



CHIEF ENGINEER
ENGINEERING DEPARTMENT
NORTHERN ZONAL OFFICE
JEEVAN PRAKASH, 25 K.G. MARG
NEW DELHI – 1100 01

BID - III (FINANCIAL BID)

PART – II

Name of Work: E-Tender for Structural Rehabilitation / Repairs, Water Proofing and Toilet Renovation works of Jeevan Deep Building at Parliament Street, New Delhi.

Scope of the work: Structural Repairing of the building, Removing Terrace Waterproofing & Re-doing Ceramic Crazy Waterproofing Treatment, Restructuring of Water Supply System, Renovation of Toilets and Other ancillary & Related works.

LAST DATE FOR ON LINE SUBMISSION
ON OR BEFORE 15:00 HRS. ON 03/03/2022

TENDER FEE DETAILS			No exemption on deposit of EMD and payment of tender fees will be given to MSME/ NSIC registered bidders.
Tender Fee	Rs	1,000.00	
GST	Rs	180.00	
Total	Rs	1,180.00	
EMD	Rs	2,08,000.00	

TENDER PART - II

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LIFE INSURANCE CORPORATION OF INDIA

LETTER TO CONTRACTOR FROM CHIEF ENGINEER

Date: 09.02.2022

To,

Dear Sir / Sirs,

SUB: E-Tender for Structural Rehabilitation / Repairs, Water Proofing and Toilet Renovation works of Jeevan Deep Building at Parliament Street, New Delhi.

1) We hereby publish the TENDER on e-Tendering Portal (Website) through <http://www.tenderwizard.com/LIC> in **Electronic Mode** hereinafter referred as “e Tendering” and consisting of following :

- (a) **BID- I : E.M.D. BID & Tender Processing Fee**
- (b) **BID-II : PRE-QUALIFICATION BID**
- (c) **BID-III : FINANCIAL BID (Tender Part I & II)**

Please note that copy of above e-Tender can be downloaded from above portal (website) and should be mandatorily submitted in **Online Electronic Mode** hereinafter referred as “**Online Offer**”. The submission of Online offer duly Encrypted & Digitally Signed on above portal should be in prescribed Electronic Forms (Online) available on above portal for respective tender in Online Envelope(s) on or before **As per the Key Dates mentioned in the tender document and online portal for above tender.**

2) The bidders should submit required Earnest Money Deposit (EMD) as mentioned in e Tender in a Physical Envelope accompanied by **Earnest Money Deposit Instrument of Rs. 2,08,000/ (Rupees two lakh eight thousand only)** in the form ~~Bank Guarantee~~ / crossed demand draft on a Nationalized Bank in favour of “**Life Insurance Corporation of India**” payable at **New Delhi**, which shall be received at the office of Chief Engineer at above address **on or before As per the Key Dates**. EMD can be deposited through on line mode of payment i.e. NEFT / RTGS etc in the bank account as per details provided in tender documents and the e Tenders will be opened at **As per the Key Dates** in the presence of contractors or accredited representatives, who wish to attend the online Tender Opening process. The bidders can view the Tender Opening details through their respective Login IDs on the above mentioned eTender portal (Website). The Tenderer should ensure that their tender is received **Online Electronically** on or before the due date and time as specified in “**Key Dates**” in the Tender Document and above mentioned Portal (website). **Please note that above eTendering System is an automatically time locked system which will be locked immediately as soon as due date and time is over and will not accept any offer after that. So, the tenderer are advised to do their process well before the due date and time to avoid any such instances.** The bidders should submit required Tender Cost as mentioned in e Tender in a sealed Envelope **of Rs 1000.00+Rs 180.00 (GST)= Rs**

1,180.00 (Rupees one Thousand one hundred eighty only) in the form of crossed demand draft/ pay order on a Nationalized Bank in favour of “**Life Insurance Corporation of India**” payable at new Delhi, which shall be received at the office of Chief Engineer at above address **on or before As per the Key Dates.** The payment can be made through on line mode of payment i.e. NEFT, RTGS also.

- 3) An annexure for Guidelines to Submit tenders on Electronic Tendering System is attached in the Tender document. The tenderer are advised to carefully read the above document for understanding of e Tendering System. The above Annexure will supersede all the terms & conditions mentioned for submission of tender in document.
- 4) The Life Insurance Corporation of India does not bind itself to accept the lowest or any tender.

Encl: As above.

CHIEF ENGINEER

LIFE INSURANCE CORPORATION OF INDIA

**LETTER FROM CONTRACTOR TO CHIEF ENGINEER
TO BE SUBMITTED ONLINE ON OR BEFORE ON As per the Key Dates**

Date:

From:

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To

The Chief Engineer,
Life Insurance Corporation of India
Northern Zonal Office
Jeevan Prakash (2nd Floor),
25 K.G. Marg,
New Delhi - 1100 01

SUB: E-Tender for Structural Rehabilitation / Repairs, Water Proofing and Toilet Renovation works of Jeevan Deep Building at Parliament Street, New Delhi.

Dear Sir,

1) Having examined the Enrolment Form, Selection Criteria , Technical Specifications, Schedule of Quantities, Detailed Drawings, Specifications, Conditions of Contract etc. included in the tender document for the Percentage Rate Contract relating to the above work, having visited/examined the site of the existing premises, having acquired the requisite information relating thereto as effecting the tender invited by you on behalf of the Life Insurance Corporation of India, I/We, the undersigned hereby offer to carry out the above mentioned work on Percentage Rate basis in strict accordance with the Contract Conditions and Specifications.

I/We, undertake to complete and deliver the whole of the works within a period as specified in Appendix to the Conditions of Contract from the date of issue of intimation from you that the tender has been accepted and upon receiving possession of the site. I/We shall be under the obligation to complete the entire work within the period of completion failing which to pay the sum as stated in the Appendix to the Conditions of Contract for every week that the works shall remain incomplete, damages as compensation subject to the conditions of contract relating to extension of time.

2) I/We enclose herewith my/our tender with an Earnest money remittance of **Rs. 2,08,000/ (Rupees two lakh eight thousand only)** in the form of ~~Bank Guarantee~~ of Nationalized/ scheduled Bank/ **CROSSED DEMAND DRAFT OF THE NATIONALISED/ SCHEDULED BANK PAYABLE AT New Delhi / NEFT / RTGS UTR No** I/We, hereby

agree that part of this sum shall be forfeited by the 'Life Insurance Corporation of India in the event of my/our tender being accepted and I/We fail to execute Contract when called upon to do so

3) In the event of the tender being accepted, I/We, agree to the retention of my/our EMD as a part of Security Deposit and the balance amount of Security Deposit to be recovered at 7.5% of Gross Value of work done from my / our Running Account Bills. **OR** I/We, agree to furnish a lump sum Security Deposit amounting to Rs. _____ (Rupees _____ only) or two like amounts in the form of Bank Guarantee/s from any Nationalized/Scheduled Bank located at _____ as per specimen given in Annexure "B" to Conditions of Contract, within 21 (Twenty One) days from the date of issuance of acceptance of tender or within 21(Twenty One) days from the extended date as may be extended by the Chief Engineer.

4) I/We, agree to furnish a lump sum Performance Guarantee amounting to Rs. _____ (Rs. _____ Only)in the form of Bank Guarantee from any Nationalized/Scheduled Bank located at _____ as per specimen given in Annexure "C" to Conditions of Contract, within 10 (ten) days from the date of issuance of acceptance of tender.

5) I/We, note that the Earnest Money Deposit of **Rs. _____ (Rupees _____ only)** would be refunded to me/us.

a. On expiry of the validity of the tender or earlier at the discretion of Chief Engineer in case my/our tender is not accepted and

b. In case my/our tender is accepted, after I/We, furnish Bank Guarantees as mentioned above.

6) I/We, agree,

a) In case my/our tender is withdrawn before expiry of the validity period or before the issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the Department, in such case 25% of the EMD will be forfeited by the department.

b) In case my/our tender is accepted and the Performance Guarantee is not submitted within the prescribed period or approved extended period, 50% of the EMD will be forfeited automatically without any notice.

Yours faithfully,

(SIGNATURE OF THE CONTRACTOR)

Name and Seal

NAME OF THE PARTNER OF THE FIRM

OR

NAME OF THE PERSON HAVING POWER OF

ATTORNEY TO SIGN THE CONTRACT

(CERTIFIED TRUE COPY OF THE POWER
OF ATTORNEY SHOULD BE ATTACHED)

E-Tender for Structural Rehabilitation / Repairs, Water Proofing and Toilet Renovation works of Jeevan Deep Building at Parliament Street, New.

APPENDIX TO CONDITIONS OF CONTRACT

ESTIMATED COST : **Rs 415.00 Lakh**
PERIOD FOR COMPLETION : **15 (Fifteen) Months**
EARNEST MONEY DEPOSIT : **Rs .2.08 lakh**
DD/ BG/ ONLINE/NEFT)

Sl.No.	Clause Nos.	Description	Remarks
1	11	Minimum requirement of Technical staff & Recovery for Non employment	Resident Engineer : 1 no. Rs40,000/- per month. (ii) Supervisor : 1 Nos. Rs. 20,000/ per month
2	13	Date of commencement	Either 21 (twenty one) days from the date of acceptance letter issued to the contractor OR The day on which contractor is instructed to take possession of the site, whichever is earlier
3	13 & 26	Date of completion	15 months from the date of commencement.
4(a)	19.1	Liquidated damages	Quantum of liquidated damages 0.5% per week of contract sum subject to a maximum of 10% of contract amount.
4(b)	19.2	<i>Reward for early completion</i>	Not applicable
5	21	Period of final measurement	60 (Sixty) days from the date of completion of contract
6	22	Interim certificate	Minimum Rs. 28.00 Lakh
7	22	Period of honouring interim certificate	20 (Twenty) days
8	22	Period of honoring final certificate	90 days from the date of submission of final bill with details.
9	35	Security Deposit , Performance Guarantee and Additional Security Deposit for retention period of 5	Security Deposit – 2.5% (two point five percent) of the accepted tender amount. Performance Guarantee – 3% (three percent) of the accepted

Sl.No.	Clause Nos.	Description	Remarks
		years from DLP on account of Water Proofing Treatment.	tender amount in the form of BG only. Addition, security deposit @10% of the work done in the “SUB HEAD WATER PROOFING” shall be retained against guarantee of the water proofing work for 5 years. 50% of the same shall be refunded after successful completion of 2.5 Years from Expiry of Defect liability period and balance 50% shall be refunded on successful completion of the guarantee period i.e. five years from the expiry defect liability period.
10	35	Recovery of Security Deposit	In case of cash option, EMD shall be retained as part of Security Deposit and balance of Security Deposit shall be recovered from R.A. Bills at @ 7.5% of Gross amount of bill till the sum along with sum already deposited as EMD equals the Total Security Deposit. (If Security Deposit is paid in the form of Bank Guarantee, no recovery from R.A. Bills shall be made and EMD shall be refunded after acceptance of Bank Guarantee).
11	35	EMD Refund / Forfeiter of in the event tender withdrawn by the Contractor	a) If the lowest tenderer withdraws his tender before the expiry of validity period or before the issue of Letter of Acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the department shall, without prejudice to any other right or remedy be at liberty to forfeit 25% of the Earnest Money absolutely and the balance Earnest Money will be refunded. b) If the contractor fails to furnish the prescribed performance guarantee within the prescribed period or duly approved extended period, 50% of the Earnest Money will be absolutely forfeited automatically without any notice and the balance 50% will be refunded c) In case the agency is selected based on the submitted documents and said submitted documents filed by the tenderer/s are found false / forged / fabricated in part or full during verification process and / or after

Sl.No.	Clause Nos.	Description	Remarks
			opening of the Price Bid the Earnest Money Deposit will be forfeited in totality. Also the agency / agencies will be debarred from LIC of India from participating in tendering for a period of 3 (three) years and such information will also be shared with other Organizations.
12	37	Interest on Lump sum Advance	Clause Not Applicable
13(a)	17.5	CAR POLICY	Car Policy shall be for full amount of Contract Value.
13(b)	17.5	Third Party Liability Insurance Policy	7.5% of Contract value. (Third Party Liability policy can be standalone or can be along with CAR Policy for specified value).
14	17.6	Workman's Compensation Policy	As per mutual Agreement.
15	22.6	No Claim Certificate	To be given on Contractors letter head

NO CLAIM CERTIFICATE CUM RECEIPT

“Received Rupees _____ (Rupees _____)
being the amount against my/our final bill dated _____ for _____ (Name of Work) in full and final settlement of bill.

I/We have no further claim for any amount on above work.

Contractor
(Signature of Contractor on Revenue stamp)

Rubber stamp/seal of the contractor /company

APPENDIX TO SPECIAL CONDITIONS

Sl.NO	Clause Nos.	Description	Remarks
1.	2	Recovery of Electricity and / or Water charges from Contractors bill if used from LIC source	0.50% of the Gross value of work done (0.25% for water and 0.25% for Electricity).

Note: **TAXES, DUTIES, LEVIES AND DEDUCTION AT SOURCE:**

1. Rates quoted shall be inclusive of all taxes like Income Tax, etc., but excluding GST and labour cess.
2. The contractor shall be responsible to pay all statutory levies imposed by the State and Central Government such as Income Tax, GST and any other applicable taxes etc. However GST as applicable on works contract shall be paid to the contractor by the corporation. Any payment by contractor to LIC/ recovery by LIC i.e. Salvage Value, Liquidated Damages, Penalty on Insurance premium etc., shall be recovered from the bill along with GST as per GST Act. This will supersede all provisions given in the tender elsewhere regarding GST.
3. Deduction at source of Income tax, GST etc. shall be made by LIC of India as per the provisions prevailing from time to time from the Running Account or Final Bills and remitted to the concerned Taxation Authorities/ State Government on behalf of the contractor.
4. Contractor shall also be responsible to seek permission from local authorities/ administration before starting the work & during the work in progress for unloading/keeping materials there or after completion of work, reqd. if any. The Work has to be carried out without disturbance/inconvenience/damage to the working offices/tenants, parking vehicles etc.
5. **Labour cess:** Rates are excluding Labour cess and labour cess will be paid by L.I.C of India, if applicable. This clause shall supersede other provisions(if any) given in the tender elsewhere in regard to labour cess.
6. **GST :** All the Participating Bidders must have valid GST Registration certificate of a particular State/Union Territory at the time of submission of the Bid. In the eventuality of not having valid GST Registration Certificate with the State/Union Territory, where implementing works the successful bidder will be required to obtain GST Registration Certificate of that particular State/Union Territory where the works Contract will be implemented within a period of 21 days from the date of issuance of Letter of Acceptance, failing which the letter of Acceptance will be withdrawn and cancelled. Earnest Money deposit will also be forfeited. No extension of time period will be given whatsoever unless there remain unforeseen impediments with the issuing Authority of such GST Registration.
GSTR 2A of the respective state of the Corporation will reflect the invoices of all Vendors who have uploaded the GSTR-1 and if the taxes are not paid to the Government, then ITC already taken by the Offices will be reversed and shall be paid in cash by the Corporation along with further interest at notified rate. Such vendors who do not pay taxes to the Government will have a low rating by the GST Portal and must be black listed for future dealing with the Corporation.
7. The bidders are requested to note that deposit of EMD and payment of tender fee must be in any one of the mode as mentioned in BID-I. Deposit / payment other than specified mode

of payment will not be entertained. **No exemption of EMD and Tender fee will be given to MSME / NSIC registered bidders.**

8. The bank guarantee shall be submitted from Scheduled Commercial Bank only (i.e. Indian or foreign bank included in second schedule of Reserve Bank of India act 1934 excluding Co – operative banks or Regional Rural banks and not from Scheduled Co operative Banks).

Sub: E-Tender for Structural Rehabilitation / Repairs, Water Proofing and Toilet Renovation works of Jeevan Deep Building at Parliament Street, New.

1. BASIC PRICE OF CEMENT at the Work-Site

(Refer Clause No. 4.3 of the General Preambles to Schedule of Quantities)

Contractors ' Quoted rates shall be based on the Basic Price of cement at the work site which includes Purchase Price of cement(without GST), Transportation charges from the factory/stockist's go-down to the work site, loading and unloading charges at all points, transit insurance etc.

Ordinary Portland Cement / Pozzolana
Portland Cement

:Rs. 5000/-M.T (Rupees Five Thousand only)
PER M.T. excluding GST

1. BASIC PRICE OF STEEL at the Work-Site:

(Refer clause No. 5.3 of the General Preambles to Schedule of Quantities)

Contractors ' Quoted rates shall be based on the Basic Price of Steel at the work site which includes Purchase Price of steel(without GST), Transportation charges from the factory/ stockist's go-down to the work site, loading and unloading charges at all points, transit insurance, weighment charges etc.

TMT/ High Strength Deformed Bars manufactured by Primary Producers of all diameters in coil or in straight lengths	Rs.49,000/=PER M.T (Rupees Forty nine Thousand only) PER M.T excluding GST.
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Note:

1. The increase/ decrease in prices of Cement and Steel shall be determined by the All India Whole Sale Price Index for Cement and Steel, as issued by Office of Economic Adviser, Dept. of Industrial Policy and Promotion under Ministry of Commerce and Industry, Government of India as per the formula given in the Tender.
2. Packing of Cement (like gunny bags, polythene bags. etc.) cost of which is included in the purchase price, shall be **THE PROPERTY OF THE CONTRACTOR.**

SCHEDULE "A" to Annexure P

- a. Contractor shall note that although the materials and the basic prices for the same have been mentioned in this schedule, the responsibility of procurement of the materials shall rest with the Contractor.
 - b. Contractor shall consider the rates given for the relevant item/s the basic rate mentioned in this schedule. The basic rates for the items mentioned in this schedule are ex-work site and are inclusive of:-
 - i. Cost of material,
 - ii. All applicable taxes levied by Central/State Government/Local Bodies, ~~octroi/Town duty etc.~~ ~~except GST.~~
 - iii. Transportation from factory/suppliers/stockiest/ dealers go-down/ shop/depot including loading and unloading charges at all points at work site, transit insurance.
 - iv. All other expenses including wastage shall be to the Contractor's account and shall be included in his quoted rates.
 - v. Contractor shall purchase those materials which basic price is mentioned in the tender items other than cement and steel in required quantities from the approved source after the Dy.C.E/S.E/EE has approved the price of materials to be purchased and brought on the site of work.
 - vi. Any increase in the price of any of the material other than cement & steel (mentioned in this schedule) procured and brought on site for incorporating in the work by the Contractor from approved source, over the basic price of the material mentioned in this schedule shall be reimbursed to the Contractor. In case the price of any of the materials mentioned in this schedule, purchased and brought on site by the Contractor is below the basic price of the materials mentioned in this schedule, the same shall be recovered from the Contractor.
- For the purpose of working out variation, Contractor shall produce the vouchers/bills in support of the material purchased and brought by him from the approved supplier. Rate of transportation, loading and unloading from suppliers' shop/depot to the work site shall be got approved from the Dy.C.E. /S.E. before the commencement of transportation of material.
- c. Reimbursement/Recovery of any variation in the price of material shall be made to the extent the quantity of material actually/theoretical used and recorded whichever is less for the item involving the use of such material.
 - d. Storage and safety of the material shall be the Contractors responsibility.

**LIFE INSURANCE CORPORATION OF INDIA
NORTHERN ZONAL OFFICE, NEW DELHI**

APPENDIX TO GENERAL INSTRUCTIONS TO CONTRACTORS

CLAUSE NO.2 :

Name and Location of the Proposed work: Proposed Structural Rehabilitation / Repairs, Water Proofing and Toilet Renovation works of Jeevan Deep Building at Parliament Street, New.

CLAUSE NO.14 :

In addition to facilities, provided by the contractor under clause 14.1 of General instruction to contractors, in Office for Corporation's Engineer on Site, the contractor shall also provide computer with printer of suitable configuration as approved and directed by Engineering-in-charge of the Corporation.

BROAD SCOPE OF WORK :

- (i) Providing and fixing of strong designed temporary structural support system to relieve loads from structural RCC elements to be repaired/rehabilitated /strengthened and for working platform etc. including providing safety nets and barricading of the area for safety measures and dismantling and removing the same after completion of work.
- (ii) Removal of overburden loose/ deteriorated waterproofing from terrace/ roof slab and demolishing of damaged rain pipe, if required.
- (iii) Dismantling of concrete floor at basement/ brickwork/ excavation of compacted materials around the columns/ etc. up to raft/pile cap level carefully.
- (iv) Removal of loose concrete, plaster, cover concrete, carbonated concrete & cleaning of existing concrete surface of columns, beams, roof slabs, wall etc. and other places carefully using impact high frequency hammer/ chisel without damaging the existing concrete followed by sand blasting of the surface.
- (v) Removal of plaster over brickwork and racking of joints in brickwork in the office building etc.

- (vi) Rehabilitation/strengthening of slabs in staggered manner which includes exposing structural elements up to good concrete, cleaning of the surface, applying rust converter primer followed by anti-corrosive treatment over the exposed reinforcement (if any), treatment by polymer modified cement mortar (PMM)/ micro-concreting/ polymer modified cementitious injection grouting, providing additional reinforcement anchored with existing slab and micro-concreting from the top after extracting cores.
- (vii) Rehabilitation/strengthening of beams that includes exposing beams up to good concrete, applying rust converter primer followed by anti-corrosive treatment over the reinforcement (if required), treatment of structural cracks / honey combings by epoxy /polymer modified cementitious injection grouting, repair with polymer modified cement mortar, confining the beams with additional reinforcement and micro-concreting and finishing the surface.
- (viii) Rehabilitation/strengthening of columns that includes exposing column up to good concrete (if required), applying rust converter primer followed by anti-corrosive treatment over the reinforcement (if required), treatment of structural cracks / honey combings by epoxy injection grouting, confining the columns with additional reinforcement and micro-concreting / ferrocement lining/ CFRP wrapping and finishing the surface etc.
- (ix) Rehabilitation/strengthening of grid beams and slabs that includes exposing members up to good concrete (if required), applying rust converter primer followed by anti-corrosive treatment over the reinforcement (if required), treatment of structural cracks / honey combings by epoxy injection grouting, confining the same with additional reinforcement and micro-concreting / fibrocement lining/ CFRP wrapping and finishing the surface etc.
- (x) The dilapidated projections need to be dismantled. If required it will be recast with new RCC.
- (xi) The toilet blocks are needed to be dismantled, if directed, with over burden materials exposing to concrete surface. The same shall be re-cast after exposing all service lines and providing appropriate waterproofing treatment.
- (xii) Providing and laying of brick-bat coba at the roof for the water proofing purpose as per the requirements including complete renovation of identified toilets.
- (xiii) Providing and fixing on column face, unplasticised Rigid PVC / RCC rain water pipes as per the specification.
- (xiv) Replacement of soil waste pipes and restructuring of water supply system.

- (xv) Repair of cracks in brick masonry walls of office building by making V groove, fixing 20/22 gauge woven 12.5x12.5mm opening galvanized wire mesh or equivalent and using polymer modified cementations mortar and finishing the surface.
- (xvi) Plastering the surface after repair/strengthening as and where required.
- (xvii) Miscellaneous work such as providing & fixing Aluminum sections/ false ceiling, cabling etc.

A brief description of structural repair work other than above works shall include but not limited to mention in subsequent sections.

SPECIAL CONDITIONS

1. PHOTOGRAPHS & VIDEOGRAPHY OF THE WORK

- 1.1 The contractor shall submit 3 sets of the prints with soft copies of the photographs size 4"x6" to LIC of India on the following stages:
- Before repair / restoration work of all the structural members.
 - After removing of all loose concrete but before application of strengthening method.
 - After repair / restoration work of all the structural members.
- 1.2 One or more photographs shall be taken to have complete clear views of the project as directed by Corporation's Engineer. The further stage of work shall proceed only on confirmation of such photographs seen by LIC Engineers and a written site instructions obtained in this regard.
- 1.3 Videography of repairs of critical sections
- 1.4 The quoted rates shall include for the same and no extra is payable to contractor on this account.

2. TESTING OF MATERIALS

During the progress of work, tests as prescribed below for various materials of construction shall be conducted as per the frequency noted in the table below. Contractor's attention is also drawn to Clause 9 of Conditions of Contract as well as Clause 9 of Preambles to Schedule of Quantities.

TABLE-A

Sl. No.	Materials	Test	Frequency
1.	Water	Chemicals & Physical properties for water	One test per source before commencement of work
2.	Sand (Fine Aggregates)	a) Slit content (field test) b) Gradation c) Bulking (Field test)	This is a routine test and should be carried out for sand for each consignment. Every 45 Cu.m or part thereof or whenever moisture content is doubtful.

Sl. No.	Materials	Test	Frequency
3.	Stone (Coarse Aggregate)	a) Aggregate crushing value b) Gradation	One in beginning of stacking of materials thereafter for every change of source. Every consignment.
4	Cement	a) Initial & final setting time b) Compressive strength	One is being of stacking of materials thereafter for every change of source. One test for 100 tonnes or part there of and every changes of brand of cement if the cement is used for structural works.
5.	Steel	1. Tensile strength a) Ultimate tensile stress b) Yield stress c) % Elongation	One test per category for every consignment used in work.
6.	Brick	a) Water absorption b) Efflorescence c) Compressive strength	One test for every 200000 Nos. or part there of and for every change of brand (set of 5 bricks)
7.	Timber	a) Moisture content b) Specific gravity c) Species in sample of teak wood	One test for every 30cum or part thereof.
8.	Anodized coating of aluminum	Thickness of Anodic Coating.	One Test for material costing Rs.8.00 Lac.
9.	Marble mosaic tiles	a) Wet Transverse Strength b) Water Absorption c) Abrasion Test	One test for every 1 lakh tiles or part thereof.
10.	Flush Door	End Immersion Knife Adhesion	Destructive test based on no.of shutter. 1-100 one test 101-200 two test 201-500 three test 500 & above four test

Sl. No.	Materials	Test	Frequency
11.	Ceramic Tiles/ Vitrified Tiles	Water absorption Crazing Test	One test for every 5000 nos. or part thereof.
12.	Marble	Moisture Absorption test	One test for every 800 sq.mt. or part thereof.
13.	Panel Door Shutter	a) Physical Test b) Glue Adhesion Test	One test from each lot. One test from each lot.
14.	Particle Board	a) Identification (Physical verification) b) Dimensional Tolerance	One test from each lot. One test from each lot.
15.	Sand Stone	Water absorption	One test from each lot.
16.	Cladding Stone	Water absorption	One test from each lot.

WATER and Electricity

The Contractors shall be allowed use of water surplus to requirements of the Employer from existing wells or other source if any, on the site, but no guarantee is given that the quantity available shall be sufficient. In case, such water from the Employer's source is used, then water charges will be recovered from the Contractor's bill/s at the rate as mentioned in "Appendix to Special Conditions". The Contractor will make his own arrangements for plumbing and storing of water. The electricity, if available shall be provided at one end only and charges for the same shall be deducted from the Contractor's bill/s at the rate as mentioned in "Appendix to Special Conditions".

3. The method of measuring the various items of work shall be done generally as described in the relevant items in Schedule of Quantities. In case of any doubt, the mode of measurement shall be in accordance with the latest Indian Standards code of procedure for method of measurement of Building Works (I.S.: 1200)
4. The rates quoted by the contractor shall include all the materials, all lead and lifts, scaffolding, labour, equipment, etc. needed for the job unless otherwise stated.

5. Unless otherwise stated, all measurements shall be net and of finished size only. All waste, extra quantities, etc. necessary for the completion of work shall be allowed by the contractor in his rates.
6. The contractor is required to take all the debris without any inconvenience to the user of the building. All debris/rubbish should have to be cleaned before handing over the Building to the LIC of India.
7. Any damages done in the existing structures/finishes during the course of work should have to be mending good before handing over the premises.
8. Materials to be used in the work as per approved schedule of LIC.
9. **Quantities mentioned in the schedule are tentative and may vary to any extent as per requirement and direction of authority.**
10. The rates quoted shall be inclusive of all taxes, packing and forwarding transportation etc. supplying and placing in position as directed, excluding GST.
11. As the premises where the work is to be carried out are our working offices therefore, the contractor shall carry out the work without causing any disturbance to the working of offices & office bearers. The contractor has to make arrangement for placing the material after unloading including permission of local authorities/administration if reqd. The work is to be carried out in proper phased manner. The contractor should take proper precautions and make safety of LIC's property etc.
12. The work shall be started immediately after the receipt of work order and completed in all respects within the scheduled time frame. In the event of failure to complete the entire work by the scheduled date or any extended date approved by the Chief Engineer, the liquidated damages will be recovered from the contractor's bills as per clause 4 of "Appendix to Conditions of Contract".
13. The tender shall be valid for the acceptance for a period of 3 months from the last date of receipt of tender.

14. The Contractors shall be allowed use of water /electricity surplus to requirements of the Employer from existing wells or other source if any, on the site, but no guarantee is given that the quantity available shall be sufficient. In case, such water /electricity from the Employer's source is used then water charges will be recovered from the Contractor's bill/s at the rate as mentioned in S.No. 8 "Appendix to the Conditions of Contract". The contractor will make his own arrangements for plumbing and storing of water and distribution of electricity from single source.
15. During the execution of work, the Corporation's Engineer may visit and inspect the work at any reasonable time. The contractor shall arrange for such inspection and co-operate with the Corporation's Engineer. In case of any discrepancy, the Schedule of Quantities shall supersede the drawings.
16. Insurance policy shall have to be taken on joint name as mentioned in condition of tender.
17. Wherever required for outside work, adjacent to road, contractor has to arrange for barricading etc. and also for taken permission, if required from Municipal Corporation / NDMC/ Police or any other Govt. authority at their own cost. No extra payment shall be made on this account.
18. Erection of barricade around working area shall be done by the contractor at his own cost.
19. All the structural repair shall be done as per good construction practice and as laid down in the relevant I.S. standard to the satisfaction of Engineer-in-charge.
20. Proper protection shall be done to the windows etc. and air conditioners so as to prevent any damage and if damaged, the same shall be made good by the contractor.
21. Full covering to be done to the entire scaffolding from top to the bottom with any suitable cloth, net etc so as to prevent the stray malba / debris, stone from falling down.

22. Necessary safety measure equipments like Helmet, Safety Rope etc shall be used to protect from the fatal accident during execution of the work.
23. Only materials actually required /certified by LIC for the execution of work as per the prescribed specifications would be brought at site. These materials would not be allowed to be taken back from the site except those rejected by the LIC of India but quality/breakage and not conforming to the specifications.
24. The contractor shall make adequate arrangement for watchmen to guard to materials brought by them at site and shall ensure the safety, breakage and theft of materials fixed or unfixed by him or other sub-contractors.
25. The contractor will have to strictly follow and abide by all the labour laws in force applicable to the work involved, and shall indemnify the employer against any penalties /claims arising from any default on their part.
26. Electrical works shall be carried out through licensed electrician(s) of approved agency only. The approval for the same shall be taken before execution.
27. Propping and supporting the structural members and its adjoining areas with steel props (adjustable or as required), bracings, steel / timber runners etc to relieve the structural member of the required load coming over it as per the pattern shall be given by the contractor & approved by the Engineer-in-charge complete - Steel prop of up to 5 MT capacity and up to 4.5m height.
28. Wherever the cable trays / pipe lines, etc have been suspended through the slab under repair / restoration, the same shall be temporarily supported through the props on floors and after repair / restoration work shall be re-suspended through the slab by dash fastners.
29. The rates quoted shall be **inclusive of scaffolding/staging/ propping of all kind and dust proof partitions** required to take up the repair and rehabilitation work in interior side of the premise.

30. The contractor is to submit the work plan along with machine and equipment deployment at site within 15 days of acceptance.

GENERAL PREAMBLES TO SCHEDULE OF QUANTITIES

These preambles apply to all the sections of the "Schedule of Quantities". Only 1st quality materials and workmanship and good engineering practices shall be adopted for all items of work.

1. RATES

TO COVER :

- 1.1** The rates quoted by the contractor shall be held to include for providing and fixing, all conveyance and delivery, loading & unloading, carrying in, storing, hoisting, all labour, setting, fitting and fixing in position, making straight, uncoiling, cutting, waste, return of packing, etc. and all materials and labour and everything else necessary for the proper completion of each item of work to the approval of Corporation's Engineer and for Establishment Charges, overheads and profits. The Contractor shall provide at his expense all labour, materials and things required by the Corporation's Engineer for testing and measuring the work, for weighing, testing the efficiency of any portion of the work, all planking, gangways etc. necessary for affording access to every part of the work except where specifically stated otherwise.
- 1.2** The contractor should also cover in his rates for the method of work, cost of materials, labour etc., to comply with the "Trade Specifications", Trade Preambles, General Instructions to Contractor", "Conditions of Contract", Technical details, General Preambles, "Special Conditions", Additional Special Conditions(if any), List of Principal makes, etc. and all documents of this contract.
- 1.3** All materials or procedure or Specifications for work, unless otherwise stated, shall conform to the current Indian Standard whether or not specific mention is made thereof. The Contractor shall be responsible for and shall replace or make good at his own expense, any materials lost or damaged, or of quality not approved, temporarily disturbed roads, pavements, approaches, gates, walls or any such dismantling carried out to execute the work.
- 1.4** All rates quoted shall include for Supplying and fixing although the same may not have been mentioned in the item of the Schedule of Quantities. Words "Providing and Fixing where used shall have same meaning as "Supplying and Fixing".
- 1.5** Rates quoted shall include for hoisting to any height, and all work at all levels and lift of materials shall not form any criterion for any extra claims, except where otherwise specified.

2. ANCILLARY WORKS :

- 2.1** The Contractor shall have to carry out all ancillary and connected work within and near vicinity of the plot of the proposed work and inside the Building if ordered to do so by the Chief Engineer at the rates given in the Schedule of Quantities, at any time during the currency of this Contract including extension of time, if any granted.

3. PRICE FLUCTUATION/VARIATION:

- 3.1 Rates quoted by the contractor shall be firm throughout the currency of the Contract including extensions of time, if any granted. No price adjustment due to variation in cost of materials or labour or any variation under any State or Central Legislation or any other reason whatsoever shall be allowed, except as stated in relevant clauses below, with regard to variation in price on materials & labour and price fluctuation in Cement & Steel.

4. **CEMENT:**

CONTRACTOR'S QUOTED RATES:

- 4.1 Contractor shall quote his rates for various relevant items in the tender on the basis of provisions of this clause detailed hereunder and on the basis of the price of cement at site of work as mentioned in Annexure "P" attached herewith (hereinafter called the Basic Price of Cement).

4.2 **APPROVAL OF SOURCE OF PURCHASE AND PRICE:**

Contractor shall purchase cement from approved reputed cement manufacturers such as ACC, UltraTech, J. P. Rewa, Vikram, Shree Cement, Birla Jute, CCI, Madras cement, Chettinad cement, India cement etc. as approved by Ministry of Industry, Govt. of India and having license to use ISI Certification mark for their products and from C&F agents and authorized dealers (with dealership certificate). Cement shall be Ordinary Portland Cement 33 / 43 Grade of fresh manufacture conforming to IS: 269/ IS: 8112 respectively; Portland Pozzolana Cement: IS: 1489 (Part 2): 1991; Portland Slag Cement: IS: 455 (1989) or relevant Indian Standards (latest revision). Cement shall be purchased and transported to the work site by the contractor in bulk quantity required to achieve desired progress in next 3 months, from the above source of purchase (including brand of cement). At the time of starting the work, the request for approval shall be submitted within 15 days of receipt of tender acceptance letter. The contractor shall intimate the EE/SE the quantity of cement being procured, with the names, full addresses and telephone numbers of cement suppliers. For subsequent approvals the contractors shall approach Employer's Engineer at site at least 20 days in advance of the desired date of delivery of cement. The contractor shall submit his request for the approval through Employer's Engineer at site with one copy of the letter to EE/SE. The contractor's request letter shall mention the quantity of cement to be/ being purchased and also the quantity of cement in stock at site on the date of submitting the request.

4.3 **BASIC PRICE OF CEMENT:**

The basic price of cement stated in Annexure 'P' is inclusive of all taxes and costs upto the site of work (without GST), transportation charges including loading and unloading charges at all points (except unloading at site), transit insurance and any other expenses (*expenditure*) not mentioned above but required. All other costs such as unloading the cement at site, handling, stacking, storage, providing watch and ward arrangements, loss due to pilferage, theft, damages if any including cement which may become unfit for consumption due to prolonged storage or due to rains etc. shall be to contractor's account and shall be included by the contractor in rates quoted in the tender.

4.4 **QUALITY OF CEMENT:**

The contractor shall satisfy himself that the cement arriving at site is ordinary port-land cement conforming to the requirement of IS: 269/8112 for 33 / 43 Grade respectively; Portland Pozzolana Cement: IS: 1489 (Part 2); Portland Slag Cement: IS: 455 (1989) or relevant Indian Standard and shall procure Manufacturer's Certificate to this effect. In case the contractor has any doubt regarding the quality of cement, it is up to him to have it tested at his own cost and make sure before incorporation in the works that the cement is of right quality. Each consignment of cement supplied should have Test Certificate of the Manufacturer.

4.5 **PAYMENT DUE TO VARIATION ON PRICE OF CEMENT**

Escalation on the price of the cement shall be worked out as per the below mentioned formulae and any such escalation shall be affected only for stipulated period of contract including the justified contract period extended without imposition of compensation for delay in the form of penalty.

However for work done /during the justified period extended as above. It will be limited to indices prevailing at the time of stipulated date of completion or as prevailing for the period under consideration, whichever is less. In case of extension granted with imposition of compensation for delay in the form of penalty, no price escalation shall be allowed during extended period, only recovery due to price escalation shall be affected.

The increase/decrease in prices of cement, shall be determined by the Price indices as published by Economic Advisor to Government of India, Ministry of Commerce and Industry and base price for cement, as indicated in Annexure 'P' as valid on the last stipulated date of receipt of tender, including extension if any and for the period under consideration.

The amount will be worked out as per the formula given below for individual material:-
Adjustment for component of cement.

$$V = P \times Q \times \frac{CI - Clo}{Clo}$$

Where,

V = Variation in Cement cost i.e. increase or decrease in the amount to be paid or recovered.

P = Base Price of cement as indicated in Annexure 'P' valid at the time of the last stipulated date of receipt of tender including extensions, if any.

Q = Quantity of Cement consumed (theoretical) in the works since previous bill.

Clo = All India Whole Sale Price index for cement, as issued by Office of the Economic Advisor, Dept. of Industrial Policy & Promotion under Ministry of Commerce and Industry, Government of India as valid on the last stipulated date of receipt of tenders including extensions, if any.

CI = All India Whole Sale Price index for cement, as issued by Office of the Economic Advisor, Dept. of Industrial Policy & Promotion under Ministry of Commerce and Industry, Government of India for period under consideration.

Note : The Indices for Grey Cement shall be used for actual CEMENT used in the work i.e. Ordinary Portland Cement / Portland Pozzolana. ~~The Indices for Slag Cement shall be used where PSC (Portland Slag Cement) is used in the works and the average of Grey Cement and Slag Cement shall be used where both Ordinary Portland Cement and Portland Slag Cement are used in the works. Indices published by Economic Advisor, DIPP, Government of India from time to time for Cement shall be considered.~~

4.6 CONTRACTOR'S OTHER RESPONSIBILITIES / LIABILITIES:

- (i) Contractor shall comply with all requirements/procedures etc. that may be stipulated if any, by Government /controlling authority from time to time and accordingly obtain the requisite supply of cement for the work.
- (ii) Even though the source of cement is approved by the employer but the employer shall not be responsible for quality of cement or any loss/ damage in transit, delays due to non-availability of cement with the factory / C&F agents /authorized dealers and/or required transport etc. The contractor shall not be entitled to make any claim and Extension of time or Cost on the employer on such grounds.
- (iii) Cement shall be kept in custody of the contractor at site. The contractor shall be responsible for the safety of the cement by providing watch and ward as is necessary and directed. In case any cement is damaged, unaccounted for or lost due to pilferage or any other reason either in transit or at site, the accountability will be with contractor. If any quantity of cement is found in excess of requirement or left over after completion of the work, same shall not be removed from site without the written permission of the Engineer-in-charge.
- (iv) The contractor shall maintain a stock register at the site and shall record therein the receipt and consumption of cement, the same day it is received or consumed. He shall also get the entries in the register for receipt and consumption of cement countersigned by Employer's Site Engineer, on the same day cement is received or consumed.
- (v) Pozzolana/ Slag cement shall be used only if specifically permitted by the Chief Engineer. The Chief Engineer reserves the right not to allow the use of Pozzolana/ Slag cement. In case Pozzolana / Slag cement is used, the Contractor shall have to observe increased periods for striking form and additional period of one week for curing for which no claim shall be entertained.
- (vi) The cement shall be got tested by the Engineer-in-charge of employer as and when new consignment comes and there is change in manufacturer's brand. The contractor shall supply free of charge the cement required for testing including its transportation cost to testing laboratories. The cost of tests shall be borne by the contractor/Department in the manner indicated below:-
 - (a) By the contractor, if the results show that the cement does not conform to relevant BIS codes.
 - (b) By the Department, if the results show that the cement conforms to relevant BIS codes.
- (vii) The contractor is allowed to use reasonable quantity from the cement brought at site for constructing temporary water storage tank to store water for construction, site office and godowns at site. The quantity used for this purpose shall not be account for payment due to price variation defined elsewhere.

(viii) The actual issue and consumption of cement on work shall be regulated and proper accounts maintained. The theoretical consumption of cement shall be worked out as per procedure prescribed elsewhere in the contract. In case the cement consumption is less than theoretical consumption including permissible variation, recovery at the rate so prescribed shall be made. In case of excess consumption no adjustment shall be made.

- (ix) If the work executed is not conforming to acceptable standard as prescribed in the tender elsewhere, the work will not be considered for payment.

The damaged cement shall be removed from the site immediately by the contractor on receipt of a notice in writing from the Engineer-in-charge. If he does not do so within 3 days of receipt of such notice, the Engineer-in-charge shall get it removed at the cost of the contractor.

Chief Engineer may change the brand of Cement depending upon availability in local market, if needed. Instructions in this respect can be issued by them at regular intervals. The name of manufacturers should be finalized after taking into consideration the suggestions of contractors during pre bid meeting, if any.

Similar conditions for cement of other types like slag cement etc. may be incorporated wherever required by the authority by providing for relevant BIS Codes, suitable brands of cement and instructions issued by the department.

5. MILD STEEL BARS AND HIGH STRENGTH DEFORMED BARS FOR REINFORCEMENT IN R.C.C. WORK TO BE SUPPLIED BY CONTRACTOR:

1.1 CONTRACTOR'S QUOTED RATES:

Contractor shall quote his rates for relevant items in the tender on the basis of provisions of this clause detailed hereunder and on the basis of price of steel at site of work as mentioned in Annexure "P" attached herewith (hereinafter called the Basic Price of Steel).

5.2 APPROVAL OF SOURCE OF PURCHASE

(1) The contractor shall procure TMT bars of Fe415/ Fe500 grade (the grade to be procured is to be specified) from primary producers such as SAIL or TISCO or RINL as approved by Ministry of Steel. The TMT bars procured from primary producers shall conform to manufacturer's specifications. In case of non-availability of steel from primary producers, the approving authority may permit use of TMT reinforcement bars procured from secondary producers. In such cases following action is to be followed:

(a) The grade of the steel such as Fe415/Fe500 or other grade to be procured is to be specified as per BIS 1786 /2008.

(b) The secondary producers must have valid BIS license to produce HSD bars conforming to IS 1786: 2008. In addition to BIS license, the secondary producer must have valid license from either of the firms Tempcore, Thermex, Evcon Turbo & Turbo Quench to produce TMT Bars.

(c) The TMT bars procured from primary producers shall conform to manufacture's specifications.

- (d) The TMT bars procured from secondary producers shall conform to the specifications as laid by Tempcore, Thermex, Evcon Turbo & Turbo Quench as the case may be.
- (e) TMT bars procured either from primary producers or secondary producers, the specifications shall meet the provisions of IS 1786 : 2008/2012 pertaining to Fe415D or Fe 500D grade of steel as specified in the tender (while preparing Tender the grade of the steel to be specified).
- (2) The contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work.
- (3) Samples shall also be taken and got tested by the Engineer-in-Charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications as defined under para (1)(d) & (1)(e) above, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time or written orders from the Engineer-in-Charge to do so.
- (4) The steel reinforcement bars shall be brought to the site in bulk supply required to achieve desired progress of the work in next 3 months, from the above source of purchase (including brand of steel) as decided by the Engineer-in-charge. At the time of starting the work, the request for approval shall be submitted within 15 days of receipt of tender acceptance letter. The contractor shall intimate the EE/SE the quantity of steel being procured, with the names, full addresses, and telephone numbers of steel suppliers. For subsequent approvals the contractors shall approach Employer's Engineer at site **at least 20 days** in advance of the desired date of delivery of steel. The contractor shall submit his request for the approval through Employer's Engineer at site with one copy of the letter to EE/SE. The contractor's request letter shall mention the quantity of steel to be/ being purchased and also the quantity of steel in stock at site on the date of submitting the request.
- (5) The steel reinforcement bars shall be stored by the contractor at site of work in such a way as to prevent their distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.
- (6) For checking nominal mass, tensile strength, bend test, re-bend test etc. specimens of sufficient length shall be cut from each size of the bar at random, and at frequency not less than that specified in the tender.

5.3 BASIC PRICE OF STEEL:

The basic price of steel reinforcement stated in Annexure 'P' is inclusive of all taxes and costs upto the site of work(**without GST**), transportation charges including loading and unloading charges at all points (except unloading at site), transit insurance, and any other expenses (*expenditure*) not mentioned above but required. All other costs such as unloading the steel at site, handling, stacking, storage, providing watch and ward arrangements, loss due to pilferage, thefts or any other reasons shall also be to contractor's account and shall be included by the contractor in rates quoted in the tender.

5.4 QUALITY OF STEEL:

The contractor shall satisfy himself that the steel arriving at site is TMT bars of Fe415/ Fe500 grade as per BIS 1786-2008/ 2012 or other grade bars procured either from primary producers or secondary producers, the specifications shall meet the provisions of IS 1786 : 2008/ 2012 pertaining to Fe 415D or Fe 500D grade of steel as specified in the tender and shall be supported by test certificate from the suppliers. In case the contractor has any doubt regarding the quality of steel, it is up to him to have it tested at his own cost and make sure before incorporation in the works that the steel is of right quality. Each consignment of steel supplied should have Test Certificate of the Manufacturer.

5.5 CONTRACTOR'S OTHER RESPONSIBILITIES/LIABILITIES

- (i) Contractor shall comply with all requirements/procedures etc. that may be stipulated if any, by Government /controlling authority from time to time and accordingly obtain the requisite supply of steel for the work.
- (ii) Even if the source of steel is approved by the employer, ~~but~~ the employer shall not be responsible for quality of steel, correctness of diameter/ size or any loss /damage in transit, delays due to non-availability of steel with the manufacturer/suppliers and/or required transport etc. The contractor shall not be entitled to make any claim & Extension of Time or Cost on the employer on such grounds.
- (iii) The contractor shall be responsible for proper storing arrangement at site. Steel shall be kept in custody of the contractor at site. The contractor shall be responsible for the safety of the steel by providing watch and ward as is necessary and directed. In case any steel is damaged, unaccounted for or lost due to pilferage or any other reasons either in transit or at site, the accountability will be with contractor. If any quantity of steel is found in excess of requirement or left over after completion of the work, same shall not be removed from site without the written permission of the Engineer-in-charge.
- (iv) The contractor shall maintain a stock register at the site and shall record therein the receipt and consumption of steel (category wise), the same day it is received or consumed. He shall also get the entries in the register for receipt and consumption of steel countersigned by Employer's Site Engineer, on the same day steel is received or consumed.
- (v) The wastage shall be to contractor's account and shall be taken away by the contractors after obtaining written permission from the **Engineer-in-charge** and the rates quoted shall allow for the same.
- (vi) The payment of steel reinforcement shall be made on weight worked out on the basis of measurement of lengths of various categories as incorporated in the work and sectional weights mentioned in tender.
- (vii) The contractor shall obtain a test certificate from the manufacturer for the lot of steel purchased for the work. The employer's site Engineer may also order testing of steel when new consignment comes and / or there is change in manufacturer's brand, by the contractor

before allowing its use in the work irrespective of the test certificate and in such case the contractor shall supply free of charge the steel required for testing including its transportation cost to testing laboratories. The cost of tests shall be borne by the contractor/Department in the manner indicated below but not any other incidental expenses for arranging the testing, which shall be to contractor's account and included in quoted rates:-

- a. By the contractor, if the results show that the steel does not conform to relevant BIS codes.
- b. By the Department, if the results show that the steel conforms to relevant BIS codes.

(viii) The actual issue and consumption of steel on work shall be regulated and proper accounts maintained. The theoretical consumption of steel shall be worked out as per procedure prescribed elsewhere in the contract. In case the steel consumption is less than theoretical consumption including permissible variation, recovery at the rate so prescribed shall be made. In case of excess consumption no adjustment shall be made.

(ix) The substitution of any category of steel shown in drawing with any other category of steel shall be done only if permitted by the EE/SE in writing.

(x) The steel brought to site and the steel remaining unused shall not be removed from site without the written permission of the Engineer-in-charge.

5.6 PAYMENT DUE TO VARIATION IN PRICE OF STEEL

Escalation on the price of the steel shall be worked out as per the below mentioned formulae and any such escalation shall be affected only for stipulated period of contract including the justified contract period extended without imposition of compensation for delay in the form of penalty.

However for work done /during the justified period extended as above. It will be limited to Indies prevailing at the time of stipulated date of completion or at prevailing for the period under consideration whichever is less. If the extension is granted with imposition of compensation for delay in the form of penalty, no price escalation shall be paid but recovery due to price escalation shall be affected.

The increase/decrease in prices of steel, shall be determined by the Price indices as published by Economic Advisor to Government of India, Ministry of Steel and base price for steel, as indicated in Annexure 'P' as valid on the last stipulated date of receipt of tender, including extension if any and for the period under consideration.

The amount will be worked out as per the formula given below for individual material:-

Adjustment for component of steel.

$$V = P \times Q \times \frac{CI - C_{lo}}{C_{lo}}$$

Where,

V = Variation in Steel cost i.e. increase or decrease in the amount to be paid or recovered.

P = Base Price of steel as indicated in Annexure 'P' valid at the time of the last stipulated date of receipt of tender including extensions, if any.

Q = Quantity of Steel consumed in the worksite i.e. as measured and recorded since previous bill.

Wastage if any, to be on contractor's account.

Clo = All India Whole Sale Price index for steel, as issued by Office of the Economic Advisor, Dept. of Industrial Policy & Promotion under Ministry of Commerce and Industry, Government of India as valid on the last stipulated date of receipt of tenders including extensions, if any.

Cl = All India Whole Sale Price index for steel, as issued by Office of the Economic Advisor, Dept. of Industrial Policy & Promotion under Ministry of Commerce and Industry, Government of India for period under consideration.

Note : The Indices for "MILD STEEL - LONG PRODUCTS" shall be used for adjustment purpose.

The Indices published by Economic Advisor, DIPP, Government of India from time to time for Steel shall be considered.

6. WASTAGE OF CEMENT AND STEEL :

- 6.1** The wastage of Cement and Steel shall be to the contractor's Account and the rates quoted shall allow for the same.

7. BALANCE STOCK OF CEMENT/STEEL ON COMPLETION OF JOB :

- 7.1** Irrespective of what is mentioned anywhere else in this tender the surplus stock of Cement/Steel remaining at the site on completion of work, shall be the property of the Contractor. However, he shall remove the surplus stock only after furnishing the necessary details of such stock in writing to the Corporation's Engineer and obtaining written permission from him.

8. STEEL OTHER THAN USED FOR REINFORCEMENT :

- 8.1** Rolled steel sections such as angles, joists, channels, flats etc. and mild steel used for M.S. Grills, railing, gates and M.S. Plates etc., shall be procured by the Contractor and Annexure "P" will not apply for cost of these items.

9. TESTING OF MATERIALS INCLUDING CEMENT AND STEEL :

- 9.1** Testing of all materials including cement & steel during the progress of work shall be as per frequency given in Table A, Clause 2 of Special Conditions.
- 9.2** Contractor shall facilitate testing of materials viz., Cement, Steel, Cubes and any other material as per the frequency / sampling mentioned in the Table 2 of the Special Conditions. Contractor shall also facilitate testing of any material to be incorporated in work even if it is not specifically mentioned. The testing charge against invoice shall be directly remitted by the corporation to the test house. If the material/s fails to conform to the standards, the test charges shall be recovered from contractor's bill.
- 9.3** For all other materials listed in Special Conditions, expenses towards testing shall be borne by LIC . If the material/s fails to conform to the standards, the test charges shall be recovered from contractor's bill.
- 9.4** The Corporation's Engineer may get tested any material to be incorporated in work even if it is not specifically mentioned. In all such cases, testing charges will be

borne by LIC. If the material/s fails to conform to the standards, the test charges shall be recovered from contractor's bill.

- 9.5** For all tests, incidental charges such as cutting, loading, unloading, casting wherever applicable such as mortar briquettes / cubes and facilitating in transportation, shall be borne by contractor.

10. "PRINCIPAL MAKE/S OR OTHER EQUAL AND APPROVED" FOR MATERIALS/ PRODUCTS :

- 10.1** The Contractor shall note that materials having "ISI" monogram shall primarily be used in the work. Materials of brands as specified in relevant literature of CPWD shall be incorporated. If in the tender "Certain Principal Make / Makes or other equal and approved of any material/Product is mentioned in any item or Trade Preambles relating to the particular items in its respective Trade Schedule, the Contractor shall have to use the Principal Make/Makes specified in the relevant item or the trade Preambles. In case the specified particular Principal make/makes of the materials product is/are not readily available, the Contractor shall take prior permission and approval of the Chief Engineer in writing before use of the alternative equivalent make of the Material / Product.

- 10.2** All principal makes specified for any item shall be treated at par as per the accepted quoted rate.

- 10.3** Use of the make other than the Principal Make/Makes (which shall be treated as an Equivalent make) shall be at the discretion of the Chief Engineer and such Make/Makes shall be used after the approval of the Chief Engineer.

- 10.4** In such cases the Contractor will not be paid any extra payment over the accepted quoted rate in any case. However if it is ascertained that the price of approved Equivalent Make or the Material/Product is lower than that for the Principal Make/Makes of the same material/product the difference of the price shall be payable by the contractor to LIC. Such difference of price shall be suitably decided by the Chief Engineer whose decision shall be final and binding to the Contractor in this regard.

11. ADJUSTMENT IN PRICES OF MATERIALS AND LABOUR (OTHER THAN CEMENT & STEEL):

- 11.1 Escalation on Material and Labour shall be payable in accordance to formula given in tender.**

- 11.2** Adjustment in prices of material & labour shall be allowed on the basis of clause-11.6, 11.7, 11.8 & 11.9 subject to the condition given below.

- 11.3** Adjustment shall be made only for tender items and deviated items for the stipulated contract period.

11.4 & 11.5

In case of extension of time, the escalation is paid as follows :

- a) When there is authorized extension i.e. no imposition of Compensation **for delay** in the form of Penalty, escalation may be paid for the extended period with prevailing index during the extended period.
- b) Extension granted but with imposition of Compensation **for delay** in the form of Penalty:- The escalation may be paid by considering index as that prevailing **on** the date scheduled date of completion or that prevailing **on** the date of billing during the extended period of contract **whichever is lower** .
- c) Extension granted due to failure on the part of the contractor but due to reasons beyond his control, the Department has taken a lenient view for not imposing Compensation **for delay** in the

form of Penalty for delay of work, no escalation shall be paid whatsoever after scheduled date of completion.

ADJUSTMENT OF MATERIALS:

- 11.6 For the purpose of adjustment in price of materials, the component shall be 60% of the value of work done upto a given stage. While computing the adjustment, the cost of cement, steel or any other materials for which basic price has been stipulated in the tender shall be deducted from the component worked out at 60% of the value of work. The cement and steel as covered under Clauses 4 and 5 of the General Preambles to schedule of quantities shall be excluded from the purview of the adjustment.

$$V_m = \{ 60/100 (R_n - R_{n-1}) - C_m - M_{n-1} + M_n \} \times (W - W_0) / W_0 \text{ Where,}$$

V_m = Variation in price for materials i.e. increase or decrease in the amount in rupees to be paid or recovered.

R_n = Total value of work done (excluding prime cost items, extra items, and advance on materials at site upto the period under reckoning) on the basis of accepted tender rates. The deviated items worked out fully on the basis of rates prevailing at the time of last date of receipt of tender to be included.

C_m = Total value of cement and steel at basic price stipulated in the tender and shall comprise of C & S as explained below and any other material which basic price is mentioned:

C = Cost of cement used in the work and recorded for any specific bill period under reference and worked out at basic price stipulated in Annexure 'P' attached in the tender.

S = Cost of steel for reinforcement (covered under Clause 5.1 AND 5.2 of the General Preambles to schedule of quantities) used in the work and recorded for any specific bill period under reference and worked out at issue price / basic price stipulated in the tender.

R_{n-1} = Total value of work done (excluding prime cost items, extra items and advance on materials at site) considered in the bill prior to the period under reckoning. The deviated items and such other items shall be considered as per R_n above.

M_n = Advance being allowed in the bill under consideration against materials at site (other than cement and steel)

M_{n-1} = Advance allowed in the bill prior to the period under scrutiny against materials at site (other than cement and steel)

W_0 = All India Wholesale Price Index for all commodities (Base = 100; Year 2004-05) as prevailing on the last day for submission of tender (including extended date, if any).

W = Average All India Wholesale Price Index for all commodities Base = 100; year 2004-05; as published in the RBI Bulletin for the period of the bill under consideration viz. from the date of previous bill (date of commencement in case of first bill) to date of current bill (date of virtual completion in case of final bill or any earlier cut off date as fixed).

- 11.7 The adjustment on materials is worked out on the basis that material component in the building construction work is 60% of the value of work done, the rest being labour and profit. But in the initial stages of construction work, it might so happen that the cost of materials used exceeds 60% which is taken as an average and therefore adjustment gets worked out on negative side even

though the economic index might have gone up. In such cases, the negative adjustment shall also have to be made in the bill.

ADJUSTMENT ON LABOUR:

- 11.8 The contractor shall pay wages to the skilled and unskilled labour not less than the rates prescribed under the minimum wages act and as stated in clause no.18 of the General Instructions to contractors for Builders' work. Variation in prices of labour shall be worked out by applying the following formula and necessary payment/ recovery made:

$$VL = 25 / 100 \times (R_n - R_{n-1}) \times (I - I_0) / I_0$$

VL = Variation in price for labour i.e. increase or decrease in the amount in rupees to be paid or recovered

I = Average All India Consumer Price Index for Industrial Workers (base 100 year - 2001) declared by Labour Bureau, Govt. of India, as published in Reserve Bank of India Bulletin during the period under reckoning.

Average All India Consumer Price Index for Industrial Workers for the period of the bill under consideration viz. from date of previous bill (date of commencement in case of first bill) to date of current bill (date of virtual completion in case of final bill or any earlier cut off date as fixed)

I_0 = All India Consumer Price Index for Industrial workers (base 100-year 2001) ruling on the last date of submission of tender (including extended date, if any)

R_n = As defined under 11.6 above

R_{n-1} = As defined under 11.6 above

- 11.9 If the last date for submission of tender / date of bill is between 1st to 15th of a particular month the relevant economic index (W , W_0 , I , I_0) for the previous month is to be considered. However, if the last date of submission of tender / date of bill is between 16th and end of month, the relevant economic index for the month shall be reckoned while calculating the material / labour price adjustment.

NOTE:

- 1) The adjustment in prices of Materials and Labour shall be considered /effected only when the Contractor submits authentic data for prevailing indices along with the RA/Final Bill. The Employer reserves the right to set aside certain amount from the Bill if the Contractor does not submit the authentic data of prevailing indices along with the bill.
- 2) For adjustment in prices of materials & labour the indices (WPI / CPI) published by RBI as mentioned above which are available as on the date of submission of final bill (final / provisional indices) will only be considered for settlement of final bill . No further review will be done, even if there are variations in indices (WPI / CPI) after the final bill is settled.
- 3) In case during the period of contract, the base years for publishing Economic Indices are changed as per statute, then the revised indices will be considered as per the published data available at the time of settling the bill/s.

Sequence of repair / Rehabilitation / strengthening measures of slab, Beams, Columns, Wall etc (For reference Only).

1. The repair / rehabilitation / strengthening of slabs shall be taken up first followed by beams and columns in aforesaid buildings. The grouting including localized repair and rehabilitation of slabs shall be taken up first without much disturbance to beams and columns.
2. The additional reinforcement for slabs shall be chemically anchored with existing beams / columns.
3. If at locations of rebarring, the strength of concrete is poor, the same shall be repaired first as localized manner.
4. The repair and strengthening of slabs shall be taken up after removing additional loads in the form of tiling / alterations / modifications.
5. Provision of adequate scaffolding / support system for structural; element & release of load coming from structure to avoid localized stress concentration during rehabilitation / strengthening procedure.

METHODOLOGIES FOR RESTORATION / REPAIRS (For reference Only):

First of all, as per the recommendations of IIT Kanpur, the heavy water proofing layer (comprising thickness approx. 600mm) proposed to be removed and shall be replaced with other suitable water proofing system such as cement based waterproofing with brick bat of minimum thickness only to provide proper slope.

Thereafter, the methodology for the repair of spelled/distressed concrete members/areas shall be as given below. Strong and adequately designed temporary structural support system of steel props, properly braced shall be erected to relieve the loads from structural RCC element to be strengthened / repaired.

1. Surface Preparation:

- The loose dilapidated concrete / existing shotcrete layer shall be removed from the substrate using mechanical breakers.
- The concrete shall be removed up to a minimum depth of 10mm beyond steel reinforcement.
- The chipping should continue till sound concrete is available.
- The chipped concrete shall be cleaned using high pressure water jet with clean potable water. This would make the substrate free from all impurities and unwanted organic deposits.

2. Reinforcement Treatment:

- (i) The corroded steel bars shall be cleaned mechanically or using high pressure water jet to remove all loose materials.
- (ii) The rust scales shall be cleaned using rust convertor chemical. The surfaces shall be brought to bright condition. The cross-sectional area of the bars shall be checked for loss and wherever it is found that the loss of section is more than 25% the same needs to be marked for retrofitting.
- (iii) The prepared bars shall be given a coat of zinc rich epoxy primer to a dry film thickness of 50 microns. The application of primer shall be carefully done covering the surfaces behind the bars.

3. Provision of Additional Reinforcement:

Wherever the reinforcement loss is heavy or reinforcement is lost completely, additional rebars of same diameter shall be provided with the help of shear connectors.

The shear connectors are provided in the repair area in a grid pattern of 200mm x 200mm by drilling holes of 10/12mm diameter to a depth of 100/150mm. The drilled holes shall be grouted with epoxy acrylate based anchoring material.

4. Injection Grouting to arrest porosity:

- i) Holes should be drilled in the concrete where the leakage and cracks are observed to fix injection packers / injection nozzles.
- ii) The packers are fixed using epoxy acrylate based anchoring material on the surface.
- iii) Injection is done using SBR polymer / Epoxy through suitable grouting gun / pump at required pressure (4kg / cm² – 8Kg/cm²) depending on the site condition, to fill the pores within the concrete.
- iv) Injection packers / nozzles shall be sealed properly, cured and cutted properly.

5. Application of bonding agent:

- The prepared and treated concrete substrate to be repaired shall be given a bonding coat using Epoxy / polymer bonding adhesive depending on requirement.
- The bonding agent is applied using either by brush or roller. The bonding agent application shall be done to only that much area that can be covered within the open time. In case the bonding agent is found to be dried, a further coat of bonding agent shall be given.

6. Refurbishment of Damaged concrete:

(H) The primed concrete substrate shall be repaired with

4 Slabs:

a) **For patch repair work:** single component, fibre reinforced, dual shrinkage compensated, cementitious, thixotropic repair mortar by hand and trowel application preferably for patch repair work of RCC members.

b) **For large quantum repair work:**

For 4th floor (or wherever cores can be cutted through slab): Dual Shrinkage compensated, flowable micro-concrete (preferably with 20% replacement by weight with 10mm and down aggregate) preferably for excessively damaged area of RCC members. Prepacked micro-concrete powder shall be thoroughly mixed with recommended proportion of water. Micro-concrete shall be poured using water tight shuttering.

For other floors (or wherever core cutting through slab is not possible): Surface shall be prepared with single component, fiber reinforced, dual shrinkage compensated, cementitious, thixotropic repair mortar by hand and trowel application. Thereafter, CFRP / Glass fibre sheet of required thickness and pattern shall be applied over the prepared surface as shown below:



5 Beams:

- c) **For patch repair work:** single component, fibre reinforced, dual shrinkage compensated, cementitious, thixotropic repair mortar by hand and trowel application preferably for patch repair work of RCC members.
- d) **For complete repair work:** Dual Shrinkage compensated flowable micro-concrete (preferably with 20% replacement by weight with 10mm and down aggregate) preferably for excessively damaged area of RCC members. Prepacked micro-concrete powder shall be thoroughly mixed with recommended proportion of water. Micro-concrete shall be poured using water tight shuttering.

Or,

Surface shall be prepared with single component, fiber reinforced, dual shrinkage compensated, cementitious, thixotropic repair mortar by hand and trowel application. Thereafter, CFRP / Glass fibre sheet of required thickness and pattern shall be applied over the prepared surface as shown below:



6 Columns:

- e) **For patch repair work:** single component, fibre reinforced, dual shrinkage compensated, cementitious, thixotropic repair mortar by hand and trowel application preferably for patch repair work of RCC members.
- f) **For complete repair work:** Dual Shrinkage compensated flowable micro-concrete (preferably with 20% replacement by weight with 10mm and down aggregate) preferably for excessively damaged area of RCC members. Prepacked micro-concrete powder shall be thoroughly mixed with recommended proportion of water. Micro-concrete shall be poured using water tight shuttering.

Or,

Surface shall be prepared with single component, fiber reinforced, dual shrinkage compensated, cementitious, thixotropic repair mortar by hand and trowel application. Thereafter, CFRP / Glass fibre sheet of required thickness and pattern shall be applied over the prepared surface as shown below:



7. Curing:

- The repaired area shall be kept wet by covering with wet Hessian cloth for a minimum period of 7 days. For ceiling, water should be sprinkled continuously for minimum 7 days.

8. Polymer based plaster over repaired mortar:

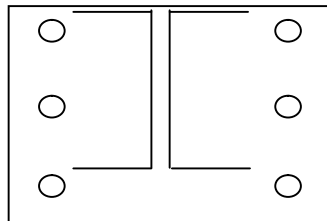
- The entire surface repaired with repair mortar shall be plastered with polymer mix with cement mortar of 1:5:15 ratio.

9.Strengthening structural elements with structural steel sections, wherever, the RCC columns / beams are showing significant sign of distress:

- MS Plate of required thickness and size can be fixed to the periphery of the columns and sides & bottom of beams by providing bolts in order to improve the flexural strength of the distressed members.

10. Provision of Structural steel interior beams column to column to divide the flat slab span (OPTIONAL):

- Since, for the said building, RCC column and RCC flat slab system with peripheral beams has been adopted and no internal beams have been provided column to column. As the top floor of the building is showing significant sign of distress. In view of this, for top storey of building or wherever required, the structural steel beams may be provided column to column internally to improve overall performance of the building.
- MS Plate of required thickness and size shall be fixed to columns by providing bolts as shown in sketch and then, 2 nos. ISMC shall be welded underneath the RCC slab.



Methodology for Repair of Slab, Beams, Column, Wall etc.

- 1) Visual survey for identification distresses during rehabilitation work.
- 2) Provision of adequate scaffolding/ support system for easy access to structural element & release of load coming from structure to avoid localized stress concentration during rehabilitation/ strengthening procedure.

- 3) Arrangement of light & ventilation for execution of work and provision of safety net, cover to protect machines / furniture / floor during execution of work.
- 4) Removal of adjoining concrete work / brick masonry and door/ windows & door/ window frames for access and execution as per requirements.
- 5) Removal of loose concrete and soot by mechanical means followed by sand blasting.
- 6) Removal of plaster/ brick work including racking of joints of the brick work.
- 7) Cleaning of exposed reinforcement bars with sand blasting / mechanical means.
- 8) Providing rust remover & anti-corrosive treatment as per specification and instruction given or product datasheet.
- 9) Opening the crack up to one-third depth of element cross section.
- 10) Cleaning of holes and open cracks, with compressed air and water jet.
- 11) Filling the cracks/ honeycombing/ voids and fixing the nozzle with epoxy putty for structural cracks or polymer modified cement sand mortar as per specification given for non-structural cracks.
- 12) Allow the material, filled in concrete/ masonry to be air cured for 24 Hrs.
- 13) Providing polymer modified cement slurry/ epoxy grouting immediately after cleaning, as per specification, with grouting pump [pressure gauge shall be provided to show delivery pressure of grouting material, which may vary from 4 kg/cm² to 8 kg/cm² depending upon site condition].
- 14) Cutting nozzles and sealing the same with epoxy putty.
- 15) Cleaning the surface with mechanical means & water to remove dirt and other foreign material.
- 16) Providing polymer modified cement slurry / Epoxy bonding adhesive as bonding agent as per specification.
- 17) Providing polymer modified cement sand mortar (PMM/ PMC); as per specification, within 45 min. of application of polymer modified cement slurry(bonding agent).

- 18) Required curves of 25 mm at the corners and face in plumb should be achieved during application of PMC only.
- 19) Cure PMC system with water for 3 days and allow the same for air cure.
- 20) Providing & laying 40-50 mm thick micro-concrete on damaged columns, beams and slabs (if required) within mentioned time of application of Epoxy bonding adhesive (bonding agent).
- 21) Providing brick-masonry after strengthening of columns, for partition wall with first class brick in (cement: sand) mortar, as per specification and fixing frames & door, as per requirement.
- 22) Filling the cracks/ joints with PMC in existing brickwork.
- 23) Providing Flooring/ Facading, as per requirement.
- 24) Relaying of false ceiling, as per specification and requirement.

Concrete Surface Preparation

- The concrete around the damaged area shall be checked for soundness by tapping with small hammer. Wherever hollow sound is emanated on tapping, the same shall be marked and the edge of the damaged area shall be extended to that point.
- After marking the boundaries of the unsound concrete, the edges shall be square cut to a depth of unsound concrete but in no case it should be less than 10 mm using

concrete saw/ rotatory hammer chipping machine. This would help in preventing formation of feathered edges and isolate the damaged area from sound concrete area.

- All unsound concrete within the marked and saw cut boundaries shall be removed using heavy-duty concrete breakers. Proper precaution should be taken during removal of damaged / unsound concrete to avoid internal micro cracking in good concrete.
- Where corrosion induced damages are being repaired, the concrete removal shall be extended till main reinforcement bars are exposed completely. The depth of cutting should extend at least 10 mm beyond steel reinforcement to enable access to rear side of rebar for necessary treatment. For areas subjected to carbonation, the entire concrete affected by carbonation shall be removed. For areas subjected to chloride ion ingress the steel reinforcement at the first layer shall be completely exposed.
- The exposed concrete surface shall be lightly abraded using suitable equipment and tools such as sand blasting or rotary abrading machine followed by hard steel brushing to remove any loose particles followed by thorough cleaning of the surface with clean potable water jetting and drying with air jetting. Alternately, a high-pressure water jet shall be used for surface preparation. The final concrete surface should be rough with 5 – 10 mm amplitude.
- Ensure clean of surface before treatment for better adhesion between existing concrete surfaces to new system to be applied. Further, surface should be dry and free from traces of soot's, grease and oil.

Reinforcement Treatment

- The exposed steel reinforcement shall be mechanically abraded to remove loose rust, scales and mills from its surface. The cleaned reinforcement shall reach bright condition.
- The existing reinforcement bars should be treated with two coats of alkaline based rust converter conforming to ASTM-B-117 with intervals of 8-12 hours between the coats.

- The exposed steel reinforcement shall be checked for loss of cross sectional area. Wherever the loss of cross sectional area is more than 20% it shall be replaced or retrofitted with steel bars of same size. It is recommended decision of replacement or retrofitting of corroded steel bars shall be based on the recommendations of concerned structural engineer.
- To enable fixing of new reinforcement as a replacement to existing corroded reinforcement, shear connectors TMT/ HYSD bars of 8 mm diameter shall be fixed on the concrete substrate using epoxy putting or ready to use epoxy based chemical anchoring system. The new rods are either tied or welded to the fixed shear connectors. For convenience and ease of application, it is ideal to have the 'L' shaped shear connectors with web length of 50 mm and flange length of 100 mm or more depending on bond length of chemical anchoring system. Where the rods are snapped or having very less cross sectional area it is advisable to provide sufficient lap lengths for splicing new reinforcement steel. In case of lap lengths are not available additional chipping of additional concrete shall be done till sufficient lap length is available for splicing.
- The shear connectors for fixing additional reinforcement shall be installed using epoxy based system of pre packed chemical anchor of HILTI Make Fe 500 or equivalent as per specifications / drawings. The mechanical anchor may also be used in special cases after prior approval of engineer in charge.
- The existing reinforcement and new (with specific approval of engineer as per site condition) should be treated with polymer based anti-corrosive primer with two coats to make continuous film of minimum 100 micron. The single component based pre packed primer available shall be of brushable consistency.
- The primer shall be applied to the steel reinforcement provided using brush giving a continuous coat on the entire steel surface. The primed steel surface shall be covered with repair mortar within 24 hrs. after primer coat becomes tack free.

Concrete Priming

- The prepared concrete surface shall be saturated with clean potable water at least 2 hours prior to application of cementitious based repair material. The water saturation shall be carried out immediately after the steel reinforcement primer becomes tack free. If the concrete was found to show dry patches after water saturation, then the same shall be repeated till concrete surface looks damp and in saturated surface dry condition. **However, in case application of epoxy mortar, the surface should be strictly in dry condition.**
- The concrete surface shall be primed with acrylic based concrete bonding agent / epoxy bonding coat for cementitious based mortar and epoxy mortar respectively. The bonding agent is available ready to use and shall be applied with brush directly on concrete surface.
- Alternately, the bonding agent can be mixed at site to a brushable consistency and applied on the concrete in a thin continuous layer. Care shall be taken to prevent over application of primer in thick patches. It is advisable that materials should be used of reputed company and from single source to avoid compatibility problems. The repair products are designed for specific usage and care should be taken before finalisation of the products to be used with out any bonding agent. In general polymer modified repair mortar is applied on the saturated surface dry concrete substrate)

FRP INSTALLATION

The installation of FRP strengthening systems is a specialized operation, only trained and certified personnel should be used. Each of the FRP system manufacturers has developed individual application procedures that may differ slightly in some cases. However, followings are a general outline of the steps in a typical externally bonded FRP strengthening application on a reinforced concrete member. Manufacturer specifications should be followed when using any specific FRP strengthening system.

Concrete Preparation:

- Most of CFRP strengthening applications are bond-critical; it is of paramount importance that the concrete substrate is a clean and sound condition prior to CFRP

installation. Improperly or poorly prepared substrate concrete can lead to debonding or delamination of the CFRP systems. The following are important considerations in ensuring a sound bonding surface:

- Unsound areas of concrete such as broken, honeycombed or delaminated regions and any low-strength materials such as plaster must be completely removed to reveal good and sound concrete.
- Corroded reinforcing steel should be repaired according to guidelines suggested in technical specifications by cleaning and applying anti corrosive treatment. It is suggested that FRP strengthening systems should not be used to substrate having corroding reinforcing steel, since the expansive force that result from ongoing corrosion could potentially lead to damage of the FRP system.
- Large voids and honeycombed concrete in soffit of the girder must be removed and strengthened with using an appropriate repair material such as micro concrete, polymer modified concrete and epoxy mortar as specified in technical specifications.
- Large cracks in the concrete surface should be pressure injected with epoxy or cementitious material.
- It is desirable to perform *pull out tests* on the concrete surface to ensure soundness of the substrate concrete.

Surface Preparation:

The bonding surface must be prepared to receive the adhesive. The end goal of the surface preparation activities is typically to provide a freshly exposed, clean, sound, open, dry and roughened texture. The following items should be addressed.

- The surface of the concrete should be levelled using epoxy putty (as specified by the FRP manufacturer) to ensure that any surface irregularities are smoothened-typically to less than 1mm in size.
- In cases where FRP systems are applied around corners, the corners must be rounded to a minimum radius (25 mm) as specified in the technical specifications.

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This is done to avoid stress concentrations at sharp edges. However, typical minimum radius for corners in FRP strengthening applications varies between 15 and 35 mm, depending to the specific system being used and applicable code regulations. Corners need not be rounded upto minimum radius in cases where the fiber direction runs parallel to the sharp edge.

Adhesive Mixing:

Accurate measuring and uniform mixing of adhesive components is critically important for successful application of FRP strengthening systems, and manufacturer's recommendations should be strictly followed. The various FRP manufacturers specify mixing methods and times for their adhesives.

Depending on the resin supplier and the amount of material required, various mixing techniques may be used, including small drill mounted mixing blades, special mixing machines may be used to agitate the mix in uniform colour and free of air bubbles for application of the FRP systems. The material shall be used within the manufacturer specified pot-life of the resin at the applicable ambient temperature conditions.

FRP Installation:

Environmental conditions must be satisfactory for installation of the FRP system to begin. Precise specifications in this regard vary from manufacturer to manufacturer. The ambient temperature should typically not be less than 10°C, nor above 30°C depending on the specific resin system being used. The surface of the substrate concrete should be free of moisture and expected in the near future.

Several methods are currently available to bond FRP materials to concrete members. However, machine wet lay-up system has been recommended in this project.

FRP Layup system:

(i) **FRP Preparations:** The FRP strip is cut to length using a high speed cutting wheel or a fire blade hacksaw. Some manufacturers have developed special cutting rigs for this

purpose. The strip is cleaned to ensure that its bonding surface is free from any contamination. This is typically accomplished by wiping it with acetone.

(ii) **Application:** A large of mixed adhesive, typically 1 mm to 3 mm thick is applied to both substrate cover the area to be bonded, and the FRP strip. Again some FRP manufacturers have developed special systems for adhesive application. The FRP is then carefully placed in position on the concrete member and is pressed against its surface using a hard rubber roller to achieve a void free bond line with a thickness of between 2 mm and 3 mm. Excessive adhesive should be removed before curing.

Fabric Systems:

(i) **FRP Preparations:** The fiber fabric (which is defined in standard widths, typically between 300 mm and 600 mm) is cut to length using commercial quality heavy duty scissors. Blunt scissors and other types of cutting tools can damage the fibres and should not generally be used.

(ii) **Application:** Two slightly different methods exist for the application of FRP fabric strengthening system for concrete, namely wet layup and dry layup. These two techniques are similar, however and consist of the following steps:

A low viscosity epoxy primer is applied to the concrete, using a standard paint roller, to seal and strengthen the concrete surface and to provide the optimal surface for bonding to the FRP material. The coverage rate and curing time for the primer should be as per manufacturer recommendations.

1. The surface of the concrete is levelled, where necessary with a squeegee or trowel using non-sag epoxy putty. Any minor voids or surface irregularities should be levelled.
2. A layer of mixed epoxy resin saturant is applied to the surface of the concrete member using a brush, roller or trowel (again, coverage rates should be in accordance with recommendations)
3. The FRP material is bonded to the surface of the concrete using the wet or dry layup technique. However, in present case, wet-layup system

Wet layup: The fiber fabric is saturated with resin before being bonded to the concrete. This is typically accomplished using a paint roller on a clean plastic drop sheet, or by using a specialized saturating roller assembly. The saturated FRP sheet is then placed on to the surface of the concrete and smoothed out by hand or using a squeegee to ensure intimate contact.

Dry layup: Unsaturated (dry) fiber fabric is placed into the initial layer of saturant applied to the surface of the member. In some cases, the fiber fabric may have a paper backing which is removed once the fabric has been placed against the member. The dry fibres are pressed into the saturant to impregnate the fiber fabric with resin.

4. Air bubbles beneath the surface of the FRP sheet should be rolled or pressed out by hand.
5. A second layer of saturant is applied with a roller or pressed out by hand.
6. The process can be repeated for multiple layer of FRP. If the resin is allowed to cure between installations of multiple FRP layers, a light sanding of the FRP surface may be required between applications.

(iii) **Spacing and Positioning:** The primary fiber direction of the installed FRP system is a key influencing the strengthening system's performance. The specified design orientations of the FRP sheets should be strictly to follow the technical specifications.

Protective coatings:

The protective coating as specified in specifications may be applied to the exterior of the FRP strengthening system. This has been done to protect from anticorrosive environment & UV exposure. This also gives better aesthetic view.

Curing Conditions:

Because curing of epoxy resins used in FRP strengthening applications is a time dependent phenomenon, Therefore, curing of FRP systems shall be applied on acceptable conditions of temperature and humidity. The recommendations of the manufacturer should be followed. While specify different FRP strengthening systems, the temperature during the curing process condensation or contamination on the surface of the FRP must be prevented during

curing. In some cases, auxiliary heat sources and temporary shelters can be used to heat the substrate concrete to allow installation in colder environments. The ambient relative humidity (RH) must typically be less than 85% in most of FRP systems also have specified maximum cure temperature, which are typically in the range of 150C to 350C. The pot life of epoxies may be significantly reduced at higher ambient temperature. It is important that the FRP not be disturbed during the early stages of the curing process (typically during the first 24 hours). Common epoxy resins reach their design strength in about seven days. The temperature and humidity conditions should be monitored and recorded throughout the installation and curing process. Research suggests that typical vibrations and strains due to traffic loads are not a concern curing of FRP strengthening applications on concrete bridges.

Equipment:

Many FRP manufacturers have developed specialized equipment for the installation of their specific FRP strengthening systems. Specialized items such as mixers. Sprayers, resin impregnators and winding machines are used in some instances. All workers should be trained in the safe and effective operation of such equipments prior to use.

Methodology for Repair to Brick Masonry Walls

- 1) Identification of cracks and weak zone location in beam, column and roof slab.
- 2) Removal loose plaster on sides of column and beam as per requirement.
- 3) Cut an V-groove along length of cracks/joints, 12x12mm wide & deep.
- 4) Cleaning cracks/ joints with mechanical means and water jet and keep the same in surface saturated dry (SSD) condition.
- 5) Fill the cracks with polymer modified cement sand mortar, as per specification
- 6) Fixing of 20/22 gauge woven 12.5x12.5mm square opening galvanised wire-mesh and plastering with polymer cementitious mortar on of brickwork (fixing can be done with 50mm long nails in a staggered fashion at a spacing of 400 mm c/c on brick masonry).
- 7) Providing 10-12 mm thick cement: sand (1:4) plaster on repaired surface.
- 8) Curing with water for 7 days.

NOTE REGARDING STATEMENT SHOWING QUANTITIES OF THEORETICAL
CONSUMPTION OF CEMENT FOR MAJOR ITEMS OF WORKS

NOTE: Refer to the latest CPWD specification and norms for Coefficient of Cement Consumption. In case no Coefficient is available for a specific item the decision of Chief Engineer, shall be final and binding on the contractor.

Annexure-B

- [illegible]

Authorised Signatory of Constitution
Name & Designation

Annexure-A1

Bill No.:

Item no	Description of item	Unit	No	Length	Breadth	D/H	Qty	Remarks / Notes.
i	Name of the work							
ii	Agreement No & date / Contract Ref:							
iii	Name of the Construction Associate & address							
iv	Name and Designation of LIC measurer with S.R. No.							
v	Period of measurement							
vi	Name of the Construction Associate's authorised Engineer/s attending measurement. Authorisation letter ref:							

Signature of Construction
Associate's Engineer.
(Name)

Signature of LCI Site
Engineer
(Name & S.R. No)

Signature of ICI Test Checking
Engineer
(Name & S.R. No)

LIFE INSURANCE CORPORATION OF INDIA

FORM OF GUARANTEE FOR WATERPROOFING

(To be given by Waterproofing Agency)

Name of the work : _____

Name of the Main contractor : _____

Name of Water Proofing Agency

M/s. _____

We M/s. _____

_____ hereby guarantee that the surfaces treated by us for waterproofing in the above work, for M/s. _____

the General builders Contractors for the above work, shall remain entirely watertight, Should, however, due to any unforeseen defect left out in the work carried out by us at the time of execution of the work, there be any leakage from any surface treated by us during the period of **Five years** from the date of virtual completion of work i.e. from _____ to _____ the same shall be rectified by us without any cost to the Life Insurance Corporation of India.

However, we shall not be responsible in any way if our work is tampered with or if the body of the structure is damaged due to sinking, cracking and/or by any other act of God. The intimation received from LIC of India during Guarantee period shall be deemed to have been received from Main Builder's Contractor and inspection as well as necessary work shall be carried out and reported upon by us forthwith.

Signature of Waterproofing Agency

Signature of the Main Builders' Contractor

LIST OF PRINCIPAL MAKES / AGENCIES / BRANDS OF VARIOUS MATERIALS

1. Materials used in the work should be from the following list of principal makes/ brands. In case of non-availability of these makes/brands, Chief Engineer shall allow materials licensed by BIS bearing "ISI" monogram at par with principal makes.
2. For all other manufactured materials for which principal makes are not mentioned the materials allowed to be used in the work shall have BIS certification and samples for which are to be got approved prior to use of the same in the work.
3. For some materials BIS certification may not be available. In such cases the samples shall have to be got approved before using in the work.

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
1.	Ordinary Portland Cement/ Pozzolana Portland Cement	2.	Reinforcement Steel – (Primary Producers)
	ACC		RINL
	Ultratech		SAIL
	Vikram		TATA STEEL Ltd.
	Shree Cement		
	Birla Jute		
	J. P. Rewa		
	CCI		
	Madras Cement		
	India Cement		
	Chettinad		
3.	GI PIPES	4.	GI PIPE FITTINGS
	a. Jindal		a. R-Brand
	b. Zenith		b. K.S.Brand
	c. Apollo		c. Zoloto
	d. GST		d. RR
	e. Prakash		e. SSS
	f. QST		f. NMC
5.	COPPER PIPES / TUBES	6.	MULTI LAYER COMPOSITE PIPES

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
	a. Rajco Metal Industries		a. Ki TEC
	b. B.P.Conex		b. Kisan
	c. Comap		c. Flowguard CPVC Astral
7.	PVC PIPES AND FITTINGS	8.	UPVC (UNPLASTICIZED PIPES & FITTINGS)
	a. Chemplast		a. Prince
	b. Prince		b. Supreme
	c. Supreme		c. Paras
	d. Finolex		
	e. Oriplast		
9.	GATE VALVES, GLOBE VALVES	10.	FOOT VALVES , CHECK VALVES
	a. Leader		a. Kirloskar
	b. Kirloskar		b. Leader
	c. Zoloto		c. Ashoka
	d. Orient		
11.	WATER METERS	12	FERRULES
	a. Capstan		a. Leader
	b. Anandaasahi		b. Hindco
	c. Dasmesh		c. Neta
	d. Remco		d. Annapurna
13	BIB COCKS, STOP COCKS, PILLAR TAPS ETC.	14	LOW LEVEL FLUSHING CISTERNS (PVC / CERAMIC)
	a. Jaguar (Continental Series)		a. Parryware
	b. Marc (Oriental Series)		b. Cera
	c. Essco		c. Hindware
	d. ARK		d. Commander
	e. GEM		

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
15.	VITREOUS SANITARY WARE LIKE IWC, WASH BASIN, URINALS, EWC ETC.	16.	PLASTIC SEAT AND COVER
	a. Parryware		a. Commander
	b. Cera		b. Parryware
	c. Hindware		c. Bestolite
	d. Neycer		d. Duroshine
17.	BATHROOM FITTINGS	18.	CI PIPES & FITTINGS
	a. Jaguar (Continental Series)		a. Hind
	b. ESSCO		b. BIS
	c. Gem		c. BIC
	d. ARK		d. NECO
	e. Marc (Oriental Series)		
19.	CI NAHANI TRAP	20.	SW PIPE
	a. BIC		a. HIND
	b. SKF		b. PERFECT
	c. NECO		c. BURNS
	d. RAJCO		
21.	PVC CABINET MIRROR	22.	SLUICE VALVE
	a. Commander		a. Leader
			b. Kirloskar
23.	HDPE / LDPE / LLDPE WATER STORAGE TANKS	24.	CERAMIC / GLAZED TILES
	a. Sintex		a. Nitco
	b. Polycon		b. Kajaria

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
	c. G&P		c. Euro
			d. H. R. Johnson
			e. SOMANY
			f. Asian Granito India Ltd.(AGL)
			g. Orient Bell
25.	VITRIFIED TILES	26.	PLY WOOD(BWR) BLOCK BOARD / FIRE RETARDENT PLY
	a. Nitco		a. Kitply
	b. Kajaria		b. Archid
	c. RAK		c. Green Ply
	d. EURO		d. Century Ply
	e. SOMANY		e. Bhutan Board
	f. Asian Granito India Ltd.(AGL)		f. Sharon
	g. Orient Bell		g. Anchor
			h. Swastik
			i. National
			J SAMRAT Ply wood Ltd.
27.	FLOAT GLASS	28.	PVC DOORS & DOOR FRAMES
	a. Saint Gobain		a. Rajshri
	b. Modi Guard		b. Sintex
	c. Triveni Sheet Glass		c. Supreme
	d. Indo Asahi Glass Co.		
	e. Tata		
	f. Atul		
29.	ALUMINIUM EXTRUDED SECTIONS	30.	STAINLESS STEEL KITCHEN SINKS
	a. Hindal		a. Nirali
	b. Jindal		b.Farnkee

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
	c. Indal		c. Jayna
	d. Hindalco		d. Diamond
			e. Neelkanth
31.	PRE - LAMINATED / VENEERED PARTICLE BOARD	32.	FLUSH DOOR SHUTTERS
	a. Novopan		a. Kutty Flush Doors
	b. Green Lam		b. Century
	c. Kitlam		c. Green Ply
	d. Archid Lam		d. Shiva Hari Ply wood Ltd. (Corbett)
	e. Swastik		e. Anchor Ply
			f. Swastik Ply
			g. Western India
			h. Parvathi Wood
			i. Archid Ply
33.	DECORATIVE LAMINATES	34.	FLOOR SPRINGS
	a. Green Lam		a. Everite
	b. Merino		b. Hardwyn
	c. Sunmica / Formica		c. Efficient Gadgets
	d. Century		d. Garness
	e. Durian		e. Dormer
	f. Sundek		
	g. Anchor		
	h. Decolam		
	i. SAMRAT Ply Wood Ltd		
35.	VENEERS	36.	MDF BOARDS
	a. Decowood		a. Duratuff
	b. Euro Veneers		b. Nuwud
	c. Durian		c. Century
	d. Green Lam		d. Novopan
			e. Kitply

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
			f. Green Ply
37. ADHESIVES		38. WOOD PRESERVATIVES	
a. Fevicol-SH		a. Bison	
b. Araldite		b. Godrej	
c. Ciba Giegy		c. Kot	
d. Mowiool -HV of Mafatlal			
39. HARDWARE FITTINGS		40. DOOR CLOSERS	
a. Jyoti		a. Everite	
b. Argent		b. Hardwyn	
c .C.I.E.F.		c .Efficient Gadgets	
d. Classic		d. Ebco	
e. Everite		e. Dorma	
f. Metaco India		f. Garness	
g. JH Alumium			
h. PV Radhakrishna			
i. Etalia			
j. Hardwin			
41. DRAWER SLIDERS		42. LOCKS	
a. Efficient Gadgets		a. Godrej	
b. EBCO		b. Golden	
c. Etahoa		c. Efficient Gadgets	
d. Sisco		d. Mark	
		e. Sheet	
		f. Vision	
		g. Dorma	
43. MIRRORS		44. WATER PROOFING COMPOUND	
a. Atul		a. Impermo	

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
	b. Sun		b. Cico
	c. Commander		c. Pidilite
	d. Saint Gobain		d. Roff
	e. Globe		e. Choksey
	f. Modi Guard		f. Hindustan Ciba Gaigey
			g. Accoproof
			h. Sika
			i. Fosroc
45.	STEEL WINDOWS AND VENTILATORS	46.	AC PIPES / SHEETS
	a. Agew Steel Mfg Co. Ltd.		a. Charminar
	b. SenHarvic		b. Everest
	c. Hopes		c. Visakha
	d. Diana Casements		d. Orient
	e. Madhu Industries Bangalore		e. Ramson
	f. Mulltiwin Unique Metal Windows		
	g. Ankur Industries		
	h. Modern Fabricators		
47.	SPECIAL PROTECTIVE & DECORATIVE FINISH	48.	OIL BOUND DISTEMPER
	a. Snowcem Paints		a. Asian
	b. Asian Paints		b. Berger
	c. Berger		c. Jenson & Nicholson
	d. Jenson & Nicholson		d. ICI
	e. Kansai- Nerolac		e. Kansai-Nerolac
	f. ICI		f. Godawari
	g. Godawari		
49.	CEMENT PAINT	50.	SURFACE TEXTURE
	a. Snowcem Plus		a. Heritage (Bakelite Hylam Ltd.)

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
	b. Berger		b. Spectrum
	c. Asian		
	d. Jenson & Nicholson		
	e. Kansai – Nerolac		
	f. ICI		
	g. Godawari		
51.	TEXTURED PAINT	52.	ENAMEL PAINT / PRIMERS / READY MIXED PUTTY FOR WOOD WORK, IRON & STEEL
	a. Snowcem India Ltd.-Sandtex matt		a. Asian
	b. Asian		b. Berger
	c. Jenson & Nicholson		c. Jenson & Nicholson
	d. Berger		d. Kansai – Nerolac
	e. Kansai – Nerolac		e. ICI
			f. MRF
			g. Godawari
53.	WALL PUTTY	54.	EXTERIOR EMULSION
	a. Birla wall care		a. Asian Paints-Apex
	b. Snowcem paints		b. Berger Paints
	c. JK		c. Kansai – Nerolac
	d. Asian Paints		d. MRF
			e. Jenson & Nicholson
			f. ICI
			g. Godawari
55.	CEMENT CONCRETE PIPES	56.	EXPANSION JOINT BOARD
	a. The Indian Hume Pipe		a. Shalimar Tar Products
	b. Premiere Pre-stressed Co.		b. Lloyds insulations
			c. Fosroc

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
			d. Shalitex
57. FALSE CEILING		58. VERTICAL BLINDS	
a. Indian Gypsum		a. Vista Levlor	
b. Armstrong		b. Trac	
c. Daikin		c. Mac	
d. QED Panels		d. MARVEL	
e. Insula			
59. ADHESIVE FOR TILE FIXING		60. PAVING TILES	
a. Roffe		a. Eurocon	
b. BalEndura		b. Ultra	
c. Cera Bond		c. Duracrete	
d. Fosroc			
e. Choksey Chemicals			
f. Dr.Fixit			
g. Sika			
h. Sunanda			
61. PVC FLOORING		62. VINYL FLEXIBLE FLOORING	
a. Flora		a. Wonder Floor	
b. Armstrong		b. Armstrong	
		c. BHOR	
		d. Rikvin	
		e. Tusker	
63. FIBRE GLASS DOORS		64. SS / CP FRICTION HINGES	
a. Master craft		a. Ebco	
		b. Jyoti	
		c. Everest	
		d. Magnum	

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
65.	SOFT BOARD	66.	SCREW
	a. Jolly Board		a. Nettlefold
			b. GKW
67.	FIBRE REINFORCED COMP.DOOR		
	a. Loknath Unique		
<u>LIST OF MAKES FOR STRUCTURAL REPAIR MORTAR / MICRO CONCRETE AND OTHER MATERIALS</u>			
68.	Bond Coat	69.	Polymer Modified Mortar/Concrete (PMM/PMC)
	M/s Fosroc Chemicals (India) Pvt. Ltd.		M/s. Fosroc Chemicals (India) Pvt. Ltd.
	M/s. Sika India Pvt. Ltd.		M/s. Sika India Pvt. Ltd.
	M/s. Pidilite India Pvt. Ltd.		M/s. Pidilite India Pvt. Ltd.
	M/s. BASF India Pvt. Ltd.		M/s. BASF India Ltd.
70	Micro Concrete	71	Epoxy Based Grout
	M/s BASF Construction Chemical (India) Pvt. Ltd		M/s. Fosroc Chemicals (India) Ltd.
	M/s FOSROC Ltd.		M/s. SikaQualcrete Pvt. Ltd.
	M/s Pidilite Ltd.		M/s. BASF (India) Pvt. Ltd.
	M/s SIKA India Pvt. Ltd.		
72.	Epoxy Based Bond Coat/ Primer Coat	73.	Epoxy Putty
	M/s. Fosroc Chemicals (India) Ltd.		M/s. Sika India Pvt. Ltd.
	M/s. SikaQualcrete Pvt. Ltd.		M/s. Fosroc Chemicals (India) Pvt. Ltd
	M/s. Pidilite India Pvt. Ltd.		M/s BASF Pvt. Ltd
	M/s. BASF (India) Ltd.		

Sl. No	MAKES / AGENCIES / BRANDS	Sl. No.	MAKES / AGENCIES / BRANDS
74.	Alkaline Rust Converting Primer on Rebar	75.	Anti Corrosive Chemical
	M/s. Fosroc Chemicals (India) Ltd.		M/s. Sika. India Ltd.
	M/s. SikaQualcrete Pvt. Ltd.		M/s Fosroc Chemicals (India) P. Ltd.
	M/s. BASF (India) Ltd.		M/s. BASF Pvt. Ltd. or any equivalent
76.	Carbon Fibre Reinforced Polymer (CFRP) wrap	77.	Polymer modified dry spray repair mortar
	M/s. Sika. India Ltd.		M/s. Fosroc Chemicals (I) Pvt. Ltd
	M/s Fosroc Chemicals (India) P. Ltd.		M/s BASF Pvt. Ltd
	M/s. BASF Pvt. Ltd. or any equivalent		M/s. Sika. India Ltd
79.	Birla Aero con Panel, Birla Aero con AAC Block, Birla Ready Mix plaster as Manufactured by M/s HIL Ltd Hyderabad.		

The technical specifications for rehabilitation / strengthening measures are given below:

1. Bond Coat

The surface over which repair treatment is to be applied must be cleaned. Further, the application of bond coat (cement slurry added with chemical admixture) is essential to provide good adhesion between old to new surface. The surface over which repair treatment is to be applied must be cleaned thoroughly.

Mix

Ordinary Portland Cement (OPC) – 43 grade : 1 pbw (part by weight)

Bonding Material Such as Nitobond AR of M/s : 1 pbw (part by weight)
FOSROC or Acrylic polymer like Master Emaco 131
of BASF or equivalent

Sufficient water shall be used for mixing to obtain consistency like honey. It is suggested that mixing may be done in stirrer type mixer.

Mix proportion	:	Mix shall prepared be as per manufacturer's recommendations with plasticized bonding agent.
Consistency	:	Honey like consistency
Surface preparation	:	The concrete surface shall be thoroughly roughened by chipping, sand blasting (if found necessary), followed by air/water jet cleaning
Bonding agent	:	Acrylic polymer based bonding agent should be mixed with cement as per the manufacturer's recommendation
Recommended thickness	:	Approximately 1-2 mm per lay

2. Polymer Modified Mortar/Concrete (PMM/PMC)

Application of polymer (latex) modified mortar is essential to repair the damages on concrete surface including sealing of the surface which will work as water barrier to surface. It has also been recommended for repairing of localized spalling etc. on the surface. The mix should be prepared on site as per specification given below:

Mix

OPC – 43 grades	:	1 pbw (part by weight)
Well graded Sieved Sand (Zone II)	:	3pbw (part by weight)
Integral waterproofing compound Conforming to IS:2645-2003 such as Conplast X421IC of FOSROC or equivalent	:	150 ml/ bag cement (50 Kg)
SBR Latex such as Nitobond SBR(Latex) or equivalent	:	10% by weight of cement or as per manufacturer's specifications
Water-Cement Ratio	:	0.30-0.35
Mix proportion	:	The mix should be carried out in ½ bag cement batches so that entire mixed mortar should be used in next 30-45 minutes. Mix should be properly applied over the surface and leveled. Mix shall prepared be as per manufacturer's recommendations with plasticized bonding agent.
Consistency	:	Trowel able consistency
Surface preparation	:	The concrete surface shall thoroughly roughened by chipping, sand blasting (if found necessary), followed by water jet cleaning.
Bonding agent	:	Acrylic polymer based bonding agent should be mixed with cement as per the manufacturer's recommendation
Recommended thickness	:	Approximately 10-20 mm

3. Polymer Modified Cement Grout

Mix

OPC – 43 grades	:	1.0 pbw
Non shrink high bonding admixture like Cebex 100 or Master flow 150 or equivalent	:	250 g per bag of cement
Nitobond SBR (Latex) of FOSROC or MaterEmaco SBR 2 of BASF or equivalent	:	2% by weight of cement

CEMENTITIOUS / EPOXY GROUTING

In rehabilitation and strengthening of existing structural elements of *distressed Jeevan Prakash building* the properties of hardened grouts are of the great importance in particular, the strength, durability and ability to provide monolithic action. The properties of fresh grouts are important because of inaccessibility of the grouted region to visual inspection. Thus in grouting specifications, much attention has been placed on flow behaviour, bleeding prior to set and strength of the hardened grout along with the nature of void to be grouted.

Grouting can be carried out in four different ways such as (i) manually (ii) by gravity (sometimes by providing hydrostatic head) (iii) under pressure (pumped) and (iv) under vacuum. The schematic diagram of grouting technique under pressure & system has been given in Fig TS-1. Although the surface preparation and main designing of grout formulations are basically remain the same for all these types of grouts. *Pressure grouting is most popular method in repair, strengthening and retrofitting of structures due to its superior, versatility, efficiency and performance.*

In the present case also, pressure grouting against the gravity has been recommended. The grouting of slabs, beams and columns and other places shall also be carried out taking due precaution to avoid entrapped air inside the concrete structural elements. The *specifications as elaborated* have been recommended.

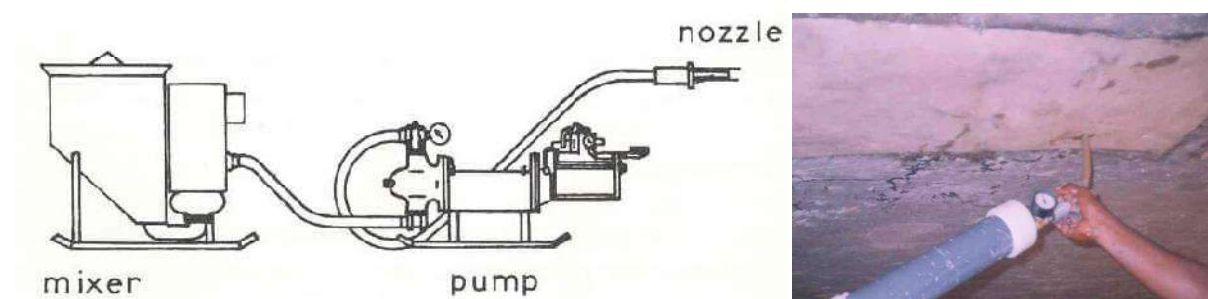


Fig. TS-1: Schematic View of Grouting System

Drilling and fixing of nozzles in Reinforced Concrete structural members:

- *Drilling of Holes:* The hole of 16/18 mm diameter and of varying depth of 75 mm to 100 mm or as per the site requirement / instruction of Engineer in Charge in damaged or honeycombed structural concrete members has to be drilled through rotatory impact hammer drilling machine at the recommended intervals in staggered manner.

- *Cleaning of holes:* Pre-drilled holes must be cleaned properly by air blower for structural concrete members prior to fixing of grout nozzle. It should be ensured that the holes are free from dust and foreign materials.
- *Fixing of Nozzles:* Insert and fix 8-10 mm dia. Aluminum nozzles or non returnable nozzles as approved by Engineer in Charge in cleaned holes. The length of grout nozzles should be strictly as per the site requirement. It should fix in predrilled holes leaving minimum 25 mm gap in holes. External end of nozzles should be machined to receive outlet of grouting gun/ machine. Fix the nozzle into the holes by applying thixotropic epoxy putty as per drawing/ instruction to ensure complete sealing. Cure the system for minimum 48 hrs before grouting. The non-returnable type of grouting nozzles of good quality is preferred.
- *Placing of nozzles:* Nozzles should be inserted @ 400 mm c/c to 6000 mm c/c or as per instruction of Engineer in Charge and as per the site requirement. The decision of Engineer in Charge shall be necessary before application of grouting.
- *Mixing of materials:* Mix the materials in stirrer type of mixture in required quantities as per technical specifications or manufacturer's instruction by weigh batching. The materials shall be vigorously mixed till material of uniform consistency is formed.
- *Grouting:* Fill the grouting gun/ machine with polymer modified cement grout. Maintain desired pressure in the gun by air compressor or by hydraulic pressure. **Maintain the pressure at exit (4 to 8 kg/ cm²)** by monitoring pressure gauge at exit. Grout the material through prefixed nozzles in the structural elements till the nozzle refuses to accept the grout or it flows from the adjacent nozzle. Seal the nozzle with epoxy putty after the refusal. Monitor leakages through other nozzles while grouting and seal them as per the requirement. Repeat the process for all the nozzles. Complete the operation within pot life of the material. Ensure no blockage of nozzles before completion of the process of grouting.

Therefore, it is very important that nozzles should be fixed in concrete members for minimum 50 mm with epoxy putty having bigger diameter holes.

- *Curing:* Curing should be done for a period of minimum 48 hours.
- *Cutting of Nozzles:* Cut the nozzles by chisel after completion of grouting and curing without damaging structural elements.
- *Cleaning of grouting machine:* Clean the grouting machine properly after finishing epoxy grouting through approved chemicals to avoid blockage in assembly line.

4. Epoxy Based Grout

The following system is recommended as epoxy grout for RCC. The nozzle should be fixed in surface through epoxy mortar and also seal the surface by epoxy mortar.

Mix

Araldite GY 257 or equivalent	:	100 pbw
Arduar 140 or equivalent	:	50 pbw

Proportions of mix should be as per manufacturer's specifications/ requirements satisfying engineering properties as per above proportioning.

Specifications

Reference	:	ASTM– 881– 87 Type I, Grade I, Class B or C.
Type of Epoxy	:	Low viscosity solvent free pre packed resin and hardener, free flow epoxy system after mixing.
Viscosity	:	Mix viscosity 1500 MPa max. at 25°C.
Pot life	:	Not less than 60 minutes.
Compressive strength after 7 days curing at 25°C	:	Not less than 60 N/Sq.mm (MPa)
Flexural strength after 7 days curing at 25° C	:	Not less than 60 N/Sq.mm (MPa)
Injection equipment	:	Compressed air driven injection pump with suitable syringe system, fitted with suitable pressure gauge. Mixing should be carried out in stirrer type of mixer.
Operating pressure	:	4– 8 Kg/sq.cm

5. Free Flow, Non Shrink High Strength Micro Concrete

The high strength, free flow, non shrink grout has been recommended for highly damaged roof slabs etc. after providing additional reinforcement (as if required). The material should be

preferably ready to use with minimum thickness of 40 mm. The thickness may vary as per requirement of the site. The application shall be by pouring through formwork until the completion of job. The washed, surface saturated dry, well graded, high density coarse aggregate of good quality (having total index i.e. flakiness & elongation should not have more than 30 preferably of basalt and granite) of size 10mm down up to 5 mm may be added as per manufacturer's instruction by 20% replacement by weight

Type	: Non shrinkage, free flow high strength cementitious micro concrete
Pot life	: Shall not be less than 1 hr. at 25°C – 35°C
Mixing	: Pan Mixer or any other suitable means as recommended by manufacturer
Mixing Temperature	: Max. Mixing temperature should not be more than 35°C.
Consistency	: Flowable/trowable/pumpable to provide uniform impermeable concrete structure
Requirements	: Shall be applied directly on the prepared surface by pouring through hopper of the formwork continuously until the completion of job
Thickness (Minimum)	: 40 mm
Thickness (Maximum)	: As per site requirement but not more than 75 mm
Surface preparation	: By wet grit blasting /wire brushing / buffing wheel / free from grease, oil, soots etc. or any suitable means
Compressive strength after 7 days curing at 25°C	: Not less than 40 N/Sq.mm (MPa)
Compressive strength after 28 days curing at 25°C	: Not less than 60 N/Sq.mm (MPa)
Flexural strength after 28 days curing at 25°C	: Not less than 7.5 N/Sq.mm (MPa)
Formwork	: Watertight formwork
Curing	: Wet curing of 7 days (minimum) or chemical curing by master cure 181 or equivalent
Removal Form work	: As per instruction of manufacturer but in no case should be less than 3 days

6. Modified Cement Mortar for Plaster

Mix

OPC – 43 grade	:	1 pbw
Well graded Sieved Sand (Zone II/III)	:	3 pbw
Integral waterproofing compound Conforming to IS:2645-2003 such as Conplast X421IC of FOSROC or equivalent	:	125 ml per bag cement (50 Kg)
Water-Cement Ratio	:	0.40

7. Epoxy Mortar (repair in Roof Slab / beam & column)

Mix

Araldite GY 257 or equivalent	:	100 pbw
Aradur 140 or equivalent	:	50 pbw
Quartz Sand Mix No. 10	:	600 pbw

Proportions of mix shall be as per manufacturer's specifications/ requirements satisfying engineering properties as per above proportioning.

The average thickness of epoxy mortar should be 20 mm. However, the minimum thickness of epoxy mortar should not be less than 10 mm. Primer coat of Araldite resin and Aradur mix is needed before application of epoxy mortar for good adhesion.

The surface requires thorough sand-blasting abrading with hand wire brush to ensure complete removal of rust particles. However, the cleaning can also be done by water jetting followed by thorough drying with hot air if required. The prerequisites for good adhesion of the coating are cleanness, roughness and dryness of the surface.

8. Epoxy Based Bond Coat/ Primer Coat

One brush coat of the following system is recommended as primer / bond coat on the prepared surface for epoxy mortar to provide good adhesion between old to new surface.

Mix

Araldite GY 250 or equivalent	:	100 pbw
Aradur 140 or equivalent	:	50 pbw

Proportions of mix should be as per manufacturer's specifications/ requirements satisfying engineering properties as per above proportioning.

Specifications

Reference	:	ASTM-881 – 87 Type I, Grade I, Class B or C.
Type of Epoxy	:	Low viscosity solvent free pre-packed resin and hardener, free flow epoxy system after mixing.
Viscosity	:	Mix viscosity 800 MPa max. at 25°C.
Pot life	:	Not less than 8-10hrs or depending on the pouring time after fixing of form work.
Application	:	Applied with brush in two coats before application of micro-concrete. Mixing should be carried out in stirrer type of mixer.

9. Epoxy Putty

Epoxy putty is recommended for filling the crack opening and fixing of nozzles etc. to seal the system in existing concrete. It may be prepared on site as given below mix proportion or pre-packed epoxy putty of reputed make.

Mix

Araldite GY 257 or equivalent	:	100 pbw
Aradur 140 or equivalent	:	50 pbw
Silica flour	:	400 pbw

Proportions of mix should be as per manufacturer's specifications/ requirements satisfying engineering properties.

Type of putty	:	Mixed or pre-packed ready to use epoxy putty system
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Hardening period	: 24 hrs max.
Strength requirement	: 40 N/mm 2 Min. at 7 days
Useable life	: 1.00 hr

10. Alkaline Rust Converting Primer on Rebar

The application of two coats of alkaline rust converting primer is recommended on the existing rebar surfaces duly cleaned and free from loose materials, shoots, dirt etc before application of anti-corrosive treatment. The alkaline rust converting primer shall be organic polymer based & shall be free from mineral, phosphoric & chromic acids.

Reference	: Confirming to ASTM – B – 117
Type of rust converter	: Organic (Water based acid free)
pH	: 7.5 (minimum)
Specific Gravity	: 1.10 (minimum)
Appearance	: Dark Brown or as manufacturer's specification
Flash Point	: N.A.
Consistency	: Brushable/spray to form a continuous film formation
Requirements	: Shall be applied directly on the prepared surface of ferrous metal to achieve intimate contact with the existing / base metal
Application	: Two coats of alkaline rust converting primer on the existing rebars with time interval of minimum 1 hour between the coats.
Surface Preparation	: Cleaning of existing reinforcement with wire brush/ rotary wire brush to remove rust, loose materials, dirt, shoots etc.
Wet film thickness (WFT)	: 80 microns (Minimum)
Dry film thickness (DFT)	: 50 microns (Minimum)

11. Anti Corrosive Chemical / Anti Corrosive Protective Coating System for Reinforcements

Anticorrosive Treatment of two coats to existing reinforcement by IPNET RB polymer modified coating or equivalent has been recommended on expose reinforcement after alkaline rust converter. Primer in two coats with time interval of minimum 8 -10 hours between each coat. The application shall be by brush or spray to form continuous film formation

Type	: IPN Polymer modified coating (preferably)/ Zinc based (minimum 90%) two parts system with epoxy / phenolic /
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suitable for application to ferrous surfaces.

Pot life	: Shall not be less than 1 hr. at 25°C -35°C
Consistency	: Brushable / spray to form a continuous formation
Requirements	: Shall be applied directly on the prepared surface of ferrous metal to achieve intimate contact with the base metal
Wet film thickness (WFT)	: 150 microns (Minimum)
Dry film thickness (DFT)	: 100 microns (Minimum)
Surface preparation	: Wire brushing / buffing wheel / solvent free from chlorides or any suitable means
Curing	: 45 minutes

Methodology:

The application of two coats of polymer modified anti-corrosive treatment of IPNet – RB (Interpenetrating polymer with epoxy / phenolic base) or equivalent or pre packed ready to use to exposed corroded bars and to new reinforcement has been recommended. Anti corrosive treatment is being carried out on existing reinforcement after the application of rust converter and air curing for minimum 6 hours.

Steps

- Clean the existing reinforcement/ new reinforcement with wire brush/ rotary wire brush to remove rust, loose materials, dirt, shoots etc.
- Apply one coat of ready to use alkaline rust converter as primer coat.
- Apply second coat of rust converter after 1 hour minimum.
- Air curing of the same should be for minimum six hours before application of anti corrosive treatment.
- Mix two component polymer modified anti-corrosive system IP Net-RB Part-A (resin component) & IP Net-RB Part-B (hardener component) in equal proportion by volume or equivalent or pre packed system as per manufacturer's specifications.
- The mixing of two component anti-corrosive system should be carried out in a clean plastic container or cleaned stirrer type of mixer. The materials should be mixed thoroughly for 4-5 min. And allowed to remain in the container for another 2-3 minutes.
- Apply first coat of the formulation by brush or spray to achieve continuous film.

- Apply second coat of formulation with minimum time interval of 8-10 hours between the coats.
- The mix shall be consumed within 30 min. Or as specified by the manufacturer.
- The application of 2nd coat should be applied after 8-10 hours and before 72 hours.
- Sprinkle dry sand (silt content not more than 2%) or standard fine sand to provide a rough finish after the 2nd coat, when it is tacky.
- Air cures the system for a period of min. 10 hours after the top coat before any subsequent treatment.
- Remove loose sand grains from the top coating by gentle touching with dry brush after 2-4 hrs.
- All instructions from the manufacturers regarding the use of the product, storage, health precaution of workers, cleaning of tools etc. in conjunction with specifications shall be followed.
- Measurement shall be Sqm of repaired/ treated concrete surface area.

Important Note:

- Ensure proper mixing for minimum 4-5 minutes.
- Don't apply system on wet surface.
- Apply the treatment on cleaned surface.
- The both coats should be allowed to dry in air (no water curing).
- Allow both the coats to dry in air with 7 hours as inter coat interval and allow the 2nd coat to dry for 10 hours.
- Further bond coat/ mortar to be applied only after 10 hours of application of system.

12 Ferrocement Lining / Strengthening

Provide 10/ 12 mm thick ferrocement, preferably in one layer to be reinforced with one layer of 20-22 gauge ½"x1/2" opening, hot dip galvanized woven square wire mesh held in place by 3 to 4mm dia anchor / nail in RCC / Brick work at 500mm grid into non shrink polymer mortar filled in a hole of 8mm dia.

Mix

OPC – 43 grade	:	1 pbw (part by weight)
Well graded Sieved Sand (Zone II)	:	3 pbw
Integral waterproofing compound Conforming to IS:2645-2003 such as Conplast X421IC of FOSROC	:	125 ml per bag cement (50 Kg)

or equivalent

Water-Cement Ratio : 0.35-0.40

- Mix Proportioning** : The mixing of in gradients should be done in pan mixtures. The chemical admixture should be added in water to be mixed with mortar. Mortar should be pressed into wire mesh by rubbing and angle penetration technique. The steel gurmala should not be used over the final surface finish. Hard wood float to be used for finishing to ferrocement. Moist curing shall be carried out at least for 10 days.
- Mixing** : Pan Mixer or any other suitable means as recommended by engineer incharge
- Mixing Temperature** : If max. Mixing temperature is more than 35°C
- Consistency** : Trowable to provide uniform impermeable surface
- Requirements** : Shall be applied directly on the surface after fixing wire meshes. No formwork is required.
- Thickness (Minimum)** : 10 mm
- Thickness (Maximum)** : As per site requirement but not more than 20 mm
- Surface preparation** : By sand/ grit blasting /wire brushing etc. or any suitable means
- Compressive strength after 7 days curing at 25°C** : Not less than 20 N/Sq.mm (MPa)
- Compressive strength after 28 days** : Not less than 30 N/Sq.mm (MPa)
- Curing** : wet curing of 10 days (minimum) or chemical curing by master cure 181 or equivalent

13. Shear Connectors

- Material for connector** : Deformed rebar (Fe 500/ Fe 500 D) or as in the drawing
- Diameter of connector** : As specified in drawing
- Diameter of holes to be drilled in concrete** : As specified in drawing
- Depth of embedment** : As specified in drawing
- Cleaning of drilled holes** : Air and water jet

Recommended pull out force : 300 kg min
 Type of equipment for drilling : Electrically operated rotary-cum- hammering action drilling machine

14. Fe 500 TMT Steel Work

Mechanical Properties IS 1786 Fe-500 (% Minimum)
 0.2% proof stress 500 N/mm²
 Tensile Strength 545 N/mm²
 UTS/YS Ratio 1.08
 Elongation 12 %

Fe 500 steel section weight per meter as per BIS

Size	Median Weight	BIS Range Min	BIS Range Max
20	2.466	2.392	2.540
25	3.854	3.738	3.970

Weight Range per Length (40feet)

Size	Median Weight	BIS Range Min	BIS Range Max
20	30.1	29.2	31.0
25	47.0	45.6	48.4

15. Carbon Fibre Reinforced Polymer (CFRP) wrap for structural strengthening

Technical Data:

Fibre Type : Carbon Fibre Reinforced Polymer (CFRP)
 Fibre Orientation : Unidirectional (0°)
 Yong's modulus of Elast. : 230 GPa(Min.)
 Density of fibre : 1.6 (Min.)
 Tensile Strength in Uni-Direction : 2300MPa (Min.)
 Density of Wrap : 230 gms/ m² (Min.) for C-type column
 430 gms/m² (min.) for rectangular column
 Dry Fibre Sheet Thickness : Should not be less than 0.11mm for 230 gsm

: Should not be less than 0.25mm for 430 gsm
Elongation at break : 1.5%

Strengthening structural elements with non-metallic composite fibre wrapping system comprise of uni-directional CFRP sheet (230 GSM / 430 GSM) and compatible saturant, by wet lay-up system including,

Surface preparation: Grinding/ moulding concrete substrate, cleaning it with wire brush removing soot, grease , oil, laitance if present, rounding sharp edges to min 25 mm radius etc. complete.

Profiling: Applying compatible primer on prepared substrate, Filling the holes and uneven surface with thixotropic putty etc. complete.

Mechanized wetting of fibre sheet: Cutting the fabric to required size. Mixing of saturant and filling in tub area of the saturation machine. Placing the fibre on metallic rods and pass through the rollers of machine and saturant tub ensuring complete wetting (65% fibre volume fraction) of fibres. Remove the fibre on rod and place the new fibre sheet.

Wrapping: Wrapping the fibre sheet to structural element at desired orientation using tamping roller to avoid any air voids etc. repeat the same procedure for multiple layers with the interval of 8 hours.

Sand pasting: Applying second coat of saturant after min. 12 hrs, rectify air voids if any paste the standard/ well graded cleaned river sand on it to make surface rough to take any further finishes.

16. Polymer modified dry spray repair mortar

Compressive strength – 1 day $\geq 15\text{MPa}$
28 days $\geq 40\text{ Mpa}$

Application thickness – Min 10mm to max 60mm

PREAMBLES TO SCHEDULE OF QUANTITY

Contractors should inspect the building, read entire tender documents and following conditions before quoting his rates. The rates quoted by contractor should be inclusive of followings:-

- (1) PPC/Slag cement conforming to latest IS shall be used in structural repair/ plastering /waterproofing work.
- (2) Sand to be used in the work shall be river sand properly screened & washed thoroughly with silt content less than 2 %. In case sand is not available locally, the sand has to be brought from other neighboring State for which no financial claim shall be accepted.
- (3) The contractor should have to take all safety measure during entire period of execution of work for his workmen and the occupants of the building and all necessary precaution must be taken against damage to parked vehicles, window glasses, Hoardings, structure etc. during the execution of work.
- (4) Contractor has to obtain specific approval of the brand of Construction chemicals to be used in the work among the approved brands mentioned in the tender and has to arrange periodical visit of the representative of manufacturer at site for joint inspection.
- (5) Cement mortar shall be mixed only with mechanical mixer of suitable capacity.
- (6) Contractor, at his own cost, has to engage approved Structural Engineer empanelled with NDMC, New Delhi for Structural Stability Certificate after completion of work. In addition to above and if required as per NDMC guidelines, Contractor has to comply all formalities of NDMC for commencement of work. If required as per requirement of NDMC, the Contractor has to arrange visit of Structural Engineer empanelled with NDMC as well as NDMC during concurrency of work for issue of Structural Stability Certificate.
- (7) If required as per rules of NDMC, New Delhi, Contractor has to obtain approval from NDMC and other relevant department for completing all formalities for obtaining approval.

(8) Contractor has to arrange all other approvals required for execution of above work from all Local Authorities, departments of State Govt.& Central Govt. etc. as will be necessary during execution of work and after completion of work.

(9) Contractor shall indemnify LIC from any claim from any authority or third party during entire period of execution.

(10) Contractor has to arrange storage of water and pumping arrangement for curing etc. to be used in the work. LIC will not allow to use water from its own pump and terrace tanks.

(11) Contractor at his own cost has to depute own plumber during entire period of execution of work for attending day to day complaint which may occur due to execution of this work. In case of absent of plumber at any day, LIC will depute his plumber on contractor's risk & cost and necessary recovery will be made from Contractor's bill.

(12) Contractor at his own cost shall arrange watch & ward of his material around the clock and LIC will not be held responsible for any theft of materials, tool & plant or any other thing.

(13) Contractor at his own cost prepare temporary store with locking arrangement for storage of his material and the same will be dismantle and removed from the site after completion of work. However, if available, LIC may provide some place for storage of cement, waterproofing compound, Micro Concrete etc..

(14) Only authorized work men with identity proof will be permitted to carry out work. Contractor has to submit to LIC necessary proof of identity of his workers with photographs etc. Work man should be given identity cards and has to bear ID card at all time during execution of work.

(15) No work man will be allowed to do work without safety belt and helmet. If any worker is seen without the above safety norms, Rs. 1000.00 penalty will be imposed and recovered from Contractor's bill without any notice. If the act is repeated by a particular worker, he will be removed from the site without any written notice to Contractor.

(16) The work requires all time presence of at least one Experienced Resident Engineer and two supervisors for monitoring, re-viewing progress, supervising, maintaining quality and all records of the work. Contractor has to depute these technical staff on permanent basis dedicated to this work. In case of violation of above norms, necessary recovery will be made from contractor's bill. Contractor's Engineer will also assist LIC Engineer in preparation of all records pertaining to measurements, Receipt & Consumption of all material etc.

(17) Photography and videography at all stages of work as per instruction and direction of LIC has to be made with submission of stage wise photos& CD.

(18) Contractor has to submit all bills, challans of material received at site for verification by LIC. He will not destroy & take away empty drums/ packaging/ bags etc. of material consumed in the work. These empty drums/ pacets/ boxes will be the property of LIC till completion of work and these will only be allowed to take away by contractor on written approval from LIC.

(19) Contractor has to arrange testing of all materials as required by LIC froman approved Govt. Laboratory and deposit the testing fee. Only testing charges on production of receipt and satisfactory test results shall be reimbursed by LIC in RA/ Final bill.

(20) Contractor has to arrange all facilities at site required for proper executionof work for day to day testing of material, weighing machine, mixer, vibrator, pumps, electrically operated mechanical chipper, first aid, drill machine, core cutter, grouting pump etc.

(21) IIT Kanpur has conducted testing of the building and suggested measures to repair the building. Contractor has to provide all facility to inspect the work by IIT Kanpur during execution if required and has to follow methodology/ specifications/ instructions of IIT Kanpur as well as Manufacturer of important chemicals.

(22) The work is required to be done in proper co-ordination of all above agencies and contractor has to provide all assistance and co-operation for best results.

(23) The building is fully occupied and LIC's Offices and other sensitive Government of India Ministries & Offices are housed in the building. Contractor has to carry out work in a very systematic & professional manner, without causing any disturbance & un-necessary noise and damage to anything. Day to day cleaning of pavement, regular disposable of debris, systematic storage of material etc. are strictly required to avoid and disturbance to families, parking and movement.

(24) Contractor has to erect temporary lift for disposal of debris and lifting his materials. Contractor will not be allowed to use Lifts for movements of his workers and transporting material.

(25) If surplus water is not available with LIC, Contractor has to arrange tanker water from his own source at his own cost. Water should be tested before commencement of work. Necessary storage of water at Ground level as well as at terrace has to be made by the contractor at his own cost.

(26) In case of any important event/ meetings in the building, contractor has to stop/ suspend his work for some time/ days. In such cases, no extra payment/ compensation/ claim will be entertained by LIC. Even, contractor has to suspend his work on a particular part of the building due to inconvenience to occupants on some particular time / hours, contractor has to shift his workers to other part of the building. No claim in this regard will be entertained by LIC.

(27) Rates are inclusive of removing and uprooting trees and plants available on the surface of building with proper treatment to avoid any further growth of these plants. No extra payment in this regard will be admissible to contractor by LIC of India.

(28) rates are inclusive of shifting minor electrical fittings, cable etc. for which Experienced Electrician has to be arranged by the bidder on his own cost without any extra payment.

(29) Contractor has to Identify the quantum of damage to structural members after removal of loose concrete and obtain approval from LIC Engineer for nature/ type of treatment suitable for different structural members according to the damage.

(30) Contractor has to provide access and use of scaffolding by other agencies also for miscellaneous and ancillary works. No extra payment in this regard will be admissible to contractor.

(31) Rates of various dismantling, removal and other works should be inclusive of disposing off debris or unserviceable materials to contractor's own dump outside the compound including transportation. Debris and other waste materials are to be removed on regular basis. Necessary approval from any authority for disposal of debris or other waste materials should be obtained by the contractor on his own cost.

(32) Contractor has to protect the repair portion by providing and covering tarpolin properly during the monsoon to protect repair work as well as to avoid entry the rain water inside the premises. No additional / extra payment will be made for the same.

(33) The water proofing work shall be got executed from the specialist agency as approved by the LIC, as per specification under the overall supervision of the main contractor. Rates quoted by the main contractor shall include for the waterproofing treatment through the water proofing agency and will cover for all over heads and profits.

(34) LEAKAGE TESTS:

After completion of waterproofing work of terraces, the leakage test shall be carried out by impounding the water 75mm. to 150 mm. deep, over the surfaces treated for a period of 10 days, without any extra cost.

"Joint inspections shall be carried out by the Contractor daily with LIC of India's representative to find out leakage/dampness of the surface if any. In case, any leakage/dampness is noticed, the same shall be rectified by the Contractor without any extra cost to LIC. Rates quoted by the Contractor shall allow for the above test also.

LIFE INSURANCE CORPORATION OF INDIA

TRADE PREAMBLES TO SCHEDULE OF QUANTITIES

These Preambles will apply to respective trades of the Schedule.

I. EXCAVATION AND EARTH WORK

1. Contractor's rate shall cover for clearing the site of shrubs, brush wood, underground & small trees not exceeding 30 cm. in girth measured at 1 mtr. above ground so that laying out, collection of materials & excavation can commence without hindrance. The block levels shall be taken only after clearing site as above.
2. Measurement for payment excavation unless otherwise mentioned shall be as per drawing dimensions of bed concrete. Any additional excavation needed for working space, form work, planking, strutting wherever required etc. shall not be measured separately & rates quoted shall include for the same.
3. Rates for excavation shall include shoring, timbering, strutting etc. for protection of excavated sides, bailing out surface water due to rains or sub soil water if encountered & dewatering by any pumps wherever required until all work below water level is finished to the satisfaction of the Dy. Chief Engineer or his representatives.
4. Black cotton soil shall not be used for refilling, around foundations & or filling under floors, soil used for filling shall be dry, free from roots & vegetable mould & shall be approved by Dy. Chief Engineer or his representatives.
5. Refer I.S. 1200 (Part-I) 1974 for classification of excavated material. Executive Director's (Bldgs.) interpretation regarding classification shall be final & binding on Contractor.
6. Excavated rock/boulders if any could be used for soling if approved by Dy. Chief Engineer or his representatives. Recovery at the rate of Rs. 500/- per Cu.mt. shall be made based on stack measurement after deducting 50% for voids.
7. Before starting excavation or filling work in site, the requisite block level of the entire plot shall be taken by the Contractor jointly along with LIC Engineers.
8. Filling in plinth with approved excavated soil &/ or soil brought from outside shall be measured net in position after consolidation. Before the item of filling in with soil brought from outside is operate, the contractor shall take prior permission of the Dy. Chief Engineer or his representatives & also arrange to take measurements of filled in soil in plinth with excavated stuff from the site.
9. Contractor is requested to satisfy himself to the character of soil & excavation & collect his own information on all matters affects excavation.
10. The excess earth/dismantled debris/refuse shall be removed & transported at contractor's cost & disposed off as directed.
11. Recovery of old Reinforcement, Steel work in built up sections or in single section made of Tees, angles, Flats, Channels, Joists, etc. removed from old structure shall be @ Rs. 4000/MT & for the old full bricks @ Rs. 500 per 1000 bricks.

2. CONCRETE & FORM WORK

1. P.C.C. shall mean plain cement concrete.
R.C.C. shall mean Reinforced cement Concrete.
2. CODE OF PRACTICE: All workmanship, materials, tests & performance in connection with Reinforced Concrete shall be in conformity with IS. Code of Practice for Reinforced Concrete in Building IS : 456 - 1964 with amendments if any, unless otherwise specified, in this contract. Where otherwise specified, by provisions made in this contract shall hold good.
3. CONTROLLED AND ORDINARY CONCRETE: 'Controlled Concrete' & 'Ordinary Concrete' wherever so defined shall be as per definition in Cl. No. 5.3.1 of IS : 456 - 1964. All relevant specifications under 'Concrete' in these preambles & in General specifications shall be applicable to controlled concrete/ ordinary concrete or exposed concrete where so classified.
4. VOLUME BATCHING: The proportion of mixes is by volume. Cement shall not, however, be measured by volume but shall be measured by weight one bag of cement containing 50 kg. of cement shall be assumed to containing 35 litres (1.20 cft). When weigh batch mixing is used, prior approval of the Executive Director (Bldgs.) shall be obtained to co-relate volume mix to weigh mix.
5. FORM WORK: Form work or shuttering shall be water tight & of timber / steel / plywood.
6. AGGREGATES :
 - i) Machine crushed grade stone aggregate from approved source shall be used as coarse aggregate & shall conform to ISI standard. Aggregate shall be washed clean, if necessary. Unless otherwise mentioned, the maximum size of coarse aggregate shall be 20mm graded down. Where thickness of the concrete member is 75mm & below, the maximum size of coarse aggregate shall be so selected that it does not exceed the $\frac{1}{4}$ of the mini thickness of the size of the structural member & graded down. Rates quoted shall allow for these factors.
 - ii) Fine aggregate shall be graded coarse sand from approved source & conforming to I.S.I standards & shall be washed clean, if necessary.
7. ALLOW IN RATES :
 - a) Rates quoted for all concrete items shall include for centering, form work, if specified in the schedule of quantities, machine mixing, pouring, consolidation by mechanical vibrators, curing, stripping form work, hacking of concrete where they have to receive plaster (but the plaster on concrete etc. surface shall be measured & paid for separately under respective plaster items etc. comp. unless otherwise stated.
 - b) Rates for all concrete items shall include for :
 - i) Sinking of floors in toilets, kitchen, leaving or forming holes for taking out dowel bars for fan hooks, provision for fixing plumbing pipes & accessories & electrical conduits (if any) gaps, slopes etc. in shuttering as directed.
 - ii) Allowing work for other agencies being carried out by them like laying conduits, boxes, pipes, clamps etc. as directed before laying concrete.
 - iii) For forming chambers, bands, drip moulds in columns, beams, slabs, chajjas, sills, facias, openings etc. & wherever directed.

- c) In case of reinforced concrete work, the rate for concrete items shall allow for pouring concrete around reinforcement shall be measured & paid for separately unless otherwise stated in the item.
- d) Rates quoted for all concrete items, like beams, ribs, columns, slabs etc. shall include for structural members of any shape & sections like linear, circular, curved, of any other type as required &/or as per detailed final drawings for cantilever, including providing slopes to slabs, beams, chajjas, canopies etc. wherever required.
8. No concrete shall be poured unless & until all fittings & fixtures for electrical & otherwise, are inserted, laid & approved/passed by Engineer-in-Charge.
9. **SIZES OF RCC MEMBERS :** The sectional dimensions of PCC. & RCC members are subject to change & no extra claim from contractor will be entertained on account of such changes, sectional sizes mentioned are structural sizes, exclusive of finishes like plaster, unless otherwise stated in the item itself.
10. **JUNCTIONS OF COLUMNS, BEAMS ETC :** In case where at the junctions of columns, beams & slabs the composition of concrete mix of specified strength be different for columns, beams & slabs there in such cases only the richest concrete among these specified for any of these member shall be used at the time junctions & rates quoted for columns, beams & slabs or any member entering such junctions shall allow for the same. Also allow for spill over richer concrete in beams etc. to rational angle of repose of wet concrete required from practical considerations while concreting the junctions. No separate payment shall be made on this account.
11. Rates quoted for concrete include the forming & treatment of construction/expansion joints as shown on drawings or required at site, except for supply of copper & G.I. strip & which shall be paid for separately.
12. **WATERPROOFING COMPOUND :** Cement waterproofing compound wherever mentioned in the item shall be of any approved make & mixed by weight of cement as per the manufacturer's specifications & rates quoted shall include for the same.
13. **PRECAST CONCRETE :** Rates for Concrete items shall be inclusive of moulds, finished faces, hoisting to all heights & levels & setting in position including jointing in cement mortar 1:3 & cement grouting as per detailed drawings. Reinforcement shall be paid for under 'STEEL AND IRON WORK' section, unless otherwise specified.
14. Please note that unless otherwise mentioned in the items/ schedule of quantities, all concrete specified in this tender shall be ordinary grade concrete as per "TABLE II - CONCRETE MIX PROPORTIONS" Clause no. 2.4 under-sub-head "2" concrete & steel reinforcement of specifications for Civil Work.

3. BRICK WORK

1. Size of bricks shall be 23x11.5x7.5 cm nominal & shall be from appd. source. Bricks shall be well burnt first quality, having regular shape with sharp corners & edges & should stand all tests as required by ISI specifications. One brick wall shall be considered as 23cm. thick. Half brick wall shall be 11.5cm thick & brick on edge wall shall be 7.5 cm. thick.
2. Crushing strength of the bricks to be used in the work shall not be less than 75 Kg. per square cm. unless otherwise stated in item of the schedule of quantities.
3. The rates quoted shall include for all work like those in walls, jambs, pillars, mullions, steps, kerbs/threshold, corbels, pins & raking out joints, cutting, scaffolding & curing etc. & also for providing opening/niches in masonry for drainage/rain water poles etc.
4. The rate quoted shall also include for recesses, cutouts, etc. in brick work for electrical work & nitch for rain water pipe to be encased at a later stage in the brick work, all as shown on drawings & as directed on site.
5. Sand for masonry mortars shall be as per IS : 2116 - 1965 as applied to un-reinforced brick work.
6. For exposed brick work, selected & approved bricks shall be used having uniform colour, size & sharp corners & edges.

4. STEEL FABRICATION WORK

1. Rates quoted for reinforcement shall include for the cost steel, all fabrication including cutting of length as shown in the drawings, all labour in binding & cranking forming hooked ends, storage, handling, hoisting etc. right up to placing of steel in position up to the final stage of work according to the drawings, providing necessary binding wire, temporary supporters & for rolling margin in calculated weight. All wastage shall be to the Contractor's account.
2. The rate quoted for reinforcement shall include for the cost of annealed steel binding wire of size not less than 0.90 mm & conforming to IS : 280 - 1962. The weight of the binding wire shall not be accounted for in the measurements. The rate shall also included for precast concrete cover blocks of specified sizes as directed.
3. The rate shall hold good for reinforcement in any structural member irrespective of its location & dimensions.
4. Reinforcement shall be placed as shown on the structural drawings & payment will be made on net measurement from drawings. Only such laps, dowels chairs & pins in reinforcement as approved by the Suptd. Engineer / Executive Engineer & shown on drawings shall be paid for. The Contractor shall allow in his rates for any wastage which will not be paid for. Rates shall allow for removal of rust by rubbing with wire brush as directed.
5. Welding or reinforcement bars will not be permitted unless specially authorized by the Executive Director (Bldgs.).

6. Tor steel or Tistrong – It shall be used as per recommendation of the manufacturers & rates shall allow for this.
7. Rate for M.S. railing, grills, rolling shutters, M.S. angles & tees in door frames, grills, door, ladder, run ladder, fan hooks, weld mesh grills etc. shall include for the following.
 - a) Fabrication, cutting & bending to required size, patterns & shape, drilling, punching, countersinking, welding, filling etc. finishing, erecting, fixing in position.
 - b) Wherever the M.S. grills/railing/ rolling shutters M.S. weld mesh, grills are required to be fixed to stone/brick concrete jambs/floor, they shall be fixed by means of required number of M.S. lugs of 100 x 16 x 3mm &/or suitable size embedded/grouted in cement concrete block 1:2:4 &/or by means of suitable countersunk screws with rawl plugs.
 - c) Wherever the M.S. grills are required to be fixed to frames of steel windows & ventilators, they shall be fixed by welding.
 - d) Grill door shall be fixed by means of M.S. holdfast or required number, size & shape as approved, embedding/grouting the holdfast in 1:2:4 cement concrete block &/or rag bolts & nuts of approved size.
 - e) Both legs of both ends of M.S. ladders shall be fixed to concrete floors/slab by embedding/grouting in 1:2:4 cement concrete block base of required size.
 - f) M.S. rung ladders shall be fixed in stone/brick/concrete work by embedding/grouting in 1:2:4 cement concrete.
 - g) In case of M.S. grills doors the Contractor shall provide & fix stone/brick concrete jambs to accommodate the sliding rod of aldrops.
 - h) Rate quoted for M.S. guard bars/M.S. grills to windows & ventilators/fanlights shall also include for making holes in frames of windows & ventilators/fan lights wherever required.
 - i) The fixing accessories like M.S. holdfast, lugs, screws, rawl plugs, concrete for embedding/grouting, bolts & nuts of any type GI pipe pieces & such other accessories for fixing. All these shall not be considered in the measurement of the weight/quality & shall not be paid separately.
 - j) Except for bar reinforcement, all exposed steel, cast iron, wrought iron & mild steel work, unless otherwise mentioned, shall be painted with three coats of synthetic enamel paint of first quality of approved brand, colour & shade, including & coat of primer as per specification of the approved manufacturer. Rates quoted shall include for the above although three coats of paint are specified. Contractor will have to do additional coats of paint if well finished surface is not obtained to the satisfaction of the Dy. Chief Engineer/Suptd. Engineer/Executive Engineer & there shall be no extra payment on account of this.
8. The rolling shutter shall be fixed over the opening by fixing the side-jamb guides against the walls (but not in between the jambs of the opening). For measurement of rolling shutter, the area of the actual opening covered shall only be considered.

9. **MEASUREMENT:** Weight of the steel reinforcement bars (Mild steel & high strength deformed bars) used in the construction shall be on the basis of the length incorporated in concrete & shall be computed in accordance with the table given below:-

diameter mm	weight per mtr. length (in Kg.)	diameter mm	weight per mtr. length (in kg.)
6	0.222	20	2.467
8	0.395	22	2.985
10	0.617	25	3.855
12	0.888	28	4.836
16	1.579	32	6.316

Note :

The weight per meter bars given in the table above are calculated on basis that steel weights 7.85 g. per cu.cm. In case of any error or omission in this table, the weight per meter length in kg. shall be computed on the basis of actual area & taking the density of steel as 7.85 gm per cu.cm.

5. **STEEL WINDOWS AND VENTILATORS & PRESSED STEEL FRAMES**

1. Specifications are applicable for the trades & as given elsewhere in the tender are applicable in except where otherwise mentioned in following paras or in the wording of items. The rates quoted shall cover for complying with the same.

2. i) Steel windows & ventilators shall be manufactured by any approved manufacturer as per list of approved makes/ brand.

Rates quoted for steel windows & ventilators shall include for cost of copper oxidized Mild Steel Hardware fittings & fixtures as shown on drawings. Rates quoted shall be for the make or group of makes as mentioned in respective items. Sections used shall be manufactured from approved good quality mild steel rolled sections conforming to IS : 7452 - 1974 & in accordance with IS : 1038 - 1975 (Revised).

ii) Sections for windows & ventilators shall be straightened on hydraulic stretching plant, cut to required lengths, & corners to be electrically flash butt welded, flushed to form one solid welded joint to confirming to requirements of welded joint under clause no. G.I. IS : 1038 - 1975 (revised). No other method of welding except electrical flash welding shall be permitted.

iii) Steel windows & ventilators shall be fixed to stone/brick work by means of standard M.S. lugs of size 100 x 16 x 32mm embedded in cement, & to concrete work by means of 125mm long counter sunk screws with rawl plugs. Rates quoted for windows & ventilators shall include for the same.

3. For glazing, approved aluminium beading shall be fixed by means of cadmium plated iron screws of adequate size & length. Approved quality special putty suitable for metal windows shall be used as per manufacturer's specifications. The hollow portion between the frames & the brick/ stone/ concrete surface & between the component part of the frame shall be filled up with mastic/cement & sand fillet as per manufacturer's recommendations or IS specifications.

4. Glass shall be as manufactured by any approved manufacturer as per list of approved makes/brand.
5. Each glass pane/louver shall be measured to the nearest 0.5 cm. both in width & height.
6. No import license shall be made available for obtaining any material available in India.
7.
 - a) Steel window/ventilators & doors shall not be manufactured till the manufacturer's shop drawings & samples have been approved by the Dy. Chief Engineer.
 - b) If particular section is not available, contractor should state what alternative section they shall use. The C.E. may ask for modifications/improvement in the shop drawings as required in keeping with good practice & I.S.S.
 - c) The Dy./ Chief Engineer's decision regarding shop drawings & different types of sections depending on the arrangement, area of the opening & height to be provided for windows/doors shall be final & binding on the contractor.

No extra payment shall be made to the contractor for providing all such section as directed. The rate for steel windows should provide for cadmium plated iron screws for fixing the beading.
8. Wherever M.S. grills are required to be fixed to frame of steel windows & ventilators, they shall be fixed by welding.
9. Rates of steel windows & ventilators shall include for M.S. weather bars of approved size & pattern to be provided the coupling members (wherever required) as per IS : 1038 - 1975 (revised) specifications.
10. Please note that all side hung shutters shall have projecting type hinges & all hinges shall be greased properly before fixing & projecting types hinges shall be protected with oil papers during construction.
11. The hardware, fittings & fixtures for the steel windows & ventilators shall be provided & fixed as per drawings & shall be in conformity with the stipulation in IS : 1038 - 1975 (Revised). Rates quoted shall include for the same.
12. Steel windows & ventilators shall be painted with 3 coats of synthetic enamel paint of first quality of approved brand, colour & shade including approved primer coat as per list of approved brand/makes. Although three coats of paint, are specified, Contractor will have to do an additional coat of paint, if well finished surface is not obtained to the satisfaction of the Engineer in Charge & there shall be no extra payment on account of this.

5. SPECIFICATIONS FOR PRESSED STEEL DOOR/WINDOW FRAMES :

Material – Steel door frames shall be manufactured from commercial mild steel sheet of 1.25 or 1.6 mm thickness, confirming to IS : 4351 – 1976.

Steel door frames with or without fan light shall be made in the profiles described which may be manufactured to suit doors of either hand, opening inwards or outwards as directed by Project Engineer.

Construction – Each door frames shall consist of hinges jamb, lock jamb, head & if required, angle threshold. The whole shall be welded or rigidly fixed together by mechanical means. Where no angle threshold is required, temporary base tie shall be screwed to the feet of frames in order to forms rigid unit. Where so specified base ties shall be pressed mild steel 1.25mm thick adjustable to suit floor thickness of 35 or 40mm & removable, or alternatively, threshold of mild steel angle of section 5/25 mm, minimum shall be provided for external frames. **Fabrication** – Fixing lugs there shall be three adjustable lugs with split & tail to each jamb without fan light, & four for jamb with fan light. The head of the fixing lug shall be of one of the following lengths :-

- a) 95mm long for use with Profile A.
- b) 120mm long for use with Profile B.
- c) 160mm long for use with Profile C.
- d) or other approved size & profile as per requirement.

The head shall be made from flat steel strip 25mm wide & not less than 1.60mm thick.

The tail of the lugs shall be 200mm long & shall be made to steel strip not less than 40mm wide & not less than 3mm thick.

Hinges 100mm mild steel butt thickness shall be used. For frames for door shutters width less than 90cm, three hinges shall be welded to one jamb for single shutter. For frames for door shutters width more than 90 cm., four hinges shall be welded to one jamb for single shutter. Three hinges on each jamb of frames shall be welded for double shutters.

In all cases the hinges shall be fixed that the distance from inside of the head rebate to the top of the upper hinges & the bottom of the lower to floor is about 175mm. Hinges shall be made of steel 2.5mm thick with a zinc-coated removable pin of 6mm diameter. The space between the two leaves of the hinge when closed shall be 3mm & the leaf that is not welded to the frame shall have for counter sunk holes to take no. 10 wood screws.

Mortar Guards – Mortar guards as instructed by Project Engineer shall be provided. These shall be welded to the frame at the head of the frame for double shutter doors to make provision for bolts.

Lock-Strike plate – There shall be an adjustable lock-strike plate of steel, complete with mortar guard, to make provision for locks or latches complying with the relevant Indian Standards. Lock-strike plates shall be of galvanized mild steel & fixed at 95 cm from the head of the frame.

Shock-Absorbers – For side hung door shutters there shall be at least three buffers of rubber suitable material inserted in the holes in the rebate & one shall be located on the centre line of the rock-strike plate & the other two at least 45cm above & below the center line of the lock-strike plate. For double shutter doors there shall be two buffers of rubber or similar suitable material inserted in holes in the rebate in the lock jamb only at the head & spaces 15cm. at either side of the centre line of the door.

Finish – The door frames shall be either hot drip galvanized or painted or as specified. The surface shall be thoroughly, cleaned, free of dust, mill-scale dirt, oil etc. Either by mechanical means, for example, sand or shot blasting or by chemical means such as pickling & then painted or galvanized as directed by Project Engineer. After pretreatment of the surface one coat, of steel primer (zinc chromate) & two coats of enamel paint as directed by Project Engineer shall be applied to the exposed surfaces.

Measurements – The length shall be measured in running meter correct to a cm. out to out of the frames.

Rate – The rate shall include the cost of labour & material involved in all the operation described above including one coat of approved steel primer (zinc chromate) & two coats of enamel paint etc. complete as directed.

6. WOOD WORK AND ALUMINIUM WORK

1. T.W. shall mean Indian Teak wood of well seasoned, good quality, uniform colour, reasonably straight, grains free from cracks & shakes, wood shall be generally free from sapwood but traces of sapwood may be permitted. Maximum moisture contents shall not exceed 10 percent with tolerance limit for average moisture content of all the samples in a given lot + 2 percent & moisture content of individual sample +3 percent of maximum permissible moisture content.
2. Generally wood shall be free from knots. However, wood with knots may be permitted provided individual hard & sound knot shall not be more than 40mm in dia. & aggregate area of all the knots shall not exceed one & a half percent of the area of the piece. Teak wood shall be got approved before incorporating in the work. Contractor should ensure that wood work does not wrap or show other defects due to lack of proper seasoning.
3. Timber shall be wrought, framed & cut to shape as shown on drawings &/or as required.
4. FLUSH DOOR SHUTTER shall be of approved make as per list of approved makes/brand and shall be solid core block board commercial/Teak veneered/faced & provided with seasoned hardwood lipping which shall be included in rates quoted.

Plywood shall be of approved make as per list of approved makes/brand & shall be water proofing quality phenol bonded (shuttering type) unless otherwise specified.

5. a) Practical Boards shall be of approved make as per list of approved makes/brand of water proof quality, Phenol bonded, 3 layer flat pressed of approved brand.
- b) Medium Density Fibre Boards shall be of approved make as per list of approved makes/brand of water proof quality, Phenol bonded/Urea Formeldihyde as per item.

6. PERMISSIBLE TOLERANCES - (DOOR WINDOW FRAMES)

a) Frames - A tolerance of $\pm 2/3$ mm shall be allowed in the finished cross sectional dimension of door, window & ventilators frames.

b) Shutter for door, windows & ventilators - The finished work with a tolerance of ± 3 mm. tolerance on thickness shall be $\pm .2$ mm, thickness of shutter shall be uniform through with a permissible variation not more than 0.8 mm when measured at any two points.

7. Wherever painting is specified, wood work & joinery shall be painted with 3 coats of approved brand colour & shade, synthetic enamel paint of first quality, including approved primer as per list of approved makes/brand. Although 3 coats of paints are specified. Contractor will have to do an additional coat of paint, if well finished surface is not obtained to the satisfaction of the Engineer-In-Charge & there shall be not extra payment on account of this.

8. Wherever polishing is mentioned for wood work, it shall be wax/French polishing of approved finish as required. Where door, frames are fixed flush with plaster to walls, teak wood cover moulds/architrave shall be provided all round. T.W. cover mould shall be paid separately & shall be painted or polished as in doors/windows.

9. Unless otherwise specified rates quoted for shutters of doors/ windows/ fan light shall include for ordinary quality sheet glass plain or frosted, figured, wired glass or any other glass (as required) manufactured by m/s. Hindustan Pilkington or other equal & approved fixed with T.W. beading & approved putty.

10. Rates quoted for shutter of doors shall include for T.W. beading/T.W. planted beads for fixing panels of shutters of doors, wherever required to be provided. Rate also shall include for painting/polishing of beading.

11. Rates quoted shall included for :-

Polishing all wood work with French or wax polish of approved quality and shade including the under surface as per the specifications to get a uniform finish or painting with two or more coats of first quality synthetic enamel paint of approved brand and shade over a coat of approved primer, including preparation of the under surface to get a uniform finish. Timbers faces coming in contact with masonry or concrete shall be painted with three coats of wood preservative and anti-insecticide paint before fixing in position. If proper evidence about seasoning and soundness of timber is provided the Engineer at site at his discretion may allow fabrication of sub frames and frames and paneled shutters.

12. Rates quoted for wood work & joinery shall include for rebates joints, chambers, mouldings, grooves, beads, laps, rounded angles, niches, nails, screws, pins etc.

13. Rates quoted for the item of the T.W. moulded hand rail (if required) for staircase/parapet wall (as the case may be) shall include the provision for special shape curve required the turning of the railing in conformity with the alignment of the railing. This shall be made out of one single piece of approved teakwood. No extra payment on this account shall be made to the Contractor.

14. Shutters of doors/ windows/ventilators/fan lights shall be measured net in a close position covering rebates of the frame. Overlap of two shutter shall not be measured.

15. For curved windows/ fan lights (if any) the area shall be measured from inside to inside of frame. Rate shall include for the T.W. beading required for fixing louvers as shown in the drawings (including painting/polishing to beading).
16. Rates quoted for doors windows/ fan lights shall include for :-
 - a) Supplying & fixing M.S. holdfast of size 300 x 35 x 6mm as approved & shall be provided viz. 6 nos. fan light.
 - b) One end of holdfast to be fixed with posts of frames by 12 mm dia bolt & nuts welded to holdfast & other end to be fixed into jambs with 1:2:4 P.C.C. of dimensions as directed including making holes of required size in posts or frames, filling them with T.W. fillets properly etc. complete as per drawings no. CA/TD/055/00. No other method of fixing holdfast except that shown in this referred drawing shall be allowed to the contractor.
17. The contractor shall erect the frames & shutters etc. in proper alignment vertically & in workmanlike manner. The defects in this work if noticed/pointed out shall be rectified by the contractor at his cost. The contractor shall be responsible for protection of shutters & the frames fixed in masonry/concrete work during the progress of the work & till the buildings are handed over.
18. All wood work wrought & framed shall be measured net in cubic meters as fixed except in the following :-
The sectional area of mouldings, doors / windows / ventilators or fan light frames shall be taken as the area of the last square or rectangle from which the same will be cut.

Unless otherwise mentioned length of the door/ windows/ ventilators or fan light frames shall be measure out to out door i.e. the sight length of tenons shall be added. Vertical member of door frames shall be embedded in the buried length of frame will be added to sight length. Length shall be measure nearest to a centimeter. No horns shall be provided.
19. Hardware for doors, windows/ ventilators shall be of the approved brand as per list of approved brand/ makes.
20. All hardware shall be fixed with suitable screws to match the hardware & rates quoted shall include for fixing the hardware in position & cost of screws etc.

FLOORING & FINISHING

1. Wherever specified terrazzo/marble mosaic tiles in flooring shall be of 250 x 250 x 20 mm of appd. colour & shade. Thickness of wearing layer of the tiles shall not be less than 6mm.
2. Terrazzo/marble mosaic tiles of light shade shall be in white cement, medium shades shall be approximately 50% white & 50% ordinary cement & dark shades shall be in ordinary cement. The same shall apply in case of in situ terrazzo/marble mosaic, cement tiles & cement concrete floors if required to be finished in light, medium or dark shades. Rates quoted for light, medium/dark shades for tiles as well as for in situ terrazzo/mosaic & cement concrete finish shall include for necessary coloring pigment also.

3. Size of the marble chips for terrazzo/marble mosaic tiles shall be varying from the smallest upto 20mm size & shall be in required proportion & of approved colour & shade & rates quoted for terrazzo/marble/mosaic in situ mosaic finish shall include for the same.

a) flooring & treads of steps/staircase shall be laid on a screed of lime mortar 1:3 (1 lime:3sand) or cement mortar 1:4 20mm thick average & floated in neat cement slurry.

b) Skirting, dado & risers of steps/staircase shall be fixed on backing of cement mortar 1:3, 12mm thick, with thick cement plaster.

c) Joints shall be finished neatly with white/coloured cement to match the colour of corresponding tiles/ stone.

d) Tiles/kota / shahbad/tendur stone slab in flooring shall be machine polished & tiles/shahbad stone in dado, skirting, treads & risers shall be hand polished.

5. Terrazzo/Marble mosaic/cement tiles shall be from any of the following manufacturers as per list of approved brand/makes.

6. MARBLE SLABS IN FLOORING AND LINING

GENERAL

Marble slabs shall be of the best Makrana Dongri Adanga marble or as specified in the item & from approved source. They shall be hard, dense, uniform & homogenous in textures. They shall have even crystalline grains & free from defects & cracks. The top surface shall be machine polished to an even & perfectly plane surface & edges machine cut due to square. The rear face shall be rough enough to provide a key for the mortar. Exposed edges of the treads/risers etc. of the entrance steps shall have machine polished edges. Marble slabs shall be of specified shape & size & shall be got approved from the Dy. Chief Engineer. No slab shall be thinner than the specified thickness at its thinnest part.

A. FLOORING :

Marble slabs in flooring shall be laid as follows & rates quoted shall include for the same.

i) Marble slabs in flooring, treads of steps of staircase shall be laid on screed of lime mortar 1:3 (1 thoroughly slacked & only lime putty:3 sand) or cement mortar 1:4 20mm thick average & floated in neat cement slurry with necessary slope.

ii) Joints shall be hair-fine width & in straight lines. They shall be grouted & finished neatly with white cement slurry of required consistency admixed with pigment to match the colour of the marble stone slab.

iii) Flooring shall be given a coat or wax polish of approved make. Rate quoted shall include for the size of marble stone slabs as specified & for the pattern as shown on drawings.

B. MARBLE SLABS IN WALL LINING

Marble slab shall be of the best markrana Dongri Adenga marble from approved source. They shall be of selected quality, dense, uniform & homogenous in texture & free from cracks or other structural defects. Marble slabs shall be got approved from the Dy./ Chief Engineer before the incorporating the same in the work. The top surface shall be machine polished to an even & perfectly plane surface before they are fixed in position & shall have machine cut polished edges true to square. The dressed slabs shall be of the thickness as specified with a tolerance of $\pm 2\text{mm}$. the tolerance in wall lining when a straight edge of 4m. length is placed should not exceed more than 3mm. Marble slabs in wall lining shall be laid as under & rates quoted shall include for the same.

i) Cement mortar 1:3 pads of 12mm thick & of required width shall be struck on to the wall at close intervals & the marble slabs shall be pressed on to them firmly in pattern as shown on drawings. The remaining cavities if any, shall then be filled with thin grout of the cement mortar of the same proportion. The sound coming on gently tapping of the slab will indicate if there are hollows. When the hollows cannot be filled with grout & the finished slabs continue to give hollow sound tapping, the slab shall be removed & reset. The marble slabs shall be fixed to the wall by bronze cramps/holdfast 100 x 50 x 6mm size, 50mm long wide bronze angle 45 x 45, 1 1/2mm dia x 75mm long expansion bolts, brass wire hooks & bronze dowels pins 50mm x 6mm dia as shown on drawings. At horizontal joints of the slabs, adjacent slabs shall be held together by a bronze pin passing through a hole drilled in the slabs. In addition bronze cramps of above mentioned size shall be provided to anchor the slabs to the wall. The cramps/holdfast shall be counter sunk into the joints of slabs & it shall be located as shown on drawings. Minimum two such cramps shall be provided for each horizontal joint for each slab.

ii) The lining between marble slabs shall be hair fine & filled with white cement grout to match the marble.

iii) The lining shall be fixed true to plumb & in perfect line as shown on drawings. The surface shall be protected from sun & rain & cured for ten days & shall be finally hand polished before buffing with polishing felt pad & acid. The marble shall be finished with a coat of wax polish of an approved manufacturer.

Rates quoted shall include for the size of marble stone slabs as specified & for the pattern as shown on drawings. Granite stone/marble slab in wall lining shall have zero level edges & rate quoted shall include for the same.

7. In situ marble mosaic flooring, treads etc, shall be 40mm thick overall (under layer 30mm thick & top layer 10mm thick). In situ marble mosaic dado, skirting shall be 20mm thick overall (under layer 12mm thick & top layer 8mm thick). Under layer for flooring & treads shall be cement concrete 1:2 & for dados & skirtings, the mix for under layer shall be 1:3 cement mortar. The proportion of cement to marble chips of smallest to 20mm size in required proportion & in top layer shall be 1:2. Marble chips shall be of approved colour & shade. Flooring shall be machine polished whereas treads, skirting & dados shall be hand polished. Rates quoted shall incl. for all the above factors.

8. Cement concrete flooring when indicated to be coloured shall be rendered with 6mm thick cement plaster consisting of 1 part of ordinary cement to 3 parts of sand, coloured with addition of mineral pigment of Shalimar make or other equal & approved shade, thoroughly mixed cement when dry. The quantity of coloring pigment for coloured concrete flooring shall be such as to produce the required shade. This top layer of 6mm thick cement plaster mixed with coloring pigment shall be laid immediately after paying concrete for flooring.
9. Cement concrete flooring (Plain/coloured) laid in single layer shall be finished smooth & will have no trowel marks on the surface. If ordered, hand polishing with carborundum stones shall be included in the rates quoted.
10. Internal cement plaster to brick walls, columns, beams, lintels etc. shall be 12mm thick. R.C.C. slab soffits shall have cement plaster not less than 6mm thick. External cement plaster shall be 20mm thick in two coats (under coat 12mm thick & finishing coat 8mm thick) except for R.C.C. members not flush with brick work which shall be 12mm thick in two coats (under coat 8mm thick & finishing coat 4mm thick) such as R.C.C. facias, chajjas, canopies, drop walls, beams ribs, projected slabs etc.
11. Rates quoted for plastering & finishing items shall include for jambs, sills, drip mould, bands, forming grooves, chambers, curved angles, arises etc. & such other projections, which shall not be measured separately & paid for.
12. Rates quoted for painting & colour washing etc. shall include for providing shade of approved colour.
13. In case of painting, white washing & colour washing items, although number of coats are specified. Contractors will have to do additional coats if well finished surface is not obtained to the satisfaction of Executive Engineer & there shall be no extra payment on account of this.
14. Sand for mortar bedding for floors shall be from approved source & shall conform to IS : 2116 - 1965 as applicable to unreinforced masonry work.
15. Sand for plaster shall be from approved source & shall conform to IS : 1542 - 1960 as applicable internal wall & ceiling, plastering & external wall plastering.
16. Unless otherwise specified white glazed earthenware tiles shall be of 108 x 108mm size & minimum 5mm thick of first quality as per the list of approved makes/brands.
17. Acrylic plastic emulsion paint shall be of approved brand manufactured by any manufacturer as per the list of approved makes/brands.
18. Cement water proofing compound wherever mentioned shall be of approved brand manufactured by any manufacturer as per the list of approved makes/brands all as per manufacturer's specifications.
19. Flat oil paint for external or internal surfaces wherever specified shall be of approved brand manufactured by any manufacturer as per the list of approved makes/brands.
20. High class synthetic enamel paint (first quality) shall be of approved brand manufactured by any manufacturer as per the list of approved makes/brands.

21. Cement paint shall be cement water proofing decorative paint of approved brand manufactured by any manufacturer as per the list of approved makes/brands.

22. KOTA STONE:

Kota stone specified in the items shall be got approved from the CE. At its thinnest part no stone shall be thinner than the minimum thickness specified in the tender item. Kota stone used in the work shall be hard, sound, durable, resistant to wear. It shall be cut to shape & size as directed. Rough kota stone shall have plain surface.

For machine polished kota stone, the exposed surface of the stone slab shall be machine polished, having smooth even & true plane. The stone slabs shall be without any soft veins cracks or flaws & shall have uniform colour. Kota stone for floorings, skirting, tread & risers shall have even natural surface free from broken flakes on top & shall be machine cut, edges shall not be marred by careless dressing of slabs & patching up shall not be straight. Kota stone used in the work shall be brought from approved quarries.

23. TOLERANCE FOR TANDUR/SHAHABAD/KOTA FLOORING :

The thickness of the slab shall be as specified in the description of items. Tolerance shall be allowed for the thickness. In respect of length & breadth of slabs, a tolerance of 5mm shall be allowed.

24. CERAMIC TILES LINING :

FLOORING & DADO

Glazed / ceramic tiles shall be of approved brand manufactured by any manufacturer as per the list of approved makes/brands. The tiles shall be laid over the base coat of cement mortar 1:4, 20mm thick with a floating coat of thick cement slurry over it. Ceramic tiles shall then be set over the screed firmly to correct plumb line & levels. The joints shall be filled & finished neat with cement paste pigmented to the shade of the tiles, all as per detailed manufacturer's specifications. The tiles shall be cleaned with acid. Rates to include to the above besides scaffolding, curing etc. complete.

GRANITE WALL LINING/ VENEERED WORK

Dressing & rubbing

Every stone shall be mirror polished and cut to the required size and shape, dressed on all beds and joints so as to be free from waviness and to give truly vertical and horizontal joints as required, the back of stones shall be left rough cut, in order to ensure a good grip with the heaving of backing. A sample of dressed stone shall be prepared as per required size and shape for approval and it shall be kept at site after being approved by Engineer-In-Charge. The dressed stone slabs shall be of the thickness as specified with a tolerance permissible as below :

SLABS :	a)	Length :	+2%
	b)	Width :	+2%
	c)	Thickness :	+3%

The tolerance in wall lining when straight edge of 3m length is placed should not be more than 2mm.

Mortar

The mortar used for fixing the stone shall be 1:3, (Cement : 3 coarse sand) and of the thickness specified.

LAYING

1. The stones shall be wetted before laying. They shall be fixed with mortar in position without the use of chips and underpinning of any sort. The care shall be taken to match the grains of veneer work as directed by the Engineer-In-Charge at site. Preferably the slabs shall be selected judiciously having uniform pattern of veins/streaks.

2. Where so desired, the adjoining stones shall be secured to each other by means of copper pins 75mm long and 5mm diameter or as specified.

3. Further the stones shall be secured to the backing by means of cramps. The material of the cramps shall have high resistance to corrosion under conditions of dampness and against chemical action of mortar or concrete in which cramps are usually embedded.

Cramps shall be of 25x6mm and 30cm long in case of backing of stone masonry walls and brick masonry walls thicker than 230mm. In case of backing with brick walls 230mm or less thick or RCC members cramps shall be of 25x6mm and length as per requirement made out of gun metal or any other metal as specified. Generally the outer length of cramp in half brick work backing shall be 115mm and in one brick wall backing it shall be 150mm. Typical details and shapes of cramps for such backing are as indicated in figure no. 2 for general guidelines. This can be modified as directed by Engineer-In-Charge if so, required at site. Cramps shall be spaced not more than 60cm apart horizontally.

Alternatively the stone may be secured to backing by means of stone dowels 10x5x2.5cm as per shape indicated in Figure 1.

3. The adjoining stones shall be secured to each other of gun metal cramps or copper pins of the specified size. The cramps may be attached to its sides (See fig. 3A,3B) or top and bottom (see fig. 3C,D,E,F) or sides top and bottom (see fig. 3G,3H). The general arrangements of cramps required for fixing facing unit to wall are illustrated in fig.3. The actual number of cramps and their sections, however, shall be as per requirements of design to carry the loads.

4. Where cramps are used to hold the unit in position only, the facings shall be provided with a continuous support on which the stone rests at the ground level and other storey levels, the support being in the form of projection from or recess into the concrete floor slab, or a beam between the columns or a metal angle attached to the floor slab or beams. These supports shall preferably be at vertical intervals not more than 3.5 m apart and also over the heads of all the openings. Such supports shall also be provided where there is transition from thin facings below to the thick facings above.

5. Alternatively the cramps may be used to hold the units in position and in addition to support the units thus transferring the weight of the units to the backing. Such cramps should be properly designed as per IS 4101 (Pt.I) - 1967.

6. The cramps may be of copper alloyed with zinc, tin, nickel, lead or stainless steel as specified.

7. The pins, cramps and dowels shall be laid in cement mortar 1:2 (1 cement : 2 fine sand) and their samples got approved by the Engineer-In-Charge and kept at site.

JOINTS

All joints shall be full of mortar, special care shall be taken to see that groundings for veneer work are full of mortar. If any hollow groundings are detected by tapping the face stones, these shall be taken out and relaid. The thickness of the face joints shall be uniform, straight and fine as possible, not more than 1.5mm and in the face joint, the top 6mm depth shall be filled with the mortar specified for the pointing.

Curing

The work shall be kept constantly moist on all faces for a period of at least seven days.

Protection

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damage during construction.

Scaffolding

Double scaffolding having two sets of vertical supports shall be provided where necessary. The supports shall be sound and strong, tied together by horizontal pieces over which the scaffolding plank shall be fixed.

Measurement

The length and breadth shall be measured correct to a cm. In case of radially dressed or circular slabs in the work, the dimensions of the circumscribing rectangles of the dressed stone used in the work, shall be measured and paid for. The area shall be calculated in sqm nearest to two places of decimal.

STONE CLADDING WORK

Stone shall be of the type specified. It shall be hard, sound, durable and tough, free from cracks, decay and weathering and defects like cavities, cracks, flaws, sand holes, veins, patches of soft or loose materials etc.

Before starting the work, the contractor shall get the stones approved by Engineer-In-Charge.

The stone shall be cut into slabs of required thickness along the planes parallel to the natural bed of stone.

Dressing

Every stone shall be cut to the required size and shape, so as to be free from waviness and to give truly vertical and horizontal joints. They shall be hand or machine cut as per site requirement to the required thickness.

The dressing at the back shall not be done, so as to ensure better grip with the hearting or backing. The dressed slab shall be of the thickness as specified, with permissible tolerance of 2mm.

Mortar for fixing shall be as specified.

LAYING

The stone shall be wetted before laying. They shall be fixed with the mortar in position without the use of chips or underpinning of any sort.

Where so desired, the adjoining stones shall be secured to each other by means of copper pins 75mm long and 6mm dia. Or as specified.

Further stones shall be secured with the backing by means of cramps. The materials for the cramps shall be high resistant to corrosion under conditions of dampness and against the chemical action of mortar or concrete in which cramps are usually embedded. Cramps shall be of 25x6mm and 30cm long in case of backing of stone masonry walls and brick masonry walls thicker than 230mm. In case of backing with brick walls 230mm or less thick or RCC members cramps shall be of 25x6mm and length as per requirement made out of gun metal or any other metal as specified. Generally the outer length of cramp in half brick work backing shall be 115mm and in one brick wall backing it shall be 150mm. Typical details and shapes of cramps for such backing are as indicated in figure no.15 for general guidelines. This can be modified as directed by Engineer-in-Charge if so, required at site. Cramps shall be spaced not more than 60cm apart horizontally.

Alternatively the stone may be secured to the backing by means of stone dowels 10x5x2.5 cm as per shape in Figure 14 and the adjoining stones secured to each other by means of gun metal cramps or copper pins of the specified size. Minimum one cramp /stone dowel shall be used to secure one slab to backing.

Cramps may be attached to its sides (See fig. 16A, 16B) or top and bottom (see fig. 16C to F) or sides, top and bottom (see fig. 16G&H). the minimum number of cramps required for fixing facing unit to wall are illustrated in Fig. 16. The actual number of cramps and their sections, however, shall be as per requirements of design to carry loads.

Where cramps are used to hold the unit in position only, the facings shall be provided with a continuous support on which the stones rest at the ground level and other storey levels, the support being in the form of projection from or recess into the concrete floor slab, or a beam between the columns or metal angle attached to the floor slab or beams. These supports shall preferably be at vertical intervals not more than apart and also over the heads of all openings. Such supports shall also be provided where there is transition from thin facings below to thick facings below.

Alternatively the cramps may be used to hold the units in position and in addition to support the units thus transferring the weight of the units to the backing. Such cramps should be properly designed as per IS 4101 (Pt.I) – 1967.

The cramps may be of copper alloyed with zinc, tin, nickel, lead or stainless steel as specified.

The pins, cramps and dowels shall be laid in cement mortar 1:2 (Cement : 2 fine sand) and their samples got approved by the Engineer-in-Charge and kept at site.

The walls shall be carried up truly plum. All courses shall be laid truly horizontal and all vertical joints truly vertical. The stone shall break joints on the face for at least half the height of the course, unless otherwise shown in the drawings. The stone shall be laid in regular courses not less than 20cm height and all the stones shall be of the same height unless otherwise specified. No stone shall be less in length than one and half times its height unless otherwise specified.

As far as possible the backing shall be carried up simultaneously with the face work. In case of reinforced cement concrete backing, the lining shall be secured to the backing after it has set and got cured. The cramps shall be fixed in concrete at the required positions, while laying.

JOINTS

The joints shall be done with cement mortar 1:2 (1 cement : 2 fine sand). All joints shall be full of mortar. Special care shall be taken to see that the groundings for veneer work are full of mortar. If any hollow groundings are detected by tapping the face stones, these shall be taken out and re-laid. The thickness of joints shall be as small as possible, not exceeding 5mm. For a close butt jointed facing the thickness shall not exceed 1.5mm. The face joints shall be uniform throughout.

Where joint filler or compound is to be used the joints shall be raked out to a depth of at least 25mm after the mortar in the joints has set sufficiently and the filler or compound applied. The joints may be subsequently finished with a mortar suited to the appearance of the work. It is preferable to use joint sealing compounds where the facings are exposed to heavy rainfall and winds and their selections would depend upon local experience and availability of joint sealing compounds. In their absence only masonry mortars 1:2 (1 cement : 2 sand) which are proved to be successful from local exposure conditions shall be used.

MEASUREMENTS

The length and breadth of the finished work shall be measured metre correct to cm. The area should be calculated in Sq.mt. correct to two places of decimal.

RATE

The rate includes the cost of materials and labour involved in all the operations described above.

8. WATERPROOFING & ROOFING

a) Water proofing to sunken portion of floor slabs in W.C. bath etc. The treatment shall consist of following operations:

i) 20mm thick plaster with cement mortar 1:4 mixed with any approved waterproofing compound as per manufacturer's specifications over the slab & sides upto the top of sunken portion.

ii) Filling the sunken portion with well burnt bricks in required number of layers set in cement mortar 1:4 mixed with approved water-proofing compound as per the top surface as per required gradient to receive the floor finish.

iii) The treatment shall be guaranteed as detailed under b(ii) below.

b) TREATMENTS OVER ROOFS :

i) The waterproofing shall be got done from anyone of following proprietary specialist firms & under their direct supervision & strictly in accordance with their specifications.

ii) the treatment shall be guaranteed against any seepage/leakage/ dampness etc. for a period of ten years from the handing over of the building to L.I.C. The guarantee shall have to be given by the proprietary specialist firm directly to the L.I.C. of India. on judicial stamp paper in approved proforma of the L.I.C.

The amount @ 10% shall be deducted from R.A. Bill/Final bill from the items of water proofing trade having 10 years guarantee. (i.e. terrace water proofing treatment, khurras, addl. Thickness, plastering and brick bat filling in sunken portions).

The 50% of retention money for this trade will be refunded after expiry of the two successful monsoons balance 50% will be refunded expiry of guarantee period of 10 years provided that there is no leakage, dampness etc.

iii) The rates shall include testing of the treated areas by ponding with water, the water shall be made to stand for 120 hours in 150mm ht. average the period of testing. In case of leakage/dampness the same shall be rectified completely & testing shall be redone until all treated surfaces are found to be free from any leakage/dampness/seepage.

iv) Min. thickness of treatment shall be 75mm. The slope of the finished treatment shall not be flatter than 1 in 120.

v) For the purpose of payment exposed area (in plan) of the RCC slab treated shall be measured (i.e. area before treatment / plaster between parapet/wall etc. & vertical surfaces shall not be measured. In case of sloping roof slab exposed area of the inclined portion shall be measured. Rounding of junctions at terrace will not be measured or paid for separately.

vi) The quoted rates shall be valid at all hts. & all floors.

I. CRAZY MARBLE MOSAIC FLOORING/TOPPING ON TERRACE.

Work of crazy marble mosaic tile topping on terraces are given in the specifications for civil work:

Rates quoted shall include for the following factors:

i) Tile piece shall be laid on screed on lime mortar 1:1:1 (1 cement: 1 surkhi: 1 sand) 20mm thick (average) & floated on neat cement slurry in required levels & slopes in crazy fashion.

ii) The joints between the pieces shall not exceed 3mm in width & shall be slidly filled with cement mortar 1:3 mixed with waterproofing compound & finally flush pointed on top with neat cement mixed with water proofing compound.

iii) Cement waterproofing compound of approved brand manufactured by any manufacturer as per the list of approved makes/brands all as per manufacturers specifications shall be added to components of the above mentioned screed float of mortar bedding & cement floating coat.

iv) The junction of the topping/paving & the parapet wall shall be rounded/covered to about 75mm radius & the topping/paving shall be extended up to the parapet wall for 15cm. The top edge shall be finished in a neat horizontal line & tucked in groove in the wall. Bel mouths around rain water pipe inlets etc. wherever required for affecting drainage, shall be formed in crazy marble mosaic tile piece finish. Necessary channels/dishing as required shall be also formed.

v) After the topping/paving has been laid as required or the day's fixing work is completed the surplus cement grout that may have come out of the joints on compacting shall be cleaned off.

- vi) Proper slopes shall be imparted to the finished surface to drain off the rain water easily without any stagnation & where on the finished surface.
- vii) Bitumen painting of slaw small extend up the parapet/kerb/upstand for 150mm.
- viii) Necessary roundings/covers near parapet/kerb/upstand shall be done & junction made leak-proof.
- ix) Dishing near rain water outlets.
- x) Preparation of channels as required.

2. MEASUREMENTS

- i) Measurements for lime concrete as well as for crazy marble mosaic flooring/copping on terrace shall be only the respective flat area in plan of the terrace between the exposed internal faces of parapet walls/curbs/up stands portions, coving rounding etc. shall not be measure.
- ii) While measuring the average thickness mentioned in the item, thickness of roundings/coves near the parapet walls/curb and the portion carried over in the parapet walls shall not be considered.
- iii) Wherever the R.C.C/Brick/Stone/Corbelling courses are required to be provided on the same terrace floor, they shall be in line & level with each other.
- iv) The contractors shall ensure water tight/leak proof construction. The contractor, if they so desire may carry out any further treatment (in addition to the water proofing treatment specified above) for water proofing of surface as considered necessary by them, however, the rates quoted by them for the items shall be deemed to allow for such additional treatment & no extra amount shall be paid for the same.

9. MISCELLANEOUS WORK & ALUMINIUM WORK

- 1. All aluminium work shall be free from defects impairing strength, appearance & shall be of the best available quality for the purpose specified. The aluminium alloy used in the manufacturer of the extruded doors/ windows/ ventilators/ partitions sections shall correspond to IS designations HE 9-WP of IS : 733 - 1956. "Specifications for wrought aluminium & aluminium alloy bars, rods & sections (for general Engineering purposes)". Hollow aluminium sections & coupling sections used shall conform to IS designation HV 9-WP & Aluminium alloys extruded round tube & hollow sections (for general Engineering purpose only. Contractors shall commence manufacturing of doors, windows, & ventilators only after the shop drawings showing full size, sections, thickness of metal, details of construction, hardware etc. submitted by them are approved by the Employer.

Where aluminium comes in contact with concrete, brickwork, plaster or any other dissimilar metals, it shall be coated with & coat of zinc chromate conforming to IS : 104 - 1950. Contractor shall cover all the anodized finish work with a thick layer of clear transparent lacquer base on methacrylates or cellulose butyrate to protect the surface from wet cement during installations. This lacquer coating shall be removed after the completion.

All the manufactured doors, windows, ventilators & partitions shall be stacked on site under cover. Damaged surfaces with defects like scratches etc., on finished work shall not be accepted. Fabricated materials shall be created in an approved manner to protect the material against any damage during transportation. Loading & unloading shall be carried out with utmost care. The doors, windows & ventilators on arrival at site shall be carefully examined to detect any damaged pieces. Arrangements shall be made for expeditious replacement of damaged pieces/parts. Materials found to be acceptable on inspection only shall be used.

All exposed surfaces of sections for aluminium doors/windows/ventilators/partitions incl. beadings & other accessories shall be anodized/powder coated after fabrication, in a manner conforming to IS : 1868 – 1968 & to approved finish. Anodizing/powder coating shall be in matt finish natural colour & anodic coating shall be of a minimum thickness of 15 microns. Powder coating shall be of minimum thickness of 60 microns with approved Epoxy/ pure polyester paint powder all as per the specifications of specialized agencies.

2.

ALUMINIUM DOORS, WINDOWS, VENTILATORS & PARTITIONS.

Aluminium doors, windows & ventilators shall be manufactured from sturdy extruded sections of approved manufacture & shall be aluminium alloy from one of the manufacturer/s as given in the attached list of approved makes.

Contractor shall design & provide sturdy sections/members of doors, windows, ventilators & partitions including combination of joints so as to withstand wind load of high intensity.

The frame shall be square & flat & corners of the frames being fabricated to true right angles. Both the fixed & opening frame shall be of sections which have been cut to length, metered & mechanically joined &/or electrically welded at corners as required for satisfactory performance. Sub-dividing bars shall be accurately machine milled & fitted to form harline joints. The jointing accessories such as cleats, brackets etc. shall be of such material as not to cause any bi-metallic action.

Dimensions shown in the drawings are overall height & width to the outside of the frames of aluminium doors, windows & ventilators. These dimensions are derived after allowing 12.5mm clearance on all four sides for the purpose of fittings windows, doors & ventilators into the openings. Contractors are advised to verify the dimensions before fabricating & fixing the doors, windows & ventilators in position.

3.

METHOD OF FIXING

a) Aluminium doors, windows, ventilators & partitions in brick work & concrete work :-

Aluminium doors, windows, ventilators & partitions shall be fixed to brick work by means of slotted steel adjustable lugs (natural finish), not less than 100mm x 16mm x 3mm with counter sunk galvanized machine screws & nuts 19x6mm & to concrete work by means of 45mm x No 10 galvanized wood screws & dash fasteners of suitable size & make.

b) **FIXING SCREWS AND LUGS.**

Outer frame shall be provided with fixing holes centrally in the web of the section at appd. intervals. Any steel lug coming in contact with aluminium should either galvanized or given a coat of bituminous paint. The members should be designed not only for its strength, stability, stiffness, against all odds, but also for easy operations, water tightness, easy replacement of glass & cleaning from inside. All screws used shall be of adequate size & shall be of cadmium plated brass.

4.

GLASS AND GLAZING

Glass shall be of type & quality specified in the schedule of quantities & manufactured by one of the manufacturer as per the list of approved makes. Before installation of the glass the contractor shall ensure the following :-

- a) All glazing rebates shall be square, plumb true in plane, clear, dry & free from dust.
- b) The glass edges shall be clear & cut to exact size, glass with chipped or damaged edges shall be rejected.
- c) The glass shall be set in glazing clips & be installed to achieve proper water tightness.
- d) Suitable PVC or Neoprene gaskets shall be used for fixing glass so as to prevent rattling.
- e) Beading shall be of anodized aluminium section and shall be snap-on type having mitred either triangular or rectangular as per contractor's design & shall not be less than 0.13 kg. per RM.
- f) Any hollow portion between the frame & the brick / concrete surfaces & the component parts of the frame shall be filled up with suitable mastic/cement & sand filled as per IS specifications & rates quoted shall include for the same.
- g) If required by the Dy. Chief Engineer putty shall be applied to the face of the bead which is in contact with glass. Putty would also be filled, if necessary at the back. Putty used for glazing shall conform to I.S. 420 - 1953. On completion of the job, all glass shall be thoroughly cleaned & free from dirt, putty or other adhering material.

Wastage of cutting of glass shall be to contractor's account. Frosted/ground/pin headed glass shall be set with smooth surface outside.

The members proposed to be provided by the contractors for aluminium doors, windows, ventilators & partitions shall be of approved quality & sturdy to withstand the wind pressure of high intensity & day to day handling & shall be free from rattling, leakage etc. if required, contractor shall furnish the detailed design calculation to substantiate the sturdiness of each door, window, ventilator & partitions, the same shall be carried out by the contractor & suitable adjustment shall be made on basis of relevant tender items.

5.

Aluminium doors, windows, ventilators & partitions shall be locally manufactured as per the design & drawing (which shall be approved by the Employer), from the extruded sections of one of the manufacturer/s as given in the attached list, including fittings & fixtures as shown on drawings.

6.

The Dy. Chief Engineer reserves the right to delete any or all items of this trade & allot the work under this head to any specialized agency/agencies. No claim what ever shall be entertained on this account.

7. **MODE OF MEASUREMENT.**

Aluminium doors, window, ventilators & partitions shall be measured by weight only. The weight shall be calculated as per theoretical weight/ actual weight whichever is less. Any wastage of aluminium sections shall be on contractor's account. The weight of screws, lugs, nuts & bolts, butt hinges, hollow hinges, neoprene gaskets, hardware fittings & fixtures shall not be considered for payment. The rate shall include for fixing of fittings & fixtures shown on shop drawings approved by Engineer-in-Charge.

9. **RATE TO INCLUDE :**

Apart from other factors mentioned elsewhere in this tender document, rate for the items of supplying & fixing aluminium doors, windows, ventilators & partitions shall also include for the following, unless otherwise specified :-

- a. All materials & labour required for supplying & fixing in position approved anodized/powder coated aluminium doors, windows, ventilators & partitions & described in the trade at site of work.
- b. After the shop drawings are approved, the contractor shall supply one sample each of window & ventilator with hardware etc. for approval as directed.
- c. Supplying & fixing in position glass of specified thickness, type & quality along with putty, glazing clips & anodized/powder coated aluminium beading of required section.
- d. Supplying & fixing all accessories such as hinges, cleats, beading, screws, nuts, bolts, lacquer, gasket, putty for fabrication & fixing doors, windows, ventilators & partitions to concrete/ masonry surface as described in the trade.
- e. Filling sealants as per details to ensure water-tightness. All the sealants must be permanently resilient & non bleeding nature.
- f. Protecting the surfaces & edges around doors, windows, ventilators & partitions from any damage while fixing the same.
- g. Removing all protective coverings & cleaning the door, window, ventilator & partition frames.
- h. Neoprene / PVC weathering strips as required.
- i. Drip strip to drain out water falling on the members of the frame.
- j. Filling in cement mortar 1:4, the space between the concrete surface & the frame windows & ventilators.
- k. PVC or rubber gasket for fixing glass.
- l. Cadmium plated brass screws wherever required.
- m. Galvanized/ aluminium channels pieces, coach screws, rawl plug etc. of required size & number for fixing door, windows, ventilators & partitions frames in position.
- n. Necessary scaffolding/cradle for erection of aluminium doors, window, ventilators & partitions in position.

- o. Rates for sliding windows & ventilators to include for adequate arrangements for draining out water collected in the channel of the outer frame.
- p. All rates quoted in the trade shall include for supplying & fixing.
- q. Swing door shutters shall include for double action oil check floor springs of "Everite" or "Hardwyn" other equal & approved make & size including embedding the floor springs in the flooring & making good the same.
- r. For all window & ventilator openings, contractor shall prepare M.S. retrievable plate frames with necessary tolerance for obtaining the correct dimensions of opening in concrete/brick masonry works.

10. & 11. SANITARY, WATER SUPPLY, PLUMBING & DRAINAGE WORK

1. GENERAL

These preambles apply to all the sections of the "Schedule of Quantities" although they may not be repeated later.

- 2. In case any variation or discrepancy is found between the description in the schedule of quantities will take precedence over the specifications for Sanitary work.

3. RATES TO COVER:

a) - Whether specifically mentioned or not, the contractor should cover in the rates quoted by him in the Schedule of quantities, for all the conditions, materials & labour (up to incorporation, in acceptable work) covered in the preambles. The contractor should also cover in his rates for the method of work, cost of materials, labour etc. to comply with the "General Specifications", "Special conditions" (if any) & all documents of this contract.

b) The contractor's rates shall cover for all materials, tools & plants, scaffolding & everything necessary, for the proper execution of the work to the satisfaction of the C.E. All materials & workmanship used in the execution of the work shall be the best or first quality & description, unless otherwise stated. All materials or procedure or specifications for work, unless otherwise stated, shall conform to the current Indian Standard whether or not specific mention made thereof. The contractor shall be responsible for, & shall replace or make good at his own expense, any materials lost or damaged, or of quality not approved.

- 4. SUPPLY & FIX - All rates quoted shall include for "Supplying & fixing" although the same may not have been mentioned in the item of the schedule of quantities. Words "Providing & fixing" where used shall have same meaning as "Supplying & Fixing".

- 5. DESCRIPTION OF ITEMS CLARIFICATION - Description of item shall mean its description in all relevant parts of the tender including that described in these preambles. General specifications, General instructions etc. Every care is taken to describe an item as clearly as possible if meaning or any of the items is not clear, the contractor is advised to have the clarification in writing from the office of the Dy. Chief Engineer.

- 6. PRICE FLUCTUATION - Rates quoted by the contractor shall be firm throughout the currency of the contract (including extensions of item, if any, granted & will not be subject to any fluctuation due to variation in cost of materials/labour).

7. The C.E. reserves the right to increase or decrease &/or revise the scopes of contract if required at his own discretion & the decision of the Dy. Chief Engineer in this respect shall be final & binding to the contractor. No claim what so ever from contractor on this account will be entertained.
8. **WORK TO BE COMPLETED WITH CIVIL WORK** – The work involved in this contract shall be completed along with civil work. If any extensions to the civil work is granted or if civil work gets extended beyond its expected date of completion for any reason what so ever & for any period of time a corresponding extensions of time will be granted to the Sanitary contractor for completion of his work. No claims whatsoever by the sanitary contractor on account of any delays in the completion of the civil work will be entertained by the C.E.
9. Contractor shall be required to extend the maximum co-operation to the other contractors like those involved in of civil work, electrical work, road work etc.
10. The work involved calls for a high standard of workmanship combined with speed.
11. The contractor shall have to carry out all ancillary & connected works within the boundary of the plot of the proposed work & inside the building if ordered to do so by the Dy. Chief Engineer at the rates quoted in the schedule of quantities, at any time during the currency of this contract including extension of times, if any granted.
12. **SAMPLES** – The contractor shall at his own cost, furnish at the earliest possible opportunity before work commence any samples of materials or workmanship that may be called for by the Executive Engineer for his approval & any further samples in case of rejection until such samples are approved. Such samples when approved shall be the minimum standard for the work to which they apply. Rates quoted shall cover for such preliminary work, which shall not be paid for separately.
13. The executive Engineer reserves the right to fix the order in which the various items of work involved in this contract are to be executed & contract shall comply with the same. There shall be no extra claims on account of this.
14. Contractor should ensure that each & every quoted rate is workable & self supporting. If called upon by the Dy. Chief Engineer detailed analysis of any or of all rates shall be submitted. The Dy. Chief Engineer not bound to recognize contractor's analysis & reserves the right to reject abnormal rates quoted by the contractor. In case there are inconsistencies in the rates for items of same schedule of quantities the lowest of such rates will be considered as the rate for all such items, unless Dy. Chief Engineer finds that there justifications for such inconsistent rates.
15. All work shall conform to the description given for each of the items, in addition to the bye-laws of the Municipality/ Public Health Authority within whose jurisdiction the items are to be executed. Contractor shall obtain approval to drainage & water supply work & work shall be considered as complete only when the contractor produces "No objection & completion Certificate" from the Municipal/ Public health Authorities. Rates quoted shall include for the same.
16. All sanitary & plumbing work shall be carried out through licensed plumbers, as per the bye-laws & regulations of the concerned Municipal Authorities.

The contractor shall complete all the formalities of local/Municipal Authorities in respect of the work covered under this tender including getting the water supply & drainage plans approved. After completion of work the contractor shall obtain the drainage & water supply completion certificate including water sufficiency certificates from the Municipal Authorities. No charges whatsoever, either professional of Municipal including any deposit of any other charges required to be paid for getting the materials tested & approved from the Municipal Authorities etc. obtaining permission, certificates etc. will be paid to the contractor & the rates should be based accordingly.

17. All joints in piping shall be made properly so as to be mechanically sound & leak proof & shall satisfy water & smoke test. Leaking or sweating joints shall be remade to Executive Engineer's satisfaction at contractor's expense.
18. Rates quoted shall allow for the following :-
 - a) Excavation in all types of soils except in hard rock, refilling & carting away surplus materials to contractor's own dump or as directed, for manholes inspection chambers, gully traps water supply & drainage lines & appurtenances.
 - b) All subsidiary fastenings, fittings & fixtures required even though they may not have been specifically described under particular items.
 - c) All fittings fixed to walls will have approved clamps fixed to wooden plugs.
 - d) Two coats of approved ready mixed paint over red oxide primer to all exposed iron or wood work including C.I. brackets, G.I. pipes & C.I. pipes. All G.I. pipes whether laid in ground or concealed in walls or floors shall be coated with bitumen, wrapped with Hessian & again coated with bitumen. All C.I. pipes fixed in chases or concealed in floors shall be given three coats of white zinc or any other colour over a red oxide primer. Lead pipes shall be painted in similar manner as C.I. or G.I. pipes. A.C. pipes shall be painted to match the surrounding finish.
 - e) Making holes through concrete/masonry, making good the work & re-doing & plastering the same to match the surroundings.
 - f) For all pipes, rates shall be inclusive of all fittings & specials such as couplings, bends, unions, sockets, shoes, cleaning eyes, tees, plugs, reducers, offsets etc. & making joints & connections to valves, tanks pumps & existing pipe lines etc. as required.
 - g) Cutting chases for concealing pipes in wall & floors & making good with cement plaster.
 - h) Fixing of drainage pipes & rain water pipes 5cm away from the wall by means of holder bats fixed to wooden plugs.
 - i) Rates quoted shall include for hoisting to & work at all levels & lift of materials shall not form any criterion for any extra claims.
 - j) Cutting into existing manholes/chamber above the invert level of the existing drain but without drop arrangements & not disturbing existing benching of manhole/chamber including making good the same.
 - k) Disinfection & flushing of water supply mains as directed.

I) Testing the installations by smoke & water test.

19. The contractor shall be responsible for the adequacy & efficiency of the entire plumbing system & if in his opinion he finds any serious objections to the system shown on the drawings he shall get forth his objection of his suggestion to ensure adequacy & efficiency of the said system & notify the Dy. Chief Engineer before proceeding with the works.
20. The work should be executed simultaneously with completion of the General Building work & the contractor shall take care to see that no damage or breakage is done to work once it is constructed & finished. The sanitary work should be so adjusted that it does not hold up the general construction or other contractor's works.
21. All the sanitary ware & fittings shall be white glazed vitreous china of approved make.
22. Unless otherwise specified pipes for water supply shall be "Medium" quality galvanized steel tubing (b class) of approved make, welded & seamless & socketed.
23. All C.I. pipes & fittings shall be of heavy quality & approved make.
24. Plumbers brass work or gunmetal valves & fittings shall be of heavy quality & of approved make with tested ISI mark. All sanitary appliances, pipes, & fittings shall be of approved make & brand as per list of approved makes brand of materials mentioned else where in the tender.
25. Rates for items with excavation shall include for shoring, timbering, strutting etc. for protection of excavated sides, bailing, out water due to rains of subsoil water of encountered & dewatering by pump wherever required until all work below water level is finished to the satisfaction of the E.E.
26. The proportion of mixes for concrete work is by volume, cement shall not however be measured by volume, but shall be measured by weight. One bag of cement containing 50kg. of cement shall be assumed to contain 35 lit. (1.20 Cft.) Unless otherwise specified, ordinary Portland cement shall be used complying with the requirement of latest specifications.
27. Bricks used for construction of manholes, gully trap chambers etc. shall be table moulded & from approved source. Bricks shall be well burnt, first quality, having regular shape with sharp corners & edges. It shall not absorb water more than 20% of the its own weight when dry.
28. The thickness of plaster where specified is the minimum thickness required over the proudest part of the wall & all dubbing out shall be included in the rates quoted. Sand for mortar & plaster shall be clean, free from salt, loam, clay, shells, vegetable matter & fit for use in the opinion of the E.E.
29. Cement waterproofing compound wherever mentioned shall be of approved make & used as per manufacturer's specifications, the rates quoted for items where water proofing compound is specified shall include for the same.
30. The contractor shall obtain all necessary permission, fill up all the requisitions, test reports etc. He shall include all such costs incidental to the work. The contractor shall obtain drainage completion certificate & water sufficiency certificate from the authorities without any obligation.

31. C.P. shall mean Chromium Plated.
R.C.C. shall mean Reinforced Cement Concrete.
P.C.C. shall mean Plain Cement Concrete.
C.I. shall mean Cast Iron.
G.I. shall mean Galvanized Iron.
A.C. shall mean Asbestos Cement.
P.V.C shall mean (Unplasticised) Polyvinyl Chloride.
I.S.I. shall mean Indian Standard Institutions.
W.C. shall mean Water Closet.
I/C shall mean Including.
P/F shall mean Providing & Fixing.

SCHEDULE OF QUANTITIES

Schedule of quantities is attached separately

BID PAGE FOR QUOTING RATES

Bid Page for quoting percentage rates by the bidders is attached separately.