E -Tender Document

RESTORATION REFURBISHMENT AND UPGRADATION OF EXISTING LABORATORY BUILDING FOR MPCB's AT MAHAPE, NAVI MUMBAI.

Tender No.:- MPCB/EE/01/25 date – 04/03/2025

Maharashtra Pollution Control Board

Kalpataru Point, 3rd& 4thFloor, Sion Matunga Scheme Road No.8

Opp.SionCircle,Sion (East), Mumbai-400 022

Website:http//:mpcb.gov.in

Price: Rs. 3540/- (Inclusive taxes)

(Non-Refundable)

(2025 – 2026)

Maharashtra Pollution Control Board

Kalpataru Point, 3rd& 4thFloor, Sion Matunga Scheme Road No.8
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Tender Notice

1) Tender Notice Details

Tender Reference no.	MPCB/EE/01/25 Date : 04/03/2025
Name of Work / Item	**Restoration refurbishment and upgradation of existing laboratory building for MPCB's at Mahape, Navi Mumbai.**
Cost of blank tender document & Mode of Payment	**Rs. 3,540 incl. GST /- (Rupees Three Thousand Five Hundred Forty Only) (Non Refundable) to be paid through Online Payment Mode i.e. Net Banking during Tender Document Download Stage.**
EMD Amount & Mode of Payment	**Rs.15,00,000/- (Rupees Fifteen Lakhs Only) to be paid through Online Payment Modes i.e. Net Banking during Bid Preparation Stage.**
Date ,Time and Place of Pre Bid Meeting	**11th March. 2025 15:00** Hrs at MPCB Conference Hall,Kalpataru Point, 4th Floor, Sion Matunga Scheme Road No.8,Opp. Sion Circle. Sion (E), **Mumbai-400 022**
Completion Period Of Project	**08 Months**
Venue of online opening of tender	MPCB Conference Hall, Kalpataru Point, 4th Floor, SionMatunga Scheme Road No.8, Opp. Sion Circle,Sion (East), **Mumbai - 400 022**
Address for Communication	Member Secretary MPC Board, Kalpataru Point, 4th Floor, SionMatunga Scheme Road No.8, Opp. Sion Circle,Sion (East), **Mumbai - 400 022**
Contact Telephone	Tel.No. - 022- 24045589 Email - ee@mpcb.gov.in
e-Tendering Helpline Support:	***24 X 7 Help Desk Toll Free No.*** **0120-4001 002, 0120-4001 005, 0120- 4493395**

2) E – TENDER TIME SCHEDULE (25 days)

Please Note: All bid related activities (Process) like Tender Document Download, Bid Preparation, and Bid Submission will be governed by the time schedule given under Key Dates below:

Sr. No	Activity	Start		Expiry	
		Date	Time	Date	Time
1	Release of Tender	04-03-2025	11.00	04-03-2025	17.00
2	RFP Document Download	04-03-2025	11.01	25-03-2025	17.00
3	Last date of Submission of Pre-Bid Quries	04-03-2025	11.01	10-03-2025	17.00
4	Pre – Bid Meeting	11-03-2024 15.00 hrs			
5	Bid Submission	04-03-2025	11.01	26-03-2025	15.00
6	Technical Qualification opening	27-03-2025	15.05	27-03-2025	15.05
7	Commercial Bid Opening	To be announce later			

Please Note: All bid related activities (Process) like Tender Document Download, Bid Preparation, and Bid Submission will be governed by the time schedule given under Key Dates below:

Dates mentioned here, are scheduled dates for Bid Opening Activities. Any changes in dates of opening of technical and commercial bids shall be notified in 'Press Notice / Corrigendum' section on the e-Tendering sub portal of the department before opening of the same.

3) INSTRUCTION TO BIDDERS

3.1 General Instruction: -

Maharashtra Pollution Control Board Invites E – tenders **for Restoration refurbishment and upgradation of existing laboratory building for MPCB's at Mahape, Navi Mumbai.**

The bidders are requested to familiarize themselves with the use of the e - Tendering portal of Government of Maharashtra well in advance.

To view- Tender Notice, Detailed Time Schedule, Tender Document for this Tender and Subsequently purchase the Tender Document and its supporting documents, kindly visit following e-Tendering website of Government of Maharashtra www.mahatenders.gov.in

The Contractors/suppliers participating first time for e-Tenders on GoM e-tendering portal will have to complete the Online Registration Process for the e-Tendering portal. A link for enrollment of new bidders has been provided on https://mahatenders.gov.in/nicgep/app;jsessionid=CA1444774BB4186D0E04B4178D5CA501.mhgeps2?page=BiddersManualKit&service=page

All bidders interested in participating in the online e-tendering process are required to procure Class II or Class III Digital e-Token having 2 certificates inside it, one for Signing/Verification purpose and another for Encryption/Decryption purpose. The tender should be prepared & submitted online using individual's Digital e-Token.

Empanelment: The Contractors interested in participating in the Tenders of Maharashtra Pollution Control Board processed using the Electronic Tendering System shall be required to enroll on the Electronic Tendering System to obtain Login ID and password. The Contractors may obtain the necessary information on the process of enrolment either from Helpdesk support team or enrolled directly on Web site www.mahatenders.gov.in.

E -Tendering Tool Kit for Bidders (detailed Help documents, designed for bidders) has been provided on Maha e tender website in https://mahatenders.gov.in/nicgep/app;jsessionid=CA1444774BB4186D0E04B4178D5CA501.mhgeps2?page=BiddersManualKit&service=page order to guide them through different stages involved during e-Tendering such as online procedure for Tender Document Purchase, Bid Preparation, Bid Submission.

Bidders will have to pay cost of **Tender Document** through online modes of payment such as **Net Banking only** during **Tender Document Download stage**. This payment will not be accepted by the department through any offline modes such as Cash, Cheque or Demand Draft.

Similarly, Bidders will have to pay **Earnest Money Deposit** through online modes of payment such as Net Banking only during Bid Preparation stage. This payment will not be accepted by the department through any offline modes such as Cash, Cheque or Demand Draft.

The interested contractors / bidders will have to make online payment (using net banking) of Rs. **3540/-** (inclusive of all taxes) per bid per tender to online service provider of e-Tendering system at the time of entering **Online Bid Submission** stage of the tender schedule.

For any assistance on the use of e-Tendering system, the Users may call the below number: ***24 X 7 Help Desk Toll Free No.*** **0120-4001 002, 0120-4001 005, 0120- 4493395**

For a bidder, online bidding process consists of following 3 stages:

1. Online Tender Document Purchase and Download
2. Online Bid Preparation
3. Online Bid Submission

All of 3 stages are mandatory in order for bidders to successfully complete Online Bidding Process.

4) <u>TENDER DOCUMENT PURCHASE AND DOWNLOAD:-</u>

4.1. The tender document is uploaded / released on Mahaetenders website www.mahatenders.gov.in. Tender document and supporting documents may be purchased and downloaded from above link of Mahaetender site GoM, by making payment through Online Payment Modes i.e. Net Banking Only.

4.2. If for any reason a bidder fails to make this payment through online modes, system won't allow the bidder proceed further for next stage resulting in his/her elimination from Online Bidding Process.

4.3. This payment will not be accepted by the department through any offline mode such as Cash, Cheque or Demand Draft.

4.4. Subsequently, bid has to be prepared and submitted online ONLY as per the schedule.

4.5. The Tender form will be available online only. Tender forms will not be sold / issued manually from **Maharashtra Pollution Control Board (MPCB)** office.

4.6. The bidders are required to download the tender document within the pre-scribed date & time mentioned in online tender schedule. After expiry of the date and time for tender document download, Department / Corporation will not be responsible for any such failure on account of bidders for not downloading the document within the schedule even though they have paid the cost of the tender to the Department / Corporation. In such case the cost of the tender paid by the bidders will not be refunded.

5) PREPARATION & SUBMISSION OF BIDS:-

Both the Bids (Technical as well as Commercial) shall have to be prepared and subsequently submitted online only. Bids not submitted online will not be entertained.

6) ONLINE BID PREPARATION PRICE BID:-

All commercial offers must be prepared online in given BoQ format (An online form will be provided for this purpose in Online Price Bid Envelope during **Online Bid Preparation** stage).

Online Bid Submission

In this stage, bidders who have successfully completed their Bid Preparation stage are required to submit the bid in prescribe time schedule.

INSTRUCTION TO BIDDERS FOR ONLINE BID PREPARATION & SUBMISSION

Bidders are required to pay Earnest Money Deposit (if applicable to them) through Online Payment modes i.e. **Net Banking only** during Bid Preparation Stage.

If for any reason a bidder fails to make this payment through online modes, system won't allow the bidder to complete Bid Preparation stage resulting in his/her elimination from Online Bidding Process.

Hence, it is strongly recommended to bidders to initiate this payment well in advance prior to expiry of Bid Preparation stage in order to avoid elimination from Online Bidding Process on grounds of failure to make this payment.

During the activity of **Bid Preparation**, bidders are required to upload all the documents of the technical bid by scanning the document sand uploading those in the PDF format. This a part, bidders will have to quote commercial offer for the work / item as per the format given, for which bids are invited, in an online form made available to them in Commercial Envelope. This activity of **Bid Preparation** should be completed within the pre-scribed schedule given for bid preparation.

After **Bid Preparation**, the bidders are required to complete **Bid Submission** activity within prescribed schedule without which the tender will not be submitted.

The date and time for online preparation followed by submission of envelopes shall strictly apply in all cases. The tenderers should ensure that their tender is prepared online before the expiry of the scheduled date and time and then submitted online

before the expiry of the scheduled date and time. No delay on account of any cause will be entertained. Offers not submitted online will not be entertained.

If for any reason, any interested bidder fails to complete any of online stages during the complete tender cycle, department shall not be responsible for that and any grievance regarding that shall not been tertained.

Any amendment to the tender will be placed on sub portal of the Department, who have invited the bids, on Maha e-tendering portal. The tenderer will not be communicated separately regarding the amendment.

OPENING OF BIDS:

The bids that are submitted online successfully shall be opened online as per date and time given in detailed tender schedule (if possible), through e-Tendering procedure only in the presence of bidders (if possible). Bids shall be opened either in the presence of bidders or its duly authorised representatives. The bidder representatives who are present shall sign are gister evidencing their attendance. Only one representative per applicant shall be permitted to be present at the time of opening the tender

7) TECHNICAL BID:-

This envelope shall be opened online as per the date and time given in detailed tender schedule (if possible), through e-Tendering procedure only,

.

The technical bid consist of following Documents:

Sr. No	List of Document	Compulsory (C) / Additional (A)
	Pre-Qualification Documents to be submitted as per schedule – I:	
1	The Contractor shall submit experience certificate for execution of single Civil, Structural Glazing (Façade), Waterproofing, Interior, Electrical & HVAC with allied services works in Metropolitan cities in Maharashtra of similar nature consisting of Civil, Structural Glazing (Façade), Waterproofing, Interior, Electrical, HVAC & Allied works not less than Rs. 24 Crores OR Two similar works not less than 18 Crores Or Three similar works not less than 12 Crores in any Government/ Semi Government Department / PSU/ local bodies such as MPCB/MJP/CIDCO etc in last seven financial years signed by an officer not below the rank of Executive Engineer OR Similar works in Private Offices in last seven years signed by the Client not below the rank of Director.(Note: The weightage of costing for private works executed shall be considered 50% ie If the party has executed private work worth 100 lacs , then the same shall be considered as 50 lacs for the purpose of evaluation.)	**C**
2	Professional Tax Registration Certificate for employees in E category for tenders without PQ and both i.e. 'E' & 'R' category for tenders where PQ is applicable.	**C**

3	Registration Certification with GST Tax Deptt. under GST Act 2017, of Govt. of Maharashtra.	**C**
4	Income Tax Returns for last 3 years & Certified copy of PAN card	**C**
5	The photo copies duly attested, of the above certificates will have to be uploaded in Envelope No.1. Original shall be produced in the office of for verification on the day of opening of the tender as mentioned elsewhere	**C**
6	Contractor need to submit the Undertaking for accepting all the tenders terms & condition on stamp paper as per the Format on page no. 47	**C**
7	Contractor shall do a Site Visit which is Compulsory till a specific date & time	**C**
8	Pre-Bid Meeting is Compulsory to attend, and contractor shall upload minutes of Pre-bid meeting. During the meeting agency has to submit the tender purchase payment receipt.	**C**

8) COMMERCIAL BID:-

All commercial offers must be prepared online (An online form will be provided for this purpose in Online Commercial Envelope (C1), during **Online Bid Preparation** stage).

Any bidder should not quote his offer anywhere directly or indirectly in Technical Envelope (T1), failing which the Commercial Envelope (C1) shall not be opened and his tender shall stand rejected.

Note: During Online Bid Preparation stage, bidders are allowed to make any changes or modifications in the bid data uploaded by them in Technical (T1) as well as Commercial (C1) envelope

Towards the end of Bid Preparation, once verification of EMD payment is successful, bidder completes the Bid Preparation stage by generating the Hash Values for T1 and C1. Post this, system won't allow him/her to make any further changes or modifications in the bid data.

9) TECHNICAL ENVELOPE (T1):-

First of all, Technical Envelope of the tenderer will be opened online through e-Tendering procedure to verify its contents as per requirements.

At the time of opening of technical bid the tenderer should bring all the original documents that have been uploaded in the Online Technical Envelope (T1) so that same can be verified at the time of opening of technical bid.

If the tenderer fails to produce the original documents at the time of opening of technical bid then the decision of the committee taken on the basis of document uploaded will be final and

binding on the tenderer.
If the various documents contained in this envelope do not meet the requirements, a note will be recorded accordingly by the tender opening authority and the said tenderer's Commercial Envelope will not be considered for further action but the same will be recorded. Decision of the tender opening authority shall be final in this regard.

The right to accept or reject any or all tenders in part or whole without assigning any reason thereof is reserved with Tender Opening Authority and his decision(s) on the matter will be final and binding to all.

The commercial bids shall not be opened till the completion of evaluation of technical bids.

The commercial Bids of only technically qualified Bidders as mentioned above will be opened.

10) COMMERCIAL ENVELOPE (C1):

This envelope shall be opened online as per the date and time given in detailed tender schedule (if possible), through e-Tendering procedure only.

11) Final List of Commercial Documents to be uploaded Online:
The following documents related to commercial envelope should be uploaded by the bidders in the form of PDF Files in the same order as mentioned below, on the e-Tendering website during **Online Bid Preparation** stage.

15 SUBMISSION OF TECHNICAL BID: COVER - 1

15.1 CRITERIA FOR MINIMUM ELIGIBILITY AND BID RESPONSIVENESS:
The Bidder shall fulfill all of the following Minimum Eligibility Criteria to participate in the bidding process. The Bidder should provide necessary documentary evidences of compliance as follows. Failure to do so for any of the Criteria mentioned below shall result in disqualification of the Bidder.

The Contractor shall submit experience certificate for execution of single Civil, Structural Glazing (Façade), Waterproofing, Interior, Electrical & HVAC with allied services works in Metropolitan cities in Maharashtra of similar nature consisting of Civil, Structural Glazing (Façade), Waterproofing, Interior, Electrical, HVAC & Allied works not less than Rs. 24 Lakhs OR Two similar works not less than 18 lacs Or Three similar works not less than 12 lacs in any Government/ Semi Government Department / PSU/ local bodies such as MPCB/MJP/CIDCO etc in last seven financial years signed by an officer not below the rank of Executive Engineer OR Similar works in Private Offices in last seven years signed by the Client not below the rank of Director.(Note: The weightage of costing for private works executed shall be considered 50% ie If the party has executed private work worth 100 lacs , then the same shall be considered as 50 lacs for the purpose of evaluation.).

Professional Tax Registration Certificate for employees in E category for tenders without PQ and both i.e. 'E' & 'R' category for tenders where PQ is applicable.

Registration Certification with GST Deptt. under GST Act 2002, of Govt. of Maharashtra.

Income Tax Returns for last 3 years & Certified copy of PAN card

The photo copies duly attested, of the above certificates will have to be uploaded in Envelope No.1. Original shall be produced in the office of for verification on the day of opening of the tender as mentioned elsewhere

Contractor need to submit the Undertaking for accepting all the tenders terms & condition on stamp paper.

Contractor shall do a Site Visit which is Compulsory till a specific date & time

Pre-Bid Meeting is Compulsory to attend, and contractor shall upload minutes of Pre-bid meeting. During the meeting agency has to submit the tender purchase payment receipt.

15.2 TECHNICAL BID: EVALUATION CRITERIA & PROCESS

The Bidder shall necessarily submit in Cover 1 of the Bid Document, the Technical Bid detailing his credentials for executing this project and the highlights of the equipment & services offered by him with respect to scope of work defined in the Bid Document and the benefits that would accrue to MPCB. The Screening Committee appointed for this purpose will do this evaluation. The Technical Bid will contain all the information required to evaluate the bidder's suitability to MPCB for the purpose of this project.

The guidelines for evaluation have been designed to facilitate the objective evaluation of the Technical Bid submitted by the bidder. The information furnished by the bidders in the technical bid shall be the basis for this evaluation. In case any of the information is not made available, the Committee will assign zero (0) marks to that item.

While evaluating the Technical Bid, MPCB reserves the right to seek clarifications from the Bidders. Bidders shall be required to furnish such clarifications in a timely manner.

MPCB also reserves the right to seek additions, modifications and other changes to the submitted Bid. Bidders shall be required to furnish such additions / modifications / other changes in a timely manner.

15.2.1 Evaluation of Technical Bid

The technical evaluation of the bidders will be done based on the criteria and marking system as specified as follows:

Sr. No	Criteria	Graded Marks	Max. Marks	Testimonial to be presented
1	Civil / Interior / Structural Glazing (Façade) jobs executed during last seven (7) years for Government/Semi Government/PSU and Private offices in metropolitan cities in Maharashtra (Note: The weightage of costing for private works executed shall be considered 50% ie If the party has executed private work worth 100 lacs, then the same shall be considered as 50 lacs for the purpose of evaluation)			
	Civil / Interior / Structural Glazing (Façade) with Electrical & Allied Services (MEP) jobs executed for Commercial / Educational / Hospital / Laboratory building			
i	Civil / Interior / Structural Glazing (Façade) works for office building (value bet. Rs. 24 Cr to 30 Cr in each case)		**15**	Copies of the orders executed in the designated period
	Upto 2 Nos	5		
	Upto 4 Nos	10		
	Over 4 Nos	15		
ii	Interior works for offices (Area of job executed in Sqft)		**15**	Copies of Work order
	Upto 30000 sqft	5		
	Upto 42000 sqft	10		
	above 42000 sqft	15		
2	Laboratory / Hospital building (value bet. Rs. 10 Cr to 15 Cr in each case)		**5**	Copies of Work order
	Upto 2 Nos	3		
	above 2 Nos	5.0		

Sr. No	Criteria	Graded Marks	Max. Marks	Testimonial to be presented
3	Electrical and Allied services works executed (MEP Works)		**10**	Copies of Work order
	400 lakhs x 3 project	5		
	500 lakhs x 2 project	7.5		
	700 lakhs x 1 project	10		
4	Establishment of the firm in Mumbai and Navi-Mumbai (Max. 5 Marks)		**5**	Documentary evidence to be attached
	Upto 10years	2		
	Upto 15 years	3		
	Upto 20 years	5		
5	Work in hands of Civil / Interior / Structural Glazing (Façade), jobs for Government/Semi Government/PSU and Private offices in metropolitan cities in Maharashtra (Note: The weightage of costing for private works executed shall be considered 50% ie If the party has executed private work worth 100 lacs, then the same shall be considered as 50 lacs for the purpose of evaluation) (value bet. Rs. 24 Cr to 30 Cr in each case)			
	Civil / Interior / Structural Glazing with Electrical & Allied Services (MEP) jobs executed for Commercial / Educational / Hospital / Residential / Laboratory building		**5**	Documentary evidence to be attached
	Upto 2 Nos	2		
	Upto 4 Nos	3		
	Over 4 Nos	5		
6	Annual turnover of during last three years (information must be supported with latest income tax certificate / Audited balance sheets)		**10**	Certificate from CA
a	Turnover of 3000 to 5000 lacs	5		
b	Turnover of more than 5000 to 7500 lacs	7.5		
c	Turnover of above 7500 lacs	10		

Sr. No	Criteria	Graded Marks	Max. Marks	Testimonial to be presented
7	Net Worth (In case of companies)/ Capital (in case of Partnership Firm or LLP) (Information must be supported with latest income tax certificate / Audited balance sheets)		**5.0**	Certificate From CA
a	Up to Rs. 10 Crores	1.5		
b	Above 10 Crores but Below 15 Crores	3.0		
c	Above 15 Crores	5.0		
8	Working Capital (Current Assets - Current Liabilities) (Information must be supported with latest income tax certificate/ Audited balance sheets)		**5.0**	Certificate From CA
a	Up to Rs. 4 Crores	1.5		
b	Above 4 Crores but Below 8 Crores	3.0		
c	Above 8 Crores	5.0		
9	Permanent employee strength of the party(should be working in the firm from past 4 years)		**5**	
	Upto 50 Nos- Maximum of 40 nos permanent employees and 10 Engineering/Administration staff	3		Salary register/ Bank payment statement
	Above 75 Nos- Minimum of 60 nos permanent employees and 15 Engineering/Administration staff	5		
10	Constitution of the Firm		**10**	Documentary evidence to be attached
	Pvt Ltd Company	10		
	Partnership Firm	7.5		
	Proprietorship Firm	5		
11	Technical presentation by the prospective Bidder	5	**5**	A presentation has to be made by the Bidder to Client/Consultant/Architect show the project completion chart, company profile, planning of work etc. Supporting work completion certificates, catalogues and brochures to be submitted high lighting the technical aspects

				and below mentioned required points.
12	Safety		**5**	
	To ensure the highest standards of safety in project execution, it is mandatory for the contractor to demonstrate a minimum of 2 million safety man-days worked in past projects. This requirement aims to verify the contractor's experience and commitment to maintaining a safe working environment. The contractor must provide documented proof, such as safety records or certificates from previous projects, to substantiate this claim. Compliance with this criterion will be a key factor in the evaluation of the tender.	5		Documentary evidence to be attached

Each responsive Bid will be attributed a technical score denoted by symbol "S(t)".

The technical score shall be out of a maximum of 100 marks.

If in MPCB's opinion, the Technical Bid does not meet the minimum technical criteria or is otherwise materially deficient / inconsistent in any other aspect; the Bid shall be declared Technically Evaluated & Non-Responsive and shall not be considered for further evaluation.

After technical evaluation, MPCB will rank the bidders in descending order of their technical scores with the top ranked bidder having the highest technical score. If any bidder is found to be technically inadequate to the requirements of MPCB, i.e. if the technical marks are lower than 70, then that bidder's bid would be deemed non-responsive for further evaluation and would not be considered further in the bidding process.

If in case, after technical evaluation, only one bidder is found to be responsive & eligible, i.e. if the technical marks of only one bidder are more than or equal to 80, the Board will decide an acceptable price band and open Price Bid of the only eligible bidder. If the price bid of the bidder falls within the price band specified by the Board, the bidder will be declared as the SUCCESSFUL BIDDER.

16.0 EVALUATION OF PRICE BID: COVER 2

16.1 PRICE BID PARAMETERS

Bidders are required to offer their best prices in terms of cost of the work including all taxes and levies as on the last date of submission of bid (detailed break-up of all applicable taxes and levies over and above the quoted price should be mentioned)

16.2 EVALUATION OF PRICE BIDS AND RANKING

The price bids of only technically successful bidders whose technical Bids have been awarded 70 or more marks by the Committee will be opened.

The evaluation will be carried out if Price bids are complete and computationally correct. For the purpose of evaluation, only the Grand Total Price Z arrived at by addition of Sub Total X & Sub Total- Y will be considered. For the purpose of arriving at Grand Total Price Z, the locations to be covered under implementation priority -1 will only be considered. Additional and/or optional charges if any will not be considered for the purpose of price bid evaluation. Lowest Price bid (denoted by symbol "P (m)") will be allotted a Price score of 100 marks. The Price score will be denoted by the symbol "S (p)". The Price score of other bidders will be computed by measuring the respective Price bids against the lowest bid.

These Price scores will be computed as: S (p) = 100 * (P (m) / P) where P is the Price bid of the bidder whose Price score is being calculated. The Price score shall be out of a maximum of 100 marks.

16.3 COMPUTING THE FINAL SCORE

The composite score is a weighted average of the Technical and Price Scores. The weightages of the Technical vis-à-vis the Price score is 0.70 of the Technical score and 0.30 of the Price score. The composite score (S) will be derived using following formula:

S = (S (t) * 0.70) + (S (p) * 0.30).

Thus the composite score shall be out of a maximum of 100 marks.

The responsive bidders will be ranked in descending order according to the composite score as calculated based on the above formula. The highest-ranking vendor as per the composite score will be selected. However, in order to ensure that MPCB gets best solution in technical terms, MPCB reserves the right to enter into negotiation with bidder having highest technical score and place order with this bidder at a suitable price.

16.4 AWARD CRITERIA

Final choice of MPCB to award this project to a suitable bidder to execute this project shall be made on the basis of composite scoring arrived as per formula mentioned above.

16.5 NOTIFICATION OF AWARD

MPCB will notify the successful bidder in writing that his bid has been accepted. Upon the successful bidder's furnishing of performance security, MPCB will promptly notify each unsuccessful bidder and will discharge their bid security.

GENERAL CONDITIONS OF CONTRACT (GCC)

1. **DEFINITIONS AND INTERPRETATIONS:**

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires.

A. The client / Employer shall mean **Maharashtra Pollution Control Board (MPCB)** having its office at Kalpataru Point, Sion Circle – East, Mumbai – 400022 Or any other place as modified subsequently and shall include its Manager or other officers authorized to deal with these presents are concerned on his behalf posted in the any of the Offices of Client and shall also include client's successors and assignees. Wherever the words "Client", "Employer" appear, these shall be deemed to mean MPCB and these words shall convey the same meaning.

B. The Tender shall mean the tender including addendum and drawings submitted by the tenderer for acceptance by Employer.

C. The **Project in-charge** shall mean the Head of the Project of the employer, or his successor in office or authorized representative nominated by the employer.

D. The **Contractor** shall mean the person or persons, firm or company whose tender has been accepted by Client and includes the Contractor's legal representatives, its successors and permitted assigns.

E. The **Sub-contractor** shall mean any person or firm or company (other than the Contractor) to whom any part of the work has been entrusted by the Contractor, with the written consent of the Consultants & / or the legal representatives, successors and permitted assigns of such person, firm or company.

F. The **Architect / Consultants** shall mean M/s. ARK Designs Pvt. Ltd. or any other consultant / the person nominated by the employer from time to time and shall include those who are expressly authorized by the client to act for and on his behalf for all functions pertaining to operation of this Contract.

G. **Consultant's Representative** shall mean any Engineer or Architect of the Consultants appointed from time to time to perform the duties set forth in the Tender Document whose authority shall be notified in writing to the Contractor.

H. The Works shall mean and include all works to be executed in accordance with the Contract or part there of as the case may be and shall include all extras, addition, altered, or substituted works as required for the purpose of the Contract.

I. The Contract shall mean the agreement between the client and the Contractor for the execution of the works including there in all documents such as the invitation to Tender, Instructions to Tenders, General and Special Conditions of Contract, Specifications, General Requirements, addendum, Time Schedule of Completion of Job, Drawings, Letter of Intent awarding the work, Agreed Variations, if any etc.

J. The Contract **"Document**" shall mean collectively the Tender Documents, addendum if any, Designs, Drawings, Specifications, agreed variations if any and other documents constituting the E-Tender and acceptance thereof.

K. **Construction Plant** shall mean all appliances or things of whatsoever nature required in or about the execution, completion or maintenance of the works or temporary works (as hereinafter defined) but does not include materials or other things intended to form or forming part of the permanent work.

L. **Temporary Works** shall mean all temporary works of every kind required in or about the execution, completion or maintenance of the works.

M. **Specifications** shall mean all directions, various technical specification, provisions and requirements attached to the Contract, which pertain to the method and manner of performing the work or works to the quantities and qualities of the work or works and the materials to be furnished under the contract for the work or works, as may be amplified or modified by the client or the Consultants during the performance of Contract in order to provide for the unforeseen conditions or in the best interest of the work or works. It shall also include the latest edition including all addenda/corrigenda of relevant Indian Standard Specifications and other relevant codes.

N. **Plans** shall mean all maps, sketches and layouts as are incorporated in the Contract in order to define broadly the scope and specifications of the work or works and all reproductions thereof.

O. **Drawings** shall include maps, plans and tracings or prints thereof with any modifications approved in writing by the Consultants/ Architects and such other drawings as may, from time to time, be furnished or approved in writing by the Consultants.

P. **Site** shall mean the lands, buildings and other places on, under, in or through which the permanent works are to be carried out and any other lands or places provided by the client for the purpose of the Contract.

Q. **Notice in writing or written notice** shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been noticed) by registered post to the last known private or business address or registered office of the addresses and shall be deemed to have been received in the ordinary course of post it would have been delivered.

R. The **Completion Certificate** in relation to the work shall mean the certificate to be issued by the Consultants /Architects and countersigned by the Representative of client, when the works have been completed to their satisfaction.

S. The **Final Completion Certificate or No dues certificate** in relation to the work shall mean the certificate regarding the satisfactory compliance of the various provisions of the Contract to be issued by the Consultants/ and the Architects countersigned by the representative of client, after the period of defects liability is over. (Defect Liability period is 12 months from the date of completion).

T. **Approved** shall mean approved in writing including subsequent written confirmation of previous verbal approval.

2. Employer‘s decision regarding interpretation of drawings etc., shall be final

In the event of there being any discrepancy, ambiguity or omission or any error or difference of opinion regarding the interpretation or granting of any specification designs, drawings, description or instructions relating to the works to be executed the decision of the Project-in-charge thereon shall be final and binding on the Contractors and the Contractors shall not be entitled to claim any additional or extra payment or claim any other benefit or advantage for the same.

3. Liability of Contractors:

In any case in which any of the power conferred upon Employer shall have become exercisable and the same shall not have been exercised, the non exercisable portion thereof shall not constitute a waiver of any of the conditions thereof and such powers shall not withstanding the same be exercisable in the event of future case of default by the Contractors and the liabilities of the Contractors shall remain unaffected thereby.

4. Completion of Work:

On completion of the works, the Contractors shall be issued the Completion Certificate jointly by the authorized representative of Client and the Consultants, but no such certificate shall be given nor shall the works be considered to be completed until the Contractors shall have removed from the premises in which the work shall have been executed all scaffoldings, surplus materials and rubbish and shall have cleaned of all dirt from such works or other parts of any building in or upon which the work have been executed.

If the Contractors shall fail to comply with the requirement of this clause as to removal of scaffolding, surplus materials and rubbish and cleaning of dirt on or before the date fixed for the completion of the works, the Client may at the expense of the Contractors remove such scaffoldings, surplus materials and rubbish and dispose of the same as it thinks fit and clean of such dirt as aforesaid, and the Contractors shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials aforesaid, except for any sum actually realized by the sale thereof.

5. Extension of time:

If the Contractors shall desire an extension of time for completion of the work on the ground of his having been unavoidably hindered in its execution or on any other ground he shall apply in writing to the Client through the Consultants within 15 days of the schedule date of completion on account of which he desires such extensions as aforesaid and the Client shall if in his opinion (which shall be final) finds reasonable grounds, authorizes such extension of time if any as may deem in his opinion necessary and proper. Any extension of time even if granted shall be without prejudice to Client's right to recover loss or damages suffered from delay in waiver thereof. Any application for extension of time made by the Contractor after the expiry of due date for completion of the work as per Terms of Contract and the Work Order shall not be entertained or be deemed to be valid. The contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not. Liquidated damages at the rates specified in Appendix to form of tender shall be levied on the Contractor for the period of delays attributed to him.

6. Contractors to supply plant, ladders, scaffoldings etc:

The Contractors shall supply at their own cost materials, plant, tools, appliance, implements, ladders cordage, tackle, scaffoldings and temporary works requisite or proper for the execution of the work.

7. Execution of additional work:

The Contractors shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and in every other respect in strict accordance with the specifications. The Contractors shall also conform exactly, fully and faithfully, to the designs, drawings and instructions in writing relating to the work. Any additional work which the Contractors may be directed to do as the part of the original work shall be carried out by the Contractors on the same basis in all respects on which they have agreed to do the main work at the same rates as are specified in the Tender for the main work provided that if any additional or altered work includes any class of work for which no rate is specified in this Contract, then such class of work shall be carried out at the rate mutually agreed upon between the Client/Consultants and the Contractors having regard to the nature of the said work and the rates of the main work. The rate of such item shall be derived on the basis of rate analysis considering prevailing market rates for labour and material and as per CPWD method. The Contractors shall however, have no claim or compensation by reason of any alternations having been made in the original specification etc., which may entail any curtailment of the work as originally contemplated.

8. No compensation for alternation in or reconstruction of work to be carried out:

If at any time after the commencement of the work the Consultants shall, for any reason whatsoever, not require the whole or any part of the work as specified in the Tender to be carried out, the Consultants shall give notice in writing thereof to the Contractors who shall have no claim to any payment of compensation whatsoever on account of any profit or advantages which he may have derived from the execution of the work in full but which he did not derive in consequence of the full amount of work not having been carried out and having been cancelled by the Client. Neither shall they have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall be involve any curtailment of the work as originally contemplated.

9. Work to be done to the satisfaction of the Consultants and Client:

The Contractors shall carry out and complete the work in accordance with this Contract and the directions, in every respect, to the entire satisfaction of the consultants and Client. If the Contractors shall find any discrepancy in or divergence between the Contract, Drawing and/or Schedule of quantities, they shall have to apply in writing for any necessary instructions from the Consultants/client in relation thereto.

10. Defective work and materials:

If at any time before the Security Deposit is refunded to the Contractors it shall appear to Client or the Consultants that any work has been executed with unsound, improper or unskillful workmanship or with materials of inferior quality or not otherwise in accordance with the Contract, it shall be lawful for the Client or the Consultants to intimate this fact in writing to Contractors either in the site order book or by letter thereupon. The Contractors shall be bound forthwith to rectify or remove and reconstruct the work so specified in whole or in part and provide with proper and suitable materials at their own charge and cost to the entire satisfaction of the Consultants. In the event of the Contractors failing to do so within a period to be specified by the Consultants. The Contractors shall be liable to pay compensation at the rate of one percent of work order value per day, not exceeding ten days of the value of the Whole Work Order. In the case of any such failure the Consultants may rectify or remove and re-execute the work or remove and replace with others the materials or articles complained of, as the case may be, at the risk and expense in all respects of the Contractors.

11. Client not to be liable for temporary suspension in work:

The Contractors shall on being so directed by the Consultants postpone any work to be executed under this contract and/or suspended further progress of all or any part of the work and shall not resume execution of the same until they receive written orders from the Consultants to proceed. The Contractors shall not be entitled to claim any payment from Client for damages arising from the postponement or suspension of such work.

12. **Measurement of work to be covered:**

The Contractors shall give at least 15 days notice in writing to the Consultants and their authorized site representatives / Client before covering or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof taken before the said work is so covered or placed beyond the reach of measurement. Without such notice having been given or consent obtained the same shall be uncovered at the Contractors expense, for taking such measurements and dimensions. In default thereof Client shall not make any payment or allowance for such work or the materials with which the same is executed.

13 Measurement / Assessment of work:

All work to be done under this Contract shall be in accordance with the mode of measurement mentioned in the tender. Any item not mentioned in the tender shall be measured as per the procedure laid down in relevant ISI standards (Bureau of Indian Standards - latest edition). Detailed measurements of works carried out shall be taken jointly by the representatives of the client / Consultants, in the presence of the Contractor's representative and final payment will be made as per measured quantities and not as per the tender quantities.

14. Defect Liability Period:

The Contractors has to maintain the work for 12 months after the work has been completed (the date of completion shall be one as recorded in virtual completion Certificate) the

Contractors shall maintain and uphold the same in an efficient condition and shall be bound to remove any omission or defects discovered or appearing in the work during such time as directed by the Consultants. The Security Deposit will be released to the Contractors only after the expiry of the aforesaid period and subject to it being ascertained that there is no defective work or material requiring repairs or maintenance under any conditions herein provided.

If the Contractors or their work people or servants shall break, deface, injure or destroy any part of the building in which they may be working or any building road, kerbs, fence enclosure, water pipes, cables drains, electric or telephone post or the work wires, trees, grass land or cultivated ground contiguous to the premises on which the work or any part of it is being executed or if any damage shall happen to the work, while in progress, from any cause whatsoever, or any imperfection become apparent in it within 24 months after completion date of entire works covered by the works order as indicated in the Final Measurement Certificate, the Contractors shall make the same good at their own expenses or, in default, the Consultants may cause to be made good through alternative means and deduct the expense from any sums that may be then or at any time thereafter may become due to the Contractors, balance Security Deposit / BG for RMD of the Contractors shall not be refunded before the expiry of twenty four months from the completion date indicated in the Completion Certificate.

15. Prevention of fire and insurance of works against fire etc.

The Contractors shall take all measures for prevention of fire to the proposed works building and any other buildings or other structures adjacent there to. Should any injury irrespective of whether it results in death or not to any life or damage to the property occur as a result of Contractors negligence to observe the preventive measures the Contractors shall be held responsible for the consequences thereof. If as a result of any fire the work under construction is in any event lost, damaged or destroyed, then irrespective of whether the Client may have made payment in respect of the said work or not, the Client will be entitled to claim compensation, reimbursement or further amount by reason of such reinstatement to the extent of the insurance money payable under the policy or up to a reasonable extent the cost of such reinstatement, if the cost exceeds the quantum of insurance money payable under the policy as may be considered reasonable by the Consultants.

The Contractors will be required to take out without claim to any extra a proper and effective insurance policy CAR POLICY from any nationalized Insurance Company approved by the Client fully insuring against loss or damage by fire, storm tempest, lightning flood, earthquake, aircraft or anything dropped there from, aerial objects, riots and civil commotion or other risks as indicated by the employer and it's satisfaction for:

(a) CAR POLICY for 125% of the Contract Value. (Contract Value plus 25% of the Contract Value).

(b) Work man compensation policy – 100% of contract value.

(c) Third party Liability - Rs. 50.00 Lakhs

Should the Contractor fail to take out such insurance cover, the Client may itself insure against the said risks and deduct a sum equivalent to the amount paid by the Client towards premium from any moneys due to or become due to the Contractor. The benefit of any such insurance

policy shall be assigned in favor of the Client and such assignment shall be duly registered with said Insurance Company. The Contractor agree that the insurance moneys payable under such insurance policy shall be utilized by Client for reinstating the work affected by such fire or other risk.

The Contractor shall indemnify Client against all claims made against Client by any member of the public or other third party in respect of the works or in consequence thereof and shall at his own expense arrange to effect and maintain until the Completion of the works, a policy of Insurance with an approved office, in the joint names of Client and the Contractor (clients name will appear 1st of the policies) against such risks and deposit such policy or policies with the Client from time to time. All the policies shall be valid till the date of completion and handing over of the work to the Employer.

16. Transfer or assignment of Contract:

This contract shall not be assigned or transferred or sublet in any manner whatsoever without the previous written approval of Client. If the Contractors shall assign or transfer or sublet or attempt to do so, Client may by notice in writing rescind the Contract and in that event the security Deposit of the Contractors shall stand forfeited and be absolutely at the disposal of the Client and the same consequences shall ensure as if this Contract had been rescinded under clause 24 hereof and in addition thereto the Contractors shall not be entitled to recover or to be paid for any work thereto performed under this Contract.

17. Insolvency attempts to bribe etc.:

If the Contractors become insolvent or commence any insolvency proceedings or make any compensation with their creditors or attempt to do so, or if any bribe, gratuity, gift, loan requisites reward or advantage whether pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Contractors or any of their servants or agents to any officer or persons in the employment of Client in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the Contract, Client on behalf of the Chairman shall have the power to adopt any of the courses specified in clause 24 shown as he may deem best suited to the interest of the Bank and in the event of any of these courses being adopted the consequences specified in the said clause 24 shall ensue.

18. Change in Constitution:

Where the Contractors are a Partnership Firm, the previous approval in writing of Client shall be obtained before any change is made in the constitution of the firm. Where the Contractor is an individual or a Hindu Undivided Family business concern, such approval as aforesaid shall likewise be obtained before the Contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the work hereby undertaken by the Contractors. If previous approval as aforesaid is not obtained, the Contractors shall be deemed to have been assigned in contravention of clause mention in contract hereof and the same action may be taken and the same consequence shall ensue as provided in the said Clause in works contract. The Contractors shall hand over to Client a certified true copy of the Deed of Partnership, which is entered into by the Contract or to with Client as evidence of the names of

the partners and of their shares in the said partnership. In the event of the Contractors being a Joint Hindu Undivided Family business concern the Contractor shall also hand over the full names, address and ages of the co-partners or members concerned and duly satisfy Client that such Joint Hindu Undivided Family has authority and power in law to enter into the said Contract. These Documents and particulars aforesaid shall be handed over by the Contractors to Client along with the quotations and offer placed by the Contractors in response to the notice inviting tenders.

19. Engagement of Apprentices:

The Contractor shall during the currency of the Contract when called upon by the Consultants engage and also ensure engagement by subcontractors and other employed by the Contractor in connection with the works, such number of apprentices in the categories mentioned in the Act 1961 and the Rules made there under and shall be responsible for all obligations of the employer under or as required under the said Act.

20. Workmen's Compensation liability:

The Contractors shall be responsible for and pay any compensation as specified in the Workmen's Compensation Act, 1923 and 1933 and amendments thereto for injuries caused to the workmen. The Contractor shall be responsible for and pay the expenses for providing medical treatment to any workmen who may suffer any bodily injury as a result of any accident. The Contractors shall be liable for all payments to their staff, labourers and workmen employed for the performance or carrying out the said work and the Client shall in no event be liable or responsible for any payment and the Contractors shall keep Client indemnified against the same and from all proceedings in respect thereof. The Contractors shall at his own expense effect and maintain during the currency of the Contract, a policy of Insurance with an approved office, in the joint names of Client and the Contractor against risks under the Workmen's compensation Act or any other statute in force during the currency this Contract and Deposit such policy or policies with Client from time to time.

21. In every case in which by virtue of the provisions of Section 12, Subsection (1) of the Workmen's Compensation Act, 1923 Client is obliged to pay compensation to a workmen employed by the Contractors in execution of the works, Client will recover from the Contractors the amount of the compensation under subsection (2) of section 12 of the said Act and Client shall be at liberty to recover such amount or any part thereof by deducting it from the Security Deposit or from any sum due by the Client to the Contractors, whether under this Contract or otherwise. Client shall not be bound to contest any claim made against it under sub-section (1) of Section 12 of the said Act, except on the written request of the Contractors and upon their giving to Client full security for all costs for which Client might become liable in consequence of contesting such claim. The contractor shall also submit an Indemnity Bond to the client on the approved proforma regarding workman compensation.

22. The Consultants may require the Contractors to dismiss or remove from the site of the work any person or persons in the Contractors' employment who in the opinion of the Consultants may be incompetent or misconduct himself or themselves and the Contractors shall forthwith comply with such requirements

23. Indemnity:

The Contractors shall assume all liability for and give to Client a complete indemnity against all actions, suits, proceedings, claim or demands arising out of or in connection with the carrying out of the work by or from any person whomsoever. In this connection the contractor shall submit an Indemnity Bond on the proforma approved by employer covering Indemnity for all claims or demands including workman compensation.

24. Determination of contract on account of abandonment of work:

The Consultants may without prejudice to the rights of Client against the Contractors mentioned in clause of the Agreement or in respect of any delay or inferior workmanship or otherwise or to any claim for damages in respect of any breach of Contract and without prejudice to any rights or remedies under any of the provisions of the Contract or otherwise and whether the date for completion of the works has or has not expired by a notice in writing absolutely, determine the Contract in any of the following cases:

(i) If the Contractor having been given by the Consultants a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner and shall omit to comply with the requirements of such notice for a period of seven days of such notice thereafter or if the Contractor shall delay or suspend the execution of the work with the judgment of the Consultants (which shall be final and binding) they will be unable to secure completion of the work by the date for completion or he has already failed to complete the work by that date.

(ii) If the Contractor being a company shall pass a resolution or the Court shall make an order that the company shall be wound up or if a receiver or a liquidator on behalf of a creditor shall be appointed or if circumstances shall be appointed or if circumstances shall arise which entitle the Court to make a winding up order.

(iii) If the Contractor commits breach of any of the Terms and Conditions of this Contract.

(iv) If the Contractors commit breach of any acts mentioned in clauses 16 to 19 hereof.

When the Contractor have made themselves liable for action under any of aforesaid cases or in any case in which under any Conditions of this Contract the Contractors shall have rendered themselves to forfeiture of their Security Deposit or in cases of abandonment of work by the Contractors for any cause whatsoever, the Consultants on behalf of Client shall have a power to adopt any of the following courses as Client may deem best suited to their own manufacture:

(a) To rescind the Contract (of which recession notice in writing to the Contractor under the hand of the Consultants shall be conclusive evidence) and in that case the Security Deposit of the Contractors shall stand forfeited and be absolutely at the disposal of Client.

(b) To employ labour and to get supply of materials to carry out the work or any parts of works, debiting the Contractors with the cost of the labour and the price of the materials as to correctness of which costs and price of the materials as per the certificate of the Consultants which shall be final and conclusive against the Contractors.

(c) To order that the work of the Contractors be measured by and to take such part thereof as shall be unexecuted out of their hands and to give it to another Contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been payable to the original Contractors if the whole work had been executed by them (as to the amount of which excess of expense, the certificate in writing of the Consultants shall be final conclusive) shall be borne and paid by the original Contractors and shall be deducted from any money due to them by Client under the contract or otherwise or from the Security Deposit or a sufficient part thereof.

In the event of any one or more of the above courses being adopted by the Consultants, Contractors shall have no claim to compensation for any loss sustained by them by reason of their having purchased or procured any materials or entered into any engagements or made any advance on account or with a view to the execution of the works or the performance of Contract. And in case action is taken under any of the provisions aforesaid, the Contractor shall not be entitled to recover or be paid any sum for any work actually performed under this Contract unless and until the Consultants has certified in writing the performance of such work value payable in respect thereof and the Contractors shall be entitled to be paid the value so certified subject to the claims if any of Client against the Contractors.

25. Termination of contract in the event of death of Contractor:

Without prejudice to any of the rights or remedies under this Contract, if the Contractor being an individual dies, the Consultants shall have the option to terminate the contract without any liability on the Client for compensation or damages to the Contractors. Measurement of work done till the death of the Contractor will be recorded by Client which shall be final and binding on the legal representative of the Contractor.

26. Substitution of Contractors:

Client may if desired may take possession of all or any of the machines, tools, plants, materials and stores in or upon the works or the site thereof or belonging to the Contractors or procured by them and intended to be used for the execution of the works or any part thereof by paying or allowing for the same an amount at the Contract rates or in the case of Contract Rates not being applicable at current market rates to be certified by the Consultants and the certificate thereof shall be final. The Contractor shall not have any claim on the materials that have not been actually brought on site of work irrespective of the fact that the Contractor may have purchased the same for use under this Contract. Client shall have also full power by giving notice in writing by the Consultants or through the Consultants to the Contractors or any of their representatives or authorized agents to require them to remove such machines, tools, plants, materials and stores from the premises within time to be specified in such notice and in the event of the Contractor failing to comply with any such requisition the Client may remove them at the Contractor's expenses or sell them by auction or private sale at the risk and on account of the Contractors in all respects and the certificates of the Consultant as to the expenses of any such removal and the amount of proceeds and expense of any such sale shall be final and conclusive.

27. Any breach or violation or non-observance of any of the Terms and Conditions and provisions contained in the agreement or the General Terms or otherwise in relation to the Contract or

Works Order shall be deemed and considered as a breach of the entire Contract and entitle the Client to exercise and enforce the various rights and powers conferred on Client under the Contract.

28. Infringement of Patents:

The Contractor shall assume all liability and fully indemnify and save harmless, Client, their successors or assigns from and against all claims, suits, proceedings, damages, losses, expenses, fees, any royalties, arising from any infringement, real or claimed, of any patent on any articles, machine manufacture, structure, composition, arrangement, improvement, design, device, methods or progress embodied or used in the performance of this contract. The Client and their successors and assigns will give written notice of all such claims and patent infringement suits or proceedings instituted against them to the Contractor who will defend the same and will give the Contractor authority, assistance and all available information to enable them to do so.

29. Escalation:

No escalation is allowed /permitted in quoted rates in the tender the same should be valid at least for completion of the project from the date of awarding the job to the successful contractor.

29A. Contract Agreement:

Contractor shall execute the contract agreement on the proforma given in Annexure I to this document immediately after issue of work order. Employer shall not make any payment to the Contractor before execution of contract agreement.

30. Initial Security Deposit

The Contractors shall within seven days of issue of acceptance letter (LOI) or before the execution of this Agreement deposit with the client a sum of equivalent to 5 % of accepted contract value by demand draft / BG in favour of MPCB. The client shall not be liable to pay any interest to the Contractors on the amount of such Security Deposit and shall hold this amount as a guarantee for timely and proper performance of the said work by the Contractors. The said amount shall be liable for forfeiture in addition to all other rights and remedies which are available to the client under the said General Conditions of Contract. NO FDR will be accepted

31. Retention Money Deposit (RMD)

An amount equivalent to 10% of the value of each interim bill shall be deducted from interim bills of the contractor towards RMD, subject to a maximum limit of 10% of contract value inclusive of Initial Security Deposit.

32. Appropriation of Security Deposits towards The client's Dues.

All sums by way of damages, Compensations or otherwise howsoever and all other sums of money payable by the Contractors to The client under the terms of this Agreement or the said Work Order may be deducted from the cash amount of the Security Deposit or be

realized from the Demand Draft of the Initial Security Deposit lying with The client under this Agreement or from any sums which may be due or may become payable by the client to the Contractors on any account whatsoever and in the event of the Contractor's Security Deposit being reduced by reason of any such deduction or as aforesaid, the Contractors shall, within 15 days thereafter, make good in cash or DD / Government securities approved by The client and endorsed as aforesaid any sum or sums which may have been deducted from, or raised by the DD, cash or Security Deposit or any part thereof. Subject to the other provisions of this Agreement and the General Conditions of Contract relating to the right of the client to retain and deduct any amount that may be due to The client on any Payment for Work done account whatsoever the 50% of total Security Deposit made by the Contractors shall be refunded after the completion of the work in all respects. This date will be the same as indicated in the completion Certificate. Balance 50% of SD (i.e 5% of contract value) retained in cash shall be refunded after completion of defects liability period of 12 months and on issue of final completion certificate. The client on the request of Contractor may release this balance SD (RMD) of 5% against Demand Draft from a nationalized Bank valid for defects liability period of 12 months on the proforma approved by the Client.

33. The client will pay to the Contractors in respect of the said work mentioned in the said contract document on the basis of the rates specified therein at the times and in the manner specified in the said Work Order and/or in the General Conditions of Contract.

34. Manner and period in which the work is to be carried out

The Contractors agree and undertake to duly perform and execute and complete the said work set forth in the contract documents and the subsequent amendments, if any, issued from time to time thereto in the manner authorized by and under the General Conditions of Contract. The said work shall throughout the stipulated period of the Contract be proceeded with all due diligence, promptness, care and accuracy and in a workman like manner to the satisfaction of Consultants and The client and would be completed in accordance with the said Specifications, Designs, Drawings, Schedule of quantities and instructions on or before the due date mentioned in the said Contract agreement, time being the essence of the Contract on the part of the Contractors.

35. Compensation for delay for unfinished work

Without prejudice to the rights and remedies of the client against the Contractors under any of the provisions of this agreement and the General Conditions of Contract or the said Work Order or otherwise if the Contractors commit any default or breach of the Terms and Conditions of this Agreement and/or the General Conditions of the Contract and/or the said Work Order or fail in the due performance thereof within the time fixed by the Contract (which is the essence of the Contract) and do not complete the entire work on the stipulated due date, The client shall be entitled to recover from the Contractors and the Contractors hereby agree to be bound to pay to the client as and by way of Compensation or liquidated damages, an amount calculated at the rate of 1% (1 percent) of the contract value per week or part there of subject to maximum 10 % (Ten percent) of the contract value for delay beyond stipulated date of completion as mentioned in the Contract / Work Order and both the parties hereby confirm, record and declare that the amount of compensation or liquidated damages fixed as above represent the genuine, fair and reasonable pre-estimate thereof considering all the facts and circumstances as the loss and damages that would be likely

suffered by The client on account thereof. It is further hereby agreed and confirmed that the sum payable by the Contractors under this provision shall be considered as reasonable compensation irrespective of whether actual loss or damage has or has not been sustained and The client would not be required to render any proof in support thereof. Liquidated damages / compensation for delay shall not be recovered for the delays which are not attributed to the Contractor and client has authorized extension of time for such delays.

It is further specifically declared that any extension of time granted by The client shall not amount to abandonment, waiver against The client of its claim for compensation or liquidated damages under this provision and the acceptance of delivery of any item of the work by The client will not be deemed to constitute any waiver of The client's right nor shall be deemed to be executed completely only when full and final measurements duly certified by The client and the Consultants have been made and till then the Contractors shall not be deemed to be discharged or absolved from all their obligations in terms of the Contract including specifically the provision relating to the payment of reasonable compensation and damages as aforesaid. It is specifically agreed and declared that in the event of the Contractors not completing the work even after the stipulated date, the aforesaid provision shall not be deemed to prevent or stop The client from exercising any other rights or remedies available to The client against the Contractors including the completion of the work through any other Contractor or agency or otherwise however at the risk and the account of Contractors and The client shall be entitled to recover and the Contractors shall bound to pay all such losses and damages to The client rights and remedies which are available to The client under clause of works contract of the General Conditions of the Works Contract.

36. Supervision of work

In addition to adequate number of technical supervisory staff, the Contractors shall keep constantly at the work site a competent Engineer or such other competent person as may be required to set the work. Any direction or explanation given by The client's or the Consultant's authorized representative to such person in writing shall be held to have been given to the Contractors.

37. Inspection of Work

Site engineers deputed by the consultant shall supervise the work constantly and inspection will be made periodically during the progress of the work by the representative / representatives of The client as well as by the senior representative of the Consultants and all materials and workmanship must be of acceptable quality and efficiency to the said representatives. The decision of the Consultants in this respect will however be final and binding on the Contractors. If the progress of any particular portion of the work is unsatisfactory, The client shall notwithstanding the fact that the general progress of the work is satisfactory, be entitled to take action after giving the Contractors 15 days notice in writing and the Contractors will have no claim for compensation for any loss sustained by them owing to such action. All works under or executed in pursuance of this contract shall at all times be open to the inspection and supervision of The client and their authorized representatives and agents as well as the Consultants or their representatives.

38. (a) It is specifically and distinctly understood and agreed to between The client and Contractors that the Contractors shall have no right, title or interest in the site made available

by The client for execution of the works or in the building structures or works executed on the said site by the Contractors or in the goods, articles, materials, etc., brought on the said site (unless the same specifically belongs to the Contractors) and the Contractors shall not have or deemed to have any lien whatsoever charge for unpaid bills nor will be entitled to assume or retain possession or control of the site or structures and The client shall have an absolute and unfettered right to take full possession of the site and to remove the Contractors, their servants, agents and materials belonging to the Contractors and lying on the site.

(b) The Contractors shall be allowed to enter upon the site for execution of the works only as a licensee and shall not have any claim, right, title or interest in the site or the structures erected thereon and The client shall be entitled for such license at any time without assigning any reason.

39. Measurement of work

As soon as the item of work is completed, notice thereof should be given forthwith by the Contractors to the Consultants. A representative of the Consultants / Site Engineer representative will then measure the work completed and record the measurements in measurement books (MB) supplied by the client which will constitute the basis for payment of such works by The client to the Contractor. The Contractor shall sign each and every Measurement sheet and Certificate in token of acceptance thereof. Client's representatives / Engineer shall have right to check / verify the measurements jointly recorded by the contractor and consultant's representative. The contractor shall submit the bills in duplicate on the proforma approved by the consultant / client along with all supporting papers to consultant for certification.

40. Provisional Payment

No payment shall be made for any item of works till the whole of the item shall have been completed and certified by the consultant. The client may however at their option and on recommendation of consultant pay to the Contractors provisional amount (part rate) proportionate to the part of the work as approved and passed by Consultants. The certificate of such approval and passing of the part sums so payable shall be final and conclusive against the Contractors.

41. Final payment

The final measurement Certificate / Bill shall be prepared by the Consultants and Contractors within three months from the date of completion of the work subject to the claim of The client against the Contractors for compensation or liquidated damages or otherwise as provided in the said Contract, agreement and the General Conditions of Contract. (50% of the total security deposit (including initial security deposit) shall be refunded to the contractor on issue of completion certificate.

42. Bills to be in The client's prescribed form

The Measurement Certificate/Bill shall be prepared jointly by the Consultants' representative and Contractors and shall be submitted in duplicate along with all the supporting documents to the consultants for certification.

43. Liability for payment of taxes, duties etc.

The Contractors shall be bound and liable to pay GST, work contract tax, income tax or any taxes to Govt. / other public authorities. Under no circumstances shall The client be liable to pay any such taxes, ceases, duties etc. on the work order or any part or component thereof or any materials or stores bought by the Contractors or supplied by The client or otherwise howsoever to the end and intent that all such liabilities shall be borne and discharged solely by the Contractors who shall keep indemnified The client against the same.

44. Settlement of dispute and Differences

a) The Contractor shall try to settle all matters pertaining to this contract first with the Consultant. The decision of the Consultant may be in the form of a certificate, instruction or otherwise. The decision, opinion, direction, certificate for payment with respect to all or any of the accepted matters (which are indicated hereinafter), of the Consultant shall be final and conclusive and binding on the Contractor and shall be without appeal.

b) All other disputes and differences of any kind whatsoever between the Contractor and the Consultant arising out of or in connection with the contract or carrying out the works (whether during progress of work or within defects liability period and whether before or within 365 days of determination / abandonment / breach of the contract) shall then be referred by the Contractor to the Employer giving interalia full details of matter under dispute and the reasons thereof. The Employer shall within a period of 60 days from the receipt of such reference from the Contractor, give his decision in writing. If the Contractor is dissatisfied with the decision of the Employer, or if the Employer does not convey his decision within 60 days, he can refer the matter for arbitration by serving a written notice on the Employer, through the Engineer within a period of 28 days of such decision. The notice shall specify the matters with full details and amount which are in dispute and referred for arbitration. However if the Contractor does not make any demand for arbitration in respect of any claims within 60 days of receiving the intimation from the Employer that the final bill is ready for payment, the claim if any received after 60 days period shall be absolutely barred from reference to the arbitration.

45. Arbitration

The disputes and differences between the Contractor and the Employer arising out of this contract shall be referred to a sole arbitrator. The sole arbitrator shall be selected by the Contractor from a panel of 3 arbitrators suggested by the Employer. The arbitration proceedings shall strictly be according to the Arbitration and Conciliations Act-1996 or any statutory modification thereof. The place of arbitration shall be at Mumbai.

The arbitrator shall have power to open up, review and revise any certificate, opinion, decision, requisition or notice and any matter required in his opinion, save in regard to excepted matters referred to in the Clause no. 46 and to determine all matters in dispute which shall be submitted for arbitration.

The arbitrator shall make his award within 1 year (or such further expected time as may be decided by him with the consent of the parties) from the date of entering on the reference. In case, during the arbitration proceedings the parties mutually settle / compromise or compound their dispute or difference, the reference to arbitration and the appointment of the Arbitrator

shall deemed to have been revoked and the arbitration proceedings shall stand withdrawn or terminated, with effect from the date on which the parties file a joint memorandum of settlement thereof, with the Arbitrator.

This submission shall be deemed to be a submission to arbitration within the meaning of the Arbitration & Conciliation's Act – 1996 or any statutory modification thereof.

It is agreed that the Contractor shall not delay the carrying out of the works by reason of any such matter, question or dispute being referred to arbitration, but shall proceed with the works with all due diligence and shall, until the decision of the Arbitrator is given, abide by the decision of the Consultant and no award of the Arbitrator shall relieve the Contractor of his obligations to adhere strictly to the Consultant instructions with regard to the actual carrying out of the works. The Employer and the Contractor hereby also agree that arbitration under this Clause shall be a condition precedent to any right of action under the contract.

46. Excepted matters

Following matters referred in General Conditions (GCC) and special conditions of contract

(SCC) shall be considered as excepted matters.

GCC –	Clause no 4 (Completion of work)
	Clause no 5 (Extension of time)
	Clause no 10 (Defective work and material.)
	Claues no 13 (Measurement of work)
	Clause no 16 (Assignment)
	Clause no 35 (Compensation for Delay)
SCC-	Scope of work
	Clause no 9 (Testing of work and material)
	Clause no 11 and 12 (Measurement and dimensions)
	Clause no 25 (Mock up)

47. Extra items

The contractor is required to execute the tender items only at site as per the requirements of client. Non-tender items i.e. extra items shall not be executed under any circumstances before taking approval from client/consultants. Incase it is required to execute such items on sites, contractor shall intimate the same to the consultant & client & will have to produce the

expected quantity of that particular item after taking site measurements & the lowest possible rate supported with rate analysis along with necessary supporting invoices, quotations duly certified by Consultants. The contractors OH & profit shall be 10 %, + Work contract tax @ 4 % of final rate to be added. The Project-in-charge from clients end shall reserve the right of checking, correcting & certifying the rate jointly with Consultants representative & permission of executing such items shall be given after entire satisfaction of rate analysis produced by contractor. As far as possible, the rates for extra items shall be derived from the rates quoted by the contractor for other similar item in the tender.

48. Deviated Items

Contractor shall not execute any deviated item without the written permission from the consultant / client. The rates for such deviated items shall be derived from the tender items.

49. Mobilization Advance

A mobilization advance up to 10 % of the contract value can be paid by the client on request of the Contractor against Bank guarantee. This advance shall carry a simple interest of 10% p.a. and secured against Bank guarantee issued by a Nationalized / Scheduled Bank of principal plus interest. The mobilization advance shall be recovered proportionately from interim bills so that the entire amount and interest thereon shall be recovered when 80% of the work is completed and billed or within 4 months from date of commencement.

50. Secured Advance against materials brought at site.

The Contractor will be paid secured advance against materials brought and stacked at site for use in permanent work and in the opinion of Consultant are required to be procured in advance. The advance paid shall be maximum up to 65% of the item rate as decided by the Consultant or 75% of the net cost of material stacked at site upon submission of "Indenture for Secured Advance" as per proforma given in Annexure – at the discretion of Consultant and the Contractor shall produce necessary vouchers / invoices in support of cost of each materials. Such advance shall not be paid on materials which are perishable and consumable in nature.

The advance granted on materials as above shall be adjusted / recovered from the bills after the materials are used in the work. The Contractor cannot remove the materials from site without written consent of the Consultant and Contractor shall be liable for loss or damages to such material.

Grant of advance against material stacked at site shall not be deemed to imply any approval by the Consultant for materials and so it shall not prevent the Consultant for rejection of any material at any time.

51. The cost of each item shall be quoted after deducting the discount and exclusive of GST & inclusive of transportation, loading ,unloading at site, wastage and any other levies etc. The Contractor has to submit the base amount of any item. GST or any applicable taxes will be paid at actual as per the prevailing rates.

52. No extra charges shall be paid for Insurance, Transportation etc.

53. The bidder is expected to examine all instructions mentioned in tender documents forms and terms & conditions.

54. Failure to furnish all information required by the tender documents or submission of all documents, not substantially responsive to the tendering document in every respect will be at the risk and may result in the rejection of bid.

55. This call of e-tender does not bind the M.P.C.B. to place order. The offer/Bids submitted in response to this invitation may be rejected without assigning any reasons.

56. The Board at its discretion may extend the last date of submission of tender and opening of tenders. The authority does not bind itself to accept the lowest e-tender and is vested with authority to reject any or all of the tenders received without assigning any reason.

57. Documents enclosed in the e-tender, shall become the property of M.P.C.B. without any payment.

58. In case of dispute, the decision of Member Secretary, Maharashtra Pollution Control Board shall be final.

59. The proposal from the firms / Bidders putting their own terms and conditions will be rejected.

60. The validity of the tender will be for the duration of 03Months

61. Each folio of the tender document shall be signed by the bidder otherwise the bid will be treated as rejected.

62. The e-tender must be filled in English and all the entries must be made by hand written in ink or may be typed. If any of the document is missing, or unsigned tender will be considered invalid.

63. The prospective bidder shall have not been disqualified by the Maharashtra Pollution Control Board for any reason for specific period.

64. The price bid of only those bidders will be opened whose Pre-qualification Criteria (schedule - I) are found to be acceptable.

65. The e-tender shall contain no interlineations erasures or overwriting of words except as necessary to correct errors made by e-tenders, in which case such correction shall be initialized by the person or persons.

66. Bids received after due date and time mentioned in the tender notice shall not be accepted.

67. In no case hard copy of tender should be handed over to any employee of the Board.

68. Canvassing in any form will disqualify the tender.

69. All tenders shall be addressed to:
The Member Secretary,

Maharashtra Pollution Control Board, Kalpataru Point, 3fd & 4th Floor, Sion Matunga Scheme Road No.8, Opp. Sion Circle.
Sion (East), Mumbai - 400 022, Tel No. 24010437, 24086916.

70. Earnest Money of the unsuccessful bidder will be refunded without any interest after the tender is finalized or within one month whichever is earliest and that of successful bidder will be refunded without any interest after 04 months of the finalization tender or can be readjusted as a security deposit, on their request.

71. The successful bidder shall deposit balanced security deposit in the form of D.D. drawn in favour of **Maharashtra Pollution Control Board** which will be refundable, without interest, after the successful completion of the contract period.

Date:-

Place: - (Name & Seal & Signature of Bidder)

SPECIAL CONDITIONS OF CONTRACT (SCC)

Scope of Work

The scope of work consists of the work of **Restoration refurbishment and upgradation of existing laboratory building for MPCB's at Mahape, Navi Mumbai** with the existing set-up i.e. Civil, Interiors, Façade, waterproofing, loose furniture, fixed furniture, doors and windows, plumbing with fitting & fixtures, SITC of Electrical Panels , Distribution Boards, Electrical fittings/fixtures/lights etc, under floor raceway, LAN networking, Earthing, Cabling and cable trays, Fire Alarm and detection system, Public Address system, CCTV wiring etc.

1. **Time Limit**

   The entire work shall be completed within the stipulated days as per the tender notice from date of commencement (i.e 08 Months).

2. **Terms of Payment**

   The following terms of payment shall apply:

a) MPCB may pay 10% of the Contract value as mobilization advance against Bank Guarantee, on acceptance of work order. The mobilization advance shall be interest bearing (@ 10% simple interest).

b) 10% mobilization advance paid will be adjusted on pro-rata basis from certified bill amount.

c) Entire amount of advance together with interest will be recovered by the time bill for 80% of contract value is certified or within four months from the date of commencement.

d) Any work done at factory will not be counted in the 75% running account bills until the material is brought to the site of work.

e) Minimum value of first and second running bills shall be at least 10% of work order value and subsequent bills shall be 15% of the work order value. Any bill of lesser amount shall be processed or rejected as per Project-in-charge's description.

f) Retention money @10 % shall be retained from every running bill subject to a maximum of 10% of contract value including ISD and the 50% of total SD shall be released on completion of work and balance 50% shall be released after completion of defects liability period of 12 months and on issue of Final Completion Certificate.

g) No payment shall be made to the Contractor unless the contract agreement is executed and all insurance policies as stipulated in the tender are taken and submitted to the Employer.

4. **Right to distribute work**

   The Consultants/Client reserve all rights to divide, distribute the tender items to more than one agency, delete any item or operate items quoted as rate only.

After Consultants / client's approval, the manufacturing of loose furniture can be carried out at the Contractors factory/premises and the rates quoted should be inclusive of free delivery to the site.

5. **Identity Cards**

The Contractor shall be given approved identity cards to all his workers, which will have to be produced by the Contractors' workmen as and when demanded by the Consultants / Client's representatives or Security men.

6. **Electric Supply & water supply**

The contractor shall make his own arrangement for power and water required for the work and pay the charges for the same. In case the power is provided by client, contractor shall install a Electrical sub meter and pay the bill as per actual power consumed in the works.

7. **Program of work and progress reports.**

The successful Contractor will have to submit a detailed Bar Chart indicating the schedule of various activities from the date of commencement till completion and get the same approved by the Consultants/Client. Once the Bar Chart is approved by Client, Contractor shall strictly adhere to the same. This program shall form part of the Contract and shall be binding on the Contractor. However, the Client reserves the right to alter the program, if necessary, from time to time. No claim whatsoever of any nature by the Contractor on his account shall be entertained by Client. They shall also have to indicate their requirements about co-ordination from other agencies working at site. In addition to this, following further information should also be furnished by the contractor.

(1) Nature of labour force required for the work.

(2) Material procurement program.

(3) Details of machinery/equipment to be used.

(4) Details of work to be executed at site and in Contractor's factory/shop.

(5) Requirements of electric power at site.

(6) Arrangements made for Contractor's own security.

(7) Requirement of funds requirement from time to time to be intimated in advance.

The Contractor will also have to furnish weekly progress report incorporating necessary details of work under execution.

8. **Office/Stores on the site**

The Contractor shall provide for all necessary storage on the site in a specified area for all materials, which is likely to deteriorate by the action of the sun, rain or other material causes due to exposure, in such a manner that all such materials, tools, etc., shall be duly protected

from damage by whether or any other cause. All such stores shall be cleared away and the ground left in good and proper order on completion of this Contract unless otherwise expressly mentioned therein.

9. **Testing of works and materials and preparation of samples**

The Contractor shall, as required by the Consultants, arrange to test materials and/or portions of the works at his own cost in order to prove their soundness and efficiency. If after any such test, the work or portions of the works are found, in the opinion of the Consultants to be defective or unsound, the Contractor shall pull down and re-erect the same at his own cost. Samples of each class of materials and workmanship shall be submitted by the Contractor for the approval of the Consultants/Client before procurement and execution.

10. **Notice**

The Contractor shall comply with all acts and regulations for the successful completion of the Contract works and shall pay necessary attention to all notices and pay all fees / charges.

11. **Measurement to be recorded before work is covered up**

The Contractor shall take joint measurements with the Consultants' representative before covering up or otherwise placing beyond the reach of measurement any item of work. Should the Contractor neglect to do so, the same shall be uncovered at Contractor's expense or in default thereof, no payment or allowance shall be made for such work or the materials with which the same was executed.

12. **Dimensions**

Figured dimensions are to be followed in all cases. Large scale details take precedence over small scale drawings. In general, the drawings shall indicate the dimensions, positions and type of construction; the specifications shall indicate the qualities and methods, and the bill of quantities shall indicate the quantum and rate for each item of work.

Any work indicated in the drawings and not mentioned in the specifications or vice-versa, shall be furnished as though fully set forth in both. Any ambiguity, conflict of interpretation, errors or inconsistencies discovered in the drawings/documents shall be promptly brought to the attention of the Client and the Consultants. Generally, the provisions giving more rigorous interpretation shall prevail, but in the event of disagreement between the Contractors and the supervisor, decision of Project-in-charge shall be final. In case of any discrepancy, the Contractor is to ask for an explanation before proceeding with the work.

13. **Action where there is no specification**

In case of any class of work over which there is no specification mentioned, the same shall be carried out in accordance with the latest Indian Standard Specifications subject to the approval of the Consultants and Client.

14. **Clearing the site of works**

The Contractor shall clear the site of works as per the instructions of the Consultants. The site of works shall be cleared of all men, materials, sheds etc., belonging to the Contractor. The site shall be delivered back to the Client in a clean and neat condition as required by the

Consultants within a period of one week after the job is completed. In case of failure by the Contractor, the Client will have the right to get the site cleared at the risk and cost of the Contractor

15. **Occupation of partially completed portion by the Client**

The Client shall be entitled to and will be at liberty to occupy even the partially completed portion of the work by themselves or through their agents and servants if they so desire. Necessary extension of time for completing the work shall, however, be granted to the Contractor but he shall have no claim for any compensation whatsoever due to the delay, if any, involved in completing the work on account of partial occupation.

16. **Typographical or Clerical Errors**

The Consultants clarifications regarding partially omitted particulars or typographical or clerical errors shall be final and binding on the Contractor.

17. **Information to be furnished to Client on completion of work**

The Contractor, on completion of work shall furnish in a tabulated form, all pertinent and necessary information regarding the material, hardware, metal work, glass etc., used in the items of work. The information also to contain the names of such agencies who are specialized for certain items like melamine polishing, exclusive hardware etc. This tabulated information is to help the Client in maintaining their office after defects liability period is over.

18. **Performance Guarantee for all bought out items**

Contractor shall submit written performance guarantee for all bought out items from him as well as from manufacturers.

19. **As Built Drawings**

Contractor shall within one month of completion of work submit `As Built' drawings (original tracings and 3 sets of prints) of all the works carried out by him. Contractor will not receive final payment in case of failure to comply with this condition.

20. **Language of Tender**

"English" is the official language of Tender.

21. **Documents to be complementary**

All Sections of Contract Documents and working drawings shall be complementary to each other. In case of ambiguities, discrepancies or contradictions between any two sections, Client / Consultants' decision shall be final and binding on the Contractor for interpretation of same.

22. **Contractors Superintendence**

The Contractor shall appoint technically qualified and experienced persons to supervise the work at site. The Contractor shall obtain the approval from Client/Consultants about competence of such persons.

23. **Inspection by Contractor**

The Contractor shall inspect all the works and satisfy himself before same is offered for inspection to the Client/Consultants.

24. **Removal of Debris**

Contractor shall arrange to dispose off debris, wood shaving and any other waste product created while carrying out the work, outside Client's premises. The Contractor shall take due care while disposing of such waste materials and ensure that any rules/regulations laid down by Municipal / Client or any other statutory Body are not violated. The Contractor shall be responsible and answerable to any complaint arising out of improper disposal of wastage. Quoted rate shall include the cost of same and no extra payment shall be made towards this account.

25. **Mock-up**

The Contractor shall prepare a mock-up of each item, if required, strictly in accordance with the specifications **free of cost,** for approval of Consultants and Client. The work on these items shall proceed further only after the approval of the mock-up.

26. Rates quoted by the Contractor for the works to be carried out shall be valid for all floors.

27. The Contractor shall submit original copies of invoices, order forms for any materials purchased for project work, to Client/Consultants.

28. The Contractor shall calculate realistic quantities after receipt of drawings and after submitting first interim bill but before submitting the second interim bill to Client/Consultants.

29. **Works at Night**

If the Contractor is required to work at night in order to complete the work within the time schedule, the Contractor shall provide and maintain at his own cost sufficient lights to enable the work to proceed satisfactorily without danger. Approach road to the site also shall be sufficiently lighted by the Contractor. No extra payments will be made for night work.

30. The rates quoted by the tenderer in the schedule of quantities will be deemed to be for the finished work and shall include all charges for:

a) Materials, Labour, maintenance, fixing, arranging, cleaning, making good, hauling etc.

b) Plant, double scaffolding, frame work, English ladders, ropes, nails, spikes, tools, materials and workmen, protection from weather, temporary supports, platform and the maintenance of the same.

c) Covering for the walling and other works during inclement weather or strikes or whenever directed, as necessary.

d) All temporary canvas, lights, tarpaulin, barricade, water shoots etc.

e) All measures required to be taken for protection of existing works.

f) All such temporary weather-proof sheds at such places and in a manner approved by the Consultants for the storage and protection of materials against the effects of sun and rain.

g) All testing of materials.

h) No tools and plants shall be issued by the Client under the Contract.

i) All present and future taxes, levies, duties, fees etc.

31. **Rates to valid for additional scope of work**

Rates quoted by the tenderer shall be valid for a period of 120 days from the date of awarding the tender or till completion of work whichever is later. If client decides to place work order for additional scope of work in the same premises or to amend the original work order for additional scope of work in the same premises, the contractor shall be bound to accept the same at rates contained in the original tender; provided such work order or amendment is issued prior to completion of the work contained in the original tender. However, any decision in this regard shall be taken by the client only.

32. **Dimensions written on drawings are to be followed. No scaling of any drawings shall be carried out at site by workmen/labor during execution of work. The clarifications, if any, required for the execution of any item shall be timely given by the client/consultants in weekly co-ordination site meetings.**

33. The running bills whenever submitted to the consultant for certification process should accompany the running measurement sheets containing those items which are billed in that particular running bill. The measurement sheets produced by the contractor should be jointly checked fully/partly as desired by the client/consultants.

34. No disturbances should be observed/ noticed in measured quantities written in measurement sheets & billed quantity for which the measured quantity takes precedence on billed quantity & the bill shall be corrected & certified accordingly.

35. No escalation is allowed/ permitted in quoted rates in the tender which should be valid at least for 120 days from the date of awarding the job to the successful contractor, or till the completion date, whichever is later.

36. Weekly site co-ordination meetings shall be conducted for the contractors working on site & proper intimation should be given to the client/consultants in order to monitor the project more efficient way. The relative decision for the execution of tender items shall be given in these meetings by client/consultants by producing working drawings/hand-made sketches if any. Contractors's, senior representatives / partner / director shall attend these meetings.

37. **Working on holidays**

The contractor is required to take permission from local authorities of client/consultants for working of extra hours at night & on public holidays by ensuring no inconvenience to

inhabitants of the premises & other offices as well as neighbours. For timely completion of project, contractor is required to produce more labors & regular material supply as required on site as directed by consultants.

38. The contractor shall submit test report from the manufacturers of various materials used in the work as instructed by the consultant / client.

ADDITIONAL TERMS AND CONDITIONS OF CONTRACT

(These conditions precedes over the similar conditions if any in the GCC)

Special Conditions of Contract shall be read in conjunction with the General Conditions of Contract, Specifications of Work, Drawings and any other documents forming part of this Contract, wherever the context so requires. Special Conditions of Contract shall override **"The General Conditions of Contract" wherever applicable."**

1. The work covered by the contract shall be carried out in accordance with the relevant specifications contained in the specifications Book-IS standards, published by Govt. of Maharashtra, P.W.D. department, as per the latest edition of the same (hereinafter called the standard Book of Specifications) subject further to the attached specifications. Where these two contradict, the latter holds good.

2. A work order will be maintained by Department, on the site of the work, and the Contractor will sign orders given therein by the Engineer in charge, his representative and his superior officers and comply with them.

3. The site of work shall be cleared by the Contractor before starting the work & after completing it to the satisfaction of the Engineer (which means the Engineer-in-charge or his representative). This will include cutting of trees, shrubs and removing grass, dismantling and removing remains of old masonry, loose boulders and stone etc. The cost of this will be deemed to have been included in the tendered rate for the several items.

4. The Contractor shall provide free of charge all labour and material required for lining out, surveying and measurement of work etc. He will similarly provide such aids as decided by Engineer in Charge, as are considered necessary for the proper and systematic execution of the work.

5. Where the proper measurement of work, it is necessary to have an initial setup levels taken, the same as recorded in the authorized field book by the Engineer in charge or his authorized representative will be signed by the Contractor who will be entitled to have a true copy of the same on demand. Any failure on the part of the Contractor to get such levels before starting the work will tender him liable to accept the decision of the Executive Engineer as to the basis of taking measurements. Likewise the Contractor will not cover any work which will render its subsequent measurement difficult or impossible, without first getting the same jointly measured by himself & the authorized representative. The record of such measurements on to department's side will be signed by the Contractor and he will be entitled to have a true copy of the same on demand.

6. All work before being finally taken over by MPCB will be entire liability of the Contractor for guarding, maintaining & making good any damage of any magnitude interim payments made for such work will not alter this position. The handing over by the Contractor & taking over by the Member Secretary, or his authorized representative, will be always in writing, of which copies will go to the member secretary, his authorized representative & the Contractor. It is, however, to understand that before taking over such work MPCB will not put it to its regular use distinct from casual/incidental one.

7. Orders issued by the member secretary of MPCB from time to time regarding the conduct of the work shall be binding on the Contractor.

8. The quantities, specified in the Contract are only approximate & may vary on either to any extent. No claims/demand for compensation/increased rate, shall be entertained for variation in quantities on higher/lower side to any extent.

9. It will be deemed that the Contractor before tendering has thoroughly inspected the work site & carried out his own investigations to arrive at the rates quoted in the tender. In this regard he will be given necessary information to the best of the knowledge of the Department but without any guarantee about its full Proofness.

10. Excavation items include, if met with, dewatering, whether specified or not and the rates quoted are deemed to be inclusive of this.

11. The material supplied or used in the work under this contract will be according to the following and other specifications herein the tender and those specified in the Standard Book of specification for the relevant items. Where these two contradict, the former holds good.

12. The tendered rates for supply of materials are for delivery of materials properly stacked in regular heaps or otherwise as directed for facility of measurement before use. In case of road materials the same will be stacked by the roadside as directed.

13. No material shall be removed from the road/land, except for excavation of gutters, or any other adjoining land unless permitted in writing subject to such conditions as the Exe. Engineer may specify. The Contractor is liable for the damages/compensation arising out of this condition.

14. Material will not be stacked at places where they are likely to be damaged or lost. The Contractor will have no claim for any loss on this account. If such material has been paid for and is subsequently lost before use in the work the Contractor will make good the loss.

15. Before staking any approved material, the same shall be freed from all foreign materials, if any. The material shall be stacked on cleared and leveled ground.

16. The order of collection and utilization of materials will be decided by Engineer in charge so as to ensure orderly work.

17. The materials will be stacked in a natural way without any attempt whatever to leave voids.

18. The measurement of the road and building materials shall be without any deduction for voids.

19. For the item so indicated, no materials will be used without first having been measured by regular stacks. The whole of the quantity of a particular material required for a sizeable section of work shall have been first collected before it can be measured & used. The same material will either have been all collected/the collection will not have been started at all before the material collected in the section under reference has been all used.

20. All materials used and supplied under the contract items shall conform to the specifications in the Standard Book on Specification and those given herein, if any, and in every case, a sufficiently large sample will be got approved from the Engineer in charge before hand before bringing any further quantities on site for use on work & these samples shall be maintained for all the time for verification of materials brought thereafter on the site.

21. Any material not conforming the approved sample shall be removed from the site forthwith & in any case not later than time specified by the Engineer in charge failing which the same will be removed & disposed of by Engineer in charge at the risk and cost of the Contractor, as he deems fir and the Contractor will have no claim whatsoever for the same. If at any time it is found that under specification materials (and also workmanship) have been used in the work notwithstanding the fact that the work has been carried out under the supervision of the department the Executive Engineer's decision as to how the case is to be disposed off will be final; he may get such work entirely removed or may accept it at any reduced rate in his unfettered discretion, including no payment whatever.

22. The Contractor will have to construct a shed for storing controlled and valuable materials issued to him under Schedule 'A' of the agreement, at work site, having double locking arrangement. The material will be taken for use in the presence of the departmental person. No material will be allowed to be removed from site of work.

23. Under no circumstances shall any Contractor be entitled to claim enhanced rates for any items in this contract.

24. The contractor shall study all the plans, specifications & other items & conditions of the contract carefully before tendering & shall also inspect the site & get self acquainted with nature of work & local conditions regarding the availability of labour, material, source & sufficiency of water supply required for the execution of the work and site conditions rivers, nalla's topography etc. existing roads, means of communications & access to site of work etc.

25. The Contractor shall, if necessary, construct temporary roads & maintain these in proper condition till the completion of work at his own cost. If necessary, he shall also at his own cost, make necessary arrangement for acquisition of land for construction of such temporary road or for any other purpose in connection with the execution of work.
26. The Contractor shall comply with all proper and legal orders & direction of local/public authority/municipality & abide by their rules & regulations and pay all such fees and charges which he may be liable to. No reimbursement of such fees and charges will be made by the Department.

27. The Contractor shall inform the Engineer-in-charge in writing when any portion of the work is ready for inspection giving him sufficient notice to enable him to inspect the same without regarding the further progress of work. The work shall not be considered to have been completed in accordance with terms of contract until the Engineer – In - Charge shall have certified in writing to the effect.

28. The Contractor should arrange for factory inspection before dispatching any machines / material. The machine / material offered for inspection shall be specific to MPCB's project. The rate quoted shall include factory inspection for 5 representative persons inclusive of travelling expenses, boarding and food etc.

29. If Contractor desires to use any design/material/process covered by letter "patent" or "Copy Right", it shall be responsibility of the Contractor to observe all legal formalities for the use of the same.

30. In the event of there being reasonable doubt as to the quality of workmanship & material used in the construction, the Engineer-in-charge may order to the contractor to satisfy the Dept. by carrying out suitable test of electrical materials or thereof.

31. The Contractor shall take all precautions, due care against by floods, rains, storms, out break of fire & accidents. No compensation will be allowed to the Contractor for his plants/materials lost, damaged by way of the above cause or other cause which in charge of the Contractor.

32. Work area for the Contractor

The quoted rates shall also be inclusive of all ancillary and incidental works required for execution of work like labour camp, stores, fabrication yard, air conditioned offices with meeting rooms, watch and ward, temporary structure for plants and machineries, water storage tanks, arrangement for temporary connection for electricity, telephone, water etc. including their consumption charges, protection works, barricading, providing testing facilities / laboratory at site of work for various field and laboratory tests or any other activity which is necessary for execution of work and as directed by Engineer-in-Charge. Before start of the work, the Contractor shall obtain approval of the Engineer-in-Charge, before locating various temporary structures/ site office, positioning of machinery, material yard, cement and other storage, steel fabrication yard, site laboratory, water tank, etc. The Contractor shall Provide Laptops/ PC with Internet facility, Printers / Scanners at site at his own cost and shall pay all bills. The Contractor, at his own expense provide temporary road on site as may be necessary for the proper performance of the contract and for his own convenience but not otherwise after due approval of Engineer-in charge (EIC) and without disrupting the work of other contractors. Upon completion of the work such road shall be broken up and levelled where so required at Contractor's cost unless engineer-in charge (EIC) shall otherwise direct.

The contractor shall maintain the site office and its surroundings in a neat and clean condition for the entire duration of the construction. The toilet effluent shall be discharged into sewer line or soak pits without causing unhygienic conditions in the surroundings. After completion of the work, site office shall be dismantled by the contractor and all the dismantled materials furniture fixtures shall be taken away at his cost.

All temporary warning / caution boards / glow signage display such as "Construction Work in Progress", "Keep Away", "No Parking", Diversions etc. shall be provided and displayed by the Contractor, wherever required and as directed by the Engineer-in-Charge. All signage shall be suitably illuminated during night also. The Contractor shall be solely responsible for damage and accident caused, if any, due to negligence on his part. Also, he shall ensure that no hindrance, as far as possible, is caused to general traffic during execution of the work.

In addition, the Contractor shall also provide a sign board of approved size, design & pattern at an approved location giving the details of the project, client / owner, architects, structural consultants, Department etc. besides providing space for names of Contractor/Sub- Contractors. All signage shall be dismantled & taken away by the Contractor after completion of the work with the approval of the Engineer-in-Charge.

In case of any discrepancy in between Technical data/details and specification, clarification should be obtained from MPCB, whose decision shall be final and binding on the Contractor.

The Contractor shall make required mock-ups of various items like, structural glazing, façade, interior items etc. as directed by the MPCB / Architect representative. Depending upon its acceptance, same may be used in the work or may be required to be dismantled and disposed off. No extra cost/ time for creation of such mock-ups will be given. Contractor shall also submit samples of all material and shall get it approved from the MPCB / Architect representative before procurement of the material.

33. PREPARATION OF SAMPLE FLOOR

In contractor shall prepare one sample for lift lobby, any one room decided by Engineer-in-charge / Architect along with toilet block Samples shall be prepared by the contractor well in advance before taking up the mass execution at the appropriate time as per Mile Stones for plan of execution of work.

The contractor shall invariably prepare the samples of finishing items i.e. flooring of different types, external & internal finishing i.e. colour scheme of paint, tiles in dado, flooring in platforms & staircase, water supply & sanitary fittings and any other item as per direction of Engineer-in- charge. The contractor shall proceed with further finishing items only after getting the samples of these items approved from Architect / Engineer-in-charge.

34. Dimensions and Levels

All dimensions and levels shown on the Drawings shall be verified by the Contractor on the Site and he shall be responsible for the accuracy and maintenance of all dimensions and levels. Figured dimensions are in all cases to be accepted and no dimension shall be scaled. Large scale details shall take precedence over small scale drawings. In case of discrepancy, the Contractor shall ask for clarification from the MPCB / Architect representative before proceeding with the work.
The Contractor, before starting the work, shall fix bench mark level on the walls/ basement structure at required places and get it approved from the MPCB / Architect / PMC representative.

35. Statutory Clearances / Permissions

The Contractor before commencing the work at site must ascertain and extend all the necessary assistance required to obtain requisite NOC's . During the course of Renovation, the Contractor may have obtained the permissions from authorities for use of materials and installation of the equipments. Same shall be transferred to the Employer on the completion of work. The Contractor will have to provide required assistance with various concerned authorities which includes necessary documentation to obtain various Statutory N.O.C.'s / Permanent Water Connection / Permanent Drainage Connection / Permanent Electric Connection / LEED / GRIHA / IGBC / tree cutting and etc all other necessary Approvals during the work or at completion stage. Necessary drawings shall be given by the Architect if found necessary. Statutory charges will be paid by the Contractor. The consultancy fees of GREEN building Consultant will be borne by the Contractor.

36. Safety of Structures

The Contractor, at his own cost, shall ensure and undertake all necessary efforts / measures to protect efficiently all structures as well as humans on site which can be endangered by the execution of the works or otherwise take such permanent measures as may be required by the MPCB representative/Engineer/ Statutory Authorities to protect the structures.

37. SAFETY PRECAUTIONS AND SAFETY PROCEDURES

The Contractor shall observe all applicable regulations regarding safety on the Site. The Contractor shall follow / adhere to all the precautions regarding the pollution measures as per Government norms. Unless otherwise agreed, the Contractor shall, from the commencement of work on Site until taking over provide:

a) fencing, lighting, guarding and watching of the Works, and
b) temporary roadways, footways, guards and fences which may be necessary for the accommodation and protection of owners and occupiers of adjacent property, the public and others.

This Sub-Clause requires the Contractor to observe all applicable regulations regarding safety on Site. Quite apart from any statutory regulations that may be applicable to the Contractor's construction activities the Employer may well have his own Site safety

regulations, copies of which should be provided to the Contractor at the tender stage in order that he may allow for any extra cost of compliance in his prices. If a "permit to work" system is in operation at the Site, full details should be given at the tender stage. The Employer should also provide the Contractor with a plan of the Site identifying any areas where hazardous material may be stored or where any special care may need to be taken by the Contractor and his employees to prevent an accident or injury.

38. SAFETY PROCEDURE

Contractor should submit a safety procedure prior to start of the construction activities for Employer review. The procedure should include the safety measures including mandatory statutory to be taken during construction work, firefighting / safety equipment which will be provided, number of safety / fire officers and their role, periodical exercise on awareness of workers towards safety. Familiarization of workers with safety equipment, teams for firefighting etc. In case of any emergency, contractor should immediately mobilize all resources to combat the emergency and co-ordinate with Employer suitably.
Contractor should ensure that all the contactor's personnel have undergone the approved basic training on fire fighting and safety before deployment.

In case of any accident at site causing injury to personnel, contractor shall inform MPCB as well as Architect immediately. Contractor shall also arrange for pickup and immediate medical attention for the injured personnel to the first aid center at site or nearest hospital. All the safety measures should be displayed and followed broadly at site.

39. Electrical / Plumbing / MEP Contractor's License

The Contractor carrying out the Electrical / Plumbing portion of the work shall have a valid Electrical / Plumbing Contractors License

40. LIABILITY FOR REGISTRATION OF WORKERS

The Contractor shall be liable for registration of its workers under Building & Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 and the rules framed there under so as to enable the building & other construction workers to avail the various benefits as mandated under the Act.

The Contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc. under various labour laws and other regulations applicable, at his site office.

41. FIRE FIGHTING ARRANGEMENT

The Contractor shall provide suitable arrangements for fire-fighting. For this purpose, he shall provide requisite number of Fire- Extinguishers and adequate number of buckets, some of which are to be always kept filled with sand and some with water. This equipment's shall be provided at suitable prominent and easily accessible places and shall be properly maintained.

The Contractor may be subjected to periodic fire prevention inspections and any deficiency or unsafe condition shall be corrected by the Contractor at his own cost and to approval of the MPCB representative and the relevant authorities. Periodical mock up drill regarding fire, evacuations and other disasters regularly at site under the supervision of the experts

These fire prevention inspections shall include but not limited to the following:

a) Proper handling, storage and disposal of combustible materials, liquids and wastes.
b) Work operations which can create fire hazards.
c) Access for firefighting equipment.
d) Type, size, number and location of fire extinguishers or other fire fighting equipment.
e) Inspection and maintenance of records for extinguishers.
f) Type, number and location of containers for the removal of surplus materials and rubbish.
g) General housekeeping

42. DISPOSAL OF REFUSE ETC.

Disposal of excavated earth, rock cutting, debris and other refuse arising from the construction activities, shall be the responsibility of the Contractor, which includes arrangements for disposal yard as well as obtaining necessary permission and approvals etc from the concerned Authorities and making payments of taxes / royalties etc as applicable. Any legal or financial implications resulting out of disposal of earth shall be carried out by the contractor at his own cost. Nothing extra shall be payable on these accounts.

43. CONTRACTOR TO VERIFY SITE MEASUREMENTS

The Contractor shall check and verify all site measurements whenever requested by other specialists Contractors or by nominated or other sub-Contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness as will not in any way delay the works. A copy of all such information passed on shall be given to the Engineer-in-charge.

The Contractor shall not use or occupy any part of the site unless its use or occupation has been agreed to by MPCB's in writing.

44. COMPATIBILITY WITH OTHER WORKS

The building has a common system for IT, IBMS, Fire-fighting, water supply, sewage, HVAC, power distribution, electricity etc. The Contractor will have to ensure that facilities provided by him get integrated in the main backbone of the respective services, conceived for the project as a whole The works to be carried out in this tender are required to be compatible with the other works being carried out in the Building particularly in areas like CCTV, Access Control etc. The Bidders are advised to familiarize themselves with the equipment's/technologies being installed in the work and ensure that compatibility between the existing systems and the systems they plan to install is maintained for seamless

integration. MPCB will not be liable for any incompatibility and will not accept any technology/ equipment which are incompatible with the equipments/ technologies being installed in work.

To test the proper working of equipment's/ facilities installed by him as well as for ensuring their integration with the respective services backbones, Contractor will have to coordinate at his own end with other agencies and show the required performance, as given in the specifications. He also has to bear all expenses for the same. He also has to ensure that his working does not in any way delay/adversely affect the working of other agencies working at site. Contractor will have to transport all his material through stairs or his own other means and may not be allowed to use lifts for the same, even if operational.

45. URGENT REPAIRS

If by reason of any accident or failure or other event occurring to in or in connection with the works, or any part thereof, either during the execution of the works or during the period of Defect Liability / maintenance any remedial or other work or repair shall, in the opinion of the Company's representative, be urgently necessary for security and safety of life or for the works or of adjoining property, and the Contractor is unable or unwillingat once to do such work or repair, the MPCB may employ his own or other workmen to do such work or repair, as the Company's representative may consider necessary. If the work or repair so done by the MPCB which is in the opinion of the Company's representative, the Contractor was liable to do at his own expense under the contract, all costs and charges incurred by the MPCB in so doing shall on demand be paid by the Contractor to MPCB or may be deducted by MPCB from any moneys due or which may become due to the Contractor. Provided always that MPCB's representative shall, as soon after the occurrence of any such emergency, as may be reasonably practicable notify, the Contractor thereof in writing.

46. CONTRACTOR TO KEEP SITE CLEAN

During the progress of the works the Contractor shall keep the site reasonably free from all unnecessary obstruction and shall store or dispose off any construction plant and surplus materials and clear away and remove from the site any wreckage, rubbish or temporary works which are no longer required on time to time basis.

47. PROTECTION OF EXISTING SERVICES/ FACILITIES

Drains, pipes, cables, overhead wires and similar services encountered in the course of the works shall be guarded from injury by the Contractor at his own cost, so that they may continue in full and uninterrupted use to the satisfaction of the owners thereof, and Contractor will not occupy any part of the site in a manner likely to hinder the operation of such services.

Should any damage be done by the Contractor to any mains, pipes, cables or lines (whether above or below ground etc.), whether or not shown on the drawings the Contractor shall make good or bear the cost of making good the same without delay to the satisfaction of the Engineer-in-charge.

Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services encountered in the course of the execution of work shall be protected against the damage by the contractor, in case any damages to such existing services take place the same shall be rectified by the contractor at his own expense to the satisfaction of the Engineer-in-charge. The contractor shall not store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services.

Examination of certain conditions before tendering by the contractor to be presumed.

(i) The contractor shall be presumed to have satisfied himself by the careful examination before submitting his tender as to the nature of the ground and subsoil, the form and the nature of the site, the quantities and the nature of work & materials necessary for the completion of the work and means of access to the site. The accommodation he may require and all other matters incidental thereto and ancillary thereof, affecting the execution and the completion of the work. He shall also be presumed to have satisfied himself before tendering as to the correctness and the sufficiency of the tender for the work as it is herein after otherwise specially provided schedule which rates and prices shall (except in so far as it is hereinafter otherwise specially provided cover all his obligations under the contract and all matters and things necessary for the proper completion and maintenance of the work.)

(ii) It is agreed and understood that no extra payments shall be admissible to the contractor under any circumstances whatsoever consequent on any alleged misunderstanding or miscalculation or arising out of their mistake or factor, not specially provided for in the contract.

The quantities set out in the accepted schedule of the rates against item of quantified are the quantities estimated to be required for such works and they shall not be taken as the actual correct quantities of the works to be executed by the contractor in fulfillment of the obligation under the contract.

The work will not be treated as completed and taken over by the MPCB till all the components of the work/structure after being constructed at site in all respects have been tested by the Engineer-In-Charge to his satisfaction. All tests shall be carried out by the contractor at his own cost as and when directed by the Engineer-In-Charge.

For all the cement concrete works, test cubes shall be obtained at the time of actual concreting as per latest IS requirements.

Any water tank or pit constructed at the site of the work shall be protected by suitable parapet walls to avoid fall of any cattle or person. Contactor shall be responsible for any loss/damage caused due to noncompliance of this requirement.

The contractor shall make arrangement for proper storage and protection of cement from moisture at his own cost cement. Contractor shall maintain a register which will show the receipt and issue of the cement. This register shall be signed by the contractor or his representative after every transaction and shall be put-up to Engineer In-charge for verification, whenever desired by him.

Within 6 days of the receipt of work order to commence the works, the contractor shall intimate to the Engineer-In-Charge in writing the name of his authorized representative along with their attested signature who will note down the instructions given to them from time to time and all such instructions, shall be binding on the contractor.

All steel required for the work shall conform to the relevant BIS specification and shall be purchased from the standard manufacturing concerns as approved make mention in the tender. The test certificates shall be produced by the contractor at his own cost. The department does not take responsibility for arranging wagon etc.

Sample of all materials to be used on the work shall be first approved by the Engineer-In-Charge before actual use on the work and for such approval requisite test, if any, indicated by the Engineer-In-Charge shall be carried by the contractor.

Nothing extra shall be paid for the dewatering, de-silting and cleaning of trenches due to collapsed soil. Contractor's rate shall be deemed to provide necessary shoring or other protective measures to guard against collapsing of the trench sides.

For RCC works all cement concrete invariably should be mixed in concrete mixers except in emergencies. Small quantities where hand mixing is allowed, prior permission of Engineer-In-Charge will be obtained.
Unless otherwise specified in the bill of quantities against individual items, all items shall be deemed to include supply of all kinds of different materials and all kinds of labours required to execute the item fully and finally.

PERMITS AND LICENSES:-

Permits and License for release of materials which are under Government control will be arranged by the Contractor. The Owner will render necessary assistance, sign any forms or applications that may be necessary. Charges, if any are to be borne by the Contractor.

SHOP DRAWING

The required shop drawings for all the services such as façade, basement ventilation, skylight, horticulture, MEP etc. will be supplied by the Contractor for approval from MPCB / Architect before commencement of such work for successful completion of work.

41. TESTS & TESTING EQUIPMENTS:-

a) In order to exercise the required degree of constant control over the ingredients of concrete and their proportions the contractor shall set up and maintain at his own expenses a testing laboratory at site manned by a qualified and experienced technician. The Contractor shall provide all apparatus required for testing of concrete and its ingredients and in particular he must provide the following:

i) Compression testing machine of minimum capacity of 200 tones.
ii) A complete set of standard sieves.

iii) Slump cones (2 nos.)

iv) Adequate number of standard moulds (24 nos. Min)

v) Weighing balance (2 nos.)

vi) Curing tanks for cubes to be constructed by Contractor at his own cost.

vii) Measuring Glass for checking the silt content of sand.

Any other apparatus deemed necessary by the PMC/Client /Architect for proper control shall be provided by the contractor at his own cost.

b) PMC/Client/Architect may ask for any tests to be performed on any construction material. Such test shall be performed at the Contractors expenses either at site, in the site laboratory or elsewhere as directed by the PMC/Client/Architect. The opinion of the PMC/Client on the mode of testing and interpretation of the results thereof shall be final and binding on the Contractor and shall be without appeal.

c) Frequency of testing of building materials shall be as per attached test schedule. Testing of various materials should be carried out as per the relevant IS standards mentioned in the technical specifications attached to the tender. Contractor should submit manufacturer's certificates for the various materials and the above tests will be carried out in addition to the certificates submitted. Cost of testing should be borne by the Contractor. In case of delay in testing materials, PMC/Client reserves the right to have the same tested at Contractor's cost.

d) Sand has to be tested for silt content, particle size and organic impurities. If the silt content is more than 8% the fine aggregate / sand has to be profusely washed and cleaned to reduce silt content to acceptable level.

Locally available best quality burnt clay bricks of minimum compressive strength of 35KG / sq cm shall be used for brick masonry.

42. Any or all services which are not specified or mentioned here upon but are required for the successful completion of the work will have to be adhered by the Contractor. However no extra charges will be paid by the Client i.e. MIDC.

The work shall be carried out in accordance with the Architectural drawings and structural drawings, released for execution from time to time, by the Engineer-in-Charge. Before commencement of any item of work, the contractor shall correlate all the relevant architectural and structural drawings issued for the work and satisfy himself that the information available therein is complete and unambiguous. The discrepancy, if any, shall be brought to the notice of

the Engineer-In-Charge before execution of the work. The contractor shall be solely responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and or incomplete information.

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

43. CONDITIONS SPECIFIC TO GREEN BUILDING PRACTICES

It is envisaged to obtain "GREEN" rating for various buildings to be constructed under this contract. The contractor shall strictly adhere to the following conditions as part of his contractual obligation.

43.1 The Contractor should follow the construction plan as proposed by the Architect /Engineer in Charge to minimize the site disturbance such as soil pollution due to spilling. Use staging and spill prevention and control plan to restrict the spilling of the contaminating materials at site. Protect top soil from erosion by collection storage and reapplication of top soil, constructing sediment basin, contour trenching, mulching etc.

43.2 No excavated earth shall be removed from the campus unless suggested otherwise by Engineer in Charge. All subsoil shall be reused in backfilling/landscape, etc. as per the instructions of the Engineer in Charge. The surplus excavated earth shall be disposed of by the contractor for reuse. A certificate of reuse as required by the Engineer-in- Charge shall be submitted by the contractor.

43.3 The contractor shall not change the natural gradient of the ground unless specifically instructed by the Engineer in Charge. This shall cover all- natural features like water bodies, drainage gullies, slopes, mounds, depressions, etc. Existing drainage patterns through or into any preservation area shall not be modified unless specifically directed by the Engineer-in-charge.

43.4 The contractor shall not carry out any work which results in the blockage of natural drainage.

43.5 The contractor shall ensure that existing grades of soil shall be maintained around existing vegetation and lowering or raising the levels around the vegetation is not allowed unless specifically directed by the Engineer-in-charge.

43.6 Contractor shall reduce pollution and land development impacts from automobiles used during construction.

43.7 Overloading of trucks is unlawful and creates the erosion and sedimentation problems, especially when loose materials like stone dust, excavated earth, sand etc. are moved. Proper covering must take place. No overloading shall be permitted.

43.8 Preserve and Protect Landscape during Construction

a) The contractor shall ensure that no trees, existing or otherwise, shall be harmed and damage to roots should be prevented during trenching, placing backfill, driving or parking heavy equipment, dumping of trash, oil, paint, and other materials detrimental to plant health. These activities should be restricted to the areas outside of the canopy of the tree, or, from a safe distance from the tree/plant by means of barricading. Trees will not be used for support; their trunks shall not be damaged by cutting and carving or by nailing posters, advertisements or other material. Lighting of fires or carrying out heat or gas emitting construction activity within the ground, covered by canopy of the tree is not to be permitted.

b) The contractor shall take steps to protect trees or saplings identified for preservation within the construction.

c) Contractor should limit all construction activity within the specified area as per the Construction Management Plan (CMP) approved by Engineer in Charge.

d) The contractor shall avoid cut and fill in the root zones, through delineating and fencing the drip line (the spread limit of a canopy projected on the ground) of all the trees or group of trees. Separate the zones of movement of heavy equipment, parking, or excessive foot traffic from the fenced plant protection zones.

e) The contractor shall ensure that maintenance activities during construction period shall be performed as needed to ensure that the vegetation remains healthy.

f) The permission for cutting of trees and / or Transplanting of the trees shall be obtained by the contractor from BMC or any other authority of the State Government.

43.9 Contractor shall collect all construction waste generated on site. Segregate these wastes based on their utility and examine means of sending such waste to manufacturing units which use them as raw material or other site which require it for specific purpose. Typical construction debris could be broken bricks, steel bars, broken tiles, spilled concrete and mortar etc.

43.10 The contractor shall provide potable water for all workers.

43.11 The contractor shall provide the minimum level of sanitation and safety facilities for the workers at site. The contractor shall ensure cleanliness of workplace with regard to the disposal of waste and effluent; provide clean drinking water and latrines and urinals as per applicable standard. Adequate toilet facilities shall be provided for the workman within easy access of their place of work. The total no. to be provided shall not be less than 1 per 30 employees in any one shift. Toilet facilities shall be provided from the start of building operations, connection to a sewer shall be made as soon as practicable. Every toilet shall be so constructed that the occupant is sheltered from view and protected from the weather and falling objects. Toilet facilities shall be maintained in a sanitary condition. A sufficient quantity of disinfectant shall be provided. Natural or artificial illumination shall be provided.

43.12 The contractor shall ensure that air pollution due to dust/generators is kept to a minimum, preventing any adverse effects on the workers and other people in and around the site. The contractor shall ensure proper screening, covering stockpiles, covering brick and loads of dusty materials, wheel-washing facility, gravel pit, and water spraying. Contractor shall ensure the following activities to prevent air pollution during construction:

 Clear vegetation only from areas where work will start right away.

 Vegetate / mulch areas where vehicles do not ply.

 Apply gravel / landscaping rock to the areas where mulching /paving is impractical.

 Identify roads on-site that would be used for vehicular traffic. Upgrade vehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape and mineral types that make up the surface & base. Add surface gravel to reduce source of dust emission. Limit amount of fine particles (smaller than 0.075mm) to 10 - 20%

 Water spray, through a simple hose for small projects, to keep dust under control. Fine mists should be used to control fine particulate. However, this should be done with care so as not to waste water. Heavy watering can also create mud, which when tracked onto paved public roadways, must be promptly removed. Also, there must be an adequate supply of clean water nearby to ensure that spray nozzles don't get plugged.

 Water spraying shall be done on:

Any dusty materials before transferring, loading and unloading Area where demolition work is being carried out

Any un-paved main haul road

Areas where excavation or earth moving activities are to be carried out

- The contractor shall ensure that the speed of vehicles within the site is limited to 10 km/hr.
- All material storages should be adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust / particulate emissions.
- Spills of dirt or dusty materials will be cleaned up promptly so the spilled material does not become a source of fugitive dust and also to prevent of seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained / cleaned up immediately before they can infiltrate into the soil / ground or runoff in nearby areas
- Provide hoardings of not less than 3m high along the site boundary, next to a road or other public area
- Provide dust screens, sheeting or netting to scaffold along the perimeter of the building
- Cover stockpiles of dusty material with impervious sheeting
- Cover dusty load on vehicles by impervious sheeting before they leave the site

43.13 The contractor shall ensure that no construction leachate (e.g. cement slurry etc.), is allowed to percolate into the ground. Adequate precautions are to be taken to safeguard against this including, reduction of wasteful curing processes, collection, basic filtering and reuse. The contractor shall follow requisite measures for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to the treatment device or facility (municipal sewer line).

43.14 The storage of material shall be as per standard good practices as specified in Storage, Stacking and Handling practices, NBC 2016 shall be to the satisfaction of the Engineer in Charge to ensure minimum wastage and to prevent any misuse, damage, inconvenience or accident. Watch and ward of the Contractor is materials shall be his own responsibility. There should be a proper planning of the layout for stacking and storage of different materials, components and equipment with proper access and proper maneuverability of the vehicles carrying the materials. While planning the layout, the requirements of various materials, components and equipment at different stages of construction shall be considered.

43.15 The contractor shall ensure the following activities for construction workers safety, among other measures:

- Guarding all parts of dangerous machinery.
- Precautionary signs for working on machinery Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- Provide protective equipment; helmets etc. –
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Provide sufficient and suitable light for working during night time

43.16 The contractor shall provide for adequate number of garbage bins around the construction site and the workers facilities and will be responsible for the proper utilization of these bins for any solid waste generated during the construction. The contractor shall ensure that the site and the workers facilities are kept litter free. Separate bins should be provided for plastic, glass, metal, biological and paper waste and labeled in both Hindi and English with suitable symbols.

43.17 The contractor shall prepare and submit spill prevention and control plans before the start of construction, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, and petroleum products.

43.18 Contractor shall collect & submit the relevant material certificates for materials with high recycled (both post-industrial and post-consumer) content, including materials like RMC mix with fly-ash, glass with recycled content, calcium silicate boards etc.

43.19 The contractor shall ensure that a flush out of all internal spaces is conducted prior to handover. This shall comprise an opening of all doors and windows for 14 days to vent out any toxic fumes due to paints, varnishes, polishes, etc.

43.20 WATER USE DURING CONSTRUCTION

Contractor should spray curing water on concrete structure and shall not allow free flow of water. Concrete structures should be kept covered with thick cloth/gunny bags and water should be sprayed on them. Contractor shall do water poundings on all sunken slabs using cement and sand mortar.

43.21 RESOURCES CONSUMED DURING CONSTRUCTION

(a) The contractor shall ensure that the water and electricity is not wasted during construction. The Engineer in Charge can bring to the attention any such wastage and the contractor will have to ensure that such bad practices are corrected.

(b) The contractor shall install necessary meters and measuring devices to record the consumption of water, electricity and diesel on a monthly basis for the entire tenure of the project.

(c) The contractor shall ensure that all run-off water from the site, during construction is collected and reused to the maximum.

(d) The contractor shall use treated recycled water of appropriate quality standards for construction, if available.

(e) The contractor shall minimize the use of electricity.

43.22 CONSTRUCTION WASTE

(a) Contractor shall minimize the generation of construction waste as per the requirement for obtaining "GREEN" rating for GHAR.

(b) All construction debris generated during construction shall be carefully segregated and stored in a demarcated waste yard. Clear, identifiable areas shall be provided for each waste type. Employ measures to segregate the waste on site into inert, chemical, or hazardous wastes.

(c) All construction debris shall be used for road preparation, back filling, etc, as per the instructions of the Engineer in Charge, with necessary activities of sorting, crushing, etc.

(d) No construction debris shall be taken away from the site, without the prior approval of the Engineer in Charge.

(e) The contractor shall recycle the unused chemical/hazardous wastes such as oil, paint, batteries, and asbestos.

(f) If and when construction debris is taken out of the site, after prior permissions from the Engineer in Charge, then the contractor shall ensure the safe disposal of all wastes and will only dispose of any such construction waste in approved dumping sites.

43.23 DOCUMENTATION

(a) The contractor shall, during the entire period of the construction, submit the following records to the Engineer in Charge on a monthly basis:

(i) Water consumption in liters

(ii)Electricity consumption in 'kwh' units

(iii)Diesel consumption in liters

(iv)Quantum of waste (volumetric/weight basis) generated at site and the segregated waste types divided into inert, chemical and hazardous wastes.

(b) Digital photo documentation to demonstrate compliance of safety guidelines as specified in the tender The contractor shall, during the entire tenure of the construction phase, submit the following records to the Engineer in Charge on a fortnightly basis:
(i) Quantities of material brought into the site, including the material issued to the contractor by the Engineer in charge.
(ii) Quantities of construction debris (if at all) taken out of the site
(iii) Digital photographs of the works at site, the workers facilities, the waste and other material storage yards, pre-fabrication and block making works, etc as guided by the Engineer in Charge

(c) The contractor shall submit a document after construction of the buildings, a brief description along with photographic records to show that other areas have not been disturbed during construction. The document should also include brief explanation and photographic records to show erosion and sedimentation control measures adopted. (Document CAD drawing showing site plan details of existing vegetation, existing buildings, existing slopes and site drainage pattern, staging and spill prevention measures, erosion and sedimentation control measures and measures adopted for top soil preservation during construction.

(d) The contractor shall submit to the Engineer in Charge after construction of the buildings, a detailed as built quantification of the following:
(i) Materials used,
(ii) Total top soil stacked and total reused
(iii)Total earth excavated
(iv)Total waste generated,
(v)Total waste reused,
(vi)Total water used,
(vii)Total electricity, and
(viii)Total diesel consumed.

(e) The contractor shall submit to the Engineer in Charge, before the start of construction, a site plan along with a narrative to demarcate areas on site from which top soil has to be gathered, designate area where it will be stored, measures adopted for top soil preservation and indicate areas where it will be reapplied after construction is complete.

(f) The contractor shall submit to the Engineer in Charge, a detailed narrative (not more than 250 words) on provision for safe drinking water and sanitation facility for construction workers and site personnel.

(g) Provide supporting document from the manufacturer of the Batch mix/ Ready Mix concrete specifying the use of Fly Ash.

(h) Provide supporting document from the manufacturer of the pre-cast building blocks specifying the fly ash content of the blocks used in an infill wall system.

(i) Provide total support to Engineer in Charge and Green Building Consultants appointed by the Engineer in charge in completing all Green Building Rating related formalities, including signing of forms, providing signed letters in the contractor’s letterhead whenever required.

f) The charges towards the site visit of officers from Green building authority including to and fro, food and accommodation shall be borne by the Contractor.

44 CONDITIONS OF NATIONAL GREEN TRIBUNAL

44.1 The contractor shall not store/ dump construction material or debris on the metaled road.

44.2 The contractor shall get prior approval from Engineer-in-Charge for the area where the construction material or debris can be stored beyond the metaled road. This area shall not cause any obstruction to the free flow of traffic /inconvenience to the pedestrians/public in general. It should be ensured by the contractor that no accidents occur because of such permissible storage.

44.3 The contractor shall take appropriate protection measures like raising wind breakers of appropriate height on all sides of the plot/area to ensure that no construction material dust fly outside the plot area.

44.4 The contractor shall ensure that all the trucks or vehicles of any kind which are used for construction purposes/or are carrying construction material like cement, sand, earth and other allied material are fully covered. The contractor shall take every necessary precaution that the vehicles are properly cleaned and dust free to ensure that enroute their destination, the dust, sand or any other particles are not released in air/contaminate air.

44.5 The contractor shall provide mask to every worker on the construction site and involved in loading, unloading and carriage of construction material and construction debris to prevent inhalation of dust particles.

44.6 The contractor shall provide all medical help, investigation and treatment to the workers involved in the construction of building and carry off construction material and debris relatable to dust emission.

44.7 The contractor shall ensure that C&D waste is transported to the C&D waste site only and due records shall be maintained by the contractor

44.8 The contractor shall compulsorily use wet jet in grinding and stone cutting.

44.9 The contractor shall comply with all the preventive and protective environmental steps as stated in the MoEF guidelines, 2010.

44.10 The contractor shall carry out on-Road-Inspection for black smoke generating machinery. The contractor shall use cleaner fuel.

44.11 The contractor shall ensure that all DG set comply emission norms notified by MoEF.

44.12 The contractor shall use vehicles having pollution under control certificate. The emissions can be reduced by a large extent by reducing the speed of a vehicle to 20 Kmph. Speed bumps

shall be used to ensure speed reduction. In case where speed reductions cannot effectively reduce fugitive dust, the contractor shall divert traffic to nearby paved areas.

44.13 The contractor shall ensure that the construction material is covered by tarpaulin. The contractor shall take all other precaution to ensure that no dust particles are permitted to pollute air quality because of such storage.

44.14 The paving of the path for plying of vehicles carrying construction material is more permanent solution to dust control and suitable for longer duration projects.

44.15 Any violation of orders of MoEF including guidelines of State Government, SPCB or any officer of any department shall lead to stoppage of work for which Contractor shall be responsible and no hindrance shall be accounted in this regard.

44.16 The contractor shall take appropriate protection measures like raising wind breakers of appropriate height on all sides of the plot/area using CGI sheets or plastic and/or other similar material to ensure that no construction material dust fly outside plot area.

45 Make in India Policy

The main contractor as well as associate contractor of each discipline shall comply to Government of India Public Procurement (Preference to Make in India), Order-2017 amended up to the date of call of tender.

46. The soil investigation report will be part of the tender document. However the Contractor has to ascertain the actual site conditions before excavation by means of any tests as may be required at his own cost. Nothing extra will be paid to him.

SAFETY CODE

1. First aid appliances including adequate supply of sterilized dressings and cotton wool shall be kept in a readily accessible place.

2. An injured person shall be taken to a public hospital without loss of time, in cases where the injury necessitates hospitalization.

3. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from ground.

4. No portable single ladder shall be over 8 meters in length. The width between the side rails shall not be less than 30 cm.(clear) and the distance between two adjacent rungs shall not be more than 30 cm. When a ladder is used an extra mazdoor shall be engaged for holding the ladder.

5. Every opening in the floor of a building or in a working platform is provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be one meter.

6. No floor, roof or other part of the structure shall be so overloaded with debris or materials as to render it unsafe.

7. Workers employed on mixing and handling material such as asphalt, cement mortar or concrete and lime mortar shall be provided with protective footwear and rubber hand gloves.

8. Those engaged in welding works shall be provided with welder's protective eye-shields and gloves.

9. (i) No paint containing lead products shall be used except in the form of paste or readymade paint.

   (ii) Suitable facemasks should be supplied for use by the workers when the paint is applied in the form of spray or surface having lead paint dry rubbed and scrapped.

10. Overalls shall be supplied by the Contractor to the painters and adequate facilities shall be provided to enable the working painters to wash during the periods of cessation of work.

11. Hoisting machines and tackles used in the works, including their attachments, anchorage and supports shall be in perfect condition.

12. The ropes used in hosting or lowering material or as a means of supervision shall be of durable quality and adequate strength and free from defects

DECLARATION OF THE CONTRACTOR

Name of Works: - Restoration refurbishment and upgradation of existing laboratory building for MPCB's at Mahape, Navi Mumbai.

"It is understood and accepted by the contractor that, he has studied drawing and information provided, and has satisfied that, information provided to him is adequate, understood the nature and extend of work, is aware of site condition and constraints of the site. The contractor is sufficiently experienced in the type of work undertaken by him in this contract and has adequate finical support and has fully experienced staff to execute the work and takes full responsibility to execute the work in time with proper safety precaution during construction under circumstance etc. Unless the work defined, proper brief is prepared, responsibility specified, liquidated damage mentioned (important as there are delays, extensions, unilateral extensions, supplementary contract, wavers which form important part of the contract), Indemnity in civil liability, Insurance including professional indemnity etc. to prove the professional approach of the Engineer – in – charge. Proper information has to be provided by the contractor about the brief of work, constraints if any in work for execution, nothing to be withheld. It is the total responsibility of the contractor."

This declaration of the contractor on requisite stamp paper of INR 500 shall be the part of the contract.

Signature of Contractor

PRICE SCHEDULE ATTACHED SEPARATELY

GENERAL SPECIFICATION FOR WORKS

The detailed specifications given herein after are for the items of works described in the schedule of quantities attached herein, and shall be guidance for proper execution of work to the required standards. **It may also be noted that the specifications are of generalized nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings.** The work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred to in these documents but are essential for the entire completion in accordance with standard Engineering practice.

Unless specifically otherwise mentioned, all the applicable codes and standards published by the Bureau of Indian Standards latest revision and all other standards which may be published by them before the date of receipt of tenders, shall govern in all respects of design, workmanship, quality and properties of materials and methods of testing, method of measurements etc. In case there in no I.S.I. (B.I.S) specification for the particular work, such work shall be carried out in accordance with instructions in all respects, and requirements of the Client/Consultant.

The contractor shall take instructions from the Client/Consultant regarding collection and stacking of materials. No building materials shall be stacked on areas where other buildings, roads, services, compound walls etc. are to be constructed.

The contractor shall maintain in perfect condition all works executed till the completion of the entire work allotted to him. Where phased delivery is contemplated, this provision shall apply to each phase.

The contractor shall clear the site thoroughly of all scaffolding materials and rubbish, etc. left out of this work to the satisfaction of the Client/Consultant before the work is considered as complete.

In case any difference or discrepancy between the specifications and the description in the schedule of quantities, the schedule of quantities shall take precedence. In case of any difference or discrepancy between specifications and drawing, the specifications shall take precedence.

Site books / Reports

For the purpose of quick communication between the Engineer and the Contractor or his Agent or representative, Site Instruction Books shall be maintained at Site in the manner as described below:

Any communication, relating to the works, may be conveyed through records in the Site Instruction Books. Such communication from the Engineer to the contractor shall be deemed to have been adequately served in terms of the contract. Each Site Instruction Book shall have machine-numbered pages in triplicate and shall be carefully maintained and preserved by the Contractor. Any instruction or other orders which the Engineer may

like to issue to the Contractor may be recorded by him in the Site Instruction book and one copy thereof issued to the Contractor.

Furnish of Reports, Statements, returns, etc., by Contractor

All reports, statements, returns, diagrams, or drawings, etc., which the Contractor is required to submit during the progress of the works to the Engineer shall unless otherwise directed, to be furnished in triplicate and at expense of the Contractor.

Contractor to Verify Site Measurements

The Contractor shall check and verify all Site levels and measurements whenever requested by other specialized Contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness, this will not in any way delay the works. A copy of all such information passed on shall be given to the Consultant.

Materials & Samples

1. **Materials to be New**
   The whole of the materials / fittings / equipments employed in connection with the permanent work shall be new and of the best quality and description of their respective kinds and shall conform to the relevant Code (latest applicable standard) and to the approval of the Engineer. The Contractor shall be responsible to ensure that the material used is suited to the specific conditions including the climatic and environmental conditions prevailing at the site.

2. All proprietary material shall be of approved make and the type as stipulated. Lists of approved makes are given at the end of this document. It will be deemed that the Contractor has priced the respective items on the basis of those approved makes. However, it shall be the prerogative of the client to choose any particular make among the list as the most appropriate one and the Contractor shall be bound to provide the same without any variation in the contract rate.

3. **Approval of Manufacturers**
   Sufficiently before ordering materials of any description, the Contractor shall submit samples to the Consultant along with the names of the manufacturers and / or supplier proposed and shall obtain approval thereof in writing from the Consultant well in advance of commencement of work & procurement of materials at site for use.

4. **Copies of orders**
   The contractor shall supply to the Consultant in triplicate copies of all orders placed by him for the supply of materials or any item of permanent work or materials for the fabrication thereof. The specialist sub – contractors, also shall supply, through the Contractor, three copies of all orders they may place for items

of work or materials for fabricating any article or thing for which they have been sub-contracted.

5. Samples of materials and work

1. Irrespective of the fact that some specific make or type of material has been stipulated. No material hall be supplied or used on permanent works until the samples of the same are prepared / submitted and have been approved in writing by the Engineer / Architect.

b) In addition to special provision made hereinafter as to sampling and testing of materials by particular methods, samples of all materials and work proposed to be employed in the execution of the work may be called for at any time by the engineer and shall be submitted to the engineer for approval without delay by the Contractor. The Contractor shall arrange for the carriage of the same to enable the tests and analysis thereof to be made.

c) Samples of materials of all trades / disciplines supplied shall be such as to have a clear idea of the general type and characteristics of the whole of the materials to be used in the work. No plea regarding samples supplied being not representative of the whole of the material will be acceptable. In case it is not practical to bring or make the sample at the site office, the Contractor shall arrange for inspection at the Sub-Contractor's / Supplier's shop or works at his own cost. In the event of the Contractor not submitting for the approval of the engineer samples of materials of satisfactory quality and workmanship, the Engineer shall have the power to specify any particular manufacturer or merchant for the supply of such materials and the Contractor shall, without extra charge, obtain such materials from the said manufacturer or merhant. Before submitting samples for approval to the Engineer the Contractor shall satisfy himself that it is in accordance with the requirement of the contract. The samples shall also be submitted sufficiently early for all procedures to be duly completed including rejection and re-submissions if required, so that the approved programme o construction is not adversely affected in any way.

d) Samples, when approved, will be retained by the Engineer until the completion of the project and for this purpose suitable labeled boxes for storage of samples shall be provided by the Contractor.

e) The Engineer shall be at the liberty to reject all materials and workmanship at nay stages, which are not at least equal in quality and character to such approved samples.

f) The Contractor shall when required by the Engineer furnish all information as to quality, weight, constituent substances, dimensions, levels, strength and description of the materials, test results, full and accurate records of the dimensions and positions of all new work and any other information necessary, and works and give the Engineer such other particulars as may be required promptly.

Inspection and Testing of Materials

The Engineer shall be kept informed as to the progress of all works being carried out or materials being manufactured, prepared or supplied so that he may be able to make such arrangements for inspection, testing and analysis as he may desire. Wherever considered desirable by the Engineer, representative will be sent to the Contractor's, Sub-Contractor's and / or manufacturer's premises to test the materials or inspect their manufacture. The Contractor shall attend to the Engineer or his representative during such inspection to be carried out satisfactorily. Should the Engineer decide not to send a representative to the said premises, the Contractor shall obtain from the Manufacturer's certificate of test, proof sheets, mill sheets, showing that the materials have been tested satisfactorily in accordance with the requirements of the specification relating thereto, but neither omission of the Engineer to send an Inspector nor the production of manufacturer's certificates of test shall affect the liberty of the Engineer to reject after delivery of any material found not to be suitable or not in accordance with the specifications.

The Contractor shall provide means of identification of the materials delivered at the site with the corresponding certificate of test and manufacturing batch numbers.

As soon as the materials are delivered at the site the Engineer shall be informed. Notwithstanding any test that the Engineer may direct to be carried out at the Contractor's, Sub-Contractor's and / or Manufacturer's premises the Engineer shall be at liberty to carry out any further test he may desire after delivery of materials at the site and may reject any or all materials which fail to comply with the approved sample or the required specification. Only

After the approval of the materials delivered at the site the same shall be used at the works and such approval shall not relieve the contractor from fulfilling the obligations under the contract.

The Contractor shall prepare and provide such and so many test pieces of the various materials as the Engineer may, from time to time, direct or as may be specified and the Contractor shall analyze, test and weight all materials in such manner and at such time or times and in such place or places as may be specified or directed by the Engineer.

Materials shall be packed, transported, handled and stored on the site carefully and in a satisfactory manner so as to prevent any damage and / or deterioration of any kind either during transit or storage. Certain perishable materials like cement, lime, fittings, doors, windows, glass, etc. are stored in covered godowns to save them from sun, rain etc.

Rejected Materials

Should the Engineer at any time condemn any material or goods intended for use in the works as: -

a) Being inferior to samples previously approved.

OR

b) Having deteriorated in transit or on storage or on the site so as to be no longer fit for incorporation in the permanent works.

OR

c) Not complying with the specification.
The Contractor shall promptly remove all such material from the vicinity of the works to the satisfaction of the engineer and confirm in writing immediately after removal.

Should the Engineer discover on the works any material other than those approved, he may order their immediate removal from the site and the Contractor shall forthwith remove the unapproved materials from site within 48 hours. Any work executed with interior material is to be taken out and reinstated with approved material at the Contractor's expenses and within the contracted time period.

List of Proprietary Materials

The Contractor shall submit a comprehensive list of all proprietary articles and materials used in the works containing catalogue reference numbers, colour shades, etc., and the manufacturer's and or supplier's names, addresses and where appropriate, suppliers names and addresses including a price list CIF to the site of works. This list is approved format shall be complete in all respects and shall be submitted together with the 'As - Built' drawings and operation and maintenance manuals.

Failure to submit the above list will defer issue of the 'Completion Certificate'.

Contractor to satisfy himself regarding all requirements

The Contractor shall satisfy himself as to the full extent and character of the work's supply and conditions affecting labor, materials and plant, requirements of the Employer's safety and Health Regulations and all local conditions and restrictions affecting the works and provide for the same

The responsibility for carrying out the works and the methods to be adopted under this Contract shall rest solely with the Contractor subject always to the approval by the Engineer of the Contractor's proposals. Such approvals shall not, however, relieve the Contractor in any way of his responsibility for the proper execution of works in accordance with the Contract.

Record Drawings

The engineer will issue two sets of the drawings / site instructions with sketches to the Contractor for the items for which some changes have been made from the approved drawings. The Contractor will mark the changes in the main original drawings issued for the purpose earlier and keep record of all such changes including the changes in levels and dimensions as required at site and issued by written instructions of the engineer and shall keep the site drawings fully updated. Finally theses drawings with all revision shall be maintained as record drawings at site and all such revisions / corrections shall be reflected / in corporate in the As - built Drawings to be submitted by the Contractor as stated hereinafter and return these copies to the Engineer for his approval. In case any revision is required or the corrections are not properly marked, the Engineer may point out the discrepancies to the Contractor.

As - built Drawings and Completion Photographs

Two copies shall be submitted by the contractor of the corrected As-Built drawings to the engineer for his approval.

The Engineer shall return one copy of the same, duly approved, if found satisfactory or advice the Contractor on the changes required of discrepancies, if any. The Contractor shall resubmit the three copies after incorporating all the corrections / changes etc. as required.

On receipt of the approved copy of these drawings the Contractor shall submit to the engineer six print copies of the same along with one reproducible copy and as directed by the Engineer for onward submission to the employer, unless otherwise stated.

Before the works (or any section there of) are completed in accordance with relevant provision of General Conditions of Contract and before submission of the Last / Final

Bill, whichever is earlier, the Contractor shall furnish to the engineer, "As-Built Drawings" or the works as completed, in sufficient details, which in the opinion of the engineer will enable the employer to maintain, dismantle, reassemble and adjust all parts of the works.

The Contractors and his specialized sub-contractors shall submit "As-Built Drawings" for the whole of the works including civil and structural works and all other services if any, fabrication, installation equipment, and their layouts, distribution system and all other relevant information as required for approval of the Engineer.

On completion, Contractor will engage a professional photographer to take external and 10 internal views of the buildings. 3 copies each of enlarge A4 size of these photographs will be submitted to the client and one set including the negatives to the Engineer.

Care of Works and Properties

The Contractor shall so conduct his operations as not to damage, close or obstruct any utility, highway, road or other property until permits thereof have been obtained. If facilities are closed, obstructed, damaged or rendered unsafe by Contractor's operations, the Contractor shall, at his own cost, make such repairs and provide such temporary guards, lights and other signals as necessary or required for safety and as will be acceptable to the engineer and / or the owner of the utility, highway, road or other property.

First Aid Service

The Contractor shall make his own arrangements for treatment of casualties on the Item in such first-aid units as may be thought necessary. The whole of the arrangements for the First Aid Service shall comply with local Health Authority Regulations and shall at all time be subject to the approval of the engineer and the Contractor shall carry out any instruction given by the Engineer in this respect.

Progress Photograph

The Contractor shall arrange to take Progress Photograph fortnightly. The number and positions from which the photographs are to be taken shall be directed by the Engineer.

Facilities, Attendance etc. On Nominated Sub-Contractors

The Contractor shall allow for the provision of facilities, attendance etc. for the nominated sub-contractors.

These facilities, attendance etc. shall include: -

i) Storage facilities for plant, tools and equipment and products and materials;

ii) The use of sanitary accommodation, medical and welfare facilities;

iii) Facilities as described in Clauses keeping site clean, providing drinking and construction water and proper lighting at work site, access, scaffolding hoist etc., hereof;

iv) Watching and lighting and protection of their work as necessary.

Dispatch of Material

Materials shall not be dispatched from the Manufacturer's works or to the site without authority from the Engineer. The engineer shall be informed prior to dispatching the materials.

SPECIFICATION FOR DEMOLISHING EXISTING STRUCTURE

A. Demolishing the existing Structure by using mechanical equipments/ manually including sorting out the material i.e. reinforcement, doors, windows, False Ceiling, Partition, electrical fixtures, piping etc and stacking the same in appropriate manner or as directed with all leads and lifts including disposal of unwanted material etc. complete.

1.1 General: The item pertains to demolishing the existing structures of cafeteria including sorting the various material and stacking the same as directed and disposing the spoils with all lead and lift.

1.2 Demolition Procedure: Before the demolishing the structure, the contractor shall submit the dismantling scheme to the Engineer-in-charge for the approval. The demolishing work shall be carried out in such a way that the dismantled materials shall be reusable. The appropriate tools and machinery shall be used. In case the Engineer-in-charge feels that the work being carried out is causing avoidable loss or damage of dismantled material, Engineer-in-charge has the right to either penalise or recover costs of material from the amounts payable to the contractor engaged for demolition work.

1.3 Safety Measures: All demolition work shall be carried out safely using procedures, which do not cause injuries to any person engaged in demolition work. Contractor shall provide proper devices to the workmen like safety belts, helmets, goggles etc. to prevent injures to the workmen. The safety of workmen is the responsibility of the contractor and the compensation for injuries or deaths shall be made by the contractor as per the prevailing acts and rules.

1.4 Stacking of Dismantled Materials: All dismantled materials shall be stacked in neat piles at location shown by the Engineer-in-charge. Recovered materials from demolition shall be stacked size wise. Similarly all fixtures, wind ties etc. shall be stacked separately. Ridges, gutters and other special materials shall be stacked so that accounting is possible. In case Engineer-in-charge so desires, he may instruct the contractor to transport the material to MPCB stores, and lead charges for the same shall be deemed to have been included under relevant items in the contract. (All the material has to taken away and MPCB should be compensated accordingly).

1.5 Disposal: Dismantled items, which are not reusable or broken during demolition and other disposable materials etc. shall be disposed off as per the directions of the Engineer-in-charge.

1.6 Item to Include: The item includes removal of AC or GI sheets from roof, gable and walls of any structure, with appropriate tools and equipment, scaffolding if required, material, labour, transporting the material to the location and stacking / disposing the material as directed by the Engineer-in-charge.

1.7 Mode of Measurement and Payment: The measurement of the actual sizes of the AC or GI sheets and the respective numbers shall be taken before the actual work of demolition starts. The total area of the sheets shall be measured on area basis in sqm. The schedule of all such sheets

and the fixtures shall be prepared. Payment shall be made on the basis of sqm of area of AC or GI sheets dismantled. No deductions for the breakage of sheets shall be made if such breakage are unavoidable in view of the Engineer-in-charge. Deductions for the breakage shall be made if they are due to negligence or mishandling the material even during transporting or stacking. The decision of the Engineer-in-charge, regarding deduction shall be final.

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Instructions to the tenderers for dismantling work.

The tenderers are advised to visit the site before quoting for the tender items to arrive at correct rate by taking into consideration of the existing site conditions. All debris are to be carried away to the nearest approved municipal disposal ground outside the premises with no extra cost. Please note that the tenderers shall not be allowed to use lift for carting away the dismantled materials and they have to use either staircase or other mechanical means to be erected on their own for disposal of materials.

The work of demolishing, cutting down, dismantling etc., includes propping wherever required, removing all the serviceable as well as unserviceable materials as directed, stacking the same at suitable places or as detailed in individual items and carting away the same including loading and unloading all the materials and debris from site to the nearest approved municipal dumping ground as per the instructions from the EIC/PMC with no extra cost.

The amount should include cost for carrying out any other unforeseen demolition items required for the proper execution of the work. The contractor will have to make good of any damage done during execution of the work without extra payment. The tenderers are requested in their own interest to inspect the site to assess the nature and quantum of work.

Demolishing and Disposing/ carting away the debris from the site as per the directions of the EIC/PMC and as detailed below:

The demolition rates as inclusive of all costs, including royalties, permissions, and disposal of materials. This typically ensures that the contractor bears the responsibility for all aspects of the demolition process, from obtaining necessary permissions to disposing of materials properly.

The unserviceable materials are to be disposed of. The agencies are required to quote the rates accordingly. The decision of EIC on the serviceability of the materials is final.

TECHNICAL SPECIFICATIONS FOR CIVIL WORKS

B) General Civil Works

This specification covers the general requirement for excavation brick masonry, plastering, flooring, doors, windows, ventilators, wood work, water proofing, painting, plumbing and sanitary work etc., and such other related work forming a part of this job which may be required to be carried out though not specifically mentioned above. The work under this specification shall consist of furnishing of all tools, plants, labour, materials, any and everything necessary for carrying out the work.

1.0 BRICK WORK

Providing Burnt Brick masonry with conventional type brick in cement mortar 1:3 in half brick (115 mm thick) including mild steel longitudinal reinforcement of 2 bars of 6 mm dia or hoop iron strip 25 mm x 1.6 mm at every third course properly bent and bonded at ends, or RCC M-15 band at every 1m height of 75 mm thickness with 8 mm dia. 2 bars longitudinally and 8 mm dia distribution @ 150 mm c/c including scaffolding, raking out joints and curing etc. complete.

1.1 General : All the provisions of shall be applicable for this item of providing the IInd class burnt brick masonry in the specified mortar proportion in half brick (115 mm thick) including mild steel reinforcement of 3 bars of 6 mm dia. or hoop iron strip 100 mm x 1.6 mm at every third course properly bent and bonded at ends or providing R.C.C. M150 grade band at every 1 m height of 75 mm thickness with 8 mm thick 2 bars longitudinally and 8 mm distribution @ 150 mm c/c. The work shall be carried out strictly as per the directions of the Engineer in Charge. The item covers bailing out water, striking out joints on exposed faces, scaffolding, curing, centering to reinforcement band etc. complete.

1.2 Material : Shall confirm to specification as per below mention:-

1.2.1. **II-Class Burnt Bricks :** Second Class Burnt bricks shall conform to the specifications. Approval to samples of locally available bricks shall be taken from the Engineer-in-Charge and samples shall be preserved to compare with the supply to work site.

1.2.2. **The Sand or Fine Aggregate :** The sand or fine aggregate for mortar shall be natural sand, crushed stone sand or crushed gravel sand.

Test results of the grading of sand shall be submitted to the Engineer-in-Charge for approval. The decision in accepting the sand, which has deviation from specification, is left to the Engineer-in-Charge.

1.2.3. **Cement :** Cement to be used, for civil and structural works, shall be one of the following or in combination thereof. For plain and reinforced concrete works normally 43 grade and 53 grade ordinary Portland cement, shall be used. Specific requirement for any other type of cement shall be as shown in the drawings or as specified in contract or as directed by the Engineer-in-Charge.

1.2.4. **Water :** Water used in construction for all civil and structural works for mixing and curing shall be clean and free from injurious amount of oil, acids, alkalies, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. The 'pH' value of water sample shall not be less than 6, but generally it should be between 6 to 8. Potable water shall be considered satisfactory. Underground water can also be used with the prior approval of Engineer-in-Charge, if it

meets all the requirements of IS : 456 (Revised).

Tests on water samples shall carried out in accordance with IS : 3025-1964 and they shall fulfil all the guidelines and requirements given in IS : 456 (Revised).

The Engineer-in-Charge may require the Contractor to prove, that the concrete prepared with water, proposed to be used, shall not have a average 28 days compressive strength lower than 90% of the strength of concrete prepared with distilled water. The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes, and shall not differ by more than + 5 minutes from the initial setting time of control test block prepared with appropriate test cement and distilled water.

As directed by the Engineer-in-Charge, the Contractor shall get the water tested from an approved laboratory before starting the construction work and in case the water contains any oil/organic matter or an excess of acid, alkalies or any injurious amount of salts etc. beyond the permissible maximum limits given in IS : 456 (Revised), the Engineer-in-Charge may refuse to permit its use. In case the water is supplied by MPCB, the contractor shall get himself satisfied regarding its quality before using the same in his works at his own expenses. In case there is any change in source of water, water samples shall be tested again to meet the specified requirements.

Water shall be stored in tin barrels, steel tanks or watertight reservoirs made with bricks/ stone or reinforced concrete. These reservoirs shall be of sufficient capacity to meet the water requirement, at any stage of construction.

Water for curing shall be of the same quality as used for concreting and masonry works. Sea water shall not be used for preparation of cement mortar, concrete as well as for curing of plain/reinforced concrete and masonry works, as it reduces the strength of concrete as well as causes dampness, surface efferesrence, corrosion of reinforcement etc. Sea water shall not be used for hydro-testing and checking the leakage of liquid retaining structures also.

1.3 Mode of Measurement and Payment : The measurement of brickwork will be on sq. meter basis of actual work done. Deduction for openings shall be as per IS: 1200.

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2.0 <u>Cement Plaster</u>

Providing plaster in cement mortar in 1:3 without neeru finishing to concrete or masonry surface in all position including scaffolding and curing complete.

c) 20 mm Thick Two Coats.

2.1 General: The item pertains to providing Plaster in CM 1:3, without neeru finish to concrete or masonry surface.

2.2 Material:

Cement: Cement to be used, for civil and structural works, shall be one of the following or in combination thereof. For plain and reinforced concrete works normally 43 grade and 53 grade ordinary Portland cement, shall be used. Specific requirement for any other type of cement shall be as shown in the drawings or as specified in contract or as directed by the Engineer-in-Charge.

Specification For 33 Grade

Ordinary Portland Cement	IS**:** 269-1989 Vth Revision
Specification For Portland Slag Cement	I S : 4 5 5 - 1 989 Vth Revision
Specification For Portland Pozzolana Cement	IS: 1489-1991 Part I
Specification For Masonry Cement	IS: 3466-1988 IInd Revision
Specification For High Alumina Cement For Structural Use	IS: 6452-1989
Specification For Super Sulphated Cement	IS: 6909-1990
Specification For Rapid Hardening Portland Cement	IS: 8041-1990 IInd Revision
Specification For 43 Grade Ordinary Portland Cement	IS: 8112-1989 Ist Revision
Specification For 53 Grade Ordinary Portland Cement	IS: 12269-1987
Specification For Sulphate Resisting Portland Cement	IS: 12330-1988

Storage at Site : The storage of cement at the site of work shall be at contractor's cost and risk and shall meet the requirements of IS : 4082-1977 Ist Revision. The cement shall be stored at least 15 cm above ground on a dry platform in a suitable weather tight building or godown and in such a manner as to permit easy access for proper inspection and also to prevent deterioration due to moisture.

The cement bags are to be placed closed together to reduce circulation of air. The bags shall not be placed along the wall. At least 30 cm distance should be left from the wall. The height of one pile of cement bags should not be more than 8 bags i.e. 2.25 m and width not more than 3.0 m or as specified in IS : 4082-1977. In the event of any damage occurring to the quality of cement due to faulty storage or on account of negligence on the part of the contractor, such damages shall be

borne by the contractor himself. All approved cement shall be arranged in batches with type, brand and date of receipt along with date of manufacture shall be flagged on them. A maximum of eight bags shall be stacked one over the other. Cement bags shall be used in the same order as received from the manufacturer/owner. The Contractor shall maintain a register, on day-to-day basis, giving the details of the receipt/consumption, source of supply, type of cement and location of cement used etc. The register shall always be accessible to the Engineer-in-Charge for verification. The cement shall be used only after inspection and instructions of Engineer in Charge. If any batch found faulty, it will be the contractor's responsibility to replace the same without ant extra cost.

Tests after Delivery : Each consignment of cement supplied by Owner or Contractor, shall after delivery at site and at the discretion of the Engineer-in-Charge, be subjected to any or all of the tests and analysis, required by the relevant Indian Standard Codes. In case the cement is supplied by the MPCB, the Contractor shall get himself satisfied regarding its quality before using the same in his works at his own expense. The contractor shall carry out and bear the cost of all tests and analysis required to ensure quality of cement before using in actual works, irrespective of the fact whether the cement is supplied by the MPCB or procured by him.

Rejection : The Engineer-in-Charge may reject at his discretion any cement, notwithstanding the manufacturer's certificate or failing to meet the requirements of relevant IS Codes for testing of cement. He may similarly reject any cement which has deteriorated due to inadequate protection from moisture or due to intrusion of foreign matter or any other cause. Any cement which is considered defective, shall not be used and shall be promptly removed from the site by the Contractor, at his own cost.

Sand : The Fine Aggregate or sand shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these meeting requirements of IS : 383-1970. The sand shall be hard, durable, clean and free from adherent coating and organic matter and shall not contain the amount of clay, silt and fine dust more than specified in IS : 2116-1980 (sand for masonry mortar).

The sand shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal or other organic impurities, mica, shale or similar laminated materials, soft fragments, sea shells in such form or in such quantities as to affect adversely the hardening, strength or durability of the mortar. The sand should consist of sharp angular and hard grains, which should be approximately, cubical in size. It should be strong and durable and should be as far as possible pure silica SiO2.

Unless found satisfactory as a result of further tests as may be specified by the Engineer-in-Charge, or unless evidence of such performance is offered which is satisfactory to him, the maximum quantities of clay, fine silt, fine dust and organic impurities in the sand, when tested in accordance with IS : 2386-1977 (Part II), colour of the liquid shall be lighter than that indicated by the standard solution specified in IS : 2386. The use of sand from sea-shore shall be avoided, only river sand shall be used. The sand should not contain more than 5% dirt if it is natural and 2% in case of crushed sand. The sand containing mica shall be avoided as it reduces the strengths of the concrete.

The lower size limit of sand is 0.07 mm or a little less. Particles between 0.06 mm and 0.002 mm are classified as silt, and the particles having size less than 0.002 mm are termed as clay. Silt and clay are undesirable particles longer than 75 mm micron are used as aggregate. Hence if such results are obtained the sand may be rejected.

Grading of Sand : The particle size grading of sand for use in concrete/mortars shall be within the limits as specified below :

Grading of Sand :

IS SIEVE DESIGNATION IS: 460 (PART-I)	**% PASSING BY MASS**	
4.75mm	1 0 0	
2.36mm	9 0 to 1 0 0	
1.18mm	7 0 to 1 0 0	REF. TO
600 micron	40 to 100	METHOD OF IS:
300 micron	5 to 70	2386 (Part-I)
150 micron	0 to 15	

In case of sand grading of which falls outside the specified limits due to excess or deficiency of coarse or fine particles, shall be processed to comply with the standard by screening through a suitably sized sieve and/or blending with required quantities of suitable sizes of natural sand particles or crushed stone screenings which are by themselves unsuitable. Based on test results and in the light of practical experience with the use of local materials, deviation in grading of sand may be considered by the Engineer-in-Charge. The various size of particles of which the sand is composed shall be uniformly distributed throughout the mass.

Sampling and Testing : The method of sampling shall be in accordance with IS : 2430-1986. The amount of material required for each test shall be as specified in relevant parts of IS : 2386-1977. Any test which the Engineer-in-Charge may require in connection with this, shall be carried out in accordance with the relevant parts of IS : 2386-1977.

If further confirmation as to the satisfactory nature of the material is required, compressive test on cement mortar cubes (1:6) may be made in accordance with IS : 2250-1981 using the supplied material in place of standard sand and the strength value so obtained shall be compared with that of another mortar made with a sand of acceptable and comparable quality.

Neeru : Standard brand instant neeru or sanala may be used.

Water : Water used in construction for all civil and structural works for mixing and curing shall be clean and free from injurious amount of oil, acids, alkalies, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. The ‘pH’ value of water sample shall not be less than 6, but generally it should be between 6 to 8. Potable water shall be considered satisfactory. Underground water can also be used with the prior approval of Engineer-in-Charge, if it meets all the requirements of IS : 456 (Revised).

Tests on water samples shall carried out in accordance with IS : 3025-1964 and they shall fulfil all the guidelines and requirements given in IS : 456 (Revised).

The Engineer-in-Charge may require the Contractor to prove, that the concrete prepared with water, proposed to be used, shall not have a average 28 days compressive strength lower than 90% of the strength of concrete prepared with distilled water.

The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes, and shall not differ by more than + 5 minutes from the initial setting time of control test block prepared with appropriate test cement and distilled water. As directed by the Engineer-in-Charge, the Contractor shall get the water tested from an approved laboratory before starting the construction work and in case the water contains any oil/organic matter or an excess of acid, alkalies or any injurious amount of salts etc. beyond the permissible maximum limits given in IS : 456 (Revised), the Engineer-in-Charge may refuse to permit its use. In case the water is supplied by MPCB, the contractor shall get himself satisfied regarding its quality before using the same in his works at his own expenses. In case

there is any change in source of water, water samples shall be tested again to meet the specified requirements.

Percentage of solids shall not exceed the following:

Sr. No.	**Types of Solids**	**Permissible limit, percentage by weight of water**
1.	Organic	0.02
2.	Inorganic	0.30
3.	Sulphates	0.05
4.	Chlorides for plain concrete	0.20
5.	Chlorides for R.C.C.	0.10

Water shall be stored in tin barrels, steel tanks or watertight reservoirs made with bricks/ stone or reinforced concrete. These reservoirs shall be of sufficient capacity to meet the water requirement, at any stage of construction.

Water for curing shall be of the same quality as used for concreting and masonry works. Sea water shall not be used for preparation of cement mortar, concrete as well as for curing of plain/reinforced concrete and masonry works, as it reduces the strength of concrete as well as causes dampness, surface efferesrence, corrosion of reinforcement etc. Sea water shall not be used for hydro-testing and checking the leakage of liquid retaining structures also.

2.3 Cement Mortar: Cement mortar of the specified proportion of 1:3 shall be prepared,

Cement mortar shall meet the requirements of IS:2250 and shall be prepared by mixing cement and sand by volume.Proportion of cement and sand shall be 1:6 (one part of cement and six parts of sand) or as specified or as directed by the Engineer-in-charge or as shown in drawings. The sand being used for mortar shall be sieved. The mortar shall be used as soon as possible after mixing and before it has begun to set and in any case within initial setting time of cement after water is added to the dry mixture. Mortar unused for more than initial setting times of cement, shall be rejected and removed from the site of work.

2.3.1 Proportioning: The unit of measurement for cement shall be a bag of cement weighing 50 kgs and this shall be taken as 0.035 cubic metre. Sand shall be measured in boxes of suitable size on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulkage.

2.3.2 Mixing: The mixing of mortar shall be done in mechanical mixer operated manually or by power. The Engineer-in-Charge may however, permit hand mixing, as a special case, taking into account the magnitude, nature and location of work. The Contractor shall take the prior permission of Engineer-in- Charge in writing, for using hand-mix, before the commencement of work.

Mixing in Mechanical Mixer : Cement and sand in specified proportions, by volume, shall be thoroughly mixed dry in a mixer. Water shall then be added gradually and wet mixing continued for at least one minute. Care shall be taken not to add more water than that which shall bring the mortar to the consistency of a stiff paste. Wet mix from the mixer shall be unloaded on watertight masonry platform, made adjacent to the mixer. Platform shall be atleast 150mm above the leveled ground, to avoid contact of surrounding earth with the mix. Size of the platform shall be such that it shall extend atleast 300mm around the loaded wet mix area. Wet mix, so, prepared shall be utilised within initial setting time of cement [thirty (30) minutes for ordinary Portland cement conforming to IS: 269] after addition of water. Mixer shall be cleaned with water each time before suspending the work.

Hand Mixing : The measured quantity of sand shall be leveled on a clean masonry platform and cement bags emptied on top. The cement and sand shall be thoroughly mixed dry by being turned over and over, backward and forward, several times till the mixture is of uniform colour. The quantity of dry mix, which can be consumed within initial setting time of cement, shall then be mixed with just sufficient quantity of water to bring the mortar to the consistency of stiff paste.

2.4 Preparation of Surface : The joints in masonry shall be raked out properly. Dust and loose mortar shall be brushed out properly. Efflorescence if any, shall be removed by brushing and scrapping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced.

2.5 Scaffolding : The contractor shall provide scaffolding required for facility of construction. Quoted rates are deemed to included the cost of scaffolding as required.

Scaffolding will be double or single as is warranted by the work.

Scaffolding shall be erected with steel sections or pipes, bullies or bamboos of adequate strength so as to be safe for all construction operations. The contractor shall take all measures to ensure the safety of the work and working people. Any instruction of the Engineer-incharge in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to property or injury to persons resulting from ill erected scaffolding, defective ladders and

materials or otherwise arising out of his default in his respect. Proper scaffolding shall be provided to allow easy approach to every part of the work. Overhead work shall not be allowed.

2.6 Application of Plaster : Before commencing the plastering the surface to the plastered shall be made wet sprinkling water. The patches of mortar, with thickness equivalent to thickness shall be provided on the area to be plastered. It shall be ensured that the surface all such patches is in true level/batter/plumb as the case may be; to achieve this the thickness of patches may vary marginally, but average thickness shall not be less than that specified.

1. Ceiling plaster shall be completed before commencement of wall plaster.

2. Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster about 15x15 cm shall be first applied, horizontally and vertically, at not more than 2 m intervals over the entire surface to serve as gauge. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness and then brought to a true surface by working a wooden straight edge reaching across the gauges, with small upward and side ways movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive trawling or over working the float shall be avoided. During this process a solution of lime putty shall be applied on the surface to make the later workable.

3. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arises, provision of grooves at junction etc. where required shall be done without any extra payment. Such rounding, chamfering or grooving shall be carried out using proper templates or battens to the sizes required.

4. When suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be

scrapped cleaned and wetted with lime putty before plaster is applied to the adjacent areas, to enable the two to properly joint together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm to any corners or arises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arises. Horizontal joints in plaster work shall not also occur on parapet tops and coping as these invariably lead to leakage. No portion of the surface should be left out initially to be patched up later on.

5. The surface of the under coat on which the punning is to be done shall be left rough. The punning shall be applied, when the under coat is still green. The mortar for punning shall be applied in a uniform layer slightly more than 3 mm thick between gauged pads, with which to ensure an even and uniformly thick surface by frequent checking with a wooden straight edge. It shall be finished to an even and smooth surface with trowels.

2.7 Finish : The plaster shall be finished to a true level and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

2.8 Thickness : The thickness of the plaster specified shall be measured exclusive of the thickness of key i.e. grooves or open joints in brick work. The average thickness of plaster shall not be less than the specified thickness or 12mm. The minimum thickness over any portion of the surface shall not be less than specified thickness by more than 3 mm. The average thickness should be regulated at the time of plastering by keeping suitable thickness of the gauges. Extra thickness required in doubling behind rounding of corners at junction of wall or in plastering of masonry cornices etc. shall not be paid for.

2.9 Curing : Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of seven days. During this period, it shall be suitably protected from all damages at the contractor's expenses by such means as the Engineer-in-charge may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

2.10 Precautions : Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective shall be cut out in rectangular shape and replastered as directed by Engineer-in-charge. When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly when the wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6 mm drawn with any suitable method while the plaster is green. To prevent surface cracks appearing between junction of column/beams and walls 150 mm wide chicken wire mesh should be fixed with U nails 150 mm c/c in one vertical plane should be carried out in one go. For providing and fixing chicken wire mesh with U nails, payment shall be made separately under relevant item.

2.11 Item to Include : The item includes providing all materials for plastering, including transportation, royalty for material, all labour, tools and plants, machinery and equipments, staging, scaffolding, bailing out water, testing, curing and construction as per above specifications etc. complete.

2.12 Mode of Measurement and Payment : The plaster area shall be measured in sqm as detailed below and shall be paid at the contract rate per sqm.

Measurements :

1. Length and breadth shall be measured correct to a cm and its area shall be calculated in m2 correct to two places of decimal.

2. Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves, or open joints in brickwork.

3. The measurement of wall plaster shall be taken between the walls or partitions (the dimensions before the plaster shall be taken) for the length and from the top of the floor of skirting to the ceiling for the height. Depth of covers or cornices if any shall be deducted.

4. The following shall be measured separately from wall plaster.

□□□Plaster bands 30 cm wide and under

□□□Cornice beading and architrave's or architrave's moulded wholly in plaster.

□□□Circular work not exceeding 6 m in radius

5. Plaster over masonry pilasters will be measured and paid for as plaster only.

6. A coefficient of 1.63 shall be adopted for the measurement of one side plastering on honeycomb work having 6 x 10cm opening.

7. Moulded cornices and coves

□□□Length shall be measured at the centre of the girth.

□□□Moulded cornices and curves shall be paid in m2 the area being arrived at by multiplying length by the girth.

□□□Flat or weathered top to cornices when exceeding 15 cm in width shall not be included in the girth but measured with the general plaster work.

□□□Cornices, which are curved in their length, shall be measured separately.

8. Exterior plastering at a height greater than 10 m from average ground level shall be measured separately in each story height. Patch plastering (in repairs) shall be measured as plastering new work, where the patch exceed 2.5 m2 extra payment being made for preparing old wall, such as dismantling old plaster, raking out the joints and cleaning the surface. Where the patch does not exceed 2.5 m2 in area it shall be measured under the appropriate item under sub head 'Repairs to Building'

9. Deductions in measurements for opening, etc. will be regulated as follows.

No deduction will be made for openings or ends of joints, beams, posts, girders, steps etc. up to 2.0 m2 in area and no additions shall be made either for the jambs, soffits and sills of such openings. When plastered an one face when plaster is provided on both faces the area of opening shall be deducted from one side. In respect of large openings with area more than 2.0 Sqm. The

deduction for opening shall be made and jambs will be paid. The above procedure will apply to both faces of wall.

1.0 Flooring

Stone Finish Vitrified Flooring:-

a) Providing & laying Stone Finish Vitrified tiles flooring for toilet area of size 600 x 600 mm of approved colour including cutting the required size, laying, jointing and grouting the joints with cement slurry of required colour on bed of 20 mm thick in C.M. 1:4 all labour and materials etc. complete

Material: Stone Finish Vitrified tiles shall be of approved make and quality and shall conform to IS: 777-1988 in all respect. Samples of tiles shall be got approved by the Engineer-in-Charge, who shall keep them in his office for verification and composition. White cement shall be of approved make. The samples of the tiles shall be got tested from the approved laboratory as per provisions in IS: 777-1988 by the contractor at his cost. The test results are submitted to the EIC for record.

Mortar Bedding: The mortar shall be of 1:4 proportions and thickness shall be as specified average, laid on prepared sub-base of appropriate level and grade. The amount of water added while preparing mortar shall be the minimum necessary to give sufficient plasticity for laying.

Care shall be taken in the preparation of the mortar to ensure that there are no hard lumps that would interfere with even bedding of the tiles. Before spreading the mortar bed, the base shall be cleaned of all dirt, scum or laitance and loose materials and then well wetted without forming any pools by the use of screed battens to proper level of slope. The thickness of the bedding shall not be less than 20 mm any one place. The tiles shall be laid on the bedding mortar when it is still plastic but has become sufficiently stiff to offer a fairly firm cushion For the tiles.

Fixing Tiles: The tiles before laying shall be soaked in water for at least 2 hours. Tiles which, are fixed in the floor adjoining the wall shall be so arranged that the surface of the round edge tiles shall correspond to the skirting or dado. Neat cement grout of honey like consistency (4.4kg/sqm) shall be spread over the bedding mortar just to cover so much area as can be tiled within half an hour. The edges of the tiles shall be smeared with neat white cement slurry or coloured cement slurry matching colour of the tiles and fixed in this grout one after the other, each tile being well pressed and gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints shall be 4mm wide and in straight lines. The joints shall be grouted with Hygienic, hardwearing, impervious, epoxide resin based vitrified tile grout of approved colour which has a high degree of resistance to chemical attack, abrasion and impact.

Curing: After fixing the tiles finally in an even plane, the flooring shall be covered with wet saw dust and allowed to mature undisturbed for 7 days.

Cleaning: After the tiles have been laid in a room or at the day's fixing work is completed, the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, the floor shall be carefully washed clean and dried. When dry, the floor shall be covered with oil free dry saw dust which shall be removed only after completion of the construction work and just before the floor is occupied.

Item to Include : The item shall include all labour, materials, cement mortar 1:4 mortar bedding, epoxy grout of filling joints, tools and equipment required for the operations to carry out the for providing and fixing the white or coloured vitrified tiles as specified above.

Mode of Measurement and Payment: The area of the flooring shall be measured in sqm correct up to 2 decimals. The contract rate shall be per sqm for the specified quality of virtified

tiles as specified.

1.2. Granite Stone Sill

Providing and fixing machine cut, machine polished granite stone sills 20 mm thick over 25 mm bedding in cement mortar 1:4 etc. complete.

1.2.1 General : The item pertains to providing the machine cut machine polished granite stone flooring for sills.

1.2.2 Material : Granite shall be hard, sound, dense and homogeneous in texture with crystalline texture as far as possible. It shall generally be uniform in colour and free from stains, cracks, decay and weathering. The rear face shall be rough enough to provide key for mortar.

1.2.3 Dressing of Slabs : Every granite stone shall be cut to the required size and shape, fine chisel dressed on all sides to the full depth so that a straight edge laid along the side of the stone shall be fully in contact with it. The top surface shall also be fine chisel dressed to remove all waviness. In case machine cut granite slab are used, fine chisel dressing of machine cut surface need not be done provided a straight edge laid any where along the machine cut surfaces is in contact with every point on it. The sides and top surface of granite slabs shall be machine rubbed with coarse sand before paving. All angles and edges of the granite slabs shall be true, square and free form Chippings and the surface shall be true and plane. The thickness of the granite slabs shall be 25 mm as specified in the description of the item. Tolerance of ± 3% shall be allowed for the thickness. In respect of length and breadth of slabs a tolerance of ± 2% shall be allowed.

1.2.4 Laying for Sills : Base concrete or the RCC slab/ brickwork, plastered surface on which the granite slabs are to be laid shall be cleaned, wetted and mopped. The bedding for the slabs shall be with cement mortar 1:4: or with lime mortar as given in the description of the item. The average thickness of the bedding mortar under the slab shall be 25 mm and the thickness at any

place under the slab shall be not less than 12 mm. The granite slabs shall be laid in the following manner. Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean and soaked in water not less than 2 hrs. before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar is allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per m2. The edges of the granite slab already paved shall be buttered with gray or white cement with or without admixture of pigment to match the shade of the granite slabs as given in the description of the item. The granite slab to be paved shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible. Subsequent granite slabs shall be laid in the same manner. After each granite slab has been laid, surplus cement on the surface of the granite slabs shall be cleaned off. The flooring shall be cured for a minimum period of seven days. The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Due care shall be taken to match the grains of granite slabs which shall be selected judiciously having uniform pattern of Veins/streaks or as directed by the Engineer-in-Charge. The granite slabs shall be matched as shown in drawings or as

instructed by the Engineer-in-Charge. The granite slabs, which are fixed in the floor adjoining the wall, shall enter not less than 12mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness.

1.2.5 Granite Stone in Sills : Granite stone slabs and Dressing of Slabs shall be as specified, except that the thickness of slabs shall be 25 mm. A tolerance of + 3 mm shall be allowed, unless otherwise specified in the description of the item.

Preparation of Surface : Where necessary, the wall surface shall be cut uniformly to the requisite depth so that the sills face shall have the projection from the finished face of wall as shown in drawings or as required by the Engineer-in-charge.

Laying : The sills shall be in gray or white cement admixed with or without pigment to match the shade of the stone, as specified in the description of the stone, as specified in the description of the item, with the line of the slab at such a distance from the wall that the average width of the gap shall be 12 mm and at no place the width shall be less than 10 mm, if necessary, the granite slabs shall be held in position by temporary MS hooks fixed into the wall at suitable intervals.

The item is similar to Bd/A/13, except in place of black cudappa, the marble shall be used. All other provisions of the item are applicable for this item also.

1.2.6 Polishing and Finishing : Slight unevenness at the meeting edges of granite slabs shall then be removed by fine chiseling and finished in the same manner as specified except that

cement slurry with or without pigments shall not be supplied on the surface before each polishing.

1.2.7 Item to Include : Item includes all material, labour, tools and equipment for cutting, dressing laying and polishing of the granite slabs for sills etc. complete.

1.2.8 Mode of Measurement and Payment : The measurement shall be recorded in sqm up to 3 decimals. Granite stone sills with different kind of Granite shall be measured separately and in square metre correct to two places of decimal. Length and breadth shall be measured correct to a cm before laying skirting, dado or wall plaster. No deduction shall be made nor extra paid for voids not exceeding 0.20 square metres. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre. Nothing extra shall be paid for

laying the floor at different levels in the same room.

1.3. Granite Jamblining for Door / Window

Providing and fixing in position & in stepped manner one side mirror polished machine cut Granite slab Jamblining for Door / Window frames of width upto 100mm of 18mm thickness (+/- 2 mm tolerance) in cement mortar bedding (1:4) of required thickness. Joints, edges to be floated and finished on neat cement of the same colour as the slab. After setting, the slabs (if read) are to be machine polished at site to obtain perfect finish. All exposed edges to be rounded & polished. The rate to include all necessary chipping of brickwork / concrete so that the slab is 12mm projects from plaster / POP surface with rounding of edges, polishing etc. complete as shown on drawing & as per directions of Engineer In charge. Note: No payment will be made for overlapped portion of the jamb lining.

1.3.1 General : The item pertains to providing and fixing in position & in stepped manner one side mirror polished machine cut granite slab 18mm thickness jamb lining for door / window frames of specified width in cement mortar bedding (1:4) of required thickness. All exposed edges to be rounded & polished as per drawings and as per best engineering practice or as per IS wherever they apply for and as per instructions of Engineer In charge and with necessary materials and labour costs etc. complete.

1.3.2 Material :

a) Granite Slab 18mm thick (+/- 2 mm tolerance)
b) Cement mortar bedding (1:4)
c) Rounding & Polishing of edges

1.3.3 Fixing : Providing and fixing in position & in stepped manner one side mirror polished machine cut granite slab 18mm thickness jamb lining for door / window frames of specified width in cement mortar bedding (1:4) of required thickness. Joints, edges to be floated and finished on neat cement of the same colour as the slab. After setting, the slabs (if reqd) are to be machine polished at site to obtain perfect finish. All exposed edges to be rounded & polished as per drawings and as per best engineering practice or as per IS wherever they apply for and as per instructions of Engineer In charge.

1.3.4 Item to Include : The rate to include all necessary chipping of brickwork / concrete so that the slab is 12mm projects from plaster / POP surface with rounding of edges, polishing etc. complete as shown on drawing & as per directions of Engineer In charge. Note: No payment will be made for overlapped portion of the jamblining.

1.3.5 Mode of Measurement and Payment: The Granite Jamblining is recorded separately for each item and measured in sqm of exposed face.

The contract rate shall be per sqm for the specified quality of Granite Jamb lining as specified.

1.4 Providing and fixing in position Wooden laminate finish floor Bevora, Pergo or approved equivalent as per the manufactures specifications. All as per drawings and instructions from Engineer-in-charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per Sqmt basis. The contract rate shall be on per Sqmt for Laminated Wooden Flooring & fixed as specified.

1.5 Providing & Fixing flexible PVC sheet flooring in 2.0mm thickness in the size of 2mx20mtr use area classification 23/34/43. Results from independent testing demonstrate that product inherently inhibits the growth of microbial strain MRSA. It shall be homogeneous in construction. The flooring shall incorporated a specially formulated polyurethane reinforced (PUR), to give lifetime polish free maintenance. Imported PVC Vinyl flooring with total weight 3250 g/m2 ,Abrasion resistance EN 660- Group P :≤0.15mm, , EN ISO 10581 Type 1 , Reaction to fire EN 13501-1 Class Bfl-S1, residual identification approx..01 mm, castor wheel test qualified, dimensional stability EN-434, static electrical charge < 2kv,impact sound reduction approx ,good resistance of scratch, slip, chemical and fire doesn't favor in growth of fungi & bacteria , Material should 100% recyclable and at least 25% recycled material. BRE Global Environmental A+ Rating' Equivalent to Polyflor Mystique Pur, Perlazzo Pur and Classic Mystique PUR

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per Sqmt basis. The contract rate shall be on per Sqmt for PVC Sheet Flooring & fixed as specified.

SANITARY FITTING:-

1.0 Providing and fixing Wall Mounted European type commode including outlet, inter connections through walls including all fittings etc. complete.As per direction of Engineer - in - Charge.

b) In Approved Colour

1.1 General : The item pertains to providing and fixing the European type white glazed earthenware commode of white or of approved colour as specified with all necessary pipe connections up to the soil and vent pipes fixed on the outside of the wall.

1.2 Materials :

Commode : The European type water-closet pan (commode) shall conform to IS:2556 with 'S' trap. The water-closet pan shall be of the best Indian make available in the market unless one of a particular make and quality and shall be white or of specified colour as specified in the item. This colour and the make of the commode shall be got approved by the Engineer-in-charge.

Plastic Seat & Covers : The seat and cover shall be of thermosetting or thermoplastic conforming to IS:2548 as specified. Unless and otherwise specified these shall be of closed pattern. Thermosetting plastic used shall conform to grade 2 or 3 of IS:1300 when it is phenolic or IS:3389 when of urea formaldehyde.

Thermo plastic materials used may be of Polystyrene conforming to type 2 or 3 or IS:2267 or of polypropylene, appendix A of IS:2548. In public buildings where rough and heavy use of seats and covers are common, plastic seats shall be flat with solid moulding.

The hinging device shall be bronze or brass with nickel chromium plating confirming to IS:2548 and the seat shall have not less than three rubber or plastic buffers unless otherwise specified. The cover shall be fitted with the same number of buffers as provided for the seat. Seats shall have a smooth finish and shall be non absorptive and free from cracks and crevices. They shall be capable of being easily cleaned and shall not be adversely affected by common solvents or household cleanser.

Strength : The seats shall withstand without permanent distortions of the seat or hinge fittings as prescribed in IS:2548.

1.3 Fixing : The European types water –closet pan and shall be fixed into the places indicated on the drawings or as directed. The vent and soil pipes shall run through the holes left in the floor and walls and the walls and floor made good. If holes are not left in the floor and wall, they shall be cut and the cavity surrounding the pipes made good properly after fixing the pipes.

The pan shall be fixed into position in 1:1 cement mortar with the connecting 'S' trap and pipes duly concealed including the lead PVC pipe from flushing cistern. All other fittings including the flushing cistern pipes etc., and the tests shall be carried out for leakages.

The seat and lid shall then be fixed to pan with chromium-plated hinges.

1.4 Item to Include : The item includes providing European type water closet (commode) pan 'S' trap, seat and lid cover, cast iron pipes, fitting and stop tap, lead pipe with nuts, fixing the pan and making good after fixing of pipes, testing the installation to give satisfactory results including all necessary labour, materials and use of tools etc. complete.

1.5 Mode of Measurement of Payment : The measurement shall be number of European type WC (commodes) provided and fixed with accessories and the contract rate shall be per number of European type water–closet (commode) of specified colour.

2.0 Providing and fixing of Over Counter wash hand basin Boul type with nickel / chrome plated fittings inlet and outlet connection, nickel plated pillar cock, down take GI pipes with C. P. bottle trap (with concealed nut bolt) cutting out in for below CI bracket etc. complete. As per direction of Engineer - in - Charge.

2.1 General : The item pertains to providing and fixing coloured wash hand basin of the specified size including all necessary fixtures and pipe connections up to the outside face of the wall and outlet waste pipe upto nearest nahani trap.

2.2 Material : The wash hand basin shall conform to IS:771. The brackets shall conform to IS:775. Brass waste shall be 32mm and of standard pattern with standard pattern plug and brass chains. The lead PVC and galvanised pipes shall conform to IS:404 and IS:1239. The 15 mm CP brass pillar taps shall conform to IS:1795 & stop cock for inlet.

2.3 Fixing : The basin shall be fixed at the location and level as per the drawings or as directed. The basin shall be supported on a pair of steel or cast iron cantilever brackets securely embedded in wall or fixed to wall with wooden cleats and screws. The height of the top of the basin from the floor shall be 75 cm or as directed. The waste pipe shall run through the wall. If holes are not left in the wall, they shall be cut and the cavity surrounding the pipes made good after fixing of the pipe. All the pipe connections shall be made as shown on the drawings or as directed. Brass stop tap shall be fixed on the supply pipe. The pipe connections shall conform to IS:1742. The lead waste pipe shall be provided with a trap. All the exposed pipes and brackets shall be painted with one coat of red lead and two coats of good oil paints of approved shade.

2.4 Item to Include : The item includes providing of Basin of specified size and type, pillar taps brass stop tap, plug with chain, brackets, pipes, chromium bottle plated trap, painting, fixing of brackets, basin taps, plugs, lead PVC and galvanised pipes up to the outside face of the wall and painting pipes, cutting and waste, making good damages, etc. including all necessary labour, materials and use of tools.

2.5 Mode of Measurement and Payment : The measurement shall be number of wash hand basins of specified size and type provided and fixed with all accessories as per specifications. The contract rate shall be per number of wash hand basin of specified size and type provided and fixed.

3.0 Providing and fixing Stainless steel Continental towel ring square with 20 mm diameter pipe in bathrooms and wherever necessary manufactured as per best engineering practice or as per I.S. wherever applicable with necessary materials and labour cost etc. complete. As per direction of Engineer - in - Charge.

3.1 General : The item pertains to providing and fixing stainless steel towel ring of 20 mm diameter of specified size in bathrooms.

3.2 Material : The stainless steel material shall be used for manufacturing towel rod.

Stainless Steel Fittings : These shall be stainless steel conforming to SS 316. These shall be manufactured from hot rolled stainless steel tubes and plates. These shall be well made and free from flaws and defects of all kinds.

Screw Holes : The screw holes shall be suitable for counter sunk head wood screws, and of specified sizes. The size of the holes shall be such that when it is counter sunk it shall be able to accommodate the full depth of counter sunk head of wood screw specified. The towel rod to be actually provided in a particular work shall however, be decided by the Engineer-in-Charge. Screws used for fittings shall be of the same metal, and finish as the fittings. However, chromium plated brass screws or stainless steel screws shall be used for fixing fittings. These shall be of the size as indicated in respective figures. The towel rod of specified size and design, manufactured as per best engineering practice and as approved by the Engineer-in-charge shall be used. The sample, approved shall be kept in the office of the Engineer-in-charge for verification.

3.3 Fixing : The towel rod shall be fixed at the position and level from the floor as shown in the drawing or as directed. The holes in the walls shall be drilled by the drilling machine. The screws shall be fixed in the holes by inserting the rawal plugs of appropriate size. On fixing of the towel rod, the damages if any caused to walls shall be made good by the contractor at his cost.

3.4 Item to Include : The item includes all labour, material, tools and equipment for providing and fixing the towel rod of specified size and material.

3.5 Mode of Measurement and Payment : The measurement shall be per number of the towel ring provided and fixed and the contract rate shall be per number of specified size and material.

4.0 Providing and fixing 32 mm diameter Bottle trap P.V.C. polymer scratch resistant, antistatic with guarantee against any manufacturing defect including socket, union nuts etc. complete. Spec: (As directed by Engineer-in-Charge)

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of 32 mm diameter Bottle trap provided & fixed as specified.

5.0 Providing and fixing 15 mm diameter Angle cock with flange P.V.C. polymer scratch resistant, anti-static with guarantee against any manufacturing defect including socket, union nuts etc. complete. Spec: (As directed by Engineer-in-Charge)

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of 15 mm diameter Angle cock provided & fixed as specified.

6.0 Providing and fixing soap dish with all types of fixtures including labour charges including transport charges etc. complete.

6.1 General : The item covers providing and fixing soap dish.

6.2 Material : The soap dish shall be of the manufactured of S.S, flow/fault, strong, and resistant wear. It shall be of approved make size and colour. Unless ordered the colour of the soap dish shall be matching to the colour of tiles fixed for dado.

6.3 Fixing : The soap dish shall be fixed at 450 mm to 600 mm above floor as approved by the Engineer-in-charge. The item includes 20 mm C.M. 1:3 plaster and neat cement paste as bedding to fix the soap dish. The joints between files and soap dish shall be neatly finished as per tiles fixed for dado. The location of soap dish fixing shall be approved by the Engineer-in-charge.

6.4 Item to Include : Item includes providing soap dish, C.M. 1:3 plaster, cement paste, labour etc.

6.5 Mode of Measurement & payment : The measurement shall be number of soap dish fix. The contract rate shall be per no of soap dish fixed.

7.0 Providing and fixing Jet Spray with flange P.V.C polymer scratch resistance, anti - static with guarantee against any manufacturing defect including socket, union nuts etc. complete.As per direction of Engineer - in - Charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No for Jet Spray provided & fixed as specified.

8.0 Providing and fixing 15 mm dia Piller cock P.V.C polymer scratch resistance, antistatic with guarantee against any manufacturing defect including socket, union nuts etc. complete. As per direction of Engineer - in - Charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of 15 mm diameter Piller Cock provided & fixed as specified.

9.0 Providing and fixing 15 mm dia 2 Way BIB cock long body with flange P.V.C polymer scratch resistance, anti - static with guarantee against any manufacturing defect including socket, union nuts etc. complete.As per direction of Engineer - in - Charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of 15 mm diameter 2 Way Bib cock provided & fixed as specified.

10.0 Providing and Fixing of Mirrors in Toilets of approved Indian quality, copper plated with 10 mm thick plywood backing in the masonry etc. complete.As per direction of Engineer - in - Charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per Sqm. basis. The contract rate shall be on Sqm for Mirror in Toilet provided & fixed as specified.

11.0 Providing and Fixing of Automatic Censors Urinals with all fitting and fixture etc complete as per direction of Engineer - in - charge.

11.1 General : The item pertains to the provision and fixing of white porcelain lined urinal pot, and spreader arrangement as mentioned in the item including all fitting and down take pipe connection.

11.2 Materials : Lipped Urinal Pot: Urinal basins shall be of flat back or corner wall type lipped in front. These shall be of white vitreous china conforming to IS:2556 (Part VI) Sec. The urinals shall of one piece construction. Each urinal shall be provided with not less than two fixing holes of minimum dia 6.5mm on each side. Each urinal shall have an integral flushing rim of suitable type and inlet or supply horn for connecting the flush pipe. The flushing rim and inlet shall be of the self-draining type. It shall have a weep hole at the flushing inlet of the urinals. At the bottom of the urinals an outlet horn for connecting to an outlet pipe shall be provided. The exterior of the outlet horn shall not be glazed and the surface shall be provided with groves at right angles to the axis of the outlet to facilitate fixing to the outlet pipe. The inside surface of the urinal shall be uniform and smooth throughout to ensure efficient flushing. The bottom of pan shall have sufficient slope form the front towards the outlet such that there is efficient draining. The following tolerances may be allowed on the dimensions:

a) On dimension 50mm and over + 5 percent

b) On dimension less than 50mm + 2 mm

c) On all angles + 3 degree

11.3 Fixing : Lipped urinal (Single or range) installation shall consist of an automatic flushing cistern, GI flush and waste pipe. The capacity of flushing cistern and relevant sizes of flush pipe for urinals in a range shall be as per drawing or as directed. Flushing cistern shall be paid separately under relevant items. Waste pipe shall be of 32 mm nominal bore GI pipe and shall be paid separately. Urinals shall be fixed in position by using wooden plugs and screws. It shall be at a height of 65 cm from the standing level to the top of the lip of the urinal, unless otherwise

directed by the Engineer-in-Charge. The size of wooden plugs shall be 50 mm x 50 mm at base tapering to 38 mm x 38 mm at top and of length of 5.0 cms. These shall be fixed in the wall in cement mortar 1:3 (1 cement : 3 fine sand). After the plug fixed in the wall, the mortar shall be cured till it is set. Each urinal shall be connected to 32 mm dia waste pipe which shall discharge into the channel or a floor trap. The connection between the urinal and flush or waste pipe shall be made by means of putty or white lead mixed with chopped hemp.

11.4 Item to Include : The item includes providing the lipped urinals of specified size with all accessories, fixing and jointing all inlets and outlets, with all labour and use of tools etc. complete.

11.5 Mode of Measurement and Payment : Urinals provided and fixed shall be measured in numbers.

The contract rate shall include the cost of all the materials and labour involved in all the operations described above and shall be per number.

12.0 Providing and fixing in position CI Nahani trap including CI grating, fixing in cement concrete M-15 etc. complete.

b) 100 mm size

12.1 General : The item pertains to providing and fixing cast iron nahani trap of specified size for sinks and baths, urinals etc. including the cast iron grating, bends and cast iron pipe.

12.2 Material : The cast iron nahani trap, bend and pipe grating of specified size shall be used of the best available in the market and approved by the Engineer-in-charge. The diameter of the cast iron nahani trap shall be as specified in the item, which shall be the inside diameter of the bore of the pipes.

12.3 Fixing : The cast iron nahani trap with the bend and pipe piece shall be fixed in position as per the drawings or as directed. The joints shall be packed with wetted spun yarn in cement slurry sealed with 1:1 cement mortar. This shall conform to IS:1942. The joint with pipe/special within wall width shall be avoided.

12.4 Item to Include : The item includes all labour, material (CI Nahani trap, pipes and fittings), tools and equipments, cutting of holes / excavation and making good the cut holes etc. to complete the item satisfactorily.

12.5 Mode of Measurement and Payment : The contract rate shall be for one number of Nahani trap fixed including all fitting. Cutting and waste will not be paid for separately.

13.0 Providing and laying UPVC pipes of standard make in line and level including necessary labour, bends, tees, fixtures etc. and testing the pipes complete.

B] U.P.V.C pipes as rain water down take pipes

ii) 110 mm diameter

13.1 General : The item covers specifications for providing and laying UPVC Pipes with all fixtures, bends tees etc. for drainage lines, rain water down take pipes.

13.2 Material :

13.2.1 Rigid (Un plasticized) PVC Pipes : are widely accepted for applications such as cold water services internal/external water supplies systems, water mains, rain water system, soil waste piping system, and under ground (sewage pipes) drainage piping system. Rigid PVC is three times as rigid as polyethylene. It is also much stronger and will withstand much higher pressure for a given wall thickness. Joints can easily be made in rigid PVC pipes by solvent welding, and a whole range of injection moulded matching fittings and specials are available for these pipes. Rigid PVC pipes are normally available in the following shades:

i)White/Cream, ii)Light to Dark Gray, iii)Black.

In general rigid PVC is resistant to most inorganic acids, alkalies and salts, as well as many organic chemicals. It is quite resistant to most effluents, salt water and plating solutions, corrosive fumes, soils which lead to its applications over a wide field. The material is also perfectly safe with potable water, whether hard or soft, and in the former case it tends to retard the formation of scale. Those materials, which do attack it, include concentrated oxidizing acids, esters, ketones, aromatic and chlorinated hydrocarbons, organonitro compounds, organoamino compounds, lacquer solvents and acetic anhydride.

The pipes shall be reasonably round and shall be supplied in straight lengths with socketed ends. The internal and external surfaces of pipes shall be smooth & clean, free form grooving and other defects. The ends shall be cleanly cut and square with the axis of the pipe. The pipe shall be designated by external diameter and shall conform to IS: 4985 (revised) in all respects.

13.2.2 Fittings: Fittings used shall be of the same make as that of PVC pipes, injection moulded or made in cast iron and shall conform to Indian Standard wherever available.

Laying :

13.3.1 Trenches : The trench bottom shall be carefully examined for the presence of hard objects such as flints, rock protrudes or tree roots etc. Pipes shall be bedded in sand or soft soil free form rock and gravel. Back fill 15cm above the pipe shall also be of fine sand or soft soil. The width of trench shall not be less

than outside di a metre of pipe plus 15cm on either side of pipe. In case of gravel soils, pipes shall be laid at least 90cms below the ground level (measured from surface of the ground to the top of the pipe).

13.3.2 For Rain Water down take Pipes : The pipe shall fixed along the surface of wall in true vertical line. The pipe shall be fixed to the wall by providing M.S. galvanised clamps, which shall nailed to wooden pegs embedded in the masonry. The M.S. clamps shall be provided at a distance not more than 2.0 m. To cover the offsets in the masonry offsets shall be used. At the cover end of pipe shoe shall be provided the M.S. clamp shall be fixed at every joint in pipe/fixture/offset, shoe.

13.4 Jointing :

13.4.1 ***Solvent Welded Joints*** **: Non Heat Application Method :** In this method, instead of forming a socket on one pipe and spigot on other, an injection moulded socket fitting or coupler is used, with a provision to take in the pipes at both ends. After properly cleaning ends of both the pipes the solvent cements are applied on the surfaces to be jointed and the joint is made at ambient temperature. Injection moulded fittings only shall be used in preference to fabricated fittings. Only solvent recommended by the manufacturers of the pipes shall be used and full load on the joints applied only after 24 hours. The pipe shall be cut perpendicular to the axis of the pipe length with a metal cutting saw. Pipe ends have to be beveled slightly with a beveling tool (Remer) at an angle of about 30 degree. The total length of insertion socket (injection moulded socket or couplet) shall be marked on the pipe and checked how far the pipe end could be inserted into the fitting socket. Attempt shall be made to push the pipe to marked distance, if not possible it shall at least be pushed for 2/3 of this distance.

Dust, oil, water grease etc. shall be wiped out with a dry cloth from the surface.Further the grease should be thoroughly removed with a suitable solvent, such as methylene chloride or as an alternative the outside surface of the pipe and the inside of the fitting may be roughened with emery paper.

Generous coatings of solvent cement shall be evenly applied on the inside of the fittings around the circumference of the full length of insertion and on the outside of the pipe end up to the marked line with a brush of suitable dimension. The pipe shall be pushed into the fitting socket and held for 2 minutes as otherwise the pipe may come out of the fitting due to the slippery quality of cement and the tapering inside bore of the fitting. The surplus cement on the pipe surfaces shall be wiped out. If the solvent cement has dried up too much or the tapering of the socket is too steep, jointing will not be proper and pipe will come out of the fitting.

In summer months joints shall be made preferably early in the morning or in the evening when surrounding environment is cooler. This will prevent joint from pulling apart when the pipe cools off at night. Heat application method for jointing shall not be allowed.

13.4.2 Flanged Joints : For jointing PVC pipes particularly of larger size to valves and vessels and larger size metal pipes where the tensile strength is required the joint is made by the compression of a gasket or ring seal in the face of CI flange. Flanges solvent welded to the PVC pipes shall be supplied by the manufacturers.

13.4.3 Rubber Ring Joints : Rubber ring joints can provide a watertight seal but do resist pull. As such these may be used only as repairs collar and for jointing pipes larger than 110mm. Such joints may be provided on pipes, which are buried in the ground and supported throughout on bedding so that they are not subject to movement and longitudinal pull. The material of rubber ring shall conform to IS : 5382-1985, where aggressive soil are met with, synthetic rubbers perform better for jointing. The ring shall be housed in a groove formed in plastic or metallic housing. The ring shape and the method of compressing the ring vary considerably in different type of joints. Most joints often require the application of lubricating paste, which shall be procured from the manufacturer of PVC pipes.

13.5 Measurements : The length shall be measured in running metre correct to a cm for the finished work which shall include PVC fittings such as bends, tees, elbows, reducer, crosses, plugs, sockets, nipples and nuts, but exclude, taps, valves, etc. All pipes and fittings shall be classified according to their outside diameter. Reducer shall be measured along with the larger diameter pipe. As far as jointing is concerned even though explained in foregoing paras the jointing of

pipes shall be carried out as per the code of practice if specified by the manufacture and the deviations of any in the code of practice by the manufacturers be strictly taken care off.

13.6 Rate : The rate shall include the cost of labour and material in all the operation described above except excavation in trenches, sand filling all around the pipes, metal pipe used for encasing PVC pipe and anchor blocks, unless otherwise specified.

14.0 Supplying, Providing and fixing in position Hindware, Parryware or Jaquar approved make first quality, recessed, roller type or box type white glazed toilet paper holder with flap etc complete as per direction of Engineer - in - charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of toilet paper holder provided & fixed as specified.

15.0 Providing and fixing Flush Valve of approved quality etc complete. As per direction of Engineer - in - Charge.

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of Flush valve provided & fixed as specified.

16.0 Providing and fixing in position Double coat hooks as per instructions from EIC/Architect

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment : The measurement shall be on per No. basis. The contract rate shall be on per No of double coat hook provided & fixed as specified.

17.0 Providing and fixing in position Hand dryer as per instructions from EIC/Architect

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications. The materials used for the work shall conform to the relevant IS Specifications and as per approved make.

Mode of Measurement and Payment: The measurement shall be on per No. basis. The contract rate shall be on per No of Hand dryer **provided** & fixed as specified.

C False ceiling work

1.0 Gypsum board false ceiling:

Material :- Gypsum Board False Ceiling 12.5mm thick
Fixing :- Providing and Fixing Gypsum Board False Ceiling 12.5mm thick as per manufacturer's specifications & instructions. The gypsum board false ceiling should be screwed and fixed to the underside of suspended G.I. grid. G.I. grid should be constructed & suspended from the main ceiling as per manufacturer's instructions & specifications.

G.I. Sections Framework: G.I. grid should consist of ceiling sections at maximum center to center distance 450mm, Perimeter channel, intermediate channels at maximum center to center distance 1200mm. The ceiling sections should be fixed to intermediate channels with connecting clips.
The G.I. grid should be fixed to R.C.C. slab above with the help of 25mm x 0.5mm straphanger & soffit cleat. The joints between soffit cleat & straphanger and G.I. grid & straphanger should be with 6.4 x 12.7 mm nut & bolt. Soffit cleats should be fixed to R.C.C. ceiling with W.E. type 12mm dia, 17/16" long steel Rawl plug maximum center to center distance (both ways) of strap hangers should be 1200mm.
The Gypboard should be fixed to G.I. Grid with 25mm long Rawl screws. The `Gypboard' to be used should be 12.5 mm thick tapered edge boards. The boards should be taped & filled from underside to ceiling.
Item to be completed as per manufacturer's specification & instructions.

Item to Include :- The rate should include material, labour, tools required to fix the false ceiling, all necessary additional ceiling sections & Intermediate channels to be provided at openings for light fixtures, A.C. ducts, vertical drops, offsets, etc. Additional Intermediate channels should be fixed to strap hangers for additional support to prevent strap hangers from buckling/swaying at every 1200mm. Item to be completed in all respect including necessary sleeves for ducts finishing of joints cut outs supports for A.C grills, light fixtures, speakers etc. complete No extra will be paid for ceiling drops and it will be considered as flat ceiling and if there is projected drop ceiling curved as per design in different level it will also be paid as addition to that but only average bottom surface area will be considered. No extra will be paid for light cuttings, cutting for glass or stain glass. No extra channel will be paid if required for additional support. Contractor shall submit Manufacturer's Test certificate for Gypsum board and GI sections.

Mode of Measurement :- The Plan area would be considered for measurement and will be measured in sqm up to two decimal places.

2.0 Acoustical False Ceiling

The frame work for false ceiling shall be laid in true line, level in both the directions; the wooden scantlings shall be straight and fixed rigidly with screws of appropriate size, drivers at appropriate distance as directed by Engineer in charge at required level. The framework shall be painted with two coats anti - termite solution or Black Japan before the same is covered with the ceiling boards etc.

The M.S. suspenders for false ceiling shall be straight and fixed rigidly to R.C.C. structures / Slab / Roof Truss /Purling or wood support etc. with one coat of Red oxide shall be applied evenly on entire surface before the suspenders are covered with false ceiling.
False Ceiling - Plaster of Paris work: M.S. suspenders or wooden support shall suspend the false ceiling. Panel shall be made in hand made dye with reinforcement of Hessian fiber. Panel should be dried in sun - it should be free from moisture before fixing at site. Brass screws shall fix panel only.
The Resin bonded fiber glass wool insulation shall be made of fine, long inorganic glass fibres bonded by high temperature resin and has energy conserving and sound insulation properties. The glass wool made of UP Twiga Fibreglass Ltd. or any equivalent product and confirming to I. S. 8183 specification and required density as per B. O. Q.
Anutone Sound Soak mineral fiber bonded wall panel shall be 12 mm thk. Brass nails or screws on wooden frame as per specification given or as per manufacturer's specification shall fix it.

2.2.1 Acoustical Ceiling:

a. Acoustical ceiling panels / Acoustical square fully perforated ceiling panel / Acoustical slit ceiling panel shall be made by India Gypsum ltd. Moreover, having confirm to I. S. 2095 - 1982, 2542 - 1981. The plain panels have paper liner on both sides while perforated panels are backed with a special non-woven lining. All joints shall have company paper jointing special paper putty. Panels to be fixed by screws or as per manufacturer's specification. Panel shall be 12. 5 mm thk.

b. Plain or perforated hard board shall be oil - tempered board and having 4. 5 mm thk. Of Jolly Board Product or Sitatex Board.

c. Plain or semi perforated insulation board (Bitulux) shall be 12 mm thk. Board of Jolly Jolly Board Product or Sitatex Board.

d. Armstrong Mineral ceiling panel shall be 15 mm thk. In addition, with square edges. It shall be suspended by standard company grid system. Brass nails or brass screws on wooden framework and as per specification given shall fix it.

e. E -board classic false ceiling sheets shall be 6 mm thk. of approved textures and fixing on wooden frame by screws.

3.0 12.5mm thk Moisture Resistance Board.

3.1. General : Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the rate of 1200 mm centre to centre to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceilinsection and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm or both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting.

3.2. Mode of Measurement : The Plan area would be considered for measurement and will be measured in sqm up to two decimal places.

D Painting work
1.0 Plaster of Paris.

Providing & Applying Plaster of Paris Punning in average 12 to 25mm thickness to walls, ceiling, beams & columns to bring the surface in plumb Line & Level including making the surface smooth, providing required grooves on top of skirting etc. complete as per direction of Engineer In Charge.

1.1 Description: Providing & applying plaster of paris punning in average 12mm thickness on walls, ceiling, beams & columns to bring the surface in plumb line & level, including making the surface smooth, providing required grooves on top of skirting & other locations complete as per directions.

Rate including cost of chipping & scrapping neeru or any other finish on the existing plastered surface.

Rate including cost of transportation, loading, unloading, scaffolding, wastage, taxes etc. Nothing will be paid extra.

1.2 Workability: Workability should be satisfactory to the Engineer- in-charge/consultant. Anything defective or not accepted by Engineer-in-charge/consultant should be removed/ rectified without delay & with the cost & risk of contractor

All complete as per approval & instructions of Engineer-incharge.

1.3 **Mode of Measurement & payment**: Measurements shall be actual executed area measured in Sqm & paid accordingly.The contract rate shall be per SqM basis.

2.0 Luster Paint

Surface Preparation:

Ensure the surface is clean, dry and free from all defective or poorly adhering material, dirt, grease, wax etc. Remove all loose or poorly adhering materials by rubbing down, using a suitable abrasive paper and thereafter wipe off. Treat the fungus affected areas by using fungicidal solution. Allow to react for 6-8hrs.

Application

Apply a coat of suitable primer followed by wall putty to level the dents and make surface uniform. Apply a coat of suitable primer again. Then apply two to three coats of synthetic enamel paint. All should be as per manufacturer's specification.

The number of coats shall be a two or more coat to give a smooth required finish meeting the approval of the Engineer or his representative. The paint shall be applied in the usual manner with brush or roller. The paint dries by evaporation of the water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time of drying varies from one hour on absorbent surfaces to 2 to 3 hours on non-absorbent surfaces.

The thinning of emulsion is to be done with water and not with turpentine. Thinning with water will be particularly required for the undercoat, which is applied on the absorbent surface. The quantity of water to be added shall be as per manufacturer's instructions.

The surface on finished shall present a flat velvety smooth finish. If necessary more coats shall be applied till the surface presents a uniform appearance with velvety smoothness.

Item to Include: Item includes all material, labour, tools and equipment for Painting, preparation of surface to receive the paint, scaffolding etc all complete.

Mode of Measurement and Payment: The measurement shall be recorded in sqm up to 2 decimals.

3.0 Plastic Emulsion Paint

Providing and applying plastic emulsion paint conforming to IS:5411- 1991 part I of superior quality of approved make, colour and shade to the old & new surfaces in two coats, including scaffolding, preparing the surfaces to receive the paint and applying putty etc. complete.

3.1 General : The item pertains to providing and applying plastic emulsion paint of approved colour to old or new plastered or masonry surfaces for the specified number of coats.

3.2 Material : Plastic emulsion paint shall be conforming to IS:5411. Paints, oil varnish etc. of approved brand and manufacture shall be used. Only ready mixed paint (Exterior grade) as received from the manufacturer without any admixture shall be used. If for any reason, thinning is necessary in case of ready mixed paint, the brand of thinner recommended by the manufacturer or as instructed by the Engineer-in-Charge shall be used. Approved paints, oil or varnishes shall be brought to the site of work by the contractor in their original containers in sealed condition. The material shall brought in at a time in adequate quantities to suffice for the whole work or at least of fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in-Charge. The empties shall not be removed from the site of work, till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge. The empties shall be property if the contractor.

3.3 Scaffolding :

1. Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No bullies, bamboos or planks shall rest on or touch the surface.

2. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

3. For white washing the ceiling, proper stage scaffolding shall be erected.

3.4 Preparation of Surface : The surface shall be thoroughly cleaned and dusted off. All rust, dirt, scales, smoke splashes, mortar dropping and grease shall be thoroughly removed before painting is started. The prepared surface shall have received the approval of the Engineer-in Charge after inspection, before painting is commenced. Painting shall not be started until the Engineer-in-Charge has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work. Painting of external surface should not be done in adverse weather condition like hail storm and dust storm. Painting, except the priming coat, shall generally be taken in hand after

practically finishing all other building work. The rooms should be thoroughly swept out and the entire building cleaned up, at least one day in advance of the paint work being started.

3.5 Application : Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its containers, when applying also, the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. The painting shall be laid on evenly and smoothly by means of crossing laying off, the latter in the direction of the grains of wood. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite direction, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. Where so stipulated, the painting shall be done by spraying. Spray machine used may be (a) high pressure (small air aperture) type, or (b) a low-pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner. Spraying should be done only when dry condition prevails. Each coat shall be allowed to dry out thoroughly and rubbed smooth before the next coat is applied. This should be facilitated by thorough ventilation. Each coat except the last coat, shall be lightly rubbed down with sand paper or fine pumice stone and cleaned off dust before the next coat is laid. No left over paint shall be put back into the stock tins. When not in use, the containers shall be kept properly closed. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moulding etc. shall be left on the work. In painting doors and windows, the putty round the glass panes must also be painted but care must be taken to see that no paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out in painting. However, bottom edge of the shutters where the painting is not practically possible, need not be done nor any deduction on this account will be done but two coats of primer of approved make shall be done on the bottom edge before fixing the shutters. On painting steelworks, special care shall be taken while painting over bolts, nuts rivets overlaps etc. The additional specifications for primer and other coats of paints shall be as according to the detailed specifications under the respective headings.

3.6 Protective Measures : Doors, windows, floors, article of furniture etc. and such other parts of the building not to be white washed, shall be protected from being splashed upon. Splashing and droppings, if any shall be removed by the contractor at his own cost and the surfaces cleaned. Damages if any to furniture of fittings and fixtures shall be recoverable from the contractor.

3.7 Item to Include : Item includes all labour, material, equipments such as brushes, scrappers, polish papers etc., scaffolding, cleaning of the area etc. complete as per the specifications. The item also includes removing nails, marking good holes, cracks, patches etc.

3.8 Mode of Measurement and Payment :

1. Length and breadth shall be measured correct to a cm. and area shall be calculated in m2 correct to two place of decimals. The contract rate shall be on Sqm. basis.

2. Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentages to allow for the girthed area.

Corrugated asbestos cement sheet 20%

Semi corrugated asbestos cement sheet 10%

3. Cornices and other such wall or ceiling features, shall be measured along the girth and included in the measurements.

4. The number of coats of each treatment shall be stated. Not exceeding 50 sqm. each with material similar in composition to the surface to be prepared.

5. Work on old treated surfaces shall be measured separately and so described. The contract rate shall be per sqm area painted including all material and labour involved in all the operations described above.

4.0 Textured Paint:-

Providing and applying TEXTURED paint of approved colour and shade including preparing surface using roller to grt approved texturised surface complete as per direction & manufacture specification & instruction of Engineer - in - charge.

4.1 General : The item pertains to providing and applying TEXTURED of approved colour to old or new plastered or masonry surfaces for the specified number of coats.

4.2 Material : The TEXTURED shall be (conforming to IS:5410) of approved brand and manufacture. The TEXTURED shall be brought to the site of work by the contractor in its original containers is sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the Contractor and the Engineer-in-Charge. The empties shall not be removed from the site of work till the relevant item of the work has been completed and permission obtained from the Engineer-in-Charge.

4.3 Scaffolding :

1. Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No bullies, bamboos or planks shall rest on or touch the surface.

2. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

4.4 Preparation of Surface : For New work, the surface shall be thoroughly cleaned of all mortar dropping, dirt dust, algae, grease and other foreign matter by brushing and washing. Pitting in plaster shall be made good and a coat of water proof TEXTURED shall be applied over patches after wetting them thoroughly.

4.5 Cement Primer Coat : Cement primer coat is used as a base coat on wall finish of cement, lime or lime cement plaster or on asbestos cement surfaces before oil emulsion distemper paints are applied on them. The cement primer is composed of a medium and pigment, which are resistant to the alkalis present in the cement, lime or lime cement in wall finish and provides a barrier for the protection of subsequent coats of oil emulsion distemper paints. The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes in both directions shall be given first and vertical strokes in both directions shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil emulsion paint is applied.

4.6 Preparation of Mix : TEXTURED shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thick, affecting flow and finish. TEXTURED shall be mixed with water in two stages. The first stage shall comprise of 2 parts of TEXTURED and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the TEXTURED gradually to the water and not vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacture's instructions shall be followed meticulously. The lids of TEXTURED drums shall be kept tightly closed when not in use, as by exposure to atmosphere the TEXTURED rapidly becomes air set due to its hygroscope qualities. In case of TEXTURED brought in gunny bags, once the bag is opened, the contents should be consumed in full on the day of its opening. If the same is not likely to be consumed in full, the balance quantity should be transferred and preserved in an airtight container to avoid its exposure to atmosphere.

4.7 Application :

1. The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface, which is on the shady side of the building so that the direct

heat of the sun on the surface is avoided. The method of application of TEXTURED shall be as per manufacturer's specification. The completed surface shall be watered after the day's work.

2. The second coat shall be applied after the first coat has been set for at least 24 hours. Before application of the second or subsequent coats, the surface of the previous coat shall not be wetted.

3. For new work, the surface shall be treated with three or more coats of water proof TEXTURED as found necessary to get a uniform shade.

4. For old work, the treatment shall be with one or more coats as found necessary to get a uniform shade.

5. After completing the work painted surface shall be kept wet for 7 days by sprinkling water for curing of paint.

4.8 Precaution : Water proof TEXTURED shall not be applied on surfaces already treated with white wash, colour wash, distemper dry or oil bound, varnishes, paints etc. It shall not be applied on gypsum, wood and metal surfaces.

4.9 Protective Measures : Doors, windows, floors, article of furniture etc. and such other parts of the building not to be white washed, shall be protected from being splashed upon. Splashing and droppings, if any shall be removed by the contractor at his own cost and the surfaces cleaned. Damages if any to furniture of fittings and fixtures shall be recoverable from the contractor.

4.10 Item to Include: Item includes all labour, material, equipments such as brushes, scrappers, polish papers etc., scaffolding, cleaning of the area etc. complete as per the specifications. The item also includes removing nails, marking good holes, cracks, patches etc.

4.11 Mode of Measurement and Payment:

1. Length and breadth shall be measured correct to a cm. and area shall be calculated in m2 correct to two places of decimals. The contract rate shall be on sqm basis

2. Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentages to allow for the girthed area.

Corrugated asbestos cement sheet 20% Semi corrugated asbestos cement sheet 10%

3. Cornices and other such wall or ceiling features, shall be measured along the girth and included in the measurements.

4. The number of coats of each treatment shall be stated. Not exceeding 50 sqm. each with material similar in composition to the surface to be prepared.

5. Work on old treated surfaces shall be measured separately and so described. The contract rate shall be per sqm area painted including all material and labour involved in all the operations described above.

E :- Doors

1.0 Partly Glazed Partly Solid Door (Double / Single Leaf door):

Workmanship:
All woodwork shall be neatly and truly finished to the exact dimensions required. Unless otherwise specified, all joints shall be simple tenon and mortise joints with the end of the tenon exposed to view. All joints shall fit truly and fully without wedging and filling in a workmanlike manner.

Hardware and Fixtures:
The doors and windows shall have the following minimum oxidized brass hardware and fixtures unless otherwise specified:

Sr. No.	***Type***	**Doors** **Single Shutter** **Double Shutter** **(on each shutter)**	**Windows**
1.	*Butt hinges (100mm long with stainless steel pin)*	**3 nos.** **3 nos.**	**2 nos.**
2.	*Lowe Bolts (200mm long)*	**2 nos.** **2 nos.**	**2 nos.**
3.	*Handles (150mm long)*	**1 nos.** **1 nos.**	**1 nos.**
4.	*Aldrop (or mortice latch and lock) – 300mm long*	**1 no.** **1 no.**	
5.	*Stoppers*	**1 no.** **1 no.**	**1 no.**

Whereas mortise latch and lock is specified, door handles shall not be provided. Any other fixtures in addition to above such as floor drop stoppers, decorative handles, door closures etc. wherever required shall be as shown on the drawing.

Painting / Polishing:

The woodwork for the doors and windows shall be painted or polished as required. The painting shall be done in three coats of enamel paint after cleaning, sand papering and putty application.

The polishing can be glossy or mat finished. The woodwork shall be first cleaned scrapped thoroughly with sandpaper. It shall be painted with filler of whiting and methylated spirit and again sandpapered. Minor knots and cracks shall then be filled with wax coloured to match and thin coats of trench polish or wax polish shall be applied to a uniform finish.

Glazing:
Glass panels of not less than 3mm thick shall be provided. They may be plain or obscured as specified. Glass panes hall be free from flaws, sparks and bubbles and shall have square corner and straight edges. The glass panes shall be so cut that they fit slightly loose in the frames. Glazing shall be provided on the outside of the frame unless otherwise specified. Putty shall be applied between glass panes and glazing bars initially and then over the glass panes. The oozed out back putty shall be cleaned and putty shall be painted within two to three weeks after glazing is fixed to avoid its cracking.

Note: Putty may be prepared by mixing one part of white lead with three parts or finely powdered chalk and then adding boiled linseed oil to the mixture to form a stiff paste and then adding varnish to the paste.

Four glazing clips may be provided per glass pane for a size larger than 30 cm x 60 cm and where the size of glass pane exceeds 80cm x 200cm, six glazing clips may be used. Glazing clips are not usually provided for glass panes smaller than 30 x 60 cm size.

Melamine polish:

This shall be applied where natural grain of the wood is required to show. Polyurethane gives tough surface which resist chipping, Scratching and boiling water.

Application:
Clean off all grease and wax with an abrasive and white spirit, this should not be applied in humid conditions. Apply the first coat, preferably of clear hard glaze with a cloth pad. Leave this to dry for at least six hours, then apply further coats with a paint brush. If you wait for longer than 24 hours between coats, rub down the previous coat with fine glass paper or a medium grade of steel wool. Obtain a matt finish, if required, by giving a final coat of clear Renseal Matt coat.

4.0 Flush Door.

Providing and fixing in position Flush Door made up of 40 mm thick approved flush door of approved size with solid core Boiling Water Proof (Marine) type hot pressed conforming to IS:2202 (Part I, II) 1999,1.5 mm thick approved Laminate on both approved beading,approved moulding including necessary hardware,approved adhesive,fittings & fixtures as specified, melamine polish to all exposed surfaces etc complete as per detailed drawing,as specified & as directed by Engineer In Charge.

4.1 General: Providing and fixing superior quality Flush Door (Marine) type hot pressed conforming to IS:2202 (Part I, II) 1999 including finishing both sides with 1.5 Thick Laminate on both faces etc. with 12 mm teak wood bedding all around, 12 mm thk moulding finished with 3 coats of melamine polish . Also, providing and fixing best quality superior Indian teak wood frame for doors including all moulding, rebating, jointing, hold fasts of MS flats of minimum size 20 x 3 mm, having length of 225 mm for doors and finishing with 3 coats of Melamine polish as directed etc. complete.

4.2 Material: The teak wood beading for fixing around the flush door shall be of 12 mm thick and of the width flush to the flush door.

Shutter: The solid core shutter shall be of the ply finish type of the exterior or interior grade as mentioned in the item or drawing. It shall confirm to the relevant specifications for the type and grade given in IS 2202/1999. Specifications for wooden Flush Door Shutters (solid core type). It shall be obtained from manufacturers from the approved list. The finished thickness of the shutter shall be as mentioned in the item. If decorative finish is specified from exterior or interior side or both sides the same shall be paid extra under relevant item incorporated in the tender concealed lock rail of teak wood shall be provided in shutter. Specific instructions be issued to the manufacturer while placing the order.

Frame: - Providing and fixing best quality superior Indian teak wood frame for doors including all moulding, rebating, jointing, hold fasts of MS flats of minimum size 20 x 3 mm, having length of 225 mm for doors and finishing with 3 coats of Melamine polish

4.3 Finishing: The Flush Door shall be finished with 1.5 mm thick Lamionate on both faces as mentioned as specified or as directed.

4.4 Item to Include: The item includes solid core shutter, Teak wood frame, all labour, materials and equipment to provide and fix the solid core flush doors and frame as specified. The fixtures shall be included in the item.

4.5 Mode of Measurement and Payment:

The Door shall be measured out to out dimension of frame in sqm. The dimensions shall be measured correct upto 1 cm.

The contract rate shall be on square metre basis.

TECHNICAL SPECIFICATIONS INTERIOR WORKS

GENERAL

This Specification is for work to be done, item to be supplied and materials to be used in the works as shown and defined on the drawings and described herein, all under the supervision and to the satisfaction of the Consultants.

1.1 The workmanship is to be the best available and of a high standard, use must be made of a special trades men in all aspects of the work and allowance must be made in the rates for doing so.

1.2 The materials and items to be provided by the Contractor shall be approved by the Client/Consultants in accordance with any samples which will be submitted for approval by Contractor and generally in accordance with the Specifications. Also if products are specified in the Specification and/or bill of brand, trade name or catalogue reference, the Contractor will be required to obtain the approval of the Consultants before using the materials. The Contractor shall produce all invoices, Vouchers or receipts for any material if called upon to do so by the Client/Consultants.

1.3 Samples of all materials are to be submitted to the Consultants for approval before the Contractor orders or deliver the materials at site. Samples together with their packing are to be provided free of charge by the Contractor and should any materials be rejected, they will be removed from the site at the Contractor's expense. All samples will be retained by the Client/Consultants for comparison with materials, which will be delivered at the site. Also, the Contractor will be required to submit specimen finishes of colours, fabrics etc. for the approval of the Consultants before proceeding with the work.

The Contractor shall be responsible for providing and maintaining and boxing or other temporary works required for the protection of dresses or finished work if left unprotected. He is also to clean out all shelving's, out ends and other waste from all parts of the works before coverings.

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

1.6 All unexposed surface of timber e.g. partition / paneling frames, false ceiling, backing fillets, backs of door frames, cupboard framing, grounds, etc. are to be treated with two coats of approved timber preservative and antitermite paint before fixing or converging.

1.7 Only first class workmanship will be accepted. Contractor shall maintain uniform quality and consistency in workmanship throughout.

2.0 Joinery:

2.1 Joinery is to be prepared immediately after issuing the work order. Framed up, bonded and tide up. Any portions that are wrapped or found with other defects are to be replaced before wedging up. The whole of the work is to be framed and finished in a workmen-like manner in accordance with the detailed drawings, specifications and wherever required, fitted with all necessary metal ties, straps, belts, screws, glue etc. Running beaded joints are to be cross-tongued with teak tongues wherever 1 or (1/2") thick double cross tongued. Joiners work generally to be finished with fine sand/glass paper.

2.2 Joints: - All joints shall be standard mortise and tenon, dowel, dovetail, and cross-halved. Nailed or glued butt joints will not be permitted. Screws, nails etc. will be standard iron or wire of oxidized nettle fold tenons should fit the mortises exactly.

2.3 Nailed or glued butt joints will not be permitted, exceptional cases to be with approval of Consultants / Client.

2.4 Where screws shown on a finished surface, those will be sunk and the whole plugged with a wood plug of the same wood and grain of the finished surfaces will be neatly punched and the hole filled with wood filler to match the colour.

2.5 If joints in joiner's work open, or other defects arise within the period stated for defect liability in the contract then the clause for such defective joinery shall be taken down, and refilled, redecorated and/or replaced the defective work if necessary and any work disturbed shall be made good at the Contractor's expense.

2.6 Nails, spikes and bolts shall be of lengths and weights approved by the Clients / Consultants. Nails shall comply with is 1959-1960 or equivalent approved quality sample. Brass headed nails are to comply with B.S.1210. Wire staples shall comply with B.S 1494 or equivalent.

2.7 The contact surface of dowels, tennons, wedges etc., shall be glued with an approved adhesive.

2.8 Where glued, joinery and carpentry work is likely to come into contact with moisture, the glue shall be waterproof.

3.0 HARDWARE & METALS:

The hardware throughout shall be of approved manufacture or supplier well made and equal to in every respect to the samples to be deposited with the Consultants. The Contractor may be required to produce and provide samples from many different sources before the Client/Consultants take decision and he should allow his rates for doing so.

3.1 Fittings generally shall be brass oxidized, unless otherwise specified and shall be suitable for their intended purpose. In any case, it will have to be approved by client and Consultants before the Contractor procures it at site of work.

3.2 Screws are to match the finish of the article to be fixed, and to be round or flat headed or counter sunk as required.

3.3 The Contractor should cover up and protect the brass and bronze surfaces with thick grease or other suitable productive material, renew as necessary and subsequently clean off away on connection.

3.4 Aluminum and stainless steel shall be of approved manufacture and suitable for its particular application. Generally, the surface of aluminum shall have an anodized finish and both shall comply with the samples approved by the Client/Consultants. All stainless steel sheets shall be 304 s.s Japan or equivalent with gauge as specified but not thinner than 16 G.

3.5 All steel, brass, bronze, aluminum and stainless steel articles shall be subjected to a reasonable test for strength, if so, required by the Client/Consultants at the Contractor's expense.

3.6 All brazing and welds are to be executed in a clean and smooth manner rubbed down and left in the flattest and tidiest way, particularly where exposed.

3.7 Chromium plating shall be in accordance with relevant I.S Standard or as per approved specification for normal outdoor conditions and shall be on a base material of copper or brass.

4.0 GLAZIER:

4.1 All glass to be of approved manufacturer complying with IS 3548-1966 as per approved quality and sample to be of the selective qualities specified and free from bubbles, smoke, air holes and other defects.

4.2 Polished plate glass shall be "glazing glass" (G.G) quality and that for mirrors shall be "silvering quality" (S.G) conforming to IS 3438-1965 or as per approved sample and quality.

4.3 The compound for glazing to metal is to be a special non-hardening compound manufactured for the purpose and of a brand and quality approved by the Client/Consultants.

4.4 While cutting glass, proper allowance be made for expansion. Each square of glazing to be in one whole sheet. On completion of work clean all glass inside and cut, replace all cracked scratched and broken panes and leave in good condition.

5.0 PAINT AND POLISHES:

5.1 All material required for the works shall be of specified and approved manufacturer, delivered to the site in the manufacturer's containers with the seals etc., unbroken and clearly marked with the manufacturer's name or trade mark with a description of the contents and colour. All materials are to be stored on the site of the work.

5.2 Spray painting with approved machines will be permitted only if written approval has been obtained from the Client/Consultants prior to painting. No spraying will be permitted in the case of priming coat or where the soiling of adjacent surfaces is likely to occur. The buzzle and pressure to be so operated as to give an even coating throughout to the satisfaction of the Client/Consultants. The paint used for spraying is to comply generally with the specification concerned and is to be specially prepared by the manufacturer for spraying. Thinning of paint made for brushing will not be allowed.

5.3 Wood preservative shall be Solignum or other equal and approved impregnating wood preservative and all concealed wood work shall be treated with wood preservative and antitermite treatment with Termiseal or equivalent chemical.

5.4 All brushes, tools, pots, kettles etc. used in carrying out the work shall be clean and free from foreign matter and are to be thoroughly cleaned out before being used with a different type of class of materials.

5.5 All iron or steel surfaces shall be thoroughly scraped and rubbed with wire brushes and shall be entirely free from rust, mill scale etc. before applying the priming coat.

5.6 Surfaces of new wood work to be painted are to be rubbed down & cleaned to the approval of the Consultants.

6.0 UPHOLSTRY

6.1 This will be of first class standard workmanship with webbing, no-sag springs, coiled springs, padding and filling as specified on drawing. Covering fabrics will be seen, tufted, and corded as shown on the drawing and as approved by the Client/Consultants.

6.2 Cushion Vents: -

Brass "Cushion Vents" should be installed at the back or under side of seat cushions (especially those covered in leather vinyl plastic or very tightly woven fabric) to allow air to escape easily and to prevent tearing.

6.3 Materials: -

Finished timber shall be of the type specified. Furnishing fabrics, colour, pattern, substance to be as specified and manufactured, or supplied by the Company specified, no variations of this will be permitted unless with prior approval of the Consultants.

7.0 POLISH

7.1 French Polish: -

The basic material shall be shellac dissolved in methylated spirit .

Preparation: -

The timber must be well sanded and cleaned and the grain filled with agrain filler. Any staining must be done before applying the polish.

Equipment: -

The polishing rubber the most important implement in French polish shall consist of a pad of cotton wool, which acts as a reservoir for the polish, and a cover of soft white linen or cotton fabric, similar to a well-worn handkerchief, which acts as a fitter. The rubber must never be dipped into the polish; it should be changed by pouring the polish on to the pad with the cover removed.

Application:-

Work evenly over the surface with a slow figure-of-eight motion until the timber is coated with a thin layer of polish. The object is to apply a series of thin coats, allowing only a few minutes for drying between the coats. When a level and even-bodied surface is obtained the work is ready for the second stage i.e. spiriting off. Allow the work to stand for at least eight hours, then take a fresh rubber with a double thickness of cover material and charge it with methylated spirit. The object of spiriting off into and remove the rubber marks and to give the brilliance of finish. Finally, work in the direction of the grain and continue until the surface is free from smears and rubber marks then leave to harden off.

7.2 Wax Polish:-

Wax polish shall contain silicon's and driers. A good silicon wax is to be used not a creamy or spray. The timber shall be sealed first with another finish such as Ronseal, before applying the wax.

Application: -

Apply a light coat of the sealer by brush or cloth direct to the unfilled timber, working it well in and finishing evenly with the grain. Allow to dry thoroughly then sand lightly with fine

abrasive paper. Apply a heavy coat of wax by cloth or on flat surfaces, with a stiff brush. Work it well into the timber and finish off by stroking with the grain before leaving to harden. Leave for several hours before rubbing up with a soft brush. Finally, buff the grain with a soft cloth.

7.3 Transparent Coloured Polyurethane (Melamine)

This shall be applied where natural grain of the wood is required to show. Polyurethane gives tough surface which resist chipping, Scratching and boiling water.

Application :

Clean off all grease and wax with an abrasive and white spirit, this should not be applied in humid conditions. Apply the first coat, preferably of clear hard glaze with a cloth pad. Leave this to dry for at least six hours, then apply further coats with a paint brush. If you wait for longer than 24 hours between coats, rub down the previous coat with fine glass paper or a medium grade of steel wool. Obtain a matt finish, if required, by giving a final coat of clear Renseal Matt coat.

8.0 Timber :

8.1 Only seasoned and chemically treated BTC/CPTW/Salwood / matching wood to be used, as specified.

8.2 All the wood shall be properly seasoned, natural growth and shall be free from worm holes, loose or dead knots or other defects, saw die square and shall not suffer warping, splitting or other defects.

8.3 The moisture content shall not exceed 12%.

8.4 All internal frame work shall be treated with approved wood preservative and anti termite chemical.

8.5 All wood brought to site should be clean shall not have any preservative or other coating / covering.

8.6 All rejected decayed, bad quality wood shall be immediately removed from site.

8.7 All wood brought to site must be stacked-stored properly as per instructions.

9.0 PLYWOOD

9.1 Marine Plywood confirming to IS:710 - 1976 as specified in the approved list of manufacturers shall only be used. (Block board/commercial plywood not to be used).

9.2 Only teak wood particleboard shall be used. Particleboard shall be phenol formaldehyde bonded and generally conform to I.S. 3087-1965.

9.3 Only 3 mm to 4 mm thick straight grained group matching approved veneers shall be used.

1. MDF CONFORMING TO IS:12406: 1988 is a zero wood substitute finding wide range of applications in Homes & Offices. MDF should be of excellent finish. This should have advantage of homogeneous constructions, design flexibility, unbeatable machinibility, no core voids & better value for money.

Woodwork in doors, windows etc.

Material

Wood used for all work shall be the best of class specified properly seasoned, suitable for joiner's work, should be of natural growth, uniform in texture, straight grained, free from sapwood, dead knots, open shakes, boreholes, rot, decay and any and all other defects and blemishes and shall be approved by Architect.

Workmanship

The thickness specified for joiner's wrought timbers are unless otherwise specified, prior to planning and 3mm will be allowed from the thickness stated for each wrought face.

Doors, windows frames, transomes, mullions shall be rebated. All dimensions shall be as per drawings. The top framing member of doors and top and bottom framing of windows and ventilators shall project about 150 mm in brickwork. The verticals of door frame shall project about 50mm below finished floor. Surface coming in contact with brick work shall be painted with bitumen. Each of the door and window frame shall be provided with 3 nos. M.S. 230x 25x 6 M.S. flat split hold fasts on each side. These hold fasts shall be embedded in masonry. The work shall confirm to I.S.: 4021. Any joiners work which shall split, fracture, shrink, or show flaws or other defects due to unsoundness, inadequate seasoning or bad workmanship, shall be removed and replaced with sound material at the Contractor's expense.

The doors shall be paralleled or solid flush doors or as described in item of work.

All doors shall have fittings such as hinges, mortise, lock, towel bolts etc. as per Consultants drawing and shall be approved by Architect.

The workmanship of all door and window shutters shall conform to the requirements of I.S.1003 (part 1 & ii) and I.S. 2202 (part i).

Measurement

All doors, windows etc., will be measured in Sq.Mt. The measurement will be taken to the outside of framework exclusive of horns, projections etc. The rate quoted shall be all inclusive such as nails, screws, glazing, fixtures, fittings providing peep holes, locking device, door closers, handles,

door stops etc. The rate shall also be inclusive of polishing/painting as described in respective items.

G. Loose Furniture:-

1.0 Meeting Room Table

1.1 General :- Providing & arranging in position Board room / Conference room table with top out of 19mm thk.plywood and supports out of necessary wood framework with necessary beadings, mouldings, footrests, etc out of wood as shown in the drawings. Top to be finished with group matching natural veneer / decorative veneer of approved type .The top shall be finished with polycoating of approved shade. The sides to be with layers of 6 mm thk plywood finished with a combination of group matching veneer of approved shade. All veneered surface to be finished with poly coating of approved shade & Colour. A seperate provision on the top of the table shall be made for fixing flatron screen with easy operation fixing details as per drawing.Item to be completed in all respects as per drawings & instructions from Project - in - charge.

1.2 **Mode of Measurement :-** Number of units supplied will be measured & paid.

1.3 Unit :- No.

2.0 Executive TABLE (main table size 2550 x 1100 x 750 mm) (side table size 1250 x 450 x 700 mm)

1.1 General :- Providing & arranging in position desk units in 19mm thk. Marine plywood including side unit, drawer unit, tea tray, pencil tray, pullout tray, footrest. All drawers to be in plywood with 19 mm in front & 12mm thk in rear & sides & bottom in 6 mm thk. Plywood Internal surfaces to be veneer with melamine polish. Table tops, drawer unit fronts & sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings & instructions of the EIC / Consultant all complete. All trays in writing desks, side units to have concealed stoppers. All pencil trays shall have small compartments for keeping miscellaneous stationaries. All beadings, mouldings & exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top & shall be finished with matching veneer all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards & mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock etc. drawings & also shall include CPU unit as shown in the drawings approved by Engineer-in-charge/Architect. No seperate payment shall be made for this. Tables all exposed surface finished with a approved veneer in approved pattern as per drawings. All exposed surface of side unit to be finished with an approved veneer.

Providing & fixing in position side unit made out of 19 mm thk. Marine ply, with shelves, drawers, shutters etc. as per drawings, finished with approved veneer from outside & French polish from inside. Item to be completed in all respects as per

drawing & instructions from EIC. The item shall include a set of drawer & openable shutters, as per the drawing & details. All shelves, openable shutters, drawer box, drawer front etc. shall be made out of 19 mm thick plywood. Drawer sides shall be in 12 mm thk Plywood. Drawer bottom shall be in 6 mm thk. Plywood. All exposed surfaces to be finished With veneer of approved shade & make. All complete with necessary hardware,like key board, CPU,Trolly, cable manger etc complected as per drawing & approval of Engineer-In-charge & Architect.

1.2 Mode of Measurement: - Number of units supplied will be measured & paid.

1.3 Unit :- No.

2.0 Open Office Table (main table size 1500 x 750 x 750 mm) (side table size 900 x 400 x 700 mm)

2.1 General :- Providing & arranging in position desk units in 19mm thk. Marine plywood including side unit, drawer unit, tea tray, pencil tray, pullout tray, footrest. All drawers to be in plywood with 19 mm in front & 12mm thk in rear & sides & bottom in 6 mm thk. Plywood Internal surfaces to be laminate. Table tops, drawer unit fronts & sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings & instructions of the EIC / Consultant all complete. All trays in writing desks, side units to have concealed stoppers. All pencil trays shall have small compartments for keeping miscellaneous stationaries. All beadings, mouldings & exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top & shall be finished with laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards & mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock etc. drawings & also shall include CPU unit as shown in the drawings approved by Engineer-in-charge/Architect. No seperate payment shall be made for this. Tables all exposed surface finished with a approved laminate in approved pattern as per drawings. All exposed surface of side unit to be finished with an approved laminate.

Providing & fixing in position side unit made out of 19 mm thk. Marine ply, with shelves, drawers, shutters etc. as per drawings, finished with approved laminate from outside & inside. Item to be completed in all respects as per drawing & instructions from EIC. The item shall include a set of drawer & openable shutters, as per the drawing & details. All shelves, openable shutters, drawer box, drawer front etc. shall be made out of 19 mm thick plywood. Drawer sides shall be in 12 mm thk Plywood. Drawer bottom shall be in 6 mm thk. Plywood. All exposed surfaces to be finished With laminate of approved shade & make. All complete with necessary hardware,like key board,

CPU,Trolly, cable manger etc complected as per drawing & approval of Engineer-In-charge & Architect.

2.2 Mode of Measurement :- Number of unit supplied will be measured & paid.

2.3 Unit :- No.

3.0 <u>Modular Type Work Stations - L shape with circular one side corner In Admin area - type -1 - 1500 X 1100x600 deep</u>

4.1 General:- Modular Type Work Stations - L shape with circular one side corner In Admin area - type -1 - 1500 X 1100x600 deep With Partation,Table top, pedistal unit,Keyboard tray,Cpo trolly,table leg. Providing and fixing in position Modular workstations consist of low ht. partition screen, work tops, Pedastal unit, key board tray & CPU holder brackets as per specifications mentioned below.60 mm thk. Low ht. partition screen made out of Aluminium frame & components with silver powder coated / anodised finish. Cable channels with openable flaps. Cable channels shall have separators for cable management. Aluminium frame shall be covered with prelaminated or Plain MDF/ particle board . Each partition frame to have 40 mm dia PVC covered level adjustable screws.Incase of plain MDF / particle board 1 mm laminate of approved make & shade will be used . Some panels shall be finished with both side 6 mm thk. Toughen glass wth Froasted film & NR treatment. Some panel shall be finished with both side approved fabric may be suitable as pin- up board, white board & other accessories will be part of Low ht. partition screen.Work top - 25 mm hk. Pre laminated / plain MDF board / particle board with approved 1 mm thk. Laminate on both side , cut to size & shape as per design & drawings. Edges to be fixed with 1.5 mm thk PVC edge binding tape of approved make & matching to laminate.Pedastal unit - 3 drawer pedastal unit of overall size 500 deep X 450 wide X 725 ht made out of 18 / 16 mm prelaminated board for caracus & 12 mm prelaminated board for drawers.

4.2 Mode of Measurement:- Number of unit supplied will be measured & paid.

4.3 Unit :- No.

5.0 Square/circular corner Table –

Providing & arranging in position centre tables made out of TW members 40X 75 mm with proper joinert & hardware as per drawing. The top finished with 12mm thk tinted glass with bevelled edges. Item to be completed in all respect as per drawing & instruction from E.I.C. of given size & shape (450x450x450mm).

General

- The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications & drawings given by MPCB. The materials used for the work shall conform to the relevant IS Specifications & also to the enclosed specifications. The work shall be executed as mentioned in the enclosed specifications or as directed by the Engineer-in-charge.
- Workability should be satisfactory to the EIC / consultant. Anything defective or not accepted by EIC / consultant should be removed / rectify without delay & with the cost & risk of contractor. The item also includes cost of labour, material, its transportation, loading ,unloading, scaffolding, wastage, taxes etc. All complete as per approval & instructions of Engineer in charge. (No extra payment will be paid for design patterns).

Mode of Measurement & payment : The measurement shall be on No basis.

The contract rate shall be per No of Corner Table provided & fixed of specified size as per approved drawings.

H. CHAIRS.

1.0 Providing chairs of approved make as per type approved by Engineer in charge.

a) Meeting chair
b) Cabin Chair
c) Cabin Visitor chair
d) Staff Chair
e) Staff Visitor Chairs
f) Lounge Chair
g) Recliner Chair

- The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The materials used for the work shall conform to the relevant IS Specifications & also to the enclosed specifications. The chair shall be got approved from Engineer-in-charge prior to supply. The chairs shall be of approved make & of equivalent type as per item wording.

Mode of Measurement & payment : The measurement shall be on No basis. The contract rate shall be per No of Chairs of specified type as per approval of Engineer In Charge.

2.0 Sofa

Providing & supplying multi seater sofas with teakwood internal frame out of size min. 70x40mm as mentioned in drawing with necessary spring /rubberised coir/32 density polyurethane foam/100% latex rubber foam of appropriate quality & thickness as shown in the drawing with melamine polish on all exposed wooden surface. 75mm thk. for seat & 50mm thk for back. 25mm polyurethane in it to give required shape. The rate to include upholstery material of approved velvet (fabric) on outer side & on the inner side white cloth of approved quality shade etc. The contractor shall use appropriate size of frame work instead of mentioned to achieve desired shape & comfort as shown. All as per instructions of Engineer-in-charge.

a) Single Seater Sofa
b) Two Seater Sofa
c) **Three Seater Sofa**

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications & drawings given by MPCB. The materials used for the work shall conform to the relevant IS Specifications & also to the enclosed specifications. The work shall be executed as mentioned in the enclosed specifications or as directed by the Engineer-in-charge.

Mode of Measurement & payment : The measurement shall be on No basis. The contract rate shall be per No of Sofas of respective type as per approved drawing.

I. MISCELLANEOUS WORKS

1. PELMETS / Jamblining : (upto 300 mm wide):-

Supplying, Providing & fixing in position of required size pelmets / jamblining made out of 19mm thick marine plywood finished with approved finish mention below and 3 coats of French polish for inside surface as per the direction by Architect. Item to be completed in all respect as per the drawing & instruction from Architect.

a) 1.5 mm thk Laminate Finish
b) Veneer Finish

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications & drawings given by MPCB. The materials used for the work shall conform to the relevant IS Specifications & also to the enclosed

specifications. The work shall be executed as mentioned in the enclosed specifications or as directed by the Engineer-in-charge.

Mode of Measurement & payment : The measurement shall be on Rmt basis. The contract rate shall be per Rmt of Pelments / Jamblining of respective type as per approved drawing.

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2. Soffit::-

Providing and fixing in position 19mm thk. Marine plywood for soffit finished with below mention including 25 x 25mm thk 2nd class TW wooden frame work (including paint)/ supports & mouldings, groove. Item to be completed in all respects as per drawings & direction by

a) **1.5 mm thk Laminate Finish**
b) **Veneer Finish**

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications & drawings given by MPCB. The materials used for the work shall conform to the relevant IS Specifications & also to the enclosed specifications. The work shall be executed as mentioned in the enclosed specifications or as directed by the Engineer-in-charge.

Mode of Measurement & payment : The measurement shall be on Sqmt basis. The contract rate shall be per Sqmt of Soffit of respective type as per approved drawing.

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3. Soft board:-

Providing and fixing in position 19mm thk. Marine plywood for soffit finished with below mention including 25 x 25mm thk 2nd class TW wooden frame work (including paint)/ supports & mouldings, groove. Item to be completed in all respects as per drawings & direction by

a) **1.5 mm thk Laminate Finish**
b) **Veneer Finish**

The work shall be executed as per item wordings & as per the directions of Engineer-in-charge. The work shall be carried out as per the specifications & drawings given by MPCB. The materials used for the work shall conform to the relevant IS Specifications & also to the enclosed specifications. The work shall be executed as mentioned in the enclosed specifications or as directed by the Engineer-in-charge.

Mode of Measurement & payment: The measurement shall be on Sqmt basis. The contract rate shall be per Sqmt of Soffit of respective type as per approved drawing.

STRUCTURAL GLAZING WORKS

UNITISED STRUCTURAL GLAZING SYSTEM "Designing, Fabricate, and installation of Glazzio Unitized Structural Glazing system comprising of Male & Female mullion , Transom, Head and Cill with Andoised finish of 20 Microns coatings (Colour as per architect intent).The male / female mullions and transoms are installed on MS (HDG) brackets preinstalled at site to the slabs (As indicated in the concept drawing) with the help of base line provided by the Main contractor at all floor level and later using Total station or Theodolite these points are shifted at all floor levels and brackets are aligned at each floors to plumb.The System and glass shall be designed to withstand a wind pressure of 1.5 kpa. and deflection L/175 at specified levels,elevation & heights.The unitised system is designed to have internal drainage system within the extruded sections. In this system cut to size and fabricated insulated glass units are glazed into the aluminium framing members at factory using structural sealant along with all necessary hardwares and later transported as final product to site.All fixtures, as Anchors, Nutbolt, and Screws shall be SS304 grade, all other accessaries as spacer tape, Structural/ Weather silicone (dow corning / G.E.SILICONE) of approved make, with EPDM gasket.System includding with all necessary hardwares labors etc.fully glazed panel to be installed at site" "Note-1 : The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accreditated by NABL (National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. Cost of testing is payable seperately. " Performance Testing of structural glazing system (Tests to be conducted in the NABL certified laboratories):
"1.Performance Laboratory Test for Air Leakage Test (-50pa to - 300pa) & (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr“ 2. Static Water Penetration Test. (50pato 1500pa) as per ASTME- 331-09 testing method for a range upto 2000 ml.“ 3. Dynamic Water Penetration (50pato 1500pa) as per AAMA 501.01-05 testing method for a range upto2000 ml“ 4. Structural Performance Deflection and deformation by static air pressure test (1.5 times design wind pressure without any failure) as per ASTME- 330-10 testing method for a range upto 50 mm“ 5. Seismic Movement Test (Upto 30 mm) as per AAMA 501.4-09 testing method for Qualitative test“"

24mm DGU Vision Glass "1) 6mm Low e double silver coated glass HS+12mm Air Gap (Mill Finish Spacer with 6mm Silicon Byte)+6mm Clear HS. 2) Glass should mandatorily have the below properties: VLT> 45%, Solar Heat Gain Coefficient (SHGC)<0.26 3) All glasses both performance and clear glasses should have iron content levels of less than 700 PPM and shall strictly adhere to this quality standard 4) The glasses should follow the below thickness tolerances for different glass thicknesses 5mm & 6mm: +/-0.2 mm (SAINT GOBAIN, ASAHI, PILKINGTON)"

FRAMELESS GLASS RAILING WORK Design, supply & install frameless Glass Railling system of 1.2 meter hight made out of the bottom level will be continue horizontal alumnium Vertical section with powder coating cover plate as per approval shade on it fixing with ss anchor fastners on bottom rc work supports with SS - 316 horizontal tube rail at the top, all complete required to perform as per drawing in conjuction with BOQ.

SPIDER GLAZING WITH FITTING SYSTEM CANOPY AREA Designe, Supply and install Suspended spider glazing systems customm designed. The design shall accommodate glass panel of 21.52MM thk. laminated Clear toughened glass (10mm clear + 1.52 pvb + 10mm clear glass) and its dead load. The spider fittings on glazing system shall be of Stainless steel spiders OZONE/DORMA/DLCO/KINGLON/GEZE with flat head bolt assembly supported on ss structure to be made the cost does not include the ss structure for support.

SPIDER GLAZING ENTRANCE AREA Designe, Supply and install Suspended spider glazing systems customm designed. The design shall accommodate glass panel of 12mm thk. Clear FT glass and its dead load. The suspended glazing system shall be of Stainless steel spiders OZONE/DORMA/DLCO/KINGLON/GEZE make with flat head bolt assembly supported on glass laminated Fin toughened glass systems. The assembly is made out of Face glass suppoerted on Glass Fin with Stainless steel spiders , M.S. hanger bracket, weather sealant, teflon / nylon bushes & separators to prevent bi-metalic contacts, all in complete required to perform as per drawing in conjuction with BOQ.

SS STEEL STRUCTURE WORK "Design ,Supply & Installation of SS grade 316 steel structure as per the drawing and design requirement for the support work for canopy, lift area, terrace area, ground floor area etc. the full welding will be done as per IS standard. with proper anchor fastners to be used for structure work as per calculation report submission. "

ACP CLADDING FOR COPPING AND CELING Design, fabricate, and installation of 4mm thk 0.50MM Aluminium composite panel cladding with PVDF coating. The cladding system comprising aluminium support grid with horizontal and vertical aluminium in tube/ angle profile. FR Class B Grade Fire Rated Aluminum composite panel cladding either straight or curved in plan, comprising Aluminum Composite Panel which should consist of 3 mm thickness of mineral core (70% inorganic and 30% organic compound) sandwiched between two Aluminum coil of alloy AL 3105 – H16/H24 of 0.50 mm thickness making an overall thickness of 4mm. The weight of ACP should be above 7.5 kg/m2. The top surface shall be finished with PVDF/FEVE based coating (thickness 35-36 microns) and service coating on the reverse side shall be with PE (Thickness 5-7 microns) base and coating shall be confirm to AAMA 2605 standard done on a color coating line located in India. The Aluminum composite Panel should The manufacturer must have a valid FPC Certificate(Factory Production Control) on reaction to fire as per class BThe aluminium based tube profile/ angle shall support the dead load of the ACP panel should be fire rated B1 and mechanically clamped on to the vertical as well as horizontal sub grid by a L clit . The System shall be designed to withstand a windpressure of 1.5 kpa at specified levels, elevation & heights. all fixures shall be made out from ss grade, The vertical and horizontal grooves shall be filled with approved weather sealant, and backup material, etc complete.The acp work will be for top bottom copping and celing area as per approved shade make VIVA/ALUBOND/ALCOPOLIC/ALUBOND

TOP HUNG OPENABLE WINDOWS Top hung Openables with Structural Glazing to comprise of heavy duty friction stay (Cotswol, Giesse, Securistyle, kinglong)to take the load of glass and frame with minimum Four point lockingsystem or more as per requirement
(Alualfa, Giesse, Securistyle, kinglong).

FRAMELESS GLASS DOORS WORK Providing, fabricate, and installation of 12mm Clear glass toughened single door having patch fitting top patch, bottom patch, floor spring, lock and handle upto maximum size of 450mm including fixing of door.all the patch fittings including handle lock etc will be provide by client along with autocad cutouts
OZONE/DORMA/DLCO/KINGLONG/GEZE

SPENDERAL INSULLATION WORK Quote extra over on item (1.0) for providing and fixing the spandrel panel with the Glass wool insulation of 50mm thick 48 kg/m3 density slab with inbuilt black veli of 0.65mm firmly held on the GI tray od 1 mm thk. The assembly is kept atleast 50mm away from the glass surface.

SMOKE SEAL WORK For supplying and fixing smoke seal Supplied by International 2 Hour Fire Rated Product from SIDE - RISE - UK - with complete Installation on each floor

Glass Reinforced Concrete Cladding Work Design, Providing, fabricate and installation of GRC Panel Cladding system to withstand the wind pressure 1.5 KPA. The anchor fasteners will be of SS grade and the MS HDGL brackets will be used as per the grid level. The design shall accommodate the building movements, thermal movements and seismic movements. The GFRC panel thickness will be up to 50mm thk. All as per detailed drawing and instruction of Engineer – in - charge. Any M.S. structure required behind the, system will be included in same item.

Providing and fixing of Sun Control System of Luxalon SL-2 Louvers or equivalent (at all heights, levels, and locations as directed) in 84R Plain Panel hunter douglas or equivalent of approved colour consisting of panel 84 mm wide x 16mm deep x 0.6mm thick with round edges panel Panels shall be clipped at a distance of 74 mm to baked enameled Aluminium SL-2 panel stringer 38mm wide and 98mm deep x 0.95 mm thick in a standard length of 5mtrs made of double baked enameled Aluminiu m Alloy white to hold the panel in a module of 74 mm centre to centre. The prongs on SL-2 stringers shall be to accommodate an angle of 66.30 Degrees between two panels. SL-2 stringers shall be fixed at 150 mm from panel ends and at a distance of maximum 600 mm center to center across the panel span from glass level. The carrier shall be fixed to a suitable structure by means of rigid fixing details. as per approved shop drawing and specifications and as directed by the Engineer - in - Charge, the sun pergola will be glass panel grid to be finalise maximum to 1200mm the depth of supergola will be maximum 700mm as per drawings approved. The alumnium box framing to be done to hold sun pergola is inclusive in the cost.

Item shall be executed as per wording in the item and as instruction / directed by Engineer-incharge. The item includes all required labour, material, equipment, transportation and all taxes excluding GST etc complete. The work should be carried with all safety measures and proper supervision etc. complete.

Mode of Mode of Measurement and payment: - The payment to this item shall be paid in Sqm basis.

SCHEDULE OF QUANTITIES

Trade Preamble

NOTES: -

1. Wherever Wood is specified or mentioned, the same to be used shall be of following species for all items of works unless otherwise specified.

   For exposed woodwork :- Wood matching to veneer species cut to size as specified.

   For internal woodwork :- Salwood cut to size as specified coated with wood preservative and firetrap paint..

   Wherever MDF board is to be used, the same shall be of Exterior grade medium density fiber board confirming IS : 12406 : 1988 or equivalent make.

   All wooden beading moldings to match with the veneer to be used.

2. Rates quoted for all items shall include for cost of materials, labor, testing of materials at laboratory or site, tools & tackle, lift & lead charges, transportation charges, loading-unloading charges, insurance cover as per tender, all types of taxes & duties including Works Contract Tax, polishing & painting charges (wherever applicable) arranging in position, cleaning, etc. and completing item to the satisfaction of Project-in-charge.

3. Rates quoted for finishing items shall include for cost of exposed wood moldings of sizes mentioned in drawings & specifications together with 3 coats of melamine polish. These members will be measured as part of respective finishing items. Separate payment for wood moldings will not be made unless separate items is contained in the tender.

4. Rate quoted for framework / partitions paneling shall include the cost for cutting charges to accommodate electrical conduits, A.C. ducts, etc. as per markings given by respective contractors. Rate for frameworks shall also include charges for applying fire retardant & wood preservative.

5. All framework for partitions shall be constructed upto main ceiling (R.C.C. floor slab). However in case any additional supports will be necessary of any size required & as advised by the consultant the same shall be provided. Cost of these supports shall be included in the rate quoted for the framework. There will be no separate payment for the additional supports envisaged as above.

6. All drawers used in furniture shall have "sliding drawer channels" of approved make.

7. Rates quoted of all storage units shall include for cost of shelves with sides made out 18mm thk. board and back with 6mm thk. MDF board. Similarly rates quoted for storage units shall also include for finishing at back of unit wherever specified. Tenderers shall note that storage units with veneer finish will have veneer finish with melamine polish at back. Rates quoted shall include for such finishes.

8. The rates quoted for all items shall include cost for providing & fixing edge binding strips of 6mm thickness for exposed edges plywood, internal framework, etc. wherever these materials are used in completing the item.

9. Rates quoted of all types of false ceiling shall include for cost of (unless otherwise stated) fixing required wooden sleeves or supports & making openings for ducts, grills, light fixtures, speakers, all types of detectors, indicators, CCTV cameras; finishing of joints, making grooves in required profile as per details in the false ceiling or between false ceiling & wall / partition with required wooden strips, etc. There will be no separate payment on this account. No deductions for all fittings/fixtures shall be made for false ceiling.

10. Rates quoted for fixing MDF / plywood of any thickness shall include for cost of skinning, boxing, paneling, facia, ledges, etc. These rates shall be valid for all width.

11. All exposed surfaces shall be finished with 3 coats of melamine polish of approved shade & colour, unless otherwise specified.

12. All materials brought at site for incorporating in work shall be of approved make & manufacture. The material which will not be of approved make & manufacture will be rejected & it shall be removed from site immediately.

13. Colours, Shades of Laminate, Veneer, Paints, Polish shall be exclusively approved by Consultants. No violation, deviation will be accepted.

14. Rates for extra items shall be got approved from the employer prior to executing such items. Payments for extra items will be made only after such approvals.

15. Unless specified otherwise in the working drawings of items or specifications, laminates used in the work shall be 1.5mm thk. & veneer 3.5mm thk.

16. Hardware's such as Locks, Handles, Hinges, Tower Bolts, Ball catches etc. shall be as per approved list of makes & manufacturers. Specific separate approvals shall be obtained before using any other accessories in lieu of approved hardware as above.

17. All the drawers & trays of Desk units & Credenza units shall have telescopic drawers fittings including stoppers system of approved make.

18. The colors, shades of melamine polish shall be as approved by Consultants. No violation shall be permitted in any of the item. Three or more coats of melamine polish shall be applied for items with melamine polish.

19. Rates for items of flush doors, such as doors with laminated or veneered finish and the glass doors shall include the cost of handles, locks, floor springs, hinges, wooden doors frames etc. There will be no separate payment for these accessories.

20. Rates quoted for relevant items shall include for modifications required for running the electrical / telecom / data wire conduits inside partitions / paneling. There will be no separate payment for this purpose.

21. Tenderers are requested to quote the unit rates in words as well as figures. In the event of discrepancies rates quoted in words will be held as valid.

22. The rates quoted for storage units & credenza units shall include for the cost of hard wares such as locks, handles, demountable hinges of approved make, tower bolts, ball catches etc.

23. The mode of measurements for storage units & credenza units shall be front elevation area only.

24. The similar design of glass doors & glass partitions should be adopted. Rates quoted for glass doors shall include for the cost of hard wares as mentioned in clause 19 above, however rates quoted for glass partitions will not include cost of any hardware as indicated in clause 19 above.

25. Rates quoted for the supply and arranging the tables, credenza units, loose furniture shall include cost of side unit, pedestal drawer unit, accompanying (if any) as shown in the drawings, foot rest, drawer units, pencil trays, tea trays, key board tray, skirtings etc. complete in all respects. The side units provided shall have top drawers, sliding shutters etc. as indicated in drawings. Skirting to be made out of matching wood to veneer and to be finished with minimum three coats of melamine polish or finished with laminate as specified.

The exposed surfaces of tables, side units, desk units other built-in furniture is required to have finishes as specified. The exposed surfaces of drawers & inside surfaces of furniture shall have finish as shown in the drawing. Reduced rates as approved by employer, will be paid for incomplete and substandard work. **Wherever MDF is used the screws should be proper chipboard screws or Euroscrews of approved make.**

a. The drawers & trays shall be made out as follows unless otherwise specified **Front / rear …….. 16mm plywood for veneer finish / 19mm plywood for laminate finish / 18mm thk. MDF finished with post formed laminate externally and 1mm thick laminate internally wherever specified.**

Sides ……. 12mm plywood to be finished with wax polish.

Bottom ……. 9mm plywood to be finished with wax polish on outside.

Internal sides of the drawers shall be finish with 1mm laminate and trays also shall be finished with 1mm thk. laminate. All beadings/mouldings shall be finished with 3 coats of melamine polish. There will be no separate payment for this purpose.

b. The sliding as well as openable shutters shall be made out as follows.**(All shutters to have postform laminates / veneer as per drawings externally and 1mm thick laminate internally.)**

Shutters ……..19mm block board for laminate finish / veneer finish.

Guide rails ……..wood cut to size finished with melamine polish.

Internal sides shall be finished with 1mm thick laminate. All beadings/mouldings shall be finished with three coats of melamine polish, wherever specified.

For work station tops, the edge bending to be of profiles / straight edge PVC as specified.

All shutter of side unit / pedestal box / storage units etc. to have postformed laminate as per specified profile externally and 1mm thick laminate internally.

c. **The foot rest to be made out of 9mm plywood on top with wood finished with wax polish.**

26. The payment shall be made based on actual work measured on site by Client/Consultants representatives.

27. The jamb lining, facia, sill board facia and skirting shall be made out of wood matching to veneer and to be finished with three coats of melamine polish.

28. **The rates quoted for sofas (if any) and lounge chairs (if any) will be including the cost of upholstery.** The tenderer is required to fix the upholstery & the charges for the same shall be included in the rates quoted for items of sofa & lounge chairs.

29. The rates quoted for veneer and melamine polish finish of all desk units shall include for cost providing and fixing inlays of various materials.

30. The rates quoted for wire managers shall include the cost of cutting and making hole on the surfaces where the wire managers will be fixed.

31. The rates quoted for soft board item will be for fixing of fabric finish on the exposed sides.

32. For all desk units and Built-in furniture's shall be of sizes and will have finishes indicated relevant drawings. The rates quoted will include for cost of all provisions made in the drawing and no separate payment will be made.

33. Tenderers to note that wherever burl veneer finish is specified, it shall be finished with three coats of polycoating and wherever ordinary veneer is specified the same shall be finished with three coats of melamine polish, unless specified otherwise. Ordinary veneer specified alongwith burl veneer on table tops will have polycoating as specified.

34. Measurements will be taken as per standard practices and relevant BIS codes for the actually executed quantities. Wastages will not be measured and paid. Rates quoted shall include for wastages anticipated.

MODE OF MEASUREMENTS

1.	Partition frame work , Paneling	Sq. mt. area – (actual executed) one side only.
2.	Finishing items – laminate ,veneer etc	Actual executed area, including skirting moulding etc.
3.	Storage units	Sq. mt. area - front elevation.
4.	Staff desk units- open office work stations.	Per number, Single unit - Double unit. Refer specific item in Bill of Quantities.
5.	Facias, Band, skirting	Skirting Total running length in metres measured only at wall. Sill board facias skirting along bottom edge, regardless of the shape on top including beading / moulding.
6.	A.C. Facias	Sq. mt. area - running length x height of the facia. Height includes lowest portion on (soffit level) upto finished false ceiling. No deduction for A.C. Grill openings.
7.	False Ceiling	Sq. mt. area - finished length finished width. No deduction for A.C. grills, lights, cut-outs; drops to be measured separate in sq. mt.
8.	Soffits	Sq. mt. total finished length x total finished depth (Width including drop of pelmet, if any). No extra charge for beading / moulding on edges.

9.	Storage	Storage etc., sq. mt. - same as storage units (Front elevation).
10.	Venetian / roller Blinds	Total sq. mt. area covered. Minimum area 1.00 Sqm.
11.	Painting	Sq. mt. Finished area only. Windows - one side - 1.5 times. Grills - both sides together 2.5 times.
12.	Carpet and other floor coverings	As laid sq. mt. area. No wastage to be added.

13. Rounding off measurement: - All measurements shall be rounded off to nearest second decimal point e.g. 21.465m will be recorded as 21.47m.

LIST OF APPROVED AND NOMINATED MANUFACTURES/SUPPLIERS OF MATERIALS AND SUB-CONTRACTORS / INTERIOR WORKS

NOTE: -

1. All materials to be used should be as per the list given below.

2. Use of equivalent make shall be only with prior approval from consultants & clients in writing. It must be at par with specified list below – in all respect any additional expenditure time due to this will be on contractors account & no claims shall be entertained.

3. Contractor Should make payment to all suppliers / Sub contractor proportionately as per the payment received form client for the particular item of work other wise client have full rights to make payment to the party directly to avoid any payment problem with supplier / sub contractor .

4. Client / Consultant reserve the right to select / prefer the material from the approved list.

LIST OF APPROVED MAKE LIST

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
A	**CIVIL WORKS**	
1	ACC Blocks	ACC, Ultratech, Birla
2.	Cement	Ultra Tech, ACC, J.P. Cement, Ambuja
3.	White cement	Birla, J.K.
4.	Vitrified Tiles	Pavit, Somany, H&R Johnson
5.	Granite Stone	A Cube Stone World, Floorapia, MRM
6.	Ceramic Tile	Somany, H&R Johnson,Nitco
7	LVT / PVC	SMJ, Merino, Welspun
8	RMC	Relcon, ACC, Godrej
9	Structural Steel / TMT bars	JSW, Tata Steel, SAIL
10	Marble	CMC, Floorapia, A Cube Stone World, Bhardeep Marble
11	GATE	GEZE, Gandhi Automation
12	Paver Tiles	Pavit, Somany, H&R Johnson

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
B	**PAINT, POLISH, ADHESIVES & PRESERVATIVES**	
1.	Paint-Plastic Emulsion/ Exterior/ OBD/ Luster/ Texture/ Primer & Cement Paint	Asian paint, ICI Dulux, Burger, Nerolac
2.	Adhesive	Pidilite Fevicol (Marine), Araldite
3.	Wood preservative	Termiseal by pest Control India, Bison by British paints
4.	Polycoating	MRF, Solvosol
5.	Melamine	MRF, Solvosol
6.	Polishes	Touch wood of Asian Paint, Wudfin of Pidilite industries, Goodlas Nerolac
7.	Silicone Sealant	Dow Corning or equivalent
8.	Plaster of Paris	Gyproc, Diamond
C	**WOOD**	
1.	Old Burma teakwood	No specific supplier, contractor to obtain approval for samples
2.	BTC	No specific supplier, contractor to obtain approval for samples
3.	CP – Teakwood	No specific supplier, contractor to obtain approval

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
		for samples
4.	Hardwood	No specific supplier, contractor to obtain approval for samples
5.	Wood to match the veneers to be used	Jalaram , Anchor, or Approved equivalent
6.	Aluminium Section	Jindal, Hindalco, Nalco
7.	Marine ply	Kutir Plywood, Greenlam Mikasaply, Century
8.	Commercial ply	Kutir Plywood, Century, Greenlam MikasaPly
9.	Particle board	Heritage, Asis, Asian, Greenlam
10.	MDF	Asis, Egger, Greenlam, Century
11.	Block board	Kutir, Century, Greenlam MikasaPly
12.	Flush Door	Kutir, Century, Greenlam MikasaPly
13.	Fire Rated Door	Kutir, Greenlam, Shakti Hormon , Sukri, Kenwood
14.	Calcium Silicate Board	Hilux, Ecophone, Western
15.	PVC Starke Board	Greenply, Century
16.	Gypsum Board	Gypsum India, Western
17.	Veneers	Kutir, Greenlam (Decowood) , Greenply (Wood Crests),

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
		Century
18.	Laminate	Merino, Century, Greenlam
19.	Glass	Asahi, Modiguard, Saint Gobian.
20.	Mirror	Modiguard, Prakash Mirror
21.	Glass blocks	Fishfa glass, Raj impex treading company.
22.	Back painted & Laminated Glass	Saint Gobain or equivalent
23	Modular Glass Partition	GEZE, Dorma
24.	Toilet Cubical	Greenlam, Merino
25.	Glass film for Tint/ safety/ frosting etc.	3M & LG
D.	**DOOR & Window**	
1.	Screws	G.K.W. Nettle folds & approved equivalent.
2.	Hardware for Door & Storages	GEZE, Dorma, Assa Abloy
3.	Floor Springs/ door closers	GEZE, Dorma, Assa Abloy
4.	Stainless steel handle, Stopper, Hinges, Mortise lock, Tower Bolt, drawer channel etc	GEZE, Dorma, Assa Abloy
5.	KD – Fittings	Syntex / Grass / Mepla.
6.	Glass Door	GEZE, Dorma
7.	Stud Anchors & Anchor Fasteners	Hilti, Fischer, Bosh, AXE
8	Automatic Sliding Door	GEZE, Dorma, Assa Abloy

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
9.	UPVC Window	Aluplast, Veka, Fenesta, Wintrack
E.	**FALSE CEILING**	
1	Gypsum board false ceiling	Gypsum India (Gypro), Western
2.	Acoustical false ceiling, Sound Scape & Panelling	Armstrong / Durlum, Ecotone / Saint Gobain
3.	Moisture Resistance Board	Gypsum India, Hilux, Western
4.	Section for false ceiling (Internal GI framing)	Gypsteel - Gyproc (Gypsum India)
5.	Metal Ceiling	Armstrong , Durlum, Hunter Douglas
6	Calcium Silicate Board	Hilux, Western
F.	**SOFT FURNISHING**	
1.	Carpet	Shaw Matrix, SMJ / Welpsun
2.	Vinyl Flooring	Armstrong, Polyfloor, CCIL, SMJ
3.	Wooden flooring	Armstrong, Greenlam
4.	Soft Board	Jolly board or equivalent
5.	Wall paper	Omexco or equivalent
6.	White board	Whitemark, Altop, Alko-sign
7.	Double side Acrylic Foam Tapes for Lacquered coated Glasses and Mirrors Bonding and Fixing	Pentagon Bow – PT715T/PT702T, 3M – VHB 4915/4918
8.	Compactor	Godrej, System Equipment Co. & Kompress
9.	Blinds & Blackout Blinds	Serge Ferrai, Soflite, Implex,

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
		Vista. Mac
10.	Dustbin	Kich, Jaquar or approved equivalent
G.	**Table & Chair**	
1.	Modular Table	Godrej , Steelcase , Herman Miller.
2.	Lab Table	Godrej / Kewaunee / Bicasa.
3.	Chairs, Lounge Chair & Sofa	Godrej , Steelcase , Herman Miller
H	**STRUCTURAL GLAZING, ROOFING AND COMPOSITE PANELLING GLASS.**	
1	Structural glazing, Roofing, ACP Cladding etc. (Fabricators)	Glazzio International, Space Shell Erectors, Anuja Enterprises,
2	Aluminum Extrusion	Jindal, Hindalco, Panache, Global
3	EPDM	Amee Rubber Industries Pvt Ltd, Bohra Rubber, Osaka, Maharashtra Rubber
4	Laminated panels	Fundermax, Prespa, Greenlam
5	Mirror	Saint Gobain glass, modiguard, Asahi,
6	Ordinary glass	Saint Gobain glass, Modiguard, Asahi,

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
7	Float glass	Saint Gobain glass, Modiguard
8	Reflective hard coated/ Soft Coated / Low-E Glass / High Performance both glass toughened / DGU glass	Saint Gobain (SCN & SKN Series), Pilkington, Asahi
9	Silicone Sealant	Dow Corning, GE, Saint Gobain
10	Structural sealant	Dow Corning, GE, Saint Gobain
11	Weather sealant	Dow Corning, GE, Saint Gobain
12	Powder coating	Jotun, Aksonobel, PPG
13	Aluminium Composite Panel	VIVA, Alupolicbond, Alucobond, Eurobond
14	MS Brackets	HDGL Inco Engineering
15	MS Material	Jindal, TATA, Apollo, Essar
16	Smoke Seal	Siderise or any equalent
17	Openable Hardwares	Kinlong, Cotswold, Securitstyle,
18	Glass Processor	Avon Tuff Glass Pvt. Ltd, Asahi Glass, Rishab Tuff

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
19	Sun Pergola Louvers	Hunter Douglas, Durlum, CP Dorma
20.	Spider Glazing Fitting	GEZE, Dorma, Assa Abloy
I	**Waterproofing Works**	
1	Waterproofing compound	Hitchins-Singapore, Blue works, Vandex International
2	Water Proofing Agency	M/s Aqua Alliance (India) Pvt Ltd, M/s BLU Waters Construct Pvt. Ltd., M/s Sandex Technologies, M/s A A Nayak Constructions Pvt Ltd
J	**Plumbing Works**	
1	Sanitary ware Fixtures	Hindware , Parryware , Jaquar
2	CP fittings & accessories fortoilet and pantry	Jaquar, Hindware, Parryware
3	Valves	Leader, Zoloto or approved equivalent
4	Stainless Steel kitchen Sink	Franke, Futura, Nirali or approved equivalent
5	UPVC & PVC pipes,	Finolex, Supreme, Prince,Kissan, Astral or approved equivalent
6	CPVC pipes	Ashirwad Flow Guard, Prince, Astral,finolex or approved equivalent
7	UPVC multi inlet floor trap withaccessories	Finolex, Supreme, Prince,Kissan, Astral or

SR. NO.	MATERIAL	APPROVED MAKE / SUB-CONTRACTOR / SUPPLIERS
		approved equivalent
8	Cast Iron Manhole covers	Bengal Iron Corpn (BIS), NECO, Zenith/ or approved equivalent
9	GI Pipe	Zenith, ITC, Tata, or approved equivalent
10	Pumps	Crompton, Havells, Kirloskar
11	Water Storage Tank	Sintex, Finolex, Ashirvad

Note: Any other item not mentioned but required at site will be as per the final approval of Client / PMC.

Technical specifications

Electrical Works

Technical Specification

INDEX

General Requirement

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor in quoted rate.

Specifications given are in amplification OR in addition to the specifications/requirements indicated in Indian Electricity Act 2003, CPWD norms and Local Power Authority rules and regulations.

The work shall be carried out with required alignments and line out. Tenderer has to provide his cost for all materials and also utilise required labour for line outs. The cost of constructing pillars, platforms for temporary works is also to be borne by the Tenderer.

Until unless stated elsewhere in this document, equipments like UPS are to be factory tested either in this country or abroad & same shall be witnessed by the representatives of Client, Architect and Consultant (Total 3-4 persons). All incidental expenses incurred for factory tests (travel, lodging, boarding etc) shall be deemed to have included in the offer quoted.

Scope

The scope of work generally comprises of supply, installation, testing & commissioning equipments such as Electrical Distribution boards, Lighting fixtures, Cables, Internal electrification, UPS System, Earthing system etc. with all allied equipments.

The agency shall work in coordination with other agencies. Any damage done to the work of others, shall be made good by the agency with out any extra cost.

CHEMICAL EARTHING

X GEL

It is a high conductivity maintenance free earth gel

It prevents from corrosion & so it significally increases the life spsn of earthing system without any maintenance

Supplied in 10kG buckets (5kG part A+ 5kG part B)

10litres water for 5kG part A+ 5kG part B,the compound becomes as thick but fluid substance that retains water & releases ions. These ions improve the conductivity of the soil thereby drastically reduces soil resistivity

Remains around the earth electrode does not get washed.

Increase life span of earthing system:protects form corrosion.

Z EARTH

It is a ground enhancing compound.

High hygroscopic properties retains moisture

Ensures thermal & humidity stability

Good diffusion/dissipation properties

Non corrosive

Made up of natural components(graphite, minerals etc…) it absorbs moisture from the surrounding soil & therefore provides very good environment around any earth termination

It is supplied in 20kG bags

1bag is sufficient to fill up 1 earth pit.

EARTH ROD

It is made up of 200µm (20mm diameter) copper bonded steel earth rods of 3M length.

Inspection pit

The earth termination system should be equipped with a disconnecting clamp housed in concrete or PVC inspection pit.

DISTRIBUTION BOARDS

Scope

The scope of work shall cover the supply, installation, testing and commissioning of lighting and power distribution boards. Associated minor civil works required for the erection of the DB's such as opening in wall etc. are also included in the scope of work.

System

The MCB distribution boards shall be suitable for operation on 400/440 volt, 3 phase, 4 wire, 50 Hz A.C. supply system or 220/250 volt, 1 phase, 2 / 3 wire, 50 Hz A.C. supply system.

Codes and Standards

Some of the important applicable codes/ standards issued by the Bureau of Indian Standards are listed below for the guidance of the Tenderers. Latest issues of the standards/codes shall be applicable:

1)	IS:2675-1983	Enclosed distribution fuse boards and cutouts for Voltages not exceeding 1000V.
2)	IS:375-1963	Marking and arrangement of Switchgear busbars main connec- tions and auxiliary wiring.
3)	IS:8828-1978	Miniature circuit Breakers
4)	IS:2607-1976	Air break Isolators for voltages not exceeding 1000V.
5)	IS:9926-1981	Fuse wire used in Rewirable type Electric fuses up to 650 volts.
6)	Indian Electricity Act 1910 and rules issued there under.	

General

The DB's shall be factory made and preferably of those manufacturers whose MCBs, ELCB's are to be used. General arrangement layout of the DB's shall be approved by the Construction manager/Consultant before manufacture.

Distributions boards along with the controlling MCB’s or Isolator as shown shall be fixed in a mild steel Box with hinged lockable door suitable for recessed / surface mounting in wall. Distribution boards shall be made of 16 SWG sheet steel duly rust inhibited through a process of degreasing, acid pickling, phosphating and powder coated to an approved colour over a primer.

The DB shall be cubicle, compartmentalized, wall/floor mounted and dead front operated. The DB shall be totally enclosed and made dust, vermin and weather proof such that it meets IP 54 of IS 2147 protection classification. A detachable cover plate of 2mm thick CRCA sheet to be provided on front of the board such that all live parts of the electrical accessories mounted on the board can be accessible only on removal of the said cover plate.

Further, the cover plate shall also, have suitable cut out so that dolly of the MCB's can be operated even if the cover plate is in position. A transparent plastic protection cover shall be

provided on the cut out portion of the cover plate. The cover plate shall also provide right above the respective cut outs a suitable arrangement to label the electrical circuit details of the MCB's mounted on it as well as to affix a danger plate in legible manner. The cover plate shall be fixed to the board with adequate size zinc passivated machine screws.

Above the detachable cover plate, one additional hinged door of 2mm thick CRCA sheet covering the MCB's etc., shall be provided with a suitable locking arrangement. The hinged door shall be provided with a suitable gasket capable of withstanding corrosive & humid atmosphere and to meet degree of enclosure protection IP 54 as per IS : 2147. The DB's shall undergo the process of painting as described under cubicle type main/sub main distribution boards. The DB shall have top/bottom entry arrangement for incoming and outgoing cables/conduits. All hardware to be used in manufacture of the DB shall either be of mild steel zinc passivated or otherwise be treated to prevent corrosion due to humid atmosphere.

All components shall be mounted on DIN rails and covered totally with a sheet steel cover rendering it finger-safe. Access to the internal connections shall be only through removing the cover sheet.

Three phase boards shall have phase barriers and a wire channel for internal wiring. All DB’s shall be internally prewired using copper insulated high temperature PVC wires brought to a terminal strip of appropriate rating for outgoing feeders.

Conduit knockouts shall be provided as required/shown on drawings and the entire board shall be rendered dust and vermin proof with necessary sealing gaskets.

MCB’s shall have quick make and break non-welding self wiping silver alloy contacts for 9KA short circuit both on the manual and automatic operation. Each pole on the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multiple breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to IS 8828 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable upto 4 sqmm Aluminium or 2.5 sqmm copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

Boards shall meet with the requirements of IS 2675 and marking arrangement of busbars shall be in accordance with IS 375. Bus Bars shall be of copper and rated for the incomer switch rating and sized for a temperature rise of 30 deg. C over the ambient. Neutral and earth bars shall be of copper and rated as follows:

	Neutral	Earth Bar
LDB's	Same as phase	Same as phase
PDB's	1.5 x phase bar	Same as neutral bar

There shall be one earth terminal for single phase boards and 2 for 3 phase boards. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed.

All outgoing feeders shall terminate on a terminal strip which in turn is prewired to the MCB by means of insulated single conductor high temperature PVC copper wires.

In the case of Dimmer DB's, the DB's shall incorporate the Dimmer panels as a part of the DB generally as shown on drawing and as approved.

Installation & Testing

All distribution boards shall be mounted on wall or recessed, with necessary angle iron frame work. All mounting frames shall have one prime coat and two finish coats after the completion of the work. All distribution boards shall be touched up for damaged painting.

All boards shall be meggered phase to phase and to neutral using 1000V megger with all switches in closed position. the megger value should not be less than 2.5 megohms between phases and 1.5 megohms between phase and neutral.

Fabrication drawings of all boards shall be approved by the Consultants before fabrication and the boards inspected before dispatch, unless waived in wiring.

LT Cable

General

The scope of this specification covers manufacture, supply, inspection, testing at works, packing and forwarding of 1100V grade LT XLPE Power cables & installation including commissioning at site.

Cables shall be aluminium, XLPE insulated, PVC sheathed and round armoured of 3 / 3-½ core and 4 core of sizes specified and suitable for 230 / 415 volts, 1 / 3 phase 50 Hz power supply. The cables shall be suitable for the rated voltage 1100 volts conforming to IS 7098 with latest amendments.

Cables shall be of approved make only. Each drum or coil of cable shall be accompanied by a certificate stating the manufacturer's name, rating of cable, result, and date of tests.

All cables shall be delivered with cable ends effectively sealed. When a cable is cut from a drum both ends shall be immediately sealed to prevent ingress of moisture. Cables shall not be transported to site in loose coils but a number of short lengths of cable may be transported on the same drum. The Contractor shall be wholly responsible for the purchase and/or hire costs of all cable drums and for the removal of these drums from site after use.

Cables shall be adequately rated for current carrying capacity under normal and short time fault conditions at the specified voltage.

The voltage drop for any circuit from origin of the installation (i.e. supply authority's terminals) and the load under steady state conditions shall not exceed ±6% of the nominal voltage.

The Contractor shall submit cable schedules for approval detailing ratings, sizes, lengths, method of installation and function of all individual cables. Cables shall be laid in uncut / single lengths from one termination to the other.

All cables will be identified close to their termination point by cable numbers as per cable schedule. Cable numbers will be punched on aluminium straps (2 mm thick) securely fastened to the cable and wrapped around it. Alternatively cable tags shall be circular in construction to which cable numbers can be conveniently punched. Each underground cable shall be provided with identity tags of lead securely fastened every 30 M of its underground length with atleast one tag at each end before the cable enters the ground. Unpaved area, cable trenches shall be identified by means of markers as per standards.

Standards

The cables offered shall conform to the latest revision of relevant Indian Standard Specifications Some of these standard are list below

Sr. No.	Indian Standard	Title
1	7098	XLPE insulated electrical cables for working voltages upto 1100V
2	8130	Conductors for insulated electric cables and flexible cords.
3	5831	PVC insulation & Sheath of electric cables.
4	3975	Mild steel wires, strips and tapes for armouring of cables.

Sr. No.	Indian Standard	Title
5	2633	Methods of testing weight, uniformity of coating, thickness on hot dip galvanised articales.
6	3961	Recommended current ratings for cables- PVC insulated and PVC sheathed.
7	1753	Aluminium conductors for insulators cables.

Principal Parameter

The LT XLPE power cables shall be used outdoors/indoor, directly burried, through pipes/duct, or laid over the tray / wall etc.

The cable shall meet the requirement of IS specifications listed above and the general technical requirement detailed below.

General Technical Requirement

The cables shall be brand new. It shall be suitable for laying in provided trenches or in provided DWC/RCC pipes or laid over the tray / wall etc.

All LT XLPE power cables shall be 1100 V grade with aluminium Conductor, XLPE insulated, inner sheathed, armoured & over all PVC sheathed.

The construction of the conductors shall be stranded for aluminium cables. Conductors of nominal area of 25sq.mm shall be circular. Those above may be circular or oval shaped.

The core insulation shall be with XLPE compound applied over the conductor by extrusion duly & shall conform to the type A compound of IS –5831.

The inner sheath shall be applied over the laid up cores by extrusion and shall be of XLPE confirming to the requirements of type ST1 PVC compound. The extruded inner sheath shall be of uniform thickness of 0.5 mm upto 16 sq.mm 0.8mm upto 120sq.mm & 1.0mm above 120sq.mm conductor size.

The armoring shall be by single round galvanized steel wires for cable diameter upto 13 mm and galvanized round steel for cables diameters above 13mm.

The outer sheath of the cables shall be applied by extrusion and shall be of PVC compound. Suitable chemicals shall be added to the PVC compound of the outer sheath to protect the cable against rodent and termite attack.

The dimensions of the insulation armour and outer sheath materials shall be governed by IS specification.

Cable Laying

Cables should be reeled / released out from their drums in such a way that no kinks are formed; and damage, twists, excess band of the cables is not allowed. The drums should be mounted on a rollers / jack, which is supported on two ends in such a way, that the drum is lifted off the ground and is free to rotate.

Standard cable grips and real shall be used for cable pulling. Care shall be taken to avoid damage to the cable / insulation or stressing the cable beyond manufacturers recommendations.

Where groups of power and control cables are to be laid along the same route, suitable barriers to segregate them physically shall be employed.

Cables should be laid in single layer wherever possible. In each cable run, some extra length shall be kept at pole location & as directed by Engineer Incharge.

Where lengths of more than 10 m are being rolled off a drum, cable runners (roller assemblies) should be used to prevent abrasion damage to the cables.

Cables shall be laid in provided Trench / DWC / RCC Pipe or laid over the tray / wall etc.

In Ground

Once the excavation of trench is completed, then sand bedding of thickness not less then 75 mm shall be laid uniformly all along the width of the trench. The cable/s is/are laid on the bedding of sand by maintaining requisite space in between. To maintain the spacing between cables, RCC spacers as shown shall be used at an interval of 10mtr. On completion of laying of first layer of cables, another layer of sand bedding of thickness not less then 75 mm shall be laid uniformly over the cable so that the cable is covered properly. RCC tiles or RCC half round cover with embossing of HT cable, month and year of laying shall be placed in continues length over the cable .For laying of second and third layer cable, procedure followed for first need to be repeated completely. Once all the cables are laid and covered with RCC titles or Half round RCC pipe then remaining portion of the trench shall be filled with excavated soil and then the surface is to be compacted, levelled by using water and ramming.

Along with above procedure, it is also necessary to follow and comply with other requirement laid down in IS code of practice IS: 1255/1983 amended up to date. For laying HT cable using good engineering practices.

At road crossing, Cables shall run through hume pipes connected each other with cemented collars so the cables are protected from injury by a pick axe or any sharp implement which could be used later on for excavation wherever road crossing is involved.

In built-in Trench

Where ever the cable is to be laid in built-in trench, the cable shall be laid with required support by maintaining the bending radius specified.

On Trays / on Wall

Where ever the cable is to be laid on tray or on wall, the cable shall be laid in an approved manner with all clamps, ties labeling & other allied accessories.

Testing

All routine, type, acceptance tests & special test such as, oxygen, temperature index & inflammability test shall be carried out as specified in IS. The tenderer shall furnish copy of result of successful Type test as carried over the cable of same design, size and type mentioned in BOQ to prove that the design has successfully passed through required tests. These tests should be carried out in CPRI. The Type Test Certificate should not be more than five years old from the date of opening of tender. The tenderer shall confirm that the material supplied would be exactly inline with the design for which type tests have been conducted.

Following type tests, acceptance tests and routine tests are to be carried out in accordance with IS 7098 (Pt-I)/1988, with its latest amendments as indicated below:-

The following shall constitute type tests:-

Sr. No.	Tests	For requirement Ref. to	For Test method Ref. to part No. of IS: 10810
A)	Test on Conductor		
	Conductor Resistance Test	IS: 8130 – 1984	5
B)	Test for thickness of insulation and Sheath:	9 & 14	6

Sr. No.	Tests	For requirement Ref. to	For Test method Ref. to part No. of IS: 10810
C)	Physical Test for Insulation :		
	Tensile Strength and elongation at break	IS : 7098 Table – 1	7
	Ageing in Air Oven	--do--	11
	Hot Test	--do--	30
	Shrinkage Test	--do--	12
	Water absorption (gravimetric)	--do--	33
D)	Physical Test for Outer Sheath :		
	Tensile Strength and elongation at break	IS: 5831/1984	7
	Ageing in Air Oven	--do--	11
	Loss of mass in air oven	--do--	10
	Shrinkage Test	--do--	12
	Hot deformation	--do--	15
	Thermal stability	--do--	14
E)	Insulation Resistance (Volume Resistivity Test)	IS: 7098 Table - 1	43
F)	High Voltage Test	IS: 7098 clause 16.2	45
G)	Flammability Test	IS: 7098 clause 16.3	53

The following shall constitute acceptance tests:-

Conductor resistance test,

Test for thickness of insulation and sheath,

Hot set test for insulation,

Tensile strength and elongation at break of insulation and sheath,

High voltage test,

Insulation resistance (volume resistivity) test.

All the above acceptance tests will be carried out by in the presence of Engineer Incharge as per relevant IS at the time of material inspection.

The following shall constitute routine test:-

Conductor Resistance test,

High voltage test,

Partial discharge test.

Termination

All XLPE cables upto 1.1KV grade shall be terminated at the equipments by means of cable glands. They shall have a screwed nipple with conduit electrical threads and check nut.

Cable leads shall be terminated at the equipment terminals, by means of crimped type lugs. When crimping the lug to the cable, proper crimping tool to suit the size of lug / cable is to be used.

CABLE TRAYS /UNDERFLOOR RACEWAYS & ACCESSORIES

Scope

Scope of these specifications covers the design, material selection, fabrication, testing at manufacturer's works, insurance, packing, transportation, loading/unloading, supply at site and installation of cable trays and accessories covered herein.

Material and construction (Cable tray)

Construction

Cable trays and accessories shall be manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturers' Association (NEMA).

Cable trays and accessories shall be fabricated using mild steel sheets and hot dip galvanized in accordance with B.S.729 after fabrication. All bolts, nuts and washers shall also be galvanized. The zinc coating shall be uniform, smooth and free from imperfections such as flux & ash, black

spots, blisters etc. Cable trays and accessories shall undergo a process of degreasing, pickling in acid & cold rinsing prior to galvanisation.

Cable trays shall be of the following type:

i. Ladder type with rungs

ii. Perforated type.

Perforated cable trays shall be generally of channel type and the perforations shall be 10x30 mm oval holes. Perforated cable trays shall also be galvanised. Galvanising shall be in accordance with that specified above for ladder type cable tray.

Ladder type cable trays shall be made from 2mm thick sheet formed in `C' section of 75mm height and inward flanges of 15mm as side runners and 30mm wide x 10mm high rungs (`C' shaped) from a 1.5mm thick sheet. Perforations as mentioned above shall be provided in the width of the rungs. Pitch of the rungs shall not exceed 250 mm center to centre. Rungs shall be tack welded to the side members.

The thickness of sheet steel for perforated trays shall be 1.6 mm and they shall be of the formed channel shape.

Cable trays shall be of following dimensions as specified in BOQ.

Accessories

Following accessories and hardware, as required, shall be supplied with cable trays :

Coupler plates

bends

Tees

Reducers

4-way cross

Fasteners (Hardware)

Material and construction of Underfloor Raceways

Construction

Unless noted otherwise, trunking and accessories shall be manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturers' Association (NEMA).

Underfloor Raceways is proposed to be installed concealed under the floor finish.

Underfloor Raceways shall be fabricated from 1.6mm thick GI sheet. Overall sizes of Underfloor Raceways and compartments to be provided in each shall be as follows :

Sr. No.	Overall Trunking Size(mm)	No. of compartments & size (mm)
i.	300 x 38	1 x 100 + 1 x 100 + 1 x 100
ii.	250 x 38	1 x 100 + 1 x 100 + 1 x 50
iii.	225 x 38	1 x 75 + 1 x 75 + 1 x 75
iv.	100 x 38	1 x 50 + 1 x 50
v.	75 x 38	1 x 50

Underfloor Raceways shall be complete with partition plates and covers.

Accessories

Underfloor Raceways of each size shall be supplied with following accessories

4 way junction boxes with removable covers

Vertical access boxes

Couplers

End caps.

Any other accessories, if required, for satisfactory installation shall also be included as part of supply.

Underfloor Raceways shall be supplied in standard length as per the manufacturer.

Testing at manufacturers work

The material for cable trays and accessories shall be offered for stage inspection by the Owner as follows:

Prior to fabrication and galvanising.

After fabrication but before galvanising.

After galvanising but prior to dispatch.

During inspection, thickness of sheets, dimensions and weight of zinc coating will be measured. Items not conforming to specifications shall be rejected.

Prior to fabrication, sheets to be used for fabrication of cable trays/underfloor compartmental raceways/accessories shall be offered for inspection. Subsequent to fabrication, but prior to galvanising, trunking/accessories shall be offered for inspection. Items not conforming to specifications shall be rejected.

wiring system

Scope

The scope of work under this section covers providing & commissioning of wiring system for lights, fans, exhaust fans, power sockets etc. The wiring shall generally be carried out using 1.1 KV grade PVC insulated stranded copper conductors FRLS wires in rigid PVC conduit laid on surface or concealed complete with insulated earth wire, flushed modular switches, sockets etc.

Standards

The installation shall conform in all respects to Indian Standard Code of Practice for Electrical wiring installation IS:732-1963 and IS:2274-1963. It shall also be in conformity with Indian Electricity Rules and the Regulations, National Electric Code and National Building Code. CPWD specifications and requirements of the Local Electric Supply Authority. In general, all materials, equipment and workmanship shall conform to the Indian Standards, specifications and code. Some of the applicable codes/standards are as under:

IS 375	Marking and arrangements for switchgear : Bus bars, main connection and auxiliary wiring
IS 2675	Specifications for enclosed distribution
IS 1554	Specifications for PVC insulated (heavy duty) electric cable Part-I for voltage upto 1100 volts.
IS 694	Specifications for PVC insulated: Cables for voltage upto 1100V with Aluminium conductors.
IS 5133	Boxes for the enclosure of electrical accessories
IS 1293	3 pin plugs and socket outlets
IS 1913	General and safety requirements for electric lighting fittings.
IS 374	Electric ceiling fans and regulators.
IS 3043	Code of practice for earthing IS 3043
IS 1646	Electrical installation.
IS 8623	Factory built assemblies of switch gear & control gear.

Distribution Wiring Systems

General

The wiring systems should be suitable for the following systems depending on the requirement.

3 phase, 4 wire, 440V, 50 Hz, AC.

Single phase, 2/3 wire, 240V, 50 Hz, AC

Wiring systems

Depending on the requirement, the following systems are covered by this specification.

Concealed / Exposed systems using conduits laid / surface mounted in / on slabs, beams, walls, flooring etc. The conduits should be of heavy duty rigid PVC.

Concealed wiring

Conduits using PVC pipes should be of not less than 20mm dia anywhere (wherever diameters of conduits are specified, they should be read as inside diameter and not outside diameter) and of not less than 2 mm thickness.

The total overall area of cross section of wires drawn into any conduit should not exceed 40% of the internal cross section of the conduit.

All conduit accessories should be of the same material as the conduit appropriately selected for the application required and necessary pull boxes of adequate size should be provided wherever required at no additional price.

During installation the following points should be taken care of:

Conduits in the ceiling slab should:

be run as straight as possible and if a change in direction is required it should be done with a gentle curve. Appropriate conduit accessories like various types of bends, should be used when required to ensure easy drawing of wires.

be laid on prepared shuttering work before concrete is poured and tied to reinforcement bars at least at every half metre.

be laid so that they protrude through the shuttering at the entry/exit points.

have GI pull wires installed in them while laying the conduit and before casting the slab.

Accessories such as concealed fan hook boxes, junction boxes, etc. should be firmly secured and its rim pressed tightly against the shuttering to prevent cement slurry from entry into the enclosure during concreting. Bitumen should be used around the rim as a further precaution.

Bitumen, alongwith cotton waste fibres, should be used as a sealant (to prevent ingress of cement slurry