 19 gauge thickness and size of 19 mm x 19 mm for styles and 15x15 mm for top & bottom rails. M.S. frame shall have a coat of steel primers of approved make and manufacture. M.S. frame covered with 5 mm thick heat moulded PVC 'C' channel of size 30 mm thickness, 70 mm width out of which 50 mm shall be flat and 20 mm shall be tapered in 45 degree angle on both side forming styles and 5 mm thick, 95 mm wide PVC sheet out of which 75mm shall be flat and 20 mm shall be tapered in 45 degree on the inner side to form top and bottom rail and 115 mm wide PVC sheet out of which 75 mm shall be flat and 20 mm shall be tapered on both sides to form lock rail. Top, bottom and lock rails shall be provided both side of the panel. 10 mm (5 mm x 2) thick, 20 mm wide cross PVC sheet be provided as gap insert for top rail & bottom rail, paneling of 5 mm thick both side PVC sheet to be fitted in the M.S. frame welded/ sealed to the styles & rails with 7 mm (5 mm+2 mm) thick x 15 mm wide PVC sheet beading on inner side, and joined together with solvent cement adhesive. An additional 5 mm thick PVC strip of 20 mm width is to be stuck on the interior side of the 'C' Channel using PVC solvent adhesive etc. complete as per direction of Engineer-in-charge, manufacturer's specification & drawing.	15.12	Sqm		
	30mm think pre-laminated PVC door shutter	6.30	Sqm		
41	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters. **80x1.25 mm M.S. laths with 1.25 mm thick top cover**	14.40	Sqm		

42	Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm, including pointing in white cement mixed with pigment of matching shade complete.	176.19	Sqm		
43	Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand), Jointing with grey cement slurry @ 3.3 kg/sqm including pointing the joints with white cement and matching pigment etc., complete.	78.00	Sqm		
44	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), jointing with grey cement slurry @ 3.3 kg/ sqm including grouting the joints with white cement and matching pigments etc., complete. **size of tiles 600mm x 600 mm**	350.00	Sqm		
45	20 mm cement plaster of mix : 1:4 (1 cement: 4 fine sand)	440.00	Sqm		
46	12 mm cement plaster of mix : 1:4 (1 cement: 4 fine sand)	1503.28	Sqm		
47	Distempering with oil bound washable distemper of approved brand and manufacture to give an even shade : New work (two or more coats) over and including water thinnable priming coat with cement primer	1503.28	Sqm		
48	**Finishing walls with Acrylic Smooth exterior paint of required shade :** New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)	440.00	Sqm		
49	**Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C., kitchen and the like consisting of:** (i) Ist course of applying cement slurry @ 4.4 kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement : 3 coarse sand) mixed with water	103.17	Sqm		

	proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sqm of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sqm).				
50	**Providing and laying water proofing treatment on roofs of slabs by applying cement slurry mixed with water proofing cement compound consisting of applying:** (a) after surface preparation, first layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/sqm. (b) laying second layer of Fibre glass cloth when the first layer is still green. Overlaps of joints of fibre cloth should not be less than 10 cm. (c) third layer of 1.5 mm thickness consisting of slurry of cement @ 1.289 kg/sqm mixed with water proofing cement compound @ 0.670 kg/sqm and coarse sand @ 1.289 kg/sqm. This will be allowed to air cure for 4 hours followed by water curing for 48 hours. The entire treatment will be taken upto 30 cm on parapet wall and tucked into groove in parapet all around. (d) fourth and final layer of brick tiling with cement mortar (which will be paid for separately.	406.00	Sqm		
	Staircase - Structural Steel works				
51	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required: In stringers, treads, landings etc. of stair cases, including use of chequered plate wherever required, all complete. Structural steel Quantities are approximately indicative, may vary as per shop /Construction drawings. Item of work will be paid item rate bases on Executed quantity on site.	**2122.60**	**Kgs**		
	Restaurant Roof				
52	Supply and installation of Tensile roof structures membrane 2mm roof sheeting Membrane shall be Precontraint PVC/PVDF coated with following Characteristics. Yarn: High Tenacity Polyester Yarn PES HT 1100 Dtex Coated fabric Weight: 750 g/m² Tensile Strength Warp/ Weft: 2800/ 2800 N/ 5cm Tear Strength Warp/ Weft: 300/ 280 N,complete item of work.	407.00	Sqm		
53	Providing and applying integral crystalline	430.00	Sqm		

	slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI- 212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage.For horizontal surface one coat @1.10 kg per sqm.				
	External Tensile Roof structures				
54	Supply and installation of Tensile roof structures memmbrane 2mm roof sheeting Membrane shall be Precontraint PVC/PVDF coated with following Characteristics. Yarn: High Tenacity Polyester Yarn PES HT 1100 Dtex Coated fabric Weight: 750 g/m² Tensile Strength Warp/ Weft: 2800/ 2800 N/ 5cm Tear Strength Warp/ Weft: 300/ 280 N,complete item of work.				
	Punching Machine Room	**60.30**	**Sqm**		
	at walkway	**20.25**	**Sqm**		
55	**Cement concrete Pontoon jetty view port and Bridge:** Dismantling Existing flooring including stacking material.	**60.00**	**Sqm**		
56	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)				
	Below Walk way flooring	**9.00**	**Cum**		
57	Providing and laying flamed finish Granite stone				

	flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge :				
	Flooring	**60.00**	**Sqm**		
58	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)				
	View port	**36.00**	**Cum**		
59	**Epoxy water proofing** Providing, mixing and applying bonding coat of approved adhesive on chipped portion of RCC as per specifications and direction of Engineer-In-charge complete in all respect: Epoxy bonding adhesive having coverage 2.20 sqm/kg of approved make.	**360.00**	**Sqm**		
	Open Air theater and surrounding area development				
60	Supplying and filling sand/earth, including watering, ramming, consolidating and dressing complete.				
	Sand filling	**9.90**	**Cum**		
61	Excavating, supplying and filling of local earth (including royalty) by mechanical transport upto a lead of 5km also including ramming and watering of the earth in layers not exceeding 20 cm in trenches, plinth, sides of foundation etc. complete.				
	Earth filling	**9.90**	**Cum**		
62	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:				
	1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)	**9.90**	**Cum**		
	Steps	**4.18**	**Cum**		

63	Providing and laying flamed finish Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge :				
	Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.				
	OAT	**99.00**	**Sqm**		
	Retaining wall construction				
64	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. (a) All kinds of soil				
	RW footing	**182.16**	**Cum**		
65	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. Back filling				
	Earth filling	**91.08**	**Cum**		
66	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) : Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 Coarse sand) to match the existing floor: With Chlorpyriphos/Lindane E.C. 20% with 1% concentration	**165.60**	**Sqm**		
67	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm				

	nominal size)				
	PCC below foundation	**24.84**	**Cum**		
68	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately). All works upto plinth level				
	RW Footing	**66.24**	**Cum**		
	RC walls	**257.60**	**Cum**		
	Beams	**27.97**	**Cum**		
	Slab	**73.50**	**Cum**		
69	Centering and shuttering including strutting, propping etc. and removal of form for :				
	Foundations, footings, bases of columns, etc. for mass concrete	**82.80**	**Sqm**		
	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	**1288.00**	**Sqm**		
70	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level. Thermo-Mechanically Treated bars of grade Fe-500D or more.	**64641.24**	**kgs**		
71	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the				

	requirements as specified in ACI- 212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage.				
	For vertical surface two coats @ 0.70 kg per sqm	**1370.80**	**Sqm**		
	Civil work for Toilet block construction				
72	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. (a) All kinds of soil.				
	F1	**116.64**	**Cum**		
73	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. Back filling	**107.57**	**Cum**		
74	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) : Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 Coarse sand) to match the existing floor:With Chlorpyriphos/Lindane E.C. 20% with 1% concentration.	**243.07**	**Sqm**		
75	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:				
	1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size)				
	F1	**3.53**	**Cum**		
	Below flooring	**14.03**	**Cum**		

76	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately).				
	All works upto plinth level				
	F1	**9.07**	**Cum**		
	All works above plinth level upto floor V level				
	C1 upto FFL	**2.51**	**Cum**		
	C1	**4.66**	**Cum**		
	Plinth beams	**9.39**	**Cum**		
	Roof Beams	**7.04**	**Cum**		
	Roof Slab	**19.25**	**Cum**		
	OHT				
	Bottom slab	**0.90**	**Cum**		
	Walls	**1.35**	**Cum**		
		0.68	**Cum**		
	Top slab	**0.68**	**Cum**		
77	Centering and shuttering including strutting, propping etc. and removal of form for :				
	Foundations, footings, bases of columns, etc. for mass concrete	**30.24**	**Sqm**		
	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	**27.00**	**Sqm**		
	Suspended floors, roofs, landings, balconies and access platform	**163.00**	**Sqm**		
	Lintels, beams, plinth beams, girders, bressumers and cantilevers	**189.78**	**Sqm**		
	Columns, Pillars, Piers, Abutments, Posts and Struts	**95.58**	**Sqm**		
78	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth				

	level.				
	Thermo-Mechanically Treated bars of grade Fe-500D or more.	**5372.64**	**kgs**		
79	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in :				
	Cement mortar 1:4 (1 cement : 4 coarse sand)	**53.57**	**Cum**		
80	Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level.				
	Cement mortar 1:3 (1 cement :3 coarse sand)	**50.47**	**Sqm**		
81	Providing and fixing 18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels.				
	Granite of any colour and shade				
	Area of slab upto 0.50 sqm	**2.52**	**Sqm**		
82	Providing edge moulding to 18 mm thick marble stone counters, Vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.				
	Granite work	**4.20**	**Rmt**		
83	Extra for providing opening of required size & shape for wash basin/ kitchen sink in kitchen platform, vanity counter and similar location in marble/ Granite/ stone work, including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.	**25.20**	**Each**		
84	Providing and fixing factory made P.V.C. door frame of size 50x47 mm with awall thickness of 5 mm, made out of extruded 5mm rigid PVC foam sheet, mitred at corners and joined with 2 Nos of 150 mm long brackets of 15x15 mm M.S.	**20.40**	**Rmt**		

	square tube, the vertical door frame profiles to be reinforced with 19x19 mm M.S. square tube of 19 gauge, EPDM rubber gasket weather seal to be provided through out the frame. The door frame to be fixed to the wall using M.S. screws of 65/100 mm size, complete as per manufacturer's specification and direction of Engineerin- Charge.				
		59.40	**Rmt**		
85	Providing and fixing factory made panel PVC door shutter consisting of frame made out of M.S. tubes of 19 gauge thickness and size of 19 mm x 19 mm for styles and 15x15 mm for top & bottom rails. M.S. frame shall have a coat of steel primers of approved make and manufacture. M.S. frame covered with 5 mm thick heat moulded PVC 'C' channel of size 30 mm thickness, 70 mm width out of which 50 mm shall be flat and 20 mm shall be tapered in 45 degree angle on both side forming styles and 5 mm thick, 95 mm wide PVC sheet out of which 75mm shall be flat and 20 mm shall be tapered in 45 degree on the inner side to form top and bottom rail and 115 mm wide PVC sheet out of which 75 mm shall be flat and 20 mm shall be tapered on both sides to form lock rail. Top, bottom and lock rails shall be provided both side of the panel. 10 mm (5 mm x 2) thick, 20 mm wide cross PVC sheet be provided as gap insert for top rail & bottom rail, paneling of 5 mm thick both side PVC sheet to be fitted in the M.S. frame welded/ sealed to the styles & rails with 7 mm (5 mm+2 mm) thick x 15 mm wide PVC sheet beading on inner side, and joined together with solvent cement adhesive. An additional 5 mm thick PVC strip of 20 mm width is to be stuck on the interior side of the 'C' Channel using PVC solvent adhesive etc. complete as per direction of Engineer-in-charge, manufacturer's specification & drawing.	**7.56**	**Sqm**		
	30 mm thick pre laminated PVC door shutters	**18.90**	**Sqm**		
86	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long				

	wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.				
	80x1.25 mm M.S. laths with 1.25 mm thick top cover	**14.40**	**Sqm**		
87	Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm, including pointing in white cement mixed with pigment of matching shade complete.	**168.46**	**Sqm**		
88	Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement : 4 Coarse sand), Jointing with grey cement slurry @ 3.3 kg/sqm including pointing the joints with white cement and matching pigment etc., complete.	**61.00**	**Sqm**		
89	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), jointing with grey cement slurry @ 3.3 kg/ sqm including grouting the joints with white cement and matching pigments etc., complete.				
	Size of Tile 600x600 mm	**66.08**	**Sqm**		
90	20 mm cement plaster of mix :				
	1:4 (1 cement: 4 fine sand)	**217.53**	**Sqm**		
91	12 mm cement plaster of mix :				
	1:4 (1 cement: 4 fine sand)	**759.49**	**Sqm**		
92	Distempering with oil bound washable distemper of approved brand and manufacture to give an even shade :				

	New work (two or more coats) over and including water thinnable priming coat with cement primer	**759.49**	**Sqm**		
93	Finishing walls with Acrylic Smooth exterior paint of required shade :				
	New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)	**157.53**	**Sqm**		
94	Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C., kitchen and the like consisting of: (i) Ist course of applying cement slurry @ 4.4 kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sqm of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sqm).	**85.07**	**Sqm**		
95	Providing and laying water proofing treatment on roofs of slabs by applying cement slurry mixed with water proofing cement compound consisting of applying:				
	(a) after surface preparation, first layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/sqm. (b) laying second layer of Fibre glass cloth when the first layer is still green. Overlaps of joints of fibre cloth should not be less than 10 cm. (c) third layer of 1.5 mm thickness consisting of slurry of cement @ 1.289 kg/sqm mixed with water proofing cement compound @ 0.670 kg/sqm and coarse sand @ 1.289 kg/sqm. This will be allowed to air cure for 4 hours followed by water curing for 48 hours. The entire treatment will be taken upto 30 cm on parapet wall and tucked into groove in parapet all around. (d) fourth and final layer of brick tiling with cement mortar (which will be paid for separately.	**190.00**	**Sqm**		

96	**Construction of Scenic Deck Structural Works** Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. (a) All kinds of soil.(i) **Footings**	**216.38**	**Cum**		
	(ii) Footings -CF	**24.02**	**Sqm**		
97	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.**Back filling**	**189.27**	**Cum**		
98	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) : Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 Coarse sand) to match the existing floor:With Chlorpyriphos/Lindane E.C. 20% with 1% concentration.	**3.90**	**Sqm**		
99	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: **1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size) PCC below Foundation**	**12.46**	**Cum**		
	PCC below CF	**1.52**	**Cum**		
100	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately). **All works upto plinth level Footing - F1**	**45.29**	**Cum**		
	Footing - CF	**5.85**	**Cum**		
	All works above plinth level upto floor V level : Column - Circular	**23.04**	**Cum**		
	Slab (Deck Slab)	**44.25**	**Cum**		

	PB1	**19.28**	**Cum**		
	PB1	**10.06**	**Cum**		
	PB1	7.07	**Cum**		
	TB1	9.64	**Cum**		
	TB1	5.42	**Cum**		
101	Centering and shuttering including strutting, propping etc. and removal of form for :Foundations, footings, bases of columns, etc. for mass concrete.	**102.24**	Sqm		
		9.45	Sqm		
	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	**0.00**	Sqm		
	Suspended floors, roofs, landings, balconies and access platform	**295.00**	Sqm		
	Columns, Pillars, Piers, Abutments, Posts and Struts	**46.07**	**Sqm**		
	Lintels, beams, plinth beams, girders, bressumers and cantilevers	**457.45**	**Sqm**		
102	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level.**Thermo-Mechanically Treated bars of grade Fe-500D or more.**	**19083.77**	**Kgs.**		
103	**Platering on walls :** 20 mm cement plaster of mix : 1:4 (1 cement: 4 fine sand)	**798.52**	**Sqm**		
104	**Structural Steel deck works :** Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. with structural members like Structural steel tubes, rafters, continuous beams, wall purlin members, curved eaves, side wall grits if required, rigid frame columns, rod bracing etc., Structural steel Quantities are approximately indicative, may vary as per shop /Construction drawings. Item of work will be paid item rate bases on Executed quantity on site.	**20989.80**	**Kgs.**		
105	Providing and fixing GI deck sheet on structural supports with studs.	**300.00**	**Sqm**		
106	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal	**615.21**	**Sqm**		

	surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI- 212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage.**For vertical surface two coats @ 0.70 kg per sqm**				
	For horizontal surface one coat @1.10 kg per sqm	**295.00**	**Sqm**		
107	25 mm wooden planking, tongued and grooved in flooring, including fixing with iron screws complete with : as per approval.	**385.00**	**Sqm**		
108	**Civil work for STP (10KLD)** Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge. (a) All kinds of soil **Equalization tank**	**6.50**	**Cum**		
	Sludge tank	**2.55**	**Cum**		
	Oil trap	**2.16**	**Cum**		
	Bar screen pit	**1.03**	**Cum**		
109	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. Back filling	**10.01**	**Cum**		
110	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) : Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 Coarse sand) to match the existing floor: With Chlorpyriphos/Lindane E.C. 20% with 1% concentration	**20.00**	**Sqm**		
111	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 Cement : 2 coarse sand (zone-III) : 4 graded stone aggregate 40 mm nominal size) **PCC below foundation**	**1.71**	**Cum**		

112	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.(Note :- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/recoverable separately). All works upto plinth level **STP RCC slab (Bottom & Top) Equalization tank**	**0.51**	**Cum**		
	Sludge tank	**0.19**	**Cum**		
	Oil trap	**0.19**	**Cum**		
	Bar screen pit	**0.12**	**Cum**		
	Pump platform	**0.60**	**Cum**		
	STP RCC walls : Equalization tank	**1.73**	**Cum**		
	Sludge tank	**0.86**	**Cum**		
	Oil trap	**0.73**	**Cum**		
	Bar screen pit	**0.29**	**Cum**		
	Bar screen pit	**0.11**	**Cum**		
113	**Centering and shuttering including strutting, propping etc. and removal of form for :** Suspended floors, roofs, landings, balconies and access platform with water proof ply 12 mm thick	**10.78**	**Sqm**		
	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	**28.72**	**Sqm**		
114	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level. Thermo-Mechanically Treated bars of grade Fe-500D or more.	**573.60**	**Kgs.**		
115	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservior, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline slurry : 2 parts water) for vertical surfaces and 3 : 1 (3 parts integral crystalline slurry : 1 part water) for horizontal surfaces and applying the same from negative (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI- 212-3R-2010 i.e by reducing permeability of concrete by more than	**28.72**	**Sqm**		

	90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage. **For vertical surface two coats @ 0.70 kg per sqm**				
	For horizontal surface one coat @1.10 kg per sqm	**6.72**	**Sqm**		
	Landscaping-Plants				
116	**Trees & Palms**				
117	Cassia fistula	**4.00**	**Nos**		
118	Ficus benjamina	**7.00**	**Nos**		
119	Plumeria rubra	**10.00**	**Nos**		
120	Tecoma gaudicgaudi	**12.00**	**Nos**		
121	Chrysalidocarpus lutescens	**11.00**	**Nos**		
122	Royastonia regia	**9.00**	**Nos**		
123	Licuala gradis	**5.00**	**Nos**		
	SHRUBS				
124	Canna indica	**100.00**	**Nos**		
125	Condiaeum variegatum	**165.00**	**Nos**		
126	Dracaena marginata	**20.00**	**Nos**		
127	Hymenocallis littoralis	**350.00**	**Nos**		
128	Rhapis excelsa	**6.00**	**Nos**		
	GROUND COVERS				
129	Pennisetum setaceum	3850.00	**Nos**		
130	Tradescantia spathacea	3850.00	**Nos**		
131	Wadelia trilobata	4290.00	**Nos**		
132	Lawn	**2611.00**	**SQ.M**		
	SOIL WORK				
133	150mm thk Top soil consist of a mixture of soil, manure and coco peat in the ratio of 2:1:1. This is to be further supplemented with bio fertilizers, Neem cake etc. complete.	**2026.00**	**SQ.M**		
	LAWN				
134	Supply and dibble the Paspalum grass at 35mm spacing. Roll the lawn after	**800.00**	**SQ.M**		

	planting. Irrigate the lawn regularly. Remove weeds on periodical basis. Nurture the lawn with organic, bio-insecticides, predator innoculation to protect the lawn from pest and disease.				
	FOOD COURT INTERNAL ELECTRICAL WORKS (G+1)				
	A) Internal Electricals ; Fans & Light Fixtures				
	Supply,erection,testing and commissioning of LED light fixtures with all accessories as required.				
135	Supply, Erection, Testing & Commissioning of Batten light fixture with Essential LED tube that integrates LED light source with frosted cover with 20W and 40, 000 hours life & 2000 lumen output & CRI 80. Complete withall accessories including lamps.	**58.00**	**Nos**		
136	Supply, Erection, Testing & Commissioning of ceiling recessed circular downlight Green Perform. Green Perform range is a breakthrough offering which combines modern product design, the latest LED technology and reliable heat management to deliver a long lasting efficient solution for offices and retails spaces. The power consumtion of fixture 15W producing a lumen output minimum of 1500 lumen. The fixture is designed for 50,000 hrs of operational life at L70, i.e. the lumen output of fixture reduces to 70% of its original output after 50,000 hrs. The fixture come with analog dimmable driver compliances : IEC 62384 , IEC 61347-2-13, IEC 61547, EMI- CISPR15, cut-out dia -138mm". The cosntruction of fixture is Pressure Die cast Aluminim heat sink and high efficiency Polycarbonate diffuser with more than 85% Transmittance and SS spring clip	**76.00**	**Nos**		

	complete as required.				
137	Supply, Erection, Testing & Commissioning of ceiling recessed circular **Spotlight** Green Perform. Green Perform range is a breakthrough offering which combines modern product design, the latest LED technology and reliable heat management to deliver a long lasting.The power consumtion of fixture 15W producing a lumen output minimum of 1500 lumen.	**55.00**	**Nos**		
138	Supply , Erection, Testing & Commissioning of LED Recessed Downlighter with a nominal system lumen output of 1200 lumens 12W Recessed, LED Round Slim Panel, White powder coated pressure die cast aluminum housing and bottom frame, Slim luminaire with high transmitive LGP technology, High efficiency, non-yellowing PMMA diffuser, Excellent thermal management with die cast aluminum construction, Specially designed, easy to install mounting clips.	**10.00**	**Nos**		
139	Supply, Erection, Testing & Commissioning of 11 W Mirror light /ceiling mounting luminaire with all other accessories as required.	**4.00**	**Nos**		
140	supply , Erection, Testing & Commissioning of 100W High Lumen output, SMD LED High Bay with Luminare efficacy upto 12000 Lumens with Al Die cast Housing , powder coated body,High purity polycarbonate Lenses for superior performance,Toughened glass with silicon gaskets for IP66 Protection Designed for installation for pendant/surface mounted.	**9.00**	**Nos**		
141	Supply and installation testing and commissioning of 48" (1200mm) Sweep ISI mark Ceiling Fan as per IS 374 - 1979 and, with double ball bearings,	**28.00**	**Nos**		

	power input not more than 50W , air delivery more than 200 cubic meter/min but with Regulator.				
142	Supply, Erection, Testing and Commissioning of following sizes of exhaust fan with 3 core flexible wire as required. a) 300 mm 900 RPM	**4.00**	**Nos**		
143	**Internal Electricals ; Earthing System** Providing independent earthing for Important equipment with 40mm dia 'B' class 2.7m long G.I pipe and 20m dia 'B' class G.I pipe of 0.3mtr. long connected with reducer providing G.I funnel with mesh enclosed in C.C.Chamber of 400m x 400m x 400mm with R.C.C. Slab cover duly providing staggered holes filling with salt and charcoal from the bottom of the pipe giving earth connection from electrode through G.I strip of 40 x 6mm x 200mm length with all accessories and labour charges complete, as per IS specifications 732/1982 (Part II)	2.00	Set		
					-
144	**Internal Electricals ; Internal Wiring** Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.				-
a	Group-A (1 LIGHT)	**35.00**	Point		
b	Group-B (2 LIGHT)	**50.00**	Point		
c	Group-C (4 LIGHT)	**35.00**	Point		
					-
145	Wiring for twin control light point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in recessed medium class PVC conduit, 2 way	**4.00**	Point		

	modular switch,modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.				
146	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				-
a	5/6 A switch	**81.00**	**Nos**		
b	2 way 5/6 A switch	**4.00**	**Nos**		
147	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.	**19.00**	**Nos**		
148	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 15/16 A modular socket outlet and 15/16 Amodular switch, connections etc. as required.	**15.00**	**Nos**		
149	Supplying and fixing 5/6 Amp modular type switch and 5/6 Amp 3 pin modular type socket outlet having polycarbonate cover plate including providing and fixing suitable size metal box including connections, etc as required.(INDIPENDENT)	**17.00**	**Nos**		
150	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 25A modular socket outlet and 25A modular switch, connections etc. as required.	**24.00**	**Nos**		
151	Supply, Erection, Testing and Commissioning of following sizes of exhaust fan with 3 core flexible wire as required. a) 300 mm 900 RPM	**4.00**	**Nos**		
152	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper	**120.00**	**Mtr.**		

	conductor single core cable in recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.				
a	(b) 2x2.5 Sq.mm+1x2.5 Sq.mm earth wire	**200.00**	**Mtr.**		
b	(c) 2x4.0 Sq.mm+1x4.0 Sq.mm earth wire	**775.00**	**Mtr.**		
c	(d) 4x 6 Sqmm +2 x6.0 Sqmm earth wire	**30.00**	**Mtr.**		
153	Supplying and fixing of following sizes of PVC conduit along with the accessories in recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. (a) 25 mm PVC PIPE Concealed	**520.00**	**Mtr.**		-
	(b) 32 mm PVC PIPE Concealed	**65.00**	**Mtr.**		
154	**Internal Electricals ; Distribution Board :** Supplying and fixing Cable End Box (Loose Wire Box) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 Volts, on recess, complete with testing and commissioning etc.as required. **For 4 way, Double door VTPN MCBDB**	**1.00**	**Set**		
	(a) For 12 way, Double door TPN MCBDB	**2.00**	**Set**		
155	Supplying and fixing following rating, four pole, (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current 30 mA in the existing MCB DB complete with connections, testing and commissioning etc. as required. (a) **40A**	**2.00**	**Nos**		
b	**(b) 63A**	**1.00**	**Nos**		
156	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required. (a)**Single pole**	**72.00**	**Nos**		
	(b) Triple pole MCB	**4.00**	**Nos**		
	SUPPLY OF L.T 1.1 KV POWER CABLES				
157	Supplying of following sizes of 1.1 KV grade XLPE / PVC insulated, PVC sheathed armoured stranded Power Cable conforming to IS 7098 Part-I/ 1554 Part -1 complete as required.(Cable tags with name plate details for every 20 mtr)				

	4 core, 6 Sq.mm. Al. Ar cable	55.00	**Meter**		
158	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required.				
	Upto 35 sq. mm	55.00	**Meter**		
159	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.		-		
	4 Cx 6 sq. mm	8.00	Each		
160	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. in the existing trench, complete as required.				-
	63 mm dia (OD-63 mm & ID-51 mm nominal)	55.00	**Meter**		
161	**EXTERNAL WORK : SUPPLY & FIXING OF LIGHT FIXTURES :** Supply and installation GI column Post Top of height 3 mtrs The optical compartment shall be of IP66 Sealsafe® tightness level suitable to mount a 45WLED. The electronic gear tray is mounted in the Post Top light column enbale power supply to illuminate the LED.	**92.00**	**Nos**		
b	supply and installation of 30W LED Decorative luminaire – with all the required accessories complete with IP66	**92.00**	**Nos**		
c	supply and installation of 10W LED Decorative light fixture housed in die-cast aluminium housing – with all the required accessories complete along with lamp with IP66	**22.00**	**Nos**		
d	supply and installation of 3W LED Step light fixture housed in die-cast aluminium housing – with all the required accessories lcomplete along with lamp with IP66	**36.00**	**Nos**		
162	**PANEL :** Supply, store, erection, testing and commissioning of 415Volts, 3 phase 50 Hz switchboards/panels/PDBs with ACB, SPDFunits, MCCB units as per specification	1.00	Set		

	titled "415 Volts switch Boards", as per schematic drawing complete as required.Supply and fixing of steel supporting channels and accessorires ,tube detection system and Fire suppression system to shall be included in the estimation as required Each Incomer shall have one set of the following items: Intelligent multi function digital meter of suitable range to read V,A,KVA, KVAH, KWAH, KW, KVAR, PF, Hz etc with communication facility and LED display with required Nos CTs, 15 VA, class 0-5 and control circuit wiring with HRC control fuses.CTs Digital Voltmeter suitable range for 3 phase, 4 wire operation with LED display and built-in selector switch along with 3 nos of MCB control Digital Voltmeter suitable range for 3 phase, 4 wire operation with LED display and built-in selector switch along with 3 nos of MCB control 1 Set of Indication Lamps, LED type, R,Y,B and breaker 'ON' , 'OFF', 'TRIP' & spring charged lamps.. **Bus Bars : 250Amps TPN Copper** **1 Set of Sufficient ventilation shall be provided in the compartment to limit the temperature rise. Cooling fans shall be provided with ON-OFF switches.** **Incomer** **250 Amps 4P MCCB (i) Outgoing (i) 8 Nos. MCB, 10A, FP, 10 KA (ii) 1 No's of MCB, 63A, FP, 16 kA (iii) 2 Nos. MCB, 40A, FP, 10 kA.** **(iv) 2 Nos. MCB, 10A, FP, 10 kA. (Spare)** **(v) 1 No. of MCB, 63A, FP, 16 kA (Spare) (v) 1 No's Set of CBCT, with ELR (vi) Timer control sets for External lights (vii) 1 Lot of control wiring.1 Set of designation plates.**				
	LT CABLES				-
	SUPPLY OF L.T 1.1 KV POWER CABLES				-
163	Supplying of following sizes of 1.1 KV grade XLPE / PVC insulated, PVC sheathed armoured stranded Power Cable conforming to IS 7098 Part-I/ 1554 Part -1 complete as required.(Cable tags with name plate details for every 20 mtr)				-
a	3.5 core, 50 Sq.mm. AL ARcable	1000.00	Mts		
b	4 core, 4 Sq.mm. AL ARcable	550.00	Mts		
c	4 core, 6 Sq.mm. AL ARcable	390.00	Mts		
164	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct				

	in ground including excavation, sand cushioning, protective covering and refilling the trench etc. as required.				
a	Upto 35 sq. mm	940.00	Mts		
b	Upto 95 sq. mm	1000.00	Mts		
165	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required				
	3½ X 25 sq. mm (28mm)	2.00	Each		
	4 X 6 sq. mm	22.00	Each		
	4 X 4 sq. mm	222.00	Each		
	EARTHING & SAFETY EQUIPMENTS				
166	Earthing with G.I. earth pipe 4.5 metre long, 40 mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal/ coke and salt as required.	4.00	set		
	EARTHING CONDUCTORS				
167	Supplying and laying 25 mm X 5 mm G.I strip at 0.50 metre below ground as strip earth electrode, including connection/ terminating with G.I. nut, bolt, spring, washer etc. as required.(Jointing shall be done by overlapping and with 2 sets of G.I. nut bolt & spring washer spaced at 50mm)	220.00	RM		
168	Supply & Laying of 8 SWG GI wire with all accessories as required	635.00	RM		
	Note:Eathpits material considered conventional method.It should be follow as per site condition.				-
169	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. in the existing trench, complete as required.				

	120 mm dia (OD-120 mm & ID-103 mm nominal)	1000.00	Metre		
170	**(4) TOILET BLOCK INTERNAL ELECTRICAL WORKS (G.FLOOR) A) Internal Electricals ; Fans & Light Fixtures : Supply,erection,testing and commissioning of LED light fixtures with all accessories as required.** Supply, Erection, Testing & Commissioning of Batten light fixture with Essential LED tube that integrates LED light source with frosted cover with 20W and 40, 000 hours life & 1600 lumen output & CRI 80. Complete withall accessories including lamps.	2.00	Nos		
	Supply, Erection, Testing & Commissioning of ceiling recessed circular downlight Green Perform. Green Perform range is a breakthrough offering which combines modern product design, the latest LED technology and reliable heat management to deliver a long lasting efficient solution for offices and retails spaces. The power consumtion of fixture 15W producing a lumen output minimum of 1000 lumen. The fixture is designed for 50,000 hrs of operational life at L70, i.e. the lumen output of fixture reduces to 70% of its original output after 50,000 hrs. The fixture come with analog dimmable driver compliances : IEC 62384 , IEC 61347-2-13, IEC 61547, EMI- CISPR15, cut-out dia -138mm". The cosntruction of fixture is Pressure Die cast Aluminim heat sink and high efficiency Polycarbonate diffuser with more than 85% Transmittance and SS spring clip complete as required.	12.00	Nos		
171	Supply , Erection, Testing & Commissioning of LED Recessed Downlighter with a nominal system lumen output of 2400 lumens 10W Recessed, LED Round Slim Panel, White powder coated pressure die cast aluminum housing and bottom frame, Slim luminaire with high transmitive LGP technology, High efficiency, non-yellowing PMMA diffuser, Excellent thermal management with die cast aluminum construction, Specially designed, easy to install mounting clips.	15.00	Nos		
172	Supply, Erection, Testing & Commissioning of 11 W Mirror light /ceiling mounting luminaire with all other accessories as required.	6.00	Nos		
173	Supply and installation testing and commissioning of 48" (1200mm) Sweep ISI mark Ceiling Fan as per IS 374 - 1979 and, with double ball bearings, power input not more than 50W , air delivery more than 200 cubic	2.00	Nos		

	meter/min but with Regulator.				
174	Supply, Erection, Testing and Commissioning of following sizes of exhaust fan with 3 core flexible wire as required. a) 300 mm 900 RPM	4.00	Nos		
175	**Internal Electricals ; Earthing System :** Providing independent earthing for Important equipment with 40mm dia 'B' class 2.7m long G.I pipe and 20m dia 'B' class G.I pipe of 0.3mtr. long connected with reducer providing G.I funnel with mesh enclosed in C.C.Chamber of 400m x 400m x 400mm with R.C.C. Slab cover duly providing staggered holes filling with salt and charcoal from the bottom of the pipe giving earth connection from electrode through G.I strip of 40 x 6mm x 200mm length with all accessories and labour charges complete, as per IS specifications 732/1982 (Part II)	2.00	Set		
176	**Internal Electricals ; Internal Wiring :** (a) Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required. **(b) Group-A (1 LIGHT**)	12.000	Point		
	(c) Group-B (2 LIGHT)	12.00	Point		
	(d) Group-C (4 LIGHT)	2.00	Point		
177	Wiring for twin control light point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in recessed medium class PVC conduit, 2 way modular switch,modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.	4.00	Point		
178	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.**(b) switch board**	26.00	Nos		
179	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.	4.00	Nos		
180	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 15/16 A modular socket outlet and 15/16 Amodular switch, connections etc. as required	6.00	Nos		
181	Supplying and fixing 5/6 Amp modular type switch and 5/6 Amp 3 pin modular type socket outlet having polycarbonate cover plate including providing and fixing suitable size metal box including connections, etc as required.(INDIPENDENT)	4.00	Nos		

182	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 25A modular socket outlet and 25A modular switch, connections etc. as required	2.00	Nos		
183	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in recessed medium class PVC conduit as required. (a) **2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire**	25.00	Mtr.		
	(b) 2x2.5 Sq.mm+1x2.5 Sq.mm earth wire	40.00	Mtr.		
	(c) 2x4.0 Sq.mm+1x4.0 Sq.mm earth wire	55.00	Mtr.		
	(d) 4x 6 Sqmm +2 x6.0 Sqmm earth wire	150.00	Mtr.		
184	Supplying and fixing of following sizes of PVC conduit along with the accessories in recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required. (a)**25 mm PVC PIPE Concealed**	250.00	Mtr.		
185	**Internal Electricals ; Distribution Board** Supplying and fixing Cable End Box (Loose Wire Box) suitable for following triple pole and neutral, sheet steel, MCB distribution board, 415 Volts, on recess, complete with testing and commissioning etc. as required. **For 4 way, Double door TPN MCBDB**	1.000	Set		
186	Supplying and fixing following rating, four pole, (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current 30 mA in the existing MCB DB complete with connections, testing and commissioning etc. As required. **40A.**	1.00	Nos		
187	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required. (a)**Single pole**	12.00	Nos		
188	**SUPPLY OF L.T 1.1 KV POWER CABLES** Supplying of following sizes of 1.1 KV grade XLPE / PVC insulated, PVC sheathed armoured stranded Power Cable conforming to IS 7098 Part-I/ 1554 Part -1 complete as required.(Cable tags with name plate details for every 20 mtr) **4 core, 6 Sq.mm. Al. Ar cable**	150.00	Mtr.		
189	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required. **(a) Upto 35 sq. mm**	150.00	Nos		
190	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC	8.00	Nos		

	sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required. **4 X 6 sq. mm**				
191	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. in the existing trench, complete as required. **63 mm dia (OD-63 mm & ID-51 mm nominal)**	90.00	Mtr.		
192	**CLOCK TOWER : SANITARY FIXTURES & CP FITTINGS** Providing and fixing white vitreous china **extended wall mounting water closet** of size 780x370x690 mm of approved shape including providing & fixing white vitreous china cistern with dual flush fitting, of flushing capacity 3 litre/ 6 litre (adjustable to 4 litre/ 8 itres), including seat cover, and cistern fittings, nuts, bolts and gasket etc complete.	**9.00**	**Nos**		
193	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require: White Vitreous China Wash basin size 630x450 mm with a pair of 15 mm C.P. brass pillar tap	**7.00**	**Nos**		
194	Providing and fixing white vitreous china flat back or wall corner type lipped front urinal basin of 430x260x350 mm and 340x410x265 mm sizes respectively with automatic flushing cistern with standard flush pipe and C.P. brass spreaders with brass unions and G.I clamps complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required : Range of three urinal basins with 10litre white P.V.C. automatic flushing cistern	**5.00**	**Nos**		
195	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS:13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required : Kitchen sink with drain board 510x1040 mm bowl depth 250 mm	**0.00**	**Nos**		
196	Providing and fixing toilet paper holder C.P. brass	**9.00**	**Nos**		
197	Providing and fixing PTMT towel ring trapezoidal shape 215 mm long, 200 mm wide with minimum distances of 37 mm from wall face with concealed fittings arrangement of approved quality and colour, weighing not less than 88 gms.	**3.00**	**Nos**		
198	Providing and fixing 8 mm dia C.P. / S.S. Jet	**9.00**	**Nos**		

	with flexible tube upto 1 metre long with S.S. triangular plate to Eureopean type W.C. of quality and make as approved by Engineer - in - charge. (Health Facuet)				
199	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 : 15 mm nominal bore (Health Facuet)	**9.00**	**Nos**		
200	Providing and fixing C.P. Brass extension nipple (size 15mmx50mm) of approved make and quality as per direction of Engineer-in-charge. (Health Facuet)	**9.00**	**Nos**		
201	Providing and fixing CP Brass 32mm size Bottle Trap of approved quality & make and as per the direction of Engineer-in-charge.	**7.00**	**Nos**		
202	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 : 15 mm nominal bore	**3.00**	**Nos**		
203	Fixing single heater type solid state fully hygienic **Auto Hand Dryer** rated for continuous repeat usage with solid state time delay LSF protection, with independent ambient light level & seasonal control temperatures including providing necessary CI / MS brackets painted with two or three coats of enamel paint of approved shade over a coat of primer, wiring cables from drier to plug, plug tops etc., complete. including cutting and making good the walls wherever required.	**3.00**	**Nos**		
204	Providing and fixing **PTMT** liquid soap container 109 mm wide, 125 mm high and 112 mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour, weighing not less than 105 gms.	**3.00**	**Nos**		
205	Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shade with 6 mm thick hard board backing : Rectangular shape 1500x450 mm	**2.00**	**Nos**		
206	Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shade with 6 mm thick hard board backing : Oval shape 450x350 mm (outer dimensions)	**1.00**	**Nos**		
207	Providing and fixing toilet paper holder : C.P. brass	**9.00**	**Nos**		
208	Providing and fixing of grab rails for PH toilets to Water closet and wash basin (Size: Vertical grab bar 1050mm length,900mm width 20mm thick and Horizantal grab bar 800mm width, 600 length and 20mm thickness)	**1.00**	**Set**		
209	**INTERNAL DRAINAGE SYSTEM (SOIL,WASTE & RAIN WATER)**				
	Supply, installation, testing and				

	commissioning of approved make **type A - SWR PVC** pipes and fittings confirming to IS13592 & IS 14735 with with all necessary specials like bends,tees, offsets, doorbends, junctions,cowls etc., laid under floor/fixed on walls etc., complete and necessary supports etc complete .The fittings should be of rubber ring type for shafts and pasted type (solvent cement) for all other locations. **Internal Toilet Piping**				
	a) 75 mm dia.	35.0	Rmt		
	b) 110 mm dia.	28.0	Rmt		
210	Supply, installation and testing of PVC pressure pipes (6 Kg/sqcm) confirming to IS 4985 for waste connection from wash basin, kitchen sinks/pantry sinks/janitor sinks/Urinals to floor trap / anti syphonage pipe with solvent cement joints, including all the fittings, laid under floor / concealed in wall etc., the work shall include wall chasing and making good the same in cement mortar necessary supports etc., complete.				
	a) 40 mm dia.	5.00	Rmt		
	b) 50 mm dia.	8.00	Rmt		
	c) 63 mm dia.	RO	Rmt		
211	Supplying, installing and testing pvc **P trap** with 100mm dia inlet and 110mm dia outlet with suitable supports and a water seal of minimum 40mm, including SS grating and making good the same complete.	2.00	Nos.		
212	Supplying, installing and testing in position **110 PVC floor traps** of self cleansing design with outlet size of 75 mm diameter , including making connection with PVC soil / waste pipes using rubber gaskets, and fixing of SS	11.00	Nos.		

	gratings etc., complete all as specified & directed**.**				
	TERRACE & SHAFT PIPING				
213	Supply, installation, testing and commissioning of approved make **type A - SWR PVC** pipes and fittings confirming to IS13592 & IS 14735 with with all necessary specials like bends,tees, offsets, doorbends, junctions,cowls etc., laid under floor/fixed on walls etc., complete and necessary supports(Suitable for Precast slab) etc complete .The fittings should be of rubber ring type for shafts and pasted type (solvent cement) for all other locations. **Vertical Downtakes**				
	a) 75 mm dia.	3.00	Rmt		
	b) 110 mm dia.	3.00	Rmt		
214	Providing and fixing Prince or equivalent make PVC SWR half round eaves gutter with bolts, nuts and flat iron brackets 40 x 3 mm size complete.				
	140 mm nominal size	20.00	Rmt		
215	Supply, fixing and testing PVC Rain water Pipe conforming to **IS -4985, Class III (6kg/cm^2)** with all fittings like shoes, bends fixed in the pipe shafts (ducts) and basement ceiling with suitable supports etc., complete. **Vertical Rainwater Pipes**				
	160 mm dia.	35.00	Rmt		
216	Supply, fixing, testing and commissionig of approved make PVC **Vent cowl** with necessary accessories etc., complete.				
	a)75mm dia	2.00	Nos		
	b)110mm dia	2.00	Nos		
217	Drilling with core cutting machine in slabs, floors etc., for laying pipes and				

	rendering the same in RCC 1:2:4, finishing the same to the satisfaction of the owner or his authorized representative etc., including nominal reinforcement wherever r				
	(a) RCC slabs				
	50mm dia upto 110 mm dia. For Wash basin and urinal	0.00	Nos		
	110mm dia. upto 160 mm dia. For EWC	0.00	Nos		
	(c) RCC walls				
	50mm dia upto 110 mm dia.	0.00	Nos		
	110mm dia. upto 160 mm dia.	0.00	Nos		
	INTERNAL WATER SUPPLY SYSTEM				
	TOILET PIPING				
218	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc. **INTERNAL DOMESTIC**				
	a) 15 mm dia	23.00	Rmt		
	b) 20 mm dia	25.00	Rmt		
	c) 25 mm dia	10.00	Rmt		
219	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete :				
	a) 20 mm dia	2.00	Nos		
	b) 25 mm dia	2.00	Nos		
	Shaft & Terrace piping				
220	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water				

	supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc. DOMESTIC WATER				
	32 mm nominal bore	25.00	Rmt		
	40 mm nominal bore	38.00	Rmt		
	50 mm nominal bore	15.00	Rmt		
221	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete				
	d) 40 mm dia	2.00	Nos		
	e) 50 mm dia	2.00	Nos		
222	**(8) RESTAURANT SANITARY FIXTURES & CP FITTINGS** Providing and fixing white vitreous china extended wall mounting water closet of size 780x370x690 mm of approved shape including providing & fixing white vitreous china cistern with dual flush fitting, of flushing capacity 3 litre/ 6 litre (adjustable to 4 litre/ 8 itres), including seat cover, and cistern fittings, nuts, bolts and gasket etc complete.	**4.00**	**Nos**		
223	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require: White Vitreous China Wash basin size 630x450 mm with a pair of 15 mm C.P. brass pillar tap	**6.00**	**Nos**		
224	Providing and fixing white vitreous china flat back or wall corner type lipped front urinal basin of 430x260x350 mm and 340x410x265 mm sizes respectively with automatic flushing cistern with standard flush pipe and C.P. brass spreaders with brass unions and G.I clamps complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required : Range of three urinal basins with 10litre white P.V.C. automatic flushing cistern	**0.000**	**Nos**		

225	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS:13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required : Kitchen sink with drain board 510x1040 mm bowl depth 250 mm	**3.00**	**Nos**		
226	Providing and fixing toilet paper holder C.P. brass	**4.00**	**Nos**		
227	Providing and fixing **PTMT** towel ring trapezoidal shape 215 mm long, 200 mm wide with minimum distances of 37 mm from wall face with concealed fittings arrangement of approved quality and colour, weighing not less than 88 gms.	**2.00**	**Nos**		
228	Providing and fixing 8 mm dia C.P. / S.S. Jet with flexible tube upto 1 metre long with S.S. triangular plate to Eureopean type W.C. of quality and make as approved by Engineer - in - charge. (Health Facuet)	**4.00**	**Nos**		
229	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 : 15 mm nominal bore (Health Facuet)	**4.00**	**Nos**		
230	Providing and fixing C.P. Brass extension nipple (size 15mmx50mm) of approved make and quality as per direction of Engineer-in-charge. (Health Facuet)	**4.00**	**Nos**		
231	Providing and fixing CP Brass 32mm size Bottle Trap of approved quality & make and as per the direction of Engineer-in-charge.	**6.00**	**Nos**		
232	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 : 15 mm nominal bore	**3.00**	**Nos**		
233	Fixing single heater type solid state fully hygienic **Auto Hand Dryer** rated for continuous repeat usage with solid state time delay LSF protection, with independent ambient light level & seasonal control temperatures including providing necessary CI / MS brackets painted with two or three coats of enamel paint of approved shade over a coat of primer, wiring cables from drier to plug, plug tops etc., complete. including cutting and making good the walls wherever required.	**2.00**	**Nos**		
234	Providing and fixing PTMT liquid soap container 109 mm wide, 125 mm high and 112 mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour, weighing not less than 105 gms.	**2.00**	**Nos**		
235	Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shade with 6 mm thick hard board backing : Rectangular shape 1500x450 mm	**2.00**	**Nos**		
236	Providing and fixing toilet paper holder : C.P.	**4.00**	**Nos**		

	brass				
237	Providing and fixing of grab rails for PH toilets to Water closet and wash basin (Size: Vertical grab bar 1050mm length,900mm width 20mm thick and Horizantal grab bar 800mm width, 600 length and 20mm thickness)	**0.00**	**Set**		
238	Providing and fixing C.P. brass long nose bib cock of approved quality conforming to IS standards and weighing not less than 810 gms. 15 mm nominal bore.	**3.00**	**Nos**		
239	**B. INTERNAL DRAINAGE SYSTEM (SOIL,WASTE & RAIN WATER)** Supply, installation, testing and commissioning of approved make type A - SWR PVC pipes and fittings confirming to IS13592 & IS 14735 with with all necessary specials like bends,tees, offsets, doorbends, junctions,cowls etc., laid under floor/fixed on walls etc., complete and necessary supports etc complete .The fittings should be of rubber ring type for shafts and pasted type (solvent cement) for all other locations. **Internal Toilet Piping a) 75 mm dia.**	30.00	RMT.		
	b) 110 mm dia.	23.00	RMT.		
240	Supply, installation and testing of PVC pressure pipes (6 Kg/sqcm) confirming to IS 4985 for waste connection from wash basin, kitchen sinks/pantry sinks/janitor sinks/Urinals to floor trap / anti syphonage pipe with solvent cement joints, including all the fittings, laid under floor / concealed in wall etc., the work shall include wall chasing and making good the same in cement mortar necessary supports etc., complete. **a) 40 mm dia.**	7.50	RMT.		
	b) 50 mm dia.	6.80	RMT.		
	c) 63 mm dia.	0.00	RMT.		
241	Supplying, installing and testing pvc P trap with 100mm dia inlet and 110mm dia outlet with suitable supports and a water seal of minimum 40mm, including SS grating and making good the same complete.	0.00	Nos		
242	Supplying, installing and testing in position 110 PVC floor traps of self cleansing design with outlet size of 75 mm diameter , including making connection with PVC soil / waste pipes using rubber gaskets, and fixing of SS gratings etc., complete all as specified & directed.	6.00	Nos		
243	**TERRACE & SHAFT PIPING** Supply, installation, testing and commissioning of approved make type A - SWR PVC pipes and fittings confirming to IS13592 & IS 14735 with with all necessary specials like bends,tees, offsets, doorbends, junctions,cowls etc., laid under floor/fixed on walls etc., complete and	10.00	RMT.		

	necessary supports(Suitable for Precast slab) etc complete .The fittings should be of rubber ring type for shafts and pasted type (solvent cement) for all other locations. **Vertical Downtakes a) 75 mm dia.**				
	b) 110 mm dia.	10.00	RMT.		
244	Providing and fixing Prince or equivalent make PVC SWR half round eaves gutter with bolts, nuts and flat iron brackets 40 x 3 mm size complete. **140 mm nominal size**	0.00	RMT.		
245	Supply, fixing and testing PVC Rain water Pipe conforming to IS -4985, Class III (6kg/cm2) with all fittings like shoes, bends fixed in the pipe shafts (ducts) and basement ceiling with suitable supports etc., complete. **Vertical Rainwater Pipes. 160 mm dia.**	82.80	RMT.		
246	Supply, fixing, testing and commissionig of approved make PVC **Vent cowl** with necessary accessories etc., complete. **a)75mm dia**	1.00	Nos		
	b)110mm dia	1.00	Nos		
247	Drilling with core cutting machine in slabs, floors etc., for laying pipes and rendering the same in RCC 1:2:4, finishing the same to the satisfaction of the owner or his authorized representative etc., including nominal reinforcement wherever **(a) RCC slabs (i) 50mm dia upto 110 mm dia. For Wash basin and urinal**	0.00	Nos		
	(ii) 110mm dia. upto 160 mm dia. For EWC	0.00	Nos		
	(c) RCC walls (i) 50mm dia upto 110 mm dia.	0.00	Nos		
	(ii) 110mm dia. upto 160 mm dia.	0.00	Nos		
248	**C. INTERNAL WATER SUPPLY SYSTEM (INCLUDING BASEMENT)(TOILET PIPING)** Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc. **INTERNAL DOMESTIC a) 15 mm dia**	21.00	RMT.		
	b) 20 mm dia	11.00	RMT.		
	c) 25 mm dia	30.00	RMT.		
249	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete : **a) 20 mm dia**	2.00	Nos		
	b) 25 mm dia	2.00	Nos		
250	**Shaft & Terrace piping**	25.00	RMT.		

	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc. INTERNAL DOMESTIC **(i) 32 mm nominal bore**				
	(ii) 40 mm nominal bore	38.00	RMT.		
	(iii) 50 mm nominal bore	15.00	RMT.		
251	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete **d) 40 mm dia**	2.00	Nos		
	e) 50 mm dia	2.00	Nos		
252	Supplying, installing, testing and commissioning pressure reducing stations with PRV, 3nos isolation valves and pressure gauge on downstream etc., complete.**a) 50 mm dia**	0.00	Nos		
	b) 80 mm dia	0.00	Nos		
253	**(9) A. EXTERNAL DRAINAGE AND WATER SUPPLY** Excavating trenches of required width for pipes, cables, etc, including excavation for sockets, depth upto 1.5 m, including getting out the excavated materials, returning the soil as required in layers not exceeding 20 cm in depth, including consolidating each deposited layers by ramming, watering etc., stacking serviceable material for measurements and disposal of unserviceable material as directed, within a lead of 50 m :**Pipes, cables etc. exceeding 80 mm dia but not exceeding 300 mm dia**	23.94	Cum		
254	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	24.28	Cum		
255	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :**1:3:6 (1 Cement : 3 coarse sand (zone-III) : 6 graded stone aggregate 20 mm nominal size)**	2.95	Cum		
256	Providing & fixing in position under floor against wall in chases cellular structure PVC ECO drain pipe of ring stiffness SN4 KN/m2, specials of make as mentioned below of approved make using sealing ring as per	85.00	RMT.		

	manufacturer's specification, including cutting the pipes square to the required lengths, necessary excavation, chasing & restoring to the original condition, testing for water tightness etc. The formation of pipe sockets by heating the pipe shall not be permitted the joints for plain ended pipes shall be made using couplers if necessary etc., complete. PVC ECO drain pipe of ring stiffness SN4 KN/m2 (a) **160 mm OD**				
	(b) 200	10.00	RMT.		
257	Supply, Installation, Testing & commissioning of uPVC manhole of sizes mentioned below including multi inlet base, riser, shaft pipe, plugs, heavy duty FRP manhole frame & cover etc., including necessary excavation lowering the manhole in to the trench & joining of the base, risers, manhole frame & cover & pipes as per manufacturer's specification etc., complete all as per relevant standard specification & directions of Engineer-In-Charge. **600mmø - MH UP TO .91 MTS**	5.00	Nos		
	600mmø - MH UP TO 1.68 MTS	3.00	Nos		
258	**External Water supply system**				
	Providing and fixing both side threaded **puddle flanges** 600mm long of following sizes 4mm thick sheet having 150mm projection alround the pipe joined by solvent or cement , including suppling end collars and heavy quality plugs etc., complete. The pipe shall be kept closed at both ends during concreting. The puddle flange shall be painted with anticorrosive metal primer at shop and supplied to site.		**Nos**		
a	50 mm n.b.	**2.00**	**Nos**		
b	65 mm n.b.	**4.00**	**Nos**		
c	80 mm n.b.	**2.00**	**Nos**		
d	100 mm n.b.	**0.00**	**Nos**		
e	150 mm n.b.	**0.00**	**Nos**		
259	Providing PVC encapsulated foot rungs of size 270x180mm including fixing in sump wall as per standard design.	**10.00**	**Nos**		

260	Providing and fixing in position DI hinged frame and cover of sizes mentioned below. 600 x 600 mm rectangular Medium duty DI hinged cover, the weight of the cover to be not less than 65 Kgs.	**0.00**	**Nos**		
261	Providing and fixing in position Vent pipes of 600 mm height above the slab top, with support blocks 345 x 345 mm square bricks near the slab top. The vent pipe shall be of 80 mm diameter of GI 'C' Class pipe & covered with mosquito proof jali.	**2.00**	**Nos**		
262	Providing and fixing in position bulk type water meter conforming to IS specifications of the following diameters 80mm Dia	**2.00**	**Nos.**		
263	Constructing masonry Chamber 60x60x75 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve, with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design : With common burnt clay F.P.S.(non modular) bricks of class designation 7.5	**2.00**	**Nos.**		
264	Providing and fixing ASTM UPVC pipe, conforming to ASTM 2467 with ISO 14001, including all UPVC plain & brass	**105.00**	**RMT.**		

	threaded fittings, including jointing of pipes & fittings with one step UPVC solvent cement, trenching ,refilling & testing of joints complete as per direction of Engineer. External work. 110mm outer dia				
		85.00	**RMT.**		
265	Supply, delivery, installation, testing, commissioning of digital water level indicator, digital display of water level in the tank, including fixing necessary stainless steel sensors, etc. The control cabling from panel to sump, making connections from the level controller to the pump starter, necessary conduiting shall have to be done by qualified electrical contractor only.	**2.00**	**Set**		
266	Earthwork in excavation in foundation pipeline trenches, drain in saturated soil upto a depth of 0.60 m lift upto 1.50 m including shoring, strutting and pumping/bailing out water stacking the excavated soil not more than 5 m. clear from the edge the excavation and returning the stacked soil in 0.15 m layers when required into plinth sides of foundation etc. consolidating each deposited layer by ramming, watering and disposing of all surplus excavated soil within a lead upto 20m.	**6.71**	**Cum.**		
	63mm outer dia.				
267	Refilling the pipeline/foundation trenches plinth sides, foundation etc. with available excavated earth in layers not exceeding 20 cm depth consolidating each layer ramming and watering lead upto 50 M and all lifts and disposal of surplus earth as directed by Engineer in Charge.	**6.37**	**Cum**		
	63mm outer dia.				

268	Providing & laying cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded granitic or basaltic stone aggrt. 40 mm. nominal size) excluding cost of centering, shuttering and finishing in:				
	All works upto plinth level				
	63mm outer dia.	**1.390**	**Cum**		
269	Providing and laying Non Pressure NP-3 class (Medium duty) R.C.C. pipes including collars/spigot jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete 600 mm dia RCC pipes. (Road crossing)	**15.00**	**RMT.**		
270	Providing and fixing ASTM UPVC pipe, conforming to ASTM 2467 with ISO 14001, including all UPVC plain & brass threaded fittings, including jointing of pipes & fittings with one step UPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer. External work.	**85.00**	**RMT.**		
	63mm outer dia.		**Nos**		
			Nos		
271	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete :				
	20 mm nominal bore	**2.00**	**Nos**		
	25mm nominal bore	**2.00**	**Nos**		
272	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :32 mm nominal bore.	**2.00**	**Nos**		
273	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :40 mm nominal bore.	**2.00**	**Nos**		
274	Providing and fixing gun metal gate	**2.00**	**Nos**		

	valve with C.I. wheel of approved quality (screwed end) :50 mm nominal bore.				
275	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :65 mm nominal bore.	**2.00**	**Nos**		
276	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required : 100mm Dia	**2.00**	**Nos**		
277	Providing, fixing in position **air release valve** of approved make with body made of brass and float ball and other moving parts of stainless steel / ABS / PP etc	**2.00**	**Nos**		
278	Providing and fixing stainless steel float valve of approved make of following mentioned sizes, for water supply inlet pipe to under ground sump.	**2.00**	**Nos**		
279	Supplying, installing, testing and Commissioning approved make GM **Pressure reducing Valves(PRV)** with all necessary specials complete to fix Pipes all as specifed and directed.				
	32 mm dia	RO	Nos.		
	50 mm	RO	Nos.		
	63 mm	RO	Nos.		
	90 mm	RO	Nos.		
	110 mm	RO	Nos.		
	PUMPS				
280	Supplying, installing, testing and commissioning of **water** lift monoblock construction pump of adequate HP capable of giving required discharge at				

	suitable head to work on 3 phase 50Hz 415 V with float necessary unions, flanges, foundations bolts RCC footing, gate valve , Non return valve etc., with wiring from pump to control panel complete. **The quoted rate shall include the cost of starter,electrical cable, non return valves, isolated valves,y strainers necessary unions, flanges etc,complete.**				
	Rain water pump (1W+1S)				
	Discharge:10 cum/hr				
	Head: 35m	1.00	Set		
281	Supplying of following sizes of 1.1 KV grade XLPE / PVC insulated, PVC sheathed armoured stranded Power Cable conforming to IS 7098 Part-I/ 1554 Part -1 complete as required.(Cable tags with name plate details for every 20 mtr)				
	4 core, 16 Sq.mm. Al Ar cable	**150.00**	**RMT.**		
282	Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required.	**1.390**	**Cum**		
	Upto 35 sq. mm				
		150.00	**RMT.**		
283	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.	**2.00**	**Nos**		
	4 core, 16 Sq.mm. Al Ar cable				
	FIRE PUMP EQUIPMENT				
	RESTAURANT				
284	Supplying, installation, testing and commissioning of electric driven terrace pump suitable for automatic operation				

	and consisting of following, complete in all respects, as required: (Terrace Pump) (a) Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical confirming to IS : 1520 b) Suitable HP squirell cage induction motor TEFC type suitable for operation on 415 volts, 3 phase, 50 Hz, AC supply with IP55 class of protection for enclosure, horiziontal foot mounted type with Class-'F' insulation, conforming to IS-325. (c) M.S.fabricated common base plate, coupling, coupling guard, foundation bolts etc.as required. (d) Suitable cement concrete foundation duly plastered and with anti vibration pads.				
	900 lpm at 35 m Head	**1.00**	**Set**		
	-				
285	Providing, laying, testing & commissioning of 'B' class heavy duty G.I. pipe conforming to IS 1239 including welding, fittings like elbows, tees, flanges, tapers, nuts, bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as required :				
	25 mm	15.00	Rmt		
	50 mm	RO	Rmt		
	80 mm	10.00	Rmt		
	100 mm. dia	RO	Rmt		
	150 mm. Dia	10.00	Rmt		
286	Providing, installation, testing and commissioning of non-return valve of following sizes confirming to IS: 5312 complete with rubber gasket, GI bolts, nuts, washers etc.as required :				

	80mm dia	2.00	Each		
	100mm dia	2.00	Each		
	150mm dia	1.00	Each		
287	Providing, installation, testing and commissioning of stainless steel Y-strainer fabricated out of 1.6 mm thick stainless steel, Grade 304, sheet with 3 mm dia holes with stainless steel flange.				
	150mm dia	1.00	Each		
288	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required :				
	80mm dia	1.00	Each		
	100mm dia	2.00	Each		
	150mm dia	1.00	Each		
289	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete :				
	a) 20 mm dia	2.00	Nos		
	b) 25 mm dia	1.00	Nos		
290	Providing & fixing of pressure switch in G.I pipe line including connection etc. as required.	1.00	Each		
	-				
	HYDRANT SYSTEM				
291	Supplying and fixing single headed internal hydrant valve with instantaneous Gunmetal/Stainless Steel coupling of 63 mm dia with cast iron wheel ISI marked conforming to IS 5290 (Type -A) with blank Gunmetal/Stainless Steel cap and chain as required :				

	Single headed Gunmetal	2.00	Set		
292	Supplying and fixing first-aid Hose Reel with MS construction spray painted in post office red, conforming to IS 884 complete with the following as required. 20 mm nominal internal dia water hose thermoplastic (Textile reinforced) type -2 as per IS: 12585 20 mm nominal internal dia gun metal globe valve & nozzle. Drum and brackets for fixing the equipmets on wall Connections from riser with 25 mm dia stop gun metal valve & M.S. Pipe and socket. 30 m	2.00	Set		
293	Supplying & fixing 63 mm dia gun metal short branch pipe with 20 mm nominal internal diameter size nozzle conforming to IS 903 suitable for instantaneous connection to interconnect hose pipe coupling as required : Gun metal	2.00	Set		
294	Providing, laying, testing & commissioning of 'B' class heavy duty G.I. pipe conforming to IS 1239 including welding, fittings like elbows, tees, flanges, tapers, nuts, bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as required :				
	100 mm. dia	13.00	Rmt		
	150 mm. Dia	RO	Rmt		
295	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required :				

	100mm dia	18.00	Each		
	150mm dia	3.00	Each		
296	Supplying, installing, testing and commissioning of approved make 20mm dia. automatic air release valve with suitable size of ball valves and unions etc. complete.	1.00	Each		
297	Acrylic Fire stop Sealant (as per IS 12458:1988) in the opening for pipes passing through fire compartment walls of RCC floors, masonry walls to provide up to 2 hours fire rating.	RO	Lbs		
	-				
	FIRE EXTINGUISHERS				
	Supplying, installing and commissioning Portable Fire extinguishers of following type & capacity.				
298	Carbon-di-oxide Gas Type Fire Extinguisher 4.5 Kgs, squeeze Grip, Discharge Time minimum 8 Secs, Controllable discharge mechanism with nozzle, bend, Hose and wall mounting bracket etc., Applicable on Class B&C Fire, B Rating 34B, Can Construction : Hot Spinning / Forging, Valve Construction : Forging & Machining, Internal Coating of Can : Seamless Cylinger, External Coating of Can : Spray Painting, Sheet metal thickness : 4.5MM, ISI Approved as per IS:2878:2004	4.00	Each		
299	AFFF Foam trolley Type fire extinguisher 9 Lt Capacity, Stored Pressure Type, Pressure Gauge, Discharge Time less than 60 Secs, with hose and brackets, Controllable discharge mechanism, Range minimum 6 Meters, applicable on Class A,B, A Rating 2A, B Rating 34B, Can	2.00	Each		

	Construction : Deep drawn & Co2 Mig welded, Valve Construction : Forging & Machining, Internal Coating of Can : Epoxy Powder coating, External Coating of Can : Epoxy Polyster Powder coating, Sheet metal thickness : 2.0MM, ISI Approved as per IS 15683:2006.				
300	ABC Powder 4 Kg Fire Extinguisher containing Mono Ammonium Phosphate Powder 50, Stored Pressure Type, Pressure Gauge, fittted with discharge hose, wall mounting bracket etc., Discharge Time minimum 8 Secs, Controllable discharge mechanism, Range minimum 4 Meters, applicable on Class A,B,C and electrically started Fire, A Rating- 4A, B Rating 34B, Can Construction : Deep drawn & Co2 Mig welded, Valve Construction : Forging & Machining, Internal Coating of Can : Epoxy Powder coating, External Coating of Can : Epoxy Polyster Powder coating, Sheet metal thickness : 1.60MM, ISI approved as per IS:15683:2006	2.00	Each		
301	ABC Powder 6 Kg Fire Extinguisher containing Mono Ammonium Phosphate Powder 50, Stored Pressure Type, Pressure Gauge, fittted with discharge hose, wall mounting bracket etc., Discharge Time minimum 8 Secs, Controllable discharge mechanism, Range minimum 4 Meters, applicable on Class A,B,C and electrically started Fire, A Rating- 4A, B Rating 34B, Can Construction : Deep drawn & Co2 Mig welded, Valve Construction : Forging & Machining, Internal Coating of Can : Epoxy Powder coating, External Coating of Can : Epoxy Polyster Powder coating, Sheet metal thickness : 1.60MM, ISI approved as per IS:15683:2006	RO	Each		

	HYDRANT SYSTEM				
302	Supplying and fixing Single headed external yard hydrant valve with 1 No. 63 mm dia instantaneous FM Gunmetal/Stainless Steel coupling and cast iron wheel, ISI marked, conforming to IS 5290 (type A) with blank Gunmetal/Stainless Steel cap and chain as required :				
	Single headed Gunmetal	6.00	Set		
303	Supplying and fixing first-aid Hose Reel with MS construction spray painted in post office red, conforming to IS 884 complete with the following as required. 20 mm nominal internal dia water hose thermoplastic (Textile reinforced) type -2 as per IS: 12585 20 mm nominal internal dia gun metal globe valve & nozzle. Drum and brackets for fixing the equipmets on wall Connections from riser with 25 mm dia stop gun metal valve & M.S. Pipe and socket. 30 m	6.00	Set		
304	Supplying & fixing 63 mm dia gun metal short branch pipe with 20 mm nominal internal diameter size nozzle conforming to IS 903 suitable for instantaneous connection to interconnect hose pipe coupling as required : Gun metal	6.00	Set		
305	Providing, laying, testing & commissioning of 'B' class heavy duty G.I. pipe conforming to IS 1239 including welding, fittings like elbows, tees, flanges, tapers, nuts, bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as				

	required :				
	100 mm. dia	55.00	Rmt		
	150 mm. Dia	20.00	Rmt		
306	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required :				
	100mm dia	3.00	Each		
	150mm dia	3.00	Each		
307	Supplying and fixing of fire brigade connection of cast iron body with gun metal male instantaneous inlet couplings complete with cap and chain as reqd. for suitable dia MS pipe connection conforming to IS 904 as required :				
	2 way-100 mm dia	2.00	Each		
	4 way - 150 mm dia	1.00	Each		
308	Supplying, installing, testing and commissioning of approved make Wrapping is applied over two coats of anti corrosive rubber modified bituminous primer of density 0.92 gm/cu cm and viscosity of 500 to 1000 cps applied at 150 gms per Sq.M. (under ground piping). (1 roll = 10 mtrs)	75.00	Nos.		
309	**CCTV Works :** Supply, Installation, Testing & Commissioning of 2MP IP IR Fixed Bullet Camera, 1/2.8" CMOS, **2 MP @ 25fps** or better, triple stream, Min. Illumination required 0.005lux @ **F2.0**(color), 2.8/3.6mm, 120dB True WDR, Min. Pixels 1920 × 1080, Shutter Speed 1/3 - 1,00,000; Adavance Video Compression technology such as H.265 High Profile , 110° wide angle lens, BLC, HLC, 3DNR, Minimum Edge Intelligence Video Analytics : Motion Detection, Video Tampering, Face Detection, SD Card Error, SD Card Capacity	**9.00**	**Nos**		

	Warning, Object Abandoned, Object Missing, Tripwire/Intrusion; Privacy Mask, Smart IR with upto **20m-40m** IR distance; 128GB SD card support, PoE Class 4 (802.3 at) and 12V DC, IP 67, IK 10 vandal proof, Housing, Certifications: UL, CE , FCC, BIS				
310	Supply, Installation, Testing & Commissioning of 2MP IP IR Vari Focal Motorised Bullet Camera, 1/2.8" CMOS, **2 MP @ 25fps** or better, triple stream, 2.8mm-12mm , Min. Illumination required 0.005lux @ **F2.0**(color), 2.8/3.6mm, 120dB True WDR, Min. Pixels 1920 × 1080, Shutter Speed 1/3 - 1,00,000; Adavance Video Compression technology such as H.265 High Profile , 110° wide angle lens, BLC, HLC, 3DNR, Minimum Edge Intelligence Video Analytics : Motion Detection, Video Tampering, Face Detection, SD Card Error, SD Card Capacity Warning, Audio Detection, Object Abandoned, Object Missing, Tripwire/Intrusion; Privacy Mask, Smart IR with upto **20m-50m** IR distance; Built-In Audio, 128GB SD card support, PoE Class 4 (802.3 at) and 12V DC, IP 67, IK 10 vandal proof, Housing, including Brcaket, Adapter along with all accessories.Certifications: UL, CE , FCC, BIS.	**4.00**	**Nos**		
311	Supply, Installation, Testing & Commissioning of 16 X digital Zoom SITC of 1080p HD PTZ Camera with 1/2.8" progressive scan CMOS, Effective pixels 1920 (H) x 1080, 30x Optical Zoom, Minimum Illumination- Color: 0.005 Lux , B/W: 0.001 lux, minimum 120 dB WDR, H.265,H.264, MJPEG streams, Dynamic Noise Reduction, BLC, EIS, White Balance, Pan Range 360° continuous, Tilt Range 0°±90°, Pan/Tilt Modes - Pan: 0.1°/s - 120°/s; Tilt: 0.1°/s - 180°/s, Presets 250, 8 Tours, Micro SD card support upto 128GB, 8 individually configurable privacy masks, HPOE, 24VAC (Dual Power options), IP66 , ONVIF Profiles,including Brcaket, Adapter along with all accessories and certifications FCC, CE, UL, BIS.	**2.00**	**Nos**		
312	Supply, Installation, Testing & Commissioning of 6TB Surveillance Hard disk.	**2.00**	**Nos**		
313	Supply, Installation, Testing & Commissioning of 32 CH Network Video Recorder,4 SATA with each TB Supports max.6TB Hard disk,Supports upto 4MP Cameras . Simultaneous 1/4/9/16 channels playback. H265, MJPEG supported. iPhone/Android support. UL, FCC & BIS certified.	**2.00**	**Nos**		
314	Supply, Installation, Testing & Commissioning of 8 CH Network Video Recorder,1 SATA with each	**1.00**	**Nos**		

	TB Supports max.6TB Hard disk,Supports upto 4MP Cameras . Simultaneous 1/4/9/16 channels playback. H265, MJPEG supported. iPhone/Android support. UL, FCC & BIS certified.				
315	SITC of 43" LED professional Wall mount Monitor along with bracket and all necessary accessories.	**1.00**	**Nos**		
316	Supply, Installation, Testing & Commissioning of 16 Port 100Mbps PoE Switch along with all accessories**.**	**1.00**	**Nos**		
317	Supply, Installation, Testing & Commissioning of 4+1 PoE Switch complete with required LIU's, LC Couplers, Plates etc complete as per specifications.	**1.00**	**Nos**		
318	Supply, Installation, Testing & Commissioning of Web Managed 8 Port Gigabyte PoE Switch complete with required LIU's, LC Couplers, Plates etc complete as per specifications.	**1.00**	**Nos**		
319	Supply , Installation, Testing and Comissioning of Wall mounted Communication rack with glass doors, handles ,lock , Top and Bottom Cable entries, Supports for mounting rack on wall , Cable managers, Fan, Equipment mounting hardware, power supply box for supplying power to switches, fans etc along with earth continuity kit, Mcb, indicator, moulded power supply cable.	**1.00**	**Nos**		
320	Supply , Installation, Testing and Comissioning of Wireless Transmitter & Receiver complete as per specifications and as required for Elevator Cameras.	**1.00**	**Nos**		
321	Supply Installation Testing and Commissioning of Cat-6A cable, with all necessary accessories and termination with connector as required in PVC/Steel conduits including all G.I saddle, spacers, bends, junction boxes Cable tie`s & Tags etc.	**500.00**	**Mtr.**		
322	SITC of Power Cable, with all necessary accessories and termination with connector as required in PVC/Steel conduits including all G.I saddle, spacers, bends, junction boxes Cable tie`s & Tags etc.	**350.00**	**Mtr.**		
323	Digging & Refilling of Hard/Soft Soil along with all accessories.	**100.00**	**Mtr.**		
324	Supply Installation Testing and Commissioning of 6 Mtr G.I Pole from the ground along with Junction box.bracket,base plate etc all necessary accessories for PTZ Cameras.	**2.000**	**Nos**		
			Grand Total=		**Rs.**

Total Tendered Amount: Rs.

Total tendered amount (in words……

…….....

[The prices quoted shall be including all statutory levies excluding GST, which shall be paid extra]

Maximum number of workmen likely to be engaged in days work……. numbers

Permanent Income Tax A/C.No… …….

Date:

(Signature of Tenderer)

[Total amount of tender, completion time and preliminary time as quoted / stated above are to be carried over to Form of Tender attached]

Witness: -

(Name in block letters)

Address:

Occupation:

THE BOARD OF TRUSTEES FOR THE PORT OF KOLKATA
FORM OF TENDER

To
The Chief Engineer,
Kolkata Port Trust.

I/We_____
_having examined the site of work, inspected the Drawings and read the specifications, General & Special Conditions of Contract and Conditions of the Tender, hereby tender and undertake to execute and complete all the works required to be performed in accordance with the Specification, Bill of Quantities, General & Special Conditions of Contract and Drawings prepared by or on behalf of the Trustees and at the rates & prices set out in the annexed Bill of Quantities within **Six months** from the date of order to commence the work and in the event of our tender being accepted in full or in part. I / We also undertake to enter into a Contract Agreement in the form hereto annexed with such alterations or additions thereto which may be necessary to give effect to the acceptance of the Tender and incorporating such Specification, Bill of Quantities, Drawing and Special & General Conditions of Contract and I / We hereby agree that until such Contract Agreement is executed the said Specification, Bill of Quantities, Conditions of Contract and the Tender, together with the acceptance thereof in writing by or on behalf of the Trustees shall be the Contract.
THE TOTAL AMOUNT OF TENDER Rs. **Not to mention here**

(Repeat in words) **_____Not to mention here**

_____

I / We require _____days / months preliminary time to arrange and procure the materials required by the work from the date of acceptance of tender before I We could commence the work.

I / We have deposited with the Trustees' Manager (Finance), HDC, vide Receipt No. _____ of _____ as Earnest Money.
I / We agree that the period for which the tender shall remain open for acceptance shall not be less than four months.

Dated: (Signature of Bidder with Seal)

Name of the Bidder :

Address :

ANNEXURE - F

General Conditions of Contract
Forms and Agreements

Sanctioned by the Trustees under Resolution No. 92 of the 6th Meeting held on 27th May, 1993

Including Addendum Sanctioned by the Trustees Meeting held on July, 2014

KOLKATA PORT TRUST

KOLKATA DOCK SYSTEM & HALDIA DOCK COMPLEX

JULY , 2014

GENERAL CONDITIONS OF CONTRACT

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AMENDMENT

TO

GENERAL CONDITIONS OF CONTRACT

❖ Cl-3.4 THE TENDER /OFFER & ITS PRE-REQUISITES

Table under sub-clause (a)

PREVIOUS	AS AMENDED

Estimated Value of Work	**Amount of Earnest Money**		**Estimated Value of Work**	Amount of Earnest Money	
	For Works Contract	**For Contract of Supplying Materials or Equipment only**		**For Works Contract**	For Contract of Supplying Materials or Equipment only
Up to Rs. 1,00,000=00	**5% of the estimated value of work**	**1% of the estimated value of work**	**Up to Rs. 10 Crore**	2% of the estimated value of work	1% of the estimated value of work
Over Rs. 1,00,000.00	**2% of the estimated value of work subject to a maximum of Rs. 20,000/- and minimum of Rs. 5,000/-.**	**½% of the estimated value of work subject to a maximum of Rs. 10,000/- and minimum of Rs. 1,000/-.**	**Over Rs. 10 Crore**	2% on first Rs. 10 Crore + 1% on the balance	½% of the estimated value of work subject to a maximum of Rs. 10,000/- and minimum of Rs. 1,000/-.

[AMENDMENT SANCTIONED BY THE BOARD OF TRUSTEES VIDE RESOLUTION NO 210 OF THE TRUSTEES' MEETING HELD ON 26.02.2013]

Table under sub-clause (d)

PREVIOUS			**AS AMENDED**		
Class of Registra-tion	Amount Of Fixed Security	Financial Limit Of Each Tender	Class of Registra-tion	Amount Of Fixed Security	Financial Limit Of Each Tender
A	Rs 10,000/-	Any tender priced upto Rs 2,00,000/-	**A**	Rs 50,000/-	Any tender priced up to Rs 10,00,000/-
B	Rs 5,000/-	Any tender priced upto Rs 1,00,000/-	**B**	Rs 25,000/-	Any tender priced upto Rs 5,00,000/-
C	Rs 2,500/-	Any tender priced upto Rs 50,000/-	**C**	Rs 15,000/-	Any tender priced upto Rs 3,00,000/-

[AMENDMENT SANCTIONED BY THE BOARD OF TRUSTEES VIDE RESOLUTION NO 82 OF THE TRUSTEES' MEETING HELD ON 12.10.2012]

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1. DEFINITIONS

1.0 In the contract, as here in after defined, the following words and

	expressions shall have the meaning herein assigned to them, except where the context otherwise required.	
1.1	**"Employer" or "Board" or "Trustees" means of the Board of Trustees for the Port of Calcutta, a body corporate under Section 3 of the Major Port Trusts Act, 1963, including their successors, representatives and assigns.**	**Employer**
1.2	**"Chairman" means the Chairman of the Board and includes the person appointed to act in his place under Sections 14 and 14A of the Major Port Trusts Act, 1963**	**Chairman**
1.3	**"Contractor" means the person or persons, Firm or Company whose tender/offer has been accepted by the Trustees and includes the Contractor's representatives, heirs, successor and assigns, if any, permitted by the Board/Chairman.**	**Contractor**
1.4	**"Engineer" means the Board's official who has invited the tender on its behalf and includes the Manager (Infrastructure & Civic Facilities) or other official as may be appointed from time to time by the Employer, with written notification to the Contractor, to act as Engineer for the purpose of the Contract, in place of the "Engineer" so designated.**	**Engineer**
1.5	**"Engineer's Representative" means any subordinate or Assistant to the Engineer or any other official appointed from time to time by the Engineer to perform the duties set forth in Clauses 2.4 to 2.6 hereof.**	**Engineer's Representative**
1.6	**"Work" means the work to be executed in accordance with the Contract and includes authorised "Extra Works" and 'Excess Works" and "Temporary Works".**	**Works**
1.7	**"Temporary Works" means all temporary works of every kind required in or about the execution, completion or maintenance of the works and includes (without thereby limiting the foregoing definitions) all temporary erections, scaffolding, ladders, timbering, soaking vats, site offices, cement and other godowns, platforms and bins for stacking building materials, gantries, temporary tracks and roads, temporary culverts and mixing platforms.**	**Temporary works**
1.8	**"Extra Works" means those works required by the Engineer for completion of the Contract which were not specifically and separately included in the schedule of items of the works i.e. (Bill of Quantities) of the tender. "Excess Works" means the required quantities of work in excess of the provision made against any item of the bill of Quantities.**	**Extra works and Excess works**
1.9	**"Specifications" means the relevant and appropriate Bureau of Indian Standard's specifications / International Standard's Specifications (latest revisions) for materials and workmanship unless stated otherwise in the Tender.**	**Specification**

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1.10	**"Drawings" means the drawings referred to in the Tender and specification and any modification of such drawings approved in writing by the Engineer and such other drawings as may from time to time be furnished or approved in writing by the Engineer.**	**Drawings**
1.11	**"Contract" means and includes the General and Special Conditions of Contract, Specifications, Drawings, priced Bill of Quantities, the Tender / Offer, the letter of acceptance of the Tender/Offer, the Contract Agreement, if separately entered into and the Schedule of Rates and Price, if any, adopted by the Trustees at their discretion.**	**Contract**
1.12	**"Constructional Plant" means all appliances or things of whatsoever nature required or about the execution, completion or maintenance of the works or temporary works and includes (without thereby limiting the foregoing definition) all machinery and tools but does not include materials or other things intended to form or forming part of the permanent works.**	**Constructional Plant**
1.13	**"Site" means the land, waterways and other places, on, under, in or through which the works are to be executed by the Trustees for the purpose of the Contract.**	**Site**
1.14	**"Contract Price" means the sum named in the letter of acceptance of the Tender/Offer of the Contractor, subject to such additions thereto and deductions therefrom as may be made by the Engineer under the provisions here in after contained.**	**Contract Price**
1.15	**"Month" means English Calendar Month.**	**Month**
1.16	**"Excepted Risks" are riot in so far as it is uninsurable, war, invasion, act of foreign enemies, hostilities) whether war be declared or not), Civil War, rebellion, revolution, insurrection or military or usurped power or use or occupation by the Trustees of any portion of the works in respect of which a certificate of completion has been issued (all of which are herein collectively referred to as the excepted risks).**	**Excepted Risks**
1.17	**Word importing the singular only, also includes the plural and vice-versa where the context so requires.**	**Singular/ Plural**
1.18	**The heading and marginal notes in these General Conditions of Contract shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.**	**Headings/ Marginal Notes.**
1.19	**Unless otherwise stipulated the work "Cost" shall be deemed to include**	**Cost**

overhead costs of the Contractor, whether on or off the site.

2.0 DUTIES & POWERS OF ENGINEER & ENGINEER'S REPRESENTATIVE.

2.1 The Contractor shall execute, compete and maintain the works in terms of the contract to the entire satisfaction of the Engineer and Shall comply with the Engineer's direction on any matter whatsoever. — **Engineer's Authority**

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2.2 The Contractor shall take instructions from the Engineer and subject to limitation of Clause 2.5 hereof, from the Engineer's Representative. — **Authority of Engineer's Representative**

2.3 ***The Engineer shall have full power and authority :*** — **Engineer's Power**

(a) to supply to the contractor from time to time during the progress of the works such further drawings and instructions as shall be necessary for the purpose of proper and adequate execution and maintenance of the works and the contractor shall carry out and be bound by the same.

(b) to alter or modify the specification of any material and workmanship and to inspect the work at any time.

(c) to order for any variation, alteration and modification of the work and for extra works.

(d) to issue certificates as per contract.

(e) to settle the claims & disputes of the Contractor and Trustees, as the first referee.

(f) To grant extension of completion time.

2.4 ***The Engineer's Representative shall :*** — **Power of Engineer's Representative.**

(i) watch and supervise the works.

(ii) test and examine any material to be used or workmanship employed in connection with the work.

(iii) have power to disapprove any material and workmanship not in accordance with the contract and the contractor shall comply with his direction in this regard.

(iv) take measurements of work done by the contractor for the purpose of payment or otherwise.

(v) order demolition of defectively done work for its reconstruction all by the Contractor at his own expense.

(vi) **have powers to issue alteration order not implying modification of design and extension of completion time of the work and**

(vii) **have such other powers and authorities vested in the Engineer, which have been delegated to him in writing by the Engineer under intimation to the Contractor.**

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2.5 ***Provided always that the Engineer's Representative shall have no power :***

Limitation of Engineer's Representative's Power

(a) to order any work involving delay or any extra payment by the Trustees,
(b) to make variation of or in the works; and
(c) to relieve the Contractor of any of his duties or obligations under the Contract.

2.6 **Provided also as follows :**

Engineer's Overriding Power

(a) Failure of Engineer's Representative to disapprove any work or materials shall not prejudice the power of the Engineer thereafter to disapprove such work or materials and to order the pulling down, removal, breaking-up thereof and re-constructing at the contractor's cost and the contractor shall have no claim to compensation for the loss if any sustained by him.

(b) If the contractor shall be dissatisfied by reason of any decision of the Engineer's Representative, he shall be entitled to refer the matter to the Engineer who shall thereupon confirm, reverse or vary such decision.

(c) Any written instructions or written approval given by the Engineer's Representative to the contractor, within the terms of delegation of power and authority vested in the Engineer to his Representative in writing, shall bind the contractor and the Trustees as though it had been given by the Engineer, who may from time to time make such delegation.

3.0 **THE TENDER/OFFER AND ITS PRE-REQUISITES**

3.1 **The Contractor shall, before making out and submitting his**

The tender

tender/offer, be deemed to have inspected and examined the site, fully considered all factors, risks and contingencies, which will have direct and indirect impact on his expenses and profit from the work and shall be specifically deemed to have taken the following aspects into consideration :	**must encompass all relevant aspects/ issues.**
(a) The form and nature of the site and its surroundings including their sub-surface, hydrological, tidal and climatic conditions, the means of access to the site and all other local conditions, including the likely charges and costs for temporary way-leave, if any, required for the work.	**Site & Local condition.**
(b) The drawings, specifications, the nature and extent of work to be executed and the quality, quantity and availability of the required materials and labour for the work and the need to execute the work to the entire satisfaction of the Engineer, and also by complying with the General and Special Conditions of Contract.	**Drawing/ Specification/ Nature & extent of work to be done.**

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(c) The accommodation required for the workmen and site office, mobilisation/demobilisation and storage of all plant, equipment and Construction materials.	**Accommodation for Contractor's men/materials.**
(d) The sources and means of procurement of water for drinking, washing and execution of work, and source and availability of electrical power, all at Contractor's cost.	**Water for drinking etc. /Electrical power.**
(e) Payment of taxes and duties and compliance of all applicable statutes, ordinances and law together with the rules made thereunder, the rules, regulations and bye-laws of public bodies or any local or other authority by the Contractor, keeping the Trustees indemnified against penalties and liabilities of every kind arising from the Contractor's failure in such compliance.	**Payment of Taxes/duties and observance of all statutes.**
(f) Payment of all kinds of stamp-duty for executing the agreement or for any legal instrument including Bank Guarantees and Indemnity Bonds.	**Payment of Stamp Duty by the Contractor.**

3.2 The Contractor's tender shall be in ink on the Tender Forms supplied by the Trustees, unless stipulated otherwise in the Notice Inviting the Tender and shall be faultless in figures and free from erasing. Corrections, if any, shall only be made by scoring out and initialling of

the revised figure.

3.3 **If required by the Engineer or the Trustees, the Contractors in their tender or subsequently, shall disclose the names of their owners/partners/share holders at the required points of time. The failure in this regard shall be treated as a breach and a contract, if entered into, shall be liable to be cancelled.**

Disclosure of Owner's name.

3.4 **(a) Unless otherwise stipulated in the Notice Inviting Tender / Offer, every tender must be submitted with Earnest Money of the amount calculated as per the following scale.**

Earnest Money and Security Deposit.

Estimated Value of Work	Amount of Earnest Money	
	For Works Contract	For Contract of Supplying Materials or Equipment only
Up to Rs. 1,00,000=00	5% of the estimated value of work	1% of the estimated value of work
Over Rs. 1,00,000=00	2% of the estimated value of work subject to a maximum of Rs. 20,000/- and minimum of Rs. 5,000/-.	½% of the estimated value of work subject to a maximum of Rs. 10,000/- and minimum of Rs. 1,000/-.

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(b) Earnest Money shall be deposited with the Trustees' treasurer in cash or by Banker's Cheque of any Calcutta Branch of a Nationalised Bank of India drawn in favour of Calcutta Port Trust or in the form of any "Account Payee" Draft of any Nationalised Bank of India drawn in favour of "Calcutta Port Trust" and payable at Calcutta/Haldia, as the case may be, and the receipt granted therefor be kept attached to the Tender/Offer in the Sealed Cover.

Method of Paying E.M.

(c) Earnest Money of unaccepted tender shall be refunded without any interest through A/c. Payee Cheque drawn on a Nationalised Bank of Calcutta / Haldia.

Refund of E.M.

(d) The enlisted (registered) Contractors of the Trustees who have deposited fixed Security with the Trustees' FA & CAO / Manager (Finance) according to his Class of Registration, shall be exempt from

Exemption from E.M. to Regd. Firms

depositing the Earnest Money, as per the following scale :

Class of Registration	Amount of Fixed Security	Financial Limit of Each Tender
A	Rs. 25,000/-	Any tender priced up to Rs.5,00,000/-
B	Rs. 10,000/-	Any tender priced up to Rs.2,00,000/-
C	Rs. 5,000/-	Any tender priced up to Rs.1,00,000/-

(e) (i) Tender submitted without requisite Earnest Money may be liable to rejection. — **Tender without EM liable to rejection.**

(ii) If before expiry of the validity period of his Tender/Offer, the tenderer amends his quoted rates or tender/offer making them unacceptable to the Trustees and/or withdraws his tender/offer, the Earnest Money deposited shall be liable to forfeiture at the option of the Trustees. — **Forfeiture of E.M. before Acceptance of offer.**

(f) The Earnest Money of accepted tender/offer shall be retained by the Trustees as part of the Security Deposit, for which a separate Treasury Receipt shall be issued to the Contractor after cancellation of the previous Receipt of Earnest Money. — **E.M. to be converted to part S.D.**

(g) Balance security for works contract shall be recovered by deduction from all progressive Bill (including final Bill, if necessary) @ 10% of the gross value of work in each such bill, so that the total recovery may not exceed the quantum computed as per the under noted percentages of the total value of work actually done up to the stage of completion. — **Mode of recovery of balance S.D.**

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Value of Work	% of Security Deposit for works contract.	% of Security Deposit For contract of supplying materials & equipment only.
For works up to Rs.10,00,000/-.	10% (Ten percent)	1% (One percent)

Scale of S.D. recovery.

For works costing more than Rs.10,00,000/- and up to Rs.20,00,000/-	**10% on first Rs.10,00,000/- +7½% on the balance.**	**1% on first Rs.10,00,000/- + ½% on the balance.**
For works costing more than Rs.20,00,000/-	**10% on first Rs.10,00,000/- + 7 ½% on the next Rs.10,00,000/- + 5% on the balance.**	**1% on first Rs.10,00,000/- + ½% on the next Rs.10,00,000/- + ¼% on the balance.**

(h) Balance Security for Contract of supplying materials and equipment computed in terms of the percentages given above, shall have to be deposited with the Trustees' Treasurer in advance and within 30 days from the date of placement of supply order, either in cash or by A/c. Payee Draft of a Nationalised Bank of India drawn in favour of Calcutta Port Trust and payable at Calcutta/Haldia, as the case may be.

S.D. for supply contracts to be deposited in advance.

(i) No interest shall be paid by the Trustees to the Tenderer/Contractor on the amount of Earnest Money/Security Deposit held by the Trustees, at any stage.

No interest payable on E.M. /S.D

3.5 (i) The Security Deposit shall refunded to the Contractor in terms of Clause 9.3 hereinafter and subject to deduction, if any, under the provision of Sub-clause 3.5 (ii) herein below. Id, however, the Contract provides for any maintenance period. 50% of the Security Deposit may be refunded against any of the treasury Receipt for that amount on expiry of half of the maintenance period and the balance deposit on the expiry of the said maintenance period and after the Engineer has certified the final completion of work in Form G.C.2 and the Contractor has submitted his "No Claim" Certificate in Form G.C.3.

Mode of refund of S.D.

(ii) The Security Deposit/Earnest Money may be liable to forfeiture at the option of the Trustees, if the Contractor fails to carry out the work or to perform/observe any of the conditions of the Contract. The Trustees shall also be at liberty to deduct any of their dues from the Security Deposit, fixed Security, Earnest Money or from any sum due or to become due to the Contractor under any other contract.

Forfeiture of S.D.

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3.6 If stipulated in the contract as a Special Condition, the contractor shall have to Bank

submit to the Engineer a performance Bond in the form of an irrevocable guarantee from Calcutta/Haldia Branch, as the case may be, of any Nationalised Bank of India in the proforma annexed hereto and for the sum and period as mentioned in the letter of acceptance of the Tender/Offer, within 15 days from the date of such letter, failing which the Contract shall be liable to be terminated and the earnest money shall be liable to forfeiture; all at the discretion of the Engineer. The cost of obtaining this or any other Bank Guarantee and/or the revalidation thereof, wherever required, has to be borne by the Contractor and it shall be his sole responsibility to arrange for timely revalidation of such Bank Guarantee, failing which and for non-fulfilment of any contractual obligation by the Contractor, the Engineer and/or the Trustees shall be at liberty to raise claim against the Guarantee and/or enforce the same unilaterally.

Guarantee in lieu of Cash S.D. in certain cases

3.7 "Every Tenderer/ Bidder shall submit, in respect of a tender value of more than Rs 5 Crore, along with their tender comprising Special Conditions of Contract, General Conditions of Contract, BOQ, Earnest Money, etc. a document called Integrity Pact Agreement duly signed by their authorized representative. The Proforma of the Integrity Pact Agreement shall as specified in the GCC. In case of tender value more than Rs 5 Crore, the Integrity Pact Agreement is an essential part and parcel of bid document to be submitted by each tenderer, without which the tender shall not be considered."

4.0 THE CONTRACT & GENERAL OBLIGATIONS OF CONTRACTOR

4.1 (a) The contract documents shall be drawn-up in English language.

English language to be used

(b) The contract shall be governed by all relevant Indian Acts. As applicable only within the jurisdiction of the High Court at Calcutta, India, including the following Acts :

Applicability of laws on the contract

1. **The Contract Act (India), 1872.**
2. **The Major Port Trusts Act, 1963.**
3. **The Workmen's Compensation Act, 1923.**
4. **The Minimum Wages Act, 1948.**
5. **The Contract Labour (Regulation & Abolition) Act,1970.**
6. **The Dock Workers' Act,1948.**
7. **The Arbitration and Conciliation Act (1996) (in the case of a definite Arbitration Agreement only).**

4.2 After acceptance of his Tender/Offer and when called on to do so by the engineer or his representative, the contractor shall, at his own expense, enter into and execute a Contract Agreement to be prepared by him in the form annexed hereto. Until such Contract Agreement is executed, the other documents referred to in the definition of the term 'Contract' here-in-before, shall collectively be the Contract.

Contractor to Execute Contract Agreement.

4.3 Several documents forming the contract are to be taken as mutually explanatory of one another. Should there by any discrepancy, ambiguity, omission or error in the various contract documents, the Engineer shall have the power to correct the same and his decision shall be final and binding on the parties to the Contract.

Interpretation of contract documents –Engineers'

Power

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4.4	**Two copies of the Drawings referred to in the general and special Conditions of Contract and in the Bill of Quantities, shall be furnished by the Engineer to the Contractors free of cost for his use on the work, but these shall remain the property of the Trustees and hence, the Contractor shall return them to the Engineer or his Representative on completion of the work, if not torn or mutilated on being regularly used at site.**	**All Drawings are Trustees' property.**
4.5	**The Contractor shall prove and make at his own expense any working or progress drawings required by him or necessary for the proper execution of the works and shall, when required, furnish copies of the same free of cost to the Engineer for his information and/or approval, without meaning thereby the shifting of Contractor's responsibility on the Engineer in any way whatsoever.**	**Contractor to prepare working / progress drawings**
4.6	**The Contractor shall not directly or indirectly transfer, assign or sublet the Contract or any part thereof without the written permission of the Engineer. Even if such permission be granted, the Contractor shall remain responsible (a) for the acts, defaults and neglect of any sub-contractor, his agents, servants or workmen as fully as if these were the acts, defaults or neglects of the Contractor himself or his agents, servants or workmen and (b) for his full and entire responsibility of the contract and for active superintendence of the works by him despite being sublet, provided always that the provision of labourers on a "piece rate" basis shall not be deemed to be sub-letting under this clause.**	**Contractor cannot sub-let the work**
4.7	**Unless otherwise specified, the Contractor shall be deemed to have included in his Tender/Offer all his cost for supplying and providing all constructional plant, temporary work. Materials both for temporary and permanent works, labour including supervision thereof, transporting to and from the site and in and about the work, including loading, unloading, fencing, watching, lighting, payment of fees, taxes and duties to the appropriate authorities and other things of every kind required for the construction, erection, completion and maintenance of the work.**	**Contractors' price is inclusive of all costs**
4.8	**The Contractor shall be solely responsible for the adequacy, stability and safety of all site operations and methods of construction, even if any prior approval thereto has been taken from the Engineer or his Representative. The Contractor shall not be responsible for the correctness of the design or specification of the Temporary and Permanent works formulated by the Engineer; but the Contractor shall be fully responsible for the correct implementation thereof, as also for any design and specification prepared/proposed/used by the Contractor.**	**Contractor is responsible for all construction process, except for correctness of design and specification formulated by**

		the Engineer
4.9	**Whenever required by the Engineer or his representative, the Contractor shall submit to him the details of his (a) programme for execution of the work, (b) proposed procedure and methods of work, (c) proposed deployment of plant, equipment, labour, materials and temporary works. The submission to and/or any approval by the Engineer or his Representative to any such programme or particulars shall not relieve the Contractor of any of his obligations under the contract.**	**Contractor to submit his programme of work**

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If for any reason the contractor be unable to adhere to his earlier programme, he shall submit his revised programme for completion of work within the stipulated time whenever asked to do so.

4.10	**Necessary and adequate supervision shall be provided by the Contractor during execution of the works and as long thereafter as the Engineer or his representative shall consider necessary during the maintenance period. The Contractor or his competent and authorised agent or representative shall be constantly at site and instructions given to him by the Engineer or his representative in writing shall be binding upon the Contractor subject to limitation in Clause 2.5 hereof. The Contractor shall inform the Engineer or his representative in writing about such representative/agent of him at site.**	**Contractor to supervise the works**
4.11	**The Contractor shall employ in execution of the Contract only qualified careful and experienced persons and the Engineer shall be at liberty to direct the Contractor to stop deployment of any of is staff, workmen or official at site and the Contractor shall within 48 hours comply with such instruction without any demur whenever the Engineer shall feel that the deployment of the person concerned will not be conducive to the proper and timely completion of the work.**	**Contractor to deploy qualified men and Engineer's power to remove Contractor's men**
4.12	**The Contractor shall be responsible for the true and proper setting out of the works in relation to reference points/lines/levels given by the Engineer in writing. The checking of any setting-out or of any alignment or level by the Engineer or his Representative shall not in any way relieve the contractor of his responsibility for the correctness thereof and he shall fully provide protect and preserve all stakes, templates, bench marks, sight rails, pegs, level marks, profile marks and other things used in setting out the works.**	**Contractor is responsible for line, level, setting out etc.**

4.13	**From the commencement of the works till issue of the completion certificate in Form G.C.1, vide Clause 5.12 hereof, the contractor shall take full responsibility for the care thereof. Save for the excepted risks, any damage, loss or injury to the work or any part thereof shall be made good by the Contractor at his own cost as per instruction and to the satisfaction of the engineer, failing which the Engineer or his Representative may cause the same to be made good by any other agency and the expenses incurred and certified by the Engineer shall deem proper. This Clause will not apply to that part of the work, which might have been taken over by the Trustees on partial completion of the work and in such case the Contractor's obligation will be limited to repairs and replacement for manufacturing or construction defects during the Maintenance period (Guarantee Period) as per the directions of the Engineer as also for defects/damages if any caused to the work by the Contractor during such repairs and replacement in the maintenance period.**	**Contractor is responsible to protect the work**

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4.14	**The Contractor shall at his own cost protect support and take all precautions in regard to the personnel or structure or services or properties belonging to the Trustees or not which may be interfered with or affected or disturbed or endangered and shall indemnify and keep indemnified the Trustees against claim for injury, loss or damage caused by the Contractor in connection with the execution and maintenance of the work to the aforesaid properties, structures and services and/or to any person including the Contractor's workmen. Cost of Insurance Cover, if any, taken by the Contractor shall not be reimbursed by the Trustees, unless otherwise stipulated in the Contract.**	**Contractor is responsible for all damages to other structures / persons caused by him in executing the work.**
4.15	**The Contractor shall immediately inform the Engineer's Representatives if any fossil, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological importance be discovered at site which shall remain the property of the Trustees and protect them from being damaged by his workmen and arrange for disposal of them at the Trustees' expense as per the instruction of the Engineer's Representative.**	**Fossils, Treasure travois, etc. are Trustees' property**
4.16	**The Contractor shall be deemed to have indemnified and shall indemnify the Trustees against all claims, demands, actions and proceedings and all costs arising therefrom on account of :**	**Contractor to Indemnify the Trustees against all**

(a) **Infringement of any patent right, design, trademark or name or other protected right in connection with the works or temporary work.**

claims for loss, damage, etc.

(b) **Payment of all royalties, rent, toll charges, local taxes, other payments or compensation, if any, for getting all materials and equipment required for the work.**

(c) **Unauthorised obstruction or nuisance caused by the contractor in respect of Public or Private or Private road, railway tracks, footpaths, crane tracks, waterways, quays and other properties belonging to the Trustees or any other person.**

(d) **Damage/injury caused to any highway and bridge on account of the movement of Contractor's plants and materials in connection with the work.**

(e) **Pollution of waterway and damage caused to river, lock, sea-wall or other structure related to waterway, in transporting contractor's plants and materials.**

(f) **The Contractor's default in affording all reasonable facilities and accommodation as per the direction of the Engineer or his Representative to the workmen of the Trustees and other agencies employed by or with the permission and/or knowledge of the Trustees on or near the site of work.**

4.17 **Debris and materials, if obtained by demolishing any property, building or structure in terms of the Contract shall remain the property of the Trustees.**

Dismantled materials Trustees' property

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4.18 **The Contractor's quoted rates shall be deemed to have been inclusive of the following :**

Contractor's quoted rates/price must be all inclusive

(a) **Keeping the site free of unnecessary obstruction and removal from site of constructional plant wreckage, rubbish, surplus earth or temporary works no longer required.**

(b) **Cleaning and removal from site all the surplus materials of every kind to leave the site clean and tidy after completion of the work, without which payment against final bill may be liable to be withheld.**

(c) **Precautionary measures to secure efficient protection of Docks, the River Hooghly and other waterways against pollution of whatever nature during execution and maintenance of the works and to prevent rubbish, refuse**

and other materials from being thrown into the water by the Contractor's men or those of his agency.

(d) Making arrangements for deployment of all labourer and workers, local or otherwise including payment for their wages, transport, accommodation, medical and all other statutory benefits and entry permits, wherever necessary.

(e) Making arrangements in or around the site, as per the requirements of local authority or the Engineer or his Representative for preventing (i) spread of any infectious disease like smallpox, cholera, plague or malaria by taking effective actions for destruction of rats, mice, vermin, mosquitoes, etc. and by maintaining healthy and sanitary condition, (ii) illegal storage and distribution of Drugs, Narcotics, Alcoholic liquor, Arms and Ammunitions, (iii) unlawful, riotous or disorderly conduct of the Contractor's or his Sub-Contractor's workmen, (iv) deployment of workmen of age less than 16 years.

4.19 Every direction or notice to be given to the Contractor shall be deemed to have been duly served on or received by the Contractor, if the same is posted or sent by hand to the address given in the tender or to the Contractor's Site Office or to the Registered Office of the Contractor. The time mentioned in these conditions for doing any act after direction or notice shall be reckoned from the time of such posting or despatch.

Notice to Contractor.

4.20 The Contractor and his Sub-contractor or their agents and men and any firm supplying plant, materials and equipment shall not publish or caused to be published any photographs or description of the works without the prior authority of the Engineer in writing.

Contractor not to publish photograph or particulars of work

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4.21 The Contractor shall at the Trustees' cost to be decided by the Engineer render all reasonable facilities and Co-operation as per direction of the Engineer or his representative to any other Contractor engaged by the Trustees and their workmen to the Trustees' own staff and to the men of other Public Body on or near the site of work and in default the Contractor shall be liable to the Trustees for any delay or expense incurred by reason of such default.

Contractor to provide facilities to outsiders

4.22	**The work has to be carried out by the Contractor causing the minimum of hindrance for any maritime traffic or surface traffic.**	**Work to cause minimum possible hindrance to traffic movement**
4.23	**All constructional plants, temporary works and materials when brought to the site by the Contractor shall be deemed to be the property of the Trustees who will have lien on the same until the satisfactory completion of the work and shall only be removed from the site in part or in full with the written permission of the Engineer or his Representative.**	**Trustees' lien on Contractor's Plant & Equipment.**
5.0	**COMMENCEMENT, EXECUTION AND COMPLETION OF WORK.**	
5.1	**The Contractor shall commence the work within 7 days of the receipt of Engineer's letter informing acceptance of the Contractor's tender/offer by the Trustees or within such preliminary time as mentioned by the Contractor in the Form of Tender or the time accepted by the Trustees. The Contractor shall then proceed with the work with due expedition and without delay, except as may be expressly sanctioned or ordered by the Engineer or his Representatives, time being deemed the essence of the contract on the part of the contractor.**	**Preliminary time to commence work an maintenance of steady rate of progress**
5.2	**The Contractor shall provide and maintain a suitable office at or near the site to which the Engineer's Representative may send communications and instructions for use of the Contractor.**	**Contractor's site office**
5.3	**Unless specified otherwise in the contract or prior permission of the Engineer has been taken, the contractor shall not execute the work beyond the working hours observed by the Engineer's Representative and on Sundays and Holidays observed in the Trustees' system, except in so far as it becomes essential on account of tidal work or for safety of the work. If the progress of the work lags behind schedule or the work has been endangered by any act or neglect on the part of the contractor, then the Engineer or his Representative shall order and the contractor at his own expense shall work by day and by night and on Sundays and Public Holidays. Any failure of the Engineer or his Representative to pass such an order shall not relieve the contractor from any of his obligations. The Engineer's decision in this regard shall be final binding and conclusive.**	**Contractor to observe Trustees' working hours**

5.4 **Unless stipulated otherwise in the contract all materials required for** **Contractor to**

	the work shall be procured and supplied by the contractor with the approval of the Engineer or his Representative and subject to subsequent testing as may be required by the Engineer or his Representative. The Engineer shall exercise his sole discretion to accept any such materials.	**supply all materials as per requirement of the Engineer or his representative**
5.5	**Unless stipulated otherwise in the contract all materials, workmanship and method of measurement shall be in accordance with the relevant Codes (Latest Revision) of the Bureau of Indian Standards and the written instructions of the Engineer or his Representative. Where no specific reference is available in the contract, the material and workmanship shall be of the best of their respective kinds to the satisfaction of the Engineer.**	**Materials & Works**
5.6	**Samples shall be prepared and submitted for approval of the Engineer or his representative, whenever required to do so, all at the Contractor's cost.**	**Contractor to submit samples for approval**
	Unless stipulated otherwise in the contract, the cost of any test required by the Engineer or his representative in respect of materials and workmanship deployed on the work, shall be borne by the Contractor.	**Contractor to arrange all testing at his own cost.**
5.8	**Regarding the supply of any materials by the Trustees to the contractor in accordance with the contract, the following conditions shall apply :**	
	(a) The Contractor shall, at his own expense, arrange for transporting the materials from the Trustees' Stores, watching, storing and keeping them in his safe custody, furnishing of statement of consumption thereof in the manner required by the Engineer or his representative, return of surplus and empty container to the Trustees' Stores as per the direction of the Engineer or his Representative.	**The Contractor shall account for and look after the Trustees' materials**
	(b) Being the custodian of the Trustees' materials, the contractor shall remain solely responsible for any such materials issued to him and for any loss or damage thereof for any reason other than "Excepted Risks", the Contractor shall compensate the Trustees' in the manner decided by the Engineer and shall at no stage remove or cause to be removed any such material from the site without his permission in writing.	**Contractor to compensate for loss and damage to Trustees' materials**
	(c)The Trustees' materials will generally be supplied in stages and in accordance with the rate of progress of work but except for grant of suitable extension of completion time of work as decided by the Engineer. The Contractor shall not be entitled to any other	**Delay in supply of Trustees' materials will only entitle the**

compensation, monetary or otherwise, for any delay in the supply of Trustees' materials to him. The Contractor shall, however, communicate his requirement of such materials to the Engineer from time to time.	**Contractor for extension of completion time of work**

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(d) Unless stipulated otherwise in the contract, the value of the Trustees' materials issued to the contractor shall be recovered from the contractor's bills and/or any of his other dues, progressively according to the consumption thereof on the work and/or in the manner decided by the Engineer or his representative and at the rate/s stipulated in the contract. These rates shall only be considered by the contractor in the preparation of his tender/offer and these will form the basis of escalation/variation, if in future the contractor is required to procure and provide any such material on the written order of the Engineer consequent on the Trustees' failure to effect timely supply thereof.	**Recovery from Contractor for Trustees' materials under normal circumstances**
(e) If the Engineer decides that due to the contractor's negligence, any of the Trustees' materials issued to the contractor has been – (i) lost or damaged, (ii) consumed in excess of requirement and (iii) wasted by the contractor in excess of normal wastage, then the value thereof shall be recovered from the contractor's bills or from any of his other dues, after adding 19 ¼% extra over the higher one of the followings -	**Recovery from Contractor for Trustees' materials under other circumstances.**
(1) The issue rate of the materials at the Trustees' Stores and	
(2) The market price of the material on the date of issue as would be determined by the Engineer.	
5.9 The Engineer or his Representative shall have the power to insect any material and work at any time and to order at any time – (I) for removal from the site of any material which in his opinion is not in accordance with the contract or the instruction of the engineer or his representative, (ii) for the substitution of the proper and suitable materials, or (iii) the removal and proper re-execution of any work which in respect of material and workmanship is not in accordance with the contract or the instructions of the Engineer. The Contractor shall comply with such order at his own expense and within the time specified in the order. If the contractor fails to comply, the Engineer shall be at liberty to dispose any such materials and re-do any work in the manner convenient to the Trustees by engaging any outside agency at the risk and expense of the contractor and after giving him a written prior notice of 7 days.	**Contractor to replace materials/work not acceptable to the Engineer or his Representative**

5.10 **No work shall be covered up and put out of view by the contractor without approval of the Engineer or his Representative and whenever required by him, the contractor shall uncover any part or parts of the work or make openings in or through the same as may be directed by the Engineer or his representative from time to time and shall reinstate or make good those part of works thus affected to the satisfaction of the Engineer, all at the cost of the contractor.**

Contractor to seek approval of Engineer or his Representative before covering up any portion of work

The Trustees shall reimburse such cost as determined by the Engineer, if the initial covering up was with prior written order of the Engineer or his Representative.

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5.11 **On a written order of the Engineer or his Representative, the contractor shall delay or suspend the progress of the work till such time the written order to resume the execution is received by him. During such suspension the contractor shall protect and secure the work to the satisfaction of the Engineer or his Representative. All extra expenses in giving effect to such order shall be considered by the Trustees, unless such suspension is –**

Contractor to suspend work on Order from Engineer or his Representative

(a) otherwise provided for in the contract, or

(b) necessary by reason of some default on the part of the contractor, or

(c) necessary by reason of climatic conditions on the site, or

(d) necessary for proper execution of the works or for the safety of the works or any part thereof.

The Engineer shall settle and determine such extra payment and/or Extension of completion time to be allowed to the contractor, as shall, in the opinion of the Engineer be fair and reasonable, and the same shall be final and binding on the Contractor.

5.11.1 **If at any time before or after commencement of the work the Trustees do not require the whole of the work tendered for the Engineer shall notify the same to the contractor in writing and the contractor shall stop further works in compliance of the same. The Contractor shall not be entitled to any claim for compensation for underived profit or for such premature stoppage of work or on account of curtailment of the originally intended work by reason of alteration made by the Engineer in the original specifications, drawings, designs and instructions.**

5.12 **When the whole of the work has been completed to the satisfaction**

Completion

of the Engineer and has passed any final test prescribed in the contract, the contractor shall, within 21 days of submission of his application to the Engineer, be entitled to receive from him a certificate for completion of work in Form G.C.1, annexed hereto. If any part of the total work having been completed to the satisfaction of the Engineer, be taken over and/or used by the Trustees, the Contractor shall on application be entitled to partial completion certificate in the Form G.C.1 indicating the portion of the work covered by it, so that the Contractor's liability during maintenance period of the contract, if any, shall commence from the date mentioned in such certificate so far as the completed portion of the work is concerned.

Certificate G.C.1.

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6.0 TERMS OF PAYMENT :

6.1 No sum shall be considered as earned by or due to the Contractor in respect of the work till final and satisfactory completion thereof and until a certificate of final completion in Form G.C.2 has been given by the Engineer.

On account payments, if any, made prior to issue of the certificate in Form G.C.2, shall all be treated as mere advance, which shall stand recoverable in full or in part, if the Engineer so decides in the context of Contractor's unfulfilled contract condition, if any.

All interim payments are advances till issue of Certificate in Form G.C.2

6.2 All payments shall be made to the Contractor only on the basis of measurements of actual work done, as recorded in the Trustees' measurement books and at accepted tendered or at agreed rates, as the case may be, except as otherwise provided in the contract and when the Engineer decides any other rate for change in the scope of work or omission, if any, on the part of the Contractor.

Payment on the basis of measurements at agreed rates.

6.3 For work of sanctioned tender value more than Rs.50,000/- or having an initially stipulated completion period of 4 months or more, on account payments may be made sat the discretion of the Engineer or his Representative at intervals deemed suitable and justified by him. Provided always that subject to execution of work of substantial value in the context of the contract price, the interval of such on account payments shall be decided by the Engineer or his

Limitation for on account payment

Representative, which shall ordinarily not be less than 1 month in between two payments for on account bill and/or advance.

6.4 **Measurement for works done shall be progressively taken by the Engineer's Representative and entered in the Trustees' Measurement Book, at intervals deemed suitable and proper by him and/or the Engineer. The Contractor or his duly accredited Representative or Agent shall remain present at the time of such measurement and assist the engineer's Representative in every manner required by him. After the measurements taken have been entered in the Measurement Book, the Contractor or his Agent shall sign the Measurement Book at the wend of such Measurements over the Contractor's Rubber Stamp as a token of acceptance of all such measurements, recorded above and prior to such signature. If the Contractor or his Agent fails to participate even after 3 days written notice from the Engineer's Representative, the measurement shall be taken ex-parte by the Engineer's Representative and those shall be accepted by the Contractor.**

Recording of measurements

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6.5 **Based on the quantum of work and the value thereof computed in the Measurement Book, the Contractor shall type out his bill in the proforma approved by the Engineer and submit the same to the Engineer's Representative in quadruplicate, duly signed by him or his accredited Agent over his Rubber Stamp. The Engineer or his Representative may in his absolute discretion, allow advance payment against such bill to the extent of an amount not exceeding 75% of the "net payable" sum of the said bill, subject to adjustment thereof against the bill at the time of checking and auditing the bill at the Trustees' end. The measurement Book will not be handed over to the Contractor; but he will obtain the abstracts of quantities, amounts and recoveries to type out the bill.**

Contractor to prepare and submit his bills

6.6 **At the discretion of the Engineer or his Representative and only in respect of accepted offers/where estimated amount put to tender would be Rs.2,00,000/- or more, advance payment may be made to the extent of 75% of the value of any material purchased and brought to the site by the Contractor. Provided always that –**

(i) the materials shall, in the opinion of the Engineer or his Representative be of imperishable nature,

(ii) the value of such materials shall be assessed by the engineer or his Representative at their own discretion,

Advance payment against Non-perishable materials

(iii) a formal agreement has been drawn up with the contractor, under which the Trustees secure a lien on the contractor's materials,

(iv) the materials are safe-guarded by the contractor against losses, shortage and misuse due to the contractor postponing the execution of the work or otherwise,

(v) in the event of storage of such materials within the Trustees' protected areas in the Docks, the contractor shall submit an Indemnity Bond in the proforma and manner acceptable to Trustees' whereby the contractor shall indemnify the Trustees against all financial loss/damage, on account of loss/damage to such materials for whatever reasons,

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(vi) in the event of storage of such materials outside the Trustees' protected areas the Contractor shall submit to the Engineer an irrevocable Bank Guarantee favouring the Trustees and for the same sum as is being advance, in the proforma and manner acceptable to the Trustees. The Guarantee shall be of a Calcutta/Haldia Branch of any Nationalised Bank or a Schedule Commercial Bank, as the case may be, acceptable to the Trustees and shall remain valid till the anticipated period of consumption of such materials in the work. The Bank Guarantee must bear an undertaking by the issuing Bank guaranteeing automatic payment of the guaranteed sum to the Trustees by the Bank on the date of expiry of the validity of the Guarantee, unless with the prior written approval of the Engineer on behalf of the Trustees, the Bank has extended the validity of the Guarantee.

(vii) The amount of advance shall be recoverable from the contractor's bills or any other dues, progressively with the consumption of the materials on the basis of quantity consumed. Consequent on full recovery of the advance the Indemnity Bond/Bank Guarantee, vide Sub-clause (v) & (vi) above, shall be returned to the Contractor duly discharged by the Engineer on behalf of the Trustees.

6.7	**No certificate of the Engineer or his representative shall protect the Contractor against or prevent the Trustees from obtaining repayment from the Contractor, in case the Engineer or his representative should overcertify for payment or the Trustees should over-pay the Contractor on any account.**	**Recovery for wrong and over payment**
6.8	**No claim for interest shall be admissible or payable to the Contractor at any stage and in respect of any money or balance or Bank Guarantee, which may be due to the Contractor from the Trustees, owing to dispute or otherwise or for any delay on the part of the Trustees in making interim or final payment or otherwise.**	**Interest not admissible to Contractor**
7.0	**VARIATION AND ITS VALUATION :**	
7.1	**The Quantities set out in the Bill of Quantities of the tender shall be treated as estimated quantities of the work and shall never be deemed as actual or correct quantities of the works to be executed by the contractor in fulfilment of his obligation under the contract.**	**Quantities in Bill of Quantities of Tender**
7.2	**The Engineer shall have the power to order the Contractor in writing to make any variation of the quantity, quality or form of the works or any part thereof that may, in his opinion, be necessary and the Contractor upon receipt of such an order shall act as follows :**	**Engineer's power to vary the works**

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7.2

(a) Increase or decrease the quantity of any work included in the contract.

(b) Omit any work included in the contract.

(c) Change the Character or quality or kind of any work included in the contract.

(d) Change the levels, lines, position and dimensions of any part of the work, and

(e) Execute extra and additional work of any kind necessary for completion of the works

7.3	**No such variation shall in any way vitiate or invalidate the contract or be treated ass revocation of the contract, but the value (if any) of all such variations evaluated in accordance with the Engineer's sole decision shall be taken into account and the contract price shall be varied accordingly.**	**Variation by engineer do not vitiate the contract**

7.4 **Provided always that written order of the Engineer shall not be required for increase or decrease in the quantity of any work upto 15% where such increase or decrease is not the result of any variation order given under this clause but is the result of the quantities exceeding or being less than those stated in the bill of quantities. Provided also that verbal order of variation from the Engineer shall be complied with by the Contractor and the Engineer'' subsequent written confirmation of such verbal order shall be deemed to be an order in writing within the meaning of this clause.**

Where written order for variation is not needed

7.5 **(a) The Contractor shall not be entitled to any claim of extra or additional work unless they have been carried out under the written orders of the Engineer.**

(b) The Engineer shall solely determine the amount (if any) to be added to or deducted from the sum named in the tender in respect of any extra work done or work omitted by his order.

(c) All extra, additional or substituted work done or work omitted by order of the Engineer shall be valued on the basis of the rates ad prices set out in the contract, if in the opinion of the Engineer, the same shall be applicable. If the contract does not contain any rates or prices directly applicable to the extra, additional or substituted work, then the Engineer may decide the suitable rates on the basis of Schedule of Rates (including surcharge in force at the time of acceptance of tender), if any, adopted by the Trustees with due regard to the accepted contractual percentage, if any thereon. In all other cases the Engineer shall solely determine suitable rates in the manner deemed by him as fair and reasonable, and his decision shall be final, binding and conclusive.

Payment for extra or additional, or omitted work or substituted work, Engineer's powers

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(d) If the nature or amount of any omission or addition relative to the nature or amount of the whole of the contract work or to any part thereof shall be such that, in the opinion of the Engineer, the rate of prices contained in the contract for any item of the works or the rate as evaluated under sub-clauses (b) and (c) of this clause, is by reason of such omission or addition rendered unreasonable or in-applicable, the Engineer shall fix such other rate or price as he deems proper and the Engineer's decision shall be final, binding and conclusive.

8.0 **DELAY / EXTENSION OF COMPLETION TIME / LIQUIDATED DAMAGE / TERMINATION OF CONTRACT**

8.1 **Should the quantum of extra or additional work of any kind or delayed availability of the Trustees' materials to be supplied as per**

Extension of completion time

contract or exceptionally adverse climatic conditions and natural phenomenon or strikes, lock-outs, civil commotion or other special circumstances of any kind beyond the control of the Contractor, cause delay in completing the work, the contractor shall apply to the Engineer in writing for suitable extension of completion time within 7 days from the date of occurrence of the reason and the Engineer shall thereupon consider the stated reasons in the manner deemed necessary and shall either reject the application or determine and allow in writing the extension period as he would deem proper for completion of the work with or without the imposition of "Liquidated Damage" Clause (No.8.3 hereof) on the Contractor and his decision shall be final and binding on the Contractor. If an extension of completion time is granted by the Engineer without imposition of liquidated damage, from the Clause No.8.3 of the Liquidated damage shall apply from its date of expiry, if the work be not completed within the extended time, unless stated otherwise in the decision communicated by the Engineer, as aforesaid.

8.2 **1. If the Contractor fails to complete the work within the stipulated dates or such extension thereof as communicated by the Engineer in writing, the Contractor shall pay as compensation (Liquidated Damage) to the Trustees and not as a penalty, ½% (half percent) of the total value of work (contract piece) as mentioned in the letter of acceptance of the tender/offer, for every week or part thereof the work remains unfinished. Provided always that the amount of such compensation shall not exceed 10% of the said value of work. The amount of Liquidated damages shall be determined by the Engineer, which shall be final and binding.**

'Liquidated Damage' and other compensation due to Trustees

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(b) Without prejudice to any of their legal rights, the Trustees shall have the power to recover the said amount of compensation/damage in Sub-clause (a) of this clause, from any money due or likely to become due to the Contractor. The payment or deduction of such compensation/damage shall not relieve the Contractor from his obligation to complete the work or from any of his other obligations/liabilities under the contract and in case of the Contractor's failure and at the absolute discretion of the Engineer, the work may be ordered to be completed by some other agency at the risk and expense of the Contractor, after a minimum three days notice in writing has been given to the Contractor by the Engineer or his Representative.

8.3 **Without being liable for any compensation to the Contractor, the Trustees may, in their absolute discretion, terminate the contract and**

Default of the Contractors

enter upon the site and works and expel the Contractor there from after giving him a minimum 3 days' notice in writing, due to occurrence of any of the following reasons and decision of the Trustees in this respect, as communicated by the Engineer shall be final and conclusive :

remedies & powers/Termination of Contract.

(i) The Contractor has abandoned the contract.

(ii) In the opinion of the Engineer, either the progress of work is not satisfactory or the work is not likely to be completed within the agreed period on account of Contractor's lapses.

(iii) The Contractor has failed to commence the works or has without any lawful excuse under these conditions has kept the work suspended for at least 15 days despite receiving the Engineer'' or his Representative'' written notice to proceed with the work.

(iv) The Contractor has failed to remove materials from site or to dismantle or demolish and replace work for 7 days after receiving from the Engineer or his representative the written notice stating that the said materials or work were condemned and rejected by him under these conditions.

(v) The Contractor is not executing the works in accordance with the contract or is persistently or flagrantly neglecting to carry out his obligations under the contract.

(vi) Any bribe, commission, gift or advantage is given, promised or offered by or on behalf of the contractor t any officer, servant or representative of the Trustees or to any person on his or their behalf in relation to the obtaining or to the execution of the contract.

(vii) The Contractor is adjusted insolvent or enters into composition with his creditors or being a company goes into liquidation either compulsory or voluntary.

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8.3.1 Upon receipt of the letter of termination of work, which may be issued by the Engineer on behalf of the Trustees, the Contractor shall hand over all the Trustees' tools, plant and materials issued to him at the place to be ascertained from the Engineer, within 7 days of receipt of such letter.

8.3.2 In all such cases of Termination of work, the Trustees shall have the power to complete the work through any other agency at the

Contractor's risk and expense and the Contractor shall be debited any sum or sums that may be expended in completing the work beyond the amount that would have been due to the Contractor, had he duly completed the work of the work in accordance with the contract.

8.3.3 Upon termination of contract, the Contractor shall be entitled to receipt payment of only 90% of the value of work actually done or materials actually supplied by him and subject to recoveries as per contract, provided the work done and materials conform to specifications at the time of taking over by the Trustees. The payment for work shall be based on measurements of actual work done and priced at approved contract rates or other rates, as decided by the Engineer. The payment for materials supplied shall be at the rates as decided by the Engineer, which shall I in no case be more than market rates prevailing at the time of taking over by the Trustees. The Engineer's decision in all such case shall be final, binding and conclusive.

8.3.4 The Trustees shall have the power to retain all moneys due to the Contractor until the work is completed by other agency and the Contractor's liabilities to the Trustees are known in all respect.

9.0 MAINTENANCE AND REFUND OF SECURITY DEPOSIT

9.1 On completion of execution of the work the Contractor shall maintain the same for a period, as may be specified in the form of a Special Condition of the Contract, from the date mentioned in the Initial Completion Certificate in Form G.C.1. Any defect/fault, which may appear in the work during aforesaid maintenance period, arising, in the sole opinion of the Engineer or his representative, from materials or workmanship not in accordance with the contract or the instruction of the Engineer or his representative, shall, upon the written notice of the Engineer or his representative, be amended and made good by the Contractor at his own cost within seven days of the date of such notice, to the satisfaction of the Engineer or his representative, failing which the Engineer or his representative shall have the defects amended and made good through other agency at the Contractor's risk and cost and all expenses, consequent thereon or incidental thereto, shall be recoverable from the Contractor in any manner deemed suitable by the Engineer.

Contractor's obligation for maintenance of work.

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9.2 The Contractor shall not be considered completed and the work shall not be treated as finally accepted by the Trustees, until a Final Completion Certificate in Form G.C.2 annexed hereto shall have been signed and issued by the Engineer to the contractor after all obligations under the

Certificate of final completion

Contract including that in the maintenance period, if any, have been fulfilled by the Contractor. Previous entry on the works or taking possession, working o using thereof by the Trustees shall not relieve the Contractor of his obligations under the contract for full and final completion of the work.

9.3 **On completion of the contract in the manner aforesaid, the Contractor may apply for the refund of his Security Deposit by submitting o the Engineer (I) The Treasury Receipts granted for the amount of Security held by the Trustees, and (ii) his "No further claim" Certificate in Form G.C.3 annexed hereto (in original), where upon the Engineer shall issue Certificate in Form G.C.2 and within two months of the Engineer's recommendation, the Trustees shall refund the balance due against the Security Deposit to the Contractor, after making deduction therefrom in respect of any sum due to the Trustees from the Contractor.**

Refund of Security Deposit

10.0 **INTERPRETATION OF CONTRACT DOCUMENTS, DISPUTES AND ARBITRATION**

10.1 **In all disputes, matters, claims, demands or questions arising out of or connected with the interpretation of the Contract including the meaning of Specifications, drawings, designs and instructions or as to the quality of workmanship or as to the materials used in the work or the execution of the work whether during the progress of the works or after the completion and whether before or after the determination, abandonment or breach of the contract the decision of the Engineer shall be final and binding on all parties to the contract and shall forthwith be given effect to by the Contractor.**

Engineer's decision

10.2 **If the Contractor be dissatisfied with any such decision of the Engineer, he shall within 15 days after receiving notice of such decision require that the matter shall be referred to Chairman, who shall thereupon consider and give a decision.**

Chairman's award.

10.3 **If, however, the Contractor be still dissatisfied with the decision of the Chairman, he shall within 15 days after receiving notice of such decision require that within 60 days from his written notice, the Chairman shall refer the matter to an Arbitrator of the panel of Arbitrators to be maintained by the Trustees for the purpose and any such reference shall be deemed to be a submission to arbitration within the meaning of Indian Arbitration Act, 1940 or any statutory modification thereof.**

Arbitration.

10.3.1. **If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever, another person from panel shall be appointed as Sole Arbitrator and he shall proceed from the stage at which his predecessor left it.**

10.3.2 **The Arbitrator shall be deemed to have entered on reference on the date he issues notice to both the parties fixing the date of first hearing.**

10.3.3 **The time limit within which the Arbitrator shall submit his award shall normally be 4 months as provided in Indian Arbitration Act, 1940 or any amendment thereof. The Arbitrator may, if found necessary, enlarge the time for making and publishing the award, with the consent of the parties..**

10.3.4 **The venue of the arbitration shall be either Calcutta or Haldia as may be fixed by the Arbitrator in his sole discretion. Upon every or any such reference the cost of any incidental to the reference and award respectively shall be in the discretion of the Arbitrator who may determine, the amount thereof or by whom and to whom and in what manner the same shall be borne and paid.**

10.3.5 **The Award of the Arbitrator shall be final and binding on all parties subject to the provisions of the Indian Arbitration Act 1940 or any amendment thereof. The Arbitrator shall give a separate award in respect of each item of disputes and respective claim referred to him by each party and give reason for the award.**

10.3.6 **The Arbitrator shall consider the claims of all the parties to the contract – within only the parameters of scope and conditions of the contract in question.**

10.3.7 **Save as otherwise provided in the contract the provisions of the Arbitration Act, 1940 and rules made thereunder, for the time being in force, shall apply to the arbitration proceedings under this Clause.**

10.4 **The Contractor shall not suspend or delay the work and proceed with the work with due diligence in accordance with Engineer's decision. The Engineer also shall not withhold any payment, which, according to him, is due or payable to the Contractor, on the ground that certain disputes have cropped up and are likely to be referred to arbitration.**

10.5 **Provided always as follows:**

[a] **Nothing of the provisions in paragraphs 10.3 to 10.3.7 hereinabove would apply in the cases of contracts, where tendered amount appearing in the letter of acceptance of the tender / offer is less than Rs.40,00,000/-.**

[b] **The Contractor shall have to raise disputes or differences of any kind whatsoever in relation to the execution of the work to the Engineer within 30 days from the date of occurrence of the cause of dispute and before the preparation of the final bill, giving detailed**

justifications, in the context of contract conditions.

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[c] Contractor's dispute if any arising only during the maintenance period, if any, stipulated in the contract, must be submitted to the Engineer, with detailed justification in the context of contract conditions, before the issuance of final completion certificate in Form G.C.-2 ibid.
No dispute or difference on any matters whatsoever, the Contractor can raise pertaining to the Contract after submission of certificate in form G.C.3 by him.

[d] Contractor's claim / dispute raised beyond the time limits prescribed in sub-clauses 10.5[b] and 10.5 [c] hereinabove, shall not be entertained by the Engineer and / or by any Arbitrator subsequently.

[e] The Chairman / Trustees shall have the right to alter the panel of Arbitrators, vide Clause 10.3 hereinabove, on their sole discretion, by adding the names of new Arbitrators and / or by deleting the names of existing Arbitrators, without making any reference to the Contractor.

(TO BE SUBMITTED WITH COVER- I OFFER)

THE BOARD OF TRUSTEES FOR THE PORT OF KOLKATA
FORM OF TENDER (UNPRICED)

To
The Manager (I&CF),
Haldia Dock Complex.

I/We_____

having examined the site of work, inspected the Drawings and read the specifications, General & Special Conditions of Contract and Conditions of the Tender, hereby tender and undertake to execute and complete all the works required to be performed in accordance with the Specification, Bill of Quantities, General & Special Conditions of Contract and Drawings prepared by or on behalf of the Trustees and at the rates & prices set out in the annexed Bill of Quantities within _____ months / weeks from the date of order to commence the work and in the event of our tender being accepted in full or in part. I / We also undertake to enter into a Contract Agreement in the form hereto annexed with such alterations or additions thereto which may be necessary to give effect to the acceptance of the Tender and incorporating such Specification, Bill of Quantities, Drawing and Special & General Conditions of Contract and I / We hereby agree that until such Contract Agreement is executed the said Specification, Bill of Quantities, Conditions of Contract and the Tender, together with the acceptance thereof in writing by or on behalf of the Trustees shall be the Contract.

THE TOTAL AMOUNT OF TENDER Rs. **NOT TO BE QUOTED IN COVER I OFFER**

(Repeat in words) **NOT TO BE QUOTED IN COVER I OFFER**

I / We require _____days / months preliminary time to arrange and procure the materials required by the work from the date of acceptance of tender before I We could commence the work.

I / We have deposited with the Trustees' Manager (Finance), HDC, vide Receipt No. _____ of _____ as Earnest Money.

I / We agree that the period for which the tender shall remain open for acceptance shall not be less than four months.

_____

Dated : (Signature of Bidder with Seal)

WITNESS :

Name of the Bidder :

Signature :

Name : (In Block Letters)

Address :

Address :

Occupation :

KOLKATA PORT TRUST
HALDIA DOCK COMPLEX

FORM G.C.1

Contractor _____

Address ----------

Date of completion :

Dear sir(s),

This is to certify that the following work viz :-

Name of work : …….

…….

…….

Estimate No. E.E.0……Dt…….

C.E.O…….Dt…….

Work Order No…….
Allocation……
Contract No. ……

which was carried out by you is in the opinion of the undersigned complete in every respect on the _____ day of _____ 2000 in accordance with terms of the Contract and you are required to maintain the work as per Clause 62 of the General Conditions of Contract and under provisions of the Contract for a period of _____ weeks / months / years

from the _____ day of
_____ 2000 to _____ day of _____ 2000 .

Yours faithfully,

Signature…….
(ENGINEER/ENGINEER'S REPRESENTATIVE)
Name…….
Designation……

OFFICE SEAL

KOLKATA PORT TRUST
HALDIA DOCK COMPLEX

FORM G.C.2.

Certificate of Final Completion.

The Financial Adviser & Chief Accounts Officer
The Manager (Finance), Haldia Dock Complex.

This is to certify that the following work viz:-

Name of work : …….

Estimate No. E.E.O……..dt…….
C.E.O……dt…….

Work Order No……..

Contract No. ……

Resolution & Meeting No. ……

Allocation : ……

which was carried out by Shri/Messrs……. is now complete in every respect in accordance with the terms of the Contract and that all obligations under the Contract have been fulfilled by the Contractor.

Signature…….
(ENGINEER/ENGINEER'S REPRESENTATIVE)
NAME…….
DESIGNATION…….
OFFICE SEAL

KOLKATA PORT TRUST
HALDIA DOCK COMPLEX

FORM G.C.3

('NO CLAIM ' CERTIFICATE FROM CONTRACTOR)

The Manager (I&CF)
Haldia Dock Complex
Calcutta Port Trust
Haldia.
(Atten:…….)

Dear Sir,

I / We do hereby declare that I / we have received full and final payment from the Calcutta Port Trust for the execution of the following work viz:-

Name of work : _____

_____

Work Order No :-_____

Contract No. _____

Agreement No……..Dt……

and I / we have no further claim against the Calcutta Port Trust in respect of the above-mentioned job.

Yours faithfully,

(Signature of the Contractor)

Dated _____

Name of Contractor……

Address:……..

(OFFICIAL SEAL OF THE CONTRACTOR)

KOLKATA PORT TRUST

PROFORMA OF FORM OF AGREEMENT

THIS AGREEMENT made _____ day of _____20____ between the "Board Of Trustees for the Port Of Calcutta , a statutory body constituted under Major Port Trust Act ,1963 under the rules there under and statutory modification thereto having Registered Office at 15, Strand Road , Calcutta -700001 (hereinafter called "EMPLOYER'' which expression unless excluded by or repugnant to the context be deemed to include his successor/s in office) on the one part and _____ _____ (hereinafter called the "CONTRACTOR" which expression shall unless excluded by or repugnant to the context he deemed to include his heirs, executors, administrators, representative, successor in officer and permitted assigns) of the other part.

WHEREAS The TRUSTEES are desirous that certain works should be executed viz_____ and have accepted a Tender/Offer by the contractor for the execution, completion and maintenance of such works .

NOW THIS CONTRACT AGREEMENT WITNESSETH as follows :-

1. **In this agreement words expressions shall have the same meanings as are respectively assigned to them in General Conditions Of Contract, hereinafter referred to.**

2. **The following documents shall be deemed to form and be read and construed as part of this Agreement , viz :-**

   i. **The said Tender/Offer & the acceptance of Tender/ Offer.**

   ii. **The Drawings.**

   iii. **The General Conditions Of Contract.**

   iv. **Special Conditions Of Contract (If any).**

   v. **The Conditions Of Tender.**

   vi. **The Specifications.**

   vii. **The Bill Of Quantities.**

   viii. **All correspondences by which the contract is added, amended, varied or modified in any way by mutual consent.**

3. In consideration of the payments to be made by the Trustees to the Contractor as hereinafter mentioned the contractor hereby covenant with the Trustees to execute ,complete and maintain the work in conformity in all respects with the provisions of Contract.

4. The Trustees hereby covenants to pay to the contractor in consideration of such execution ,completion and maintenance of the works the Contract Prices at the times and in the manner prescribed by the contractor .

IN WITNESS whereof the parties hereto have caused their respective Common Seals to be hereunto as fixed (or have set their respective hands and seals) the day and year first above written.
have executed these presents on the day and year first above written.

The Seal of _____

Was hereunto affixed in the presence of :

Name :- _____

Address :-_____

OR

SIGNED SEALED AND DELIVERED

By the said _____

In the presence of :

Name :- _____

Address :-_____

The Common Seal of the Trustees was hereunto affixed in he presence of :

Name :- _____

Address :-_____

Proforma Of Irrevocable Bank Guarantee (PERFORMANCE BOND) in lieu of cash Security Deposit, to be issued by the Kolkata/ Haldia Branch, as the case may be, of any nationalised Bank of India on Non-Judicial Stamp Paper worth Rs 50/- or as decided by the Engineer/ Legal Adviser of the Trustees.

Ref. _____ Bank Guarantee No. _____

Date _____

To
The Board of Trustees for the Port of Kolkata,
15, Strand Road
Kolkata – 700 001

Dear Sirs,

In consideration of the Board of Trustees For the Port of Kolkata, - (hereinafter referred to as the " EMPLOYER"which expression shall unless repugnant to the context or meaning thereof include its successors administrators and assigns) having awarded to _____, with registered office at _____ (hereinafter referred to as the "CONTRACTOR " which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) a CONTRACT by issue of EMPLOYER'S work order dated _____ the same having been unequivocally accepted by the Contractor resulting in a 'CONTRACT' bearing Letter Of Award No _____ dated _____ Valued at Rs _____ for " " and the contractor having agreed to prove a Contract performance Guarantee for the faithful performance of the entire Contract equivalent to Rs. (rupees only) to the EMPLOYER.

We, the Bank, , Kolkata/ Haldia having its Head Office at (hereinafter referred to as the "Bank", which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer on demand any and all monies payable by the Contractor to the extent of Rs. -(only) as aforesaid at any time upto without any demur, reservation, contest, recourse or protest an/or without any reference to the CONTRACTOR, Any such demand made by Employer on the Bank shall be conclusive and binding notwithstanding any difference between EMPLOYEER and CONTRACTOR or any dispute pending before any Court, tribunal, Arbitrator or any other Authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of employer and further agrees that the guarantee herein contained shall continue to be enforceable till the Employer discharges his guarantee.

EMPLOYER shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee from time to time to extend the time for performance of the CONTRACT by CONTRACTOR. Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or any right which they might have against Contractor, and to exercise the same at any time in any manner, and other to enforce or to forebear to enforce any covenants, contained or implied, in the CONTRACT between EMPLOYER and CONTRACTOR or any other course of remedy or security available to EMPLOYER . The Bank shall not be released of its obligations

under these presents by any exercise by EMPLOYER of its liberty with reference to the matters aforesaid or any of them or by reason or any other acts of omission or commission on the part of employer or any other indulgence shown by EMPLOYER or by any other matter or thing whatsoever which under Law would, but for this provision, have the effect of reliving the bank.
The Bank also agreed that EMPLOYER at its option shall be entitled to enforce this Guarantee against the Bank as principal debtor, in the first instance without proceeding against CONTRACTOR and notwithstanding any security or other guarantee that EMPLOYER may have in relation to the CONTRACTOR'S liabilities.

Notwithstanding anything contained herein above our liability under this guarantee is restricted to Rs (rupees only) and it shall remain in force up to and including and shall be extended from time to time for such period , on whose behalf this guarantee has been given.

Dated, this ……. day of ……..2010 ……. at …….

WITNESSES

--- ---
(Signature) (Signature)

--- ---
(Name) (Name)

--- ---
(Official address) (Designation with Bank Stamp)
+ Attorney as per power of Attorney No.

Dated …….

Integrity Pact

Between
Kolkata Port Trust (KoPT) hereinafter referred to as "**The Principal/ Employer**".

And

…….. hereinafter referred to as "**The Bidder/Contractor**"

Preamble

The Principal intends to award, under laid down organizational procedures, contract/s for ……. The Principal values full compliances with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relations with its Bidder(s) and/or Contractor(s).

In order to achieve these goals, an Independent External Monitor (IEM) appointed by the principal, will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

Enabling the PRINCIPAL/EMPLOYER to get the contractual work executed and/or to obtain/dispose the desired said stores/ equipment at a competitive price in conformity with the defined specifications/ scope of work by avoiding the high cost and the distortionary impact of corruption on such work /procurement/ disposal and Enabling BIDDERs/ CONTRACTORs to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the PRINCIPAL/EMPLOYER will commit to prevent corruption, in any form, by its officials by following transparent procedures.

Section 1 – Commitments of the Principal/ Employer.

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

a. No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
b. The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will, in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
c. The Principal will exclude from the process all known prejudiced persons.

(2). If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal Code (IPC)/Prevention of Corruption (PC) Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

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

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

a. The Bidder(s) /Contractor(s) will not directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

b. The Bidder(s)/Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contract, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

c. The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act; further the Bidder(s)/Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d. The Bidder(s)/Contractor(s) of foreign origin shall disclose the name and address of the Agents/representatives in India, if any. Similarly the Bidder(s)/Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principles, if any. Further details as mentioned in the "Guidelines on Indian Agents of Foreign Suppliers" shall be disclosed by the Bidder(s)/Contractor(s). Further, as mentioned in the Guidelines, all the payments made to the Indian agent/representative have to be in Indian Rupees only. Copy of the "Guidelines on Indian Agents of Foreign Suppliers" is annexed and marked as Annex-A.

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

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

Section-3-Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/Contractor(s) before award or during execution has committed a transgression through a violation of Section 2 above, or in any other form such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/Contractor(s) from the tender process or take action as considered appropriate.

Section 4-Compensation for damages

(1) If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/Bid Security.

(2) If the Principal has terminated the contract according to Section 3 or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages of the contract value or the amount equivalent to Performance Bank Guarantee.

Section 5-Previous transgression

(1) The Bidder declares that no previous transgressions occurred in the last 3 years from the date of signing the Integrity pact with any other Company in any country conforming to the anti corruption approach or with any other Public Sector Undertaking / Enterprise in India, Major Ports/ Govt. Departments of India that could justify his exclusion from the tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as considered appropriate.

Section 6- Equal treatment of all Bidders/Contractors/Sub-Contractors

(1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.

(2) The Principal, will enter into agreements with identical conditions as this one with all Bidders, Contractors and Sub-contractors.

(3) The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7- Other Legal actions against violating Bidder(s)/ Contractor(s)/ Sub Contractor(s)

The actions stipulated in this Integrity pact are without prejudice to any other legal action that may follow in accordance with provisions of the extant law in force relating to any civil or criminal proceedings. .

Section 8 – Role of Independent External Monitor(IEM):

(a) The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this pact.

(b) The Monitors shall not be subject to instructions by the representatives of the parties and shall perform their functions neutrally and independently.

(c) Both the parties accept that the Monitors have the right to access all the documents relating to the contract.

(d) As soon as the Monitor notices, or has reason to believe, a violation of this pact, he will so inform the authority designated by the Principal and the Chief Vigilance Officer of Kolkata Prot Trust.

(e) The BIDDER/ CONTRACTOR(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the PRINCIPAL including that provided by the BIDDER/ CONTRACTOR. The BIDDER/ CONTRACTOR will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation, if any. The same is applicable to sub-contractors. The Monitor shall be under contractual obligation to treat the information and documents of the Bidder/Contractor/ Sub-contractor(s) with confidentiality.

(f) The Principal/ Employer will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor, the option to participate in such meetings.

(g) The Monitor will submit a written report to the designated Authority of Principal/ Employer/ Chief Vigilance Officer of Kolkata Port Trust within 8 to 10 weeks from the date of reference or intimation to him by the Principal/ Employer/ Bidder/ Contractor and should the occasion arise, submit proposals for correcting problematic situation. BIDDER/ CONTRACTOR can approach the Independent External Monitor (s) appointed for the purposes of this Pact.

(h) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or to take corrective action, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

(i) If the Monitor has reported to the Principal substantiated suspicion of an offence under the relevant IPC/PCA, and the Principal/ Employer has not, within reasonable time, taken visible action to proceed against such offence or reported to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

(j) The word 'Monitor' would include both singular and plural.

Section 9 – Facilitation of Investigation:

In case of any allegation of violation of any provisions of this Pact or payment of commission, the PRINCIPAL/EMPLOYER or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER/CONTRACTORS and the BIDDER/CONTRACTOR shall provide necessary information and documents **in English** and shall extend all possible help for the purpose of such examination.

Section 10 – Pact Duration:

The pact beings with when both parties have legally signed it and will extend upto 2 years or the complete execution of the contract including warranty period whichever is later. In case

bidder/contractor is unsuccessful this Integrity Pact shall expire after 6 months from the date of signing of the contract.

If any claim is made/lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by Chairman, KoPT.

Section 11 – Other Provisions:

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal in Kolkata.

(2) Changes and supplements as well as termination notices need to be made in writing in English.

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

(4) Should one or several provisions of this agreement turn out to be invalid, the reminder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

_____ _____

(For & on behalf of the Principal) (For & on behalf of Bidder/Contractor).

(Office Seal) (Office Seal)

Place :

Date :

Witness 1:

(Name & Address) …….

……

……

Witness 2:

(Name & Address) ……

……
…….

ANNEXURE-A

GUIDELINES FOR INDIAN AGENTS OF FOREIGN SUPPLIERS

1.1 There shall be compulsory registration of Indian agents of Foreign suppliers for all Tenders. An agent who is not registered with KoPT shall apply for registration in the prescribed Application-Form.

1.2 Registered agents will file an authenticated Photostat copy (duly attested by a Notary Public)/Original certificate of the principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/salary/retainer ship being paid by the principal to the agent before the placement of order by KoPT.

1.3 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.

2.0 DISCLOSURE OF PARTICULARS OF AGENTS/REPRESENTATIVES IN INDIA. IF ANY.

2.1 Tenderers of Foreign nationality shall furnish the following details in their offer:

2.1.1 The name and address of the agents/representatives in India, if any and the extent of authorization and authority given to commit the Principals. In case the agent/representative be a foreign Company, it is to be conformed whether it is real substantial Company and details of the same shall be furnished.

2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.

2.1.3 Confirmation of the Tenderer that the commission/remuneration if any, payable to his agents/ representatives in India, is to be paid by KoPT in Indian Rupees only.

2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:

2.2.1 The name and address of the foreign principals indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents /representatives.

2.2.2 The amount of commission/remuneration included in the price(s) quoted by the Tenderer for himself.

2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/remunerations, if any, reserved for the Tenderer in the quoted price(s), is to be paid by KoPT in India in equivalent Indian Rupees.

2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/remuneration, if any payable to the agents/representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.

2.4 Failure to furnish correct and detailed information as called for in paragraph-2.0 above will render the concerned tender liable for rejection or in the event of a contract materializing, the same liable to termination by KoPT. Besides this there would be a penalty of banning business dealings with KoPT or damage or payment of a named sum.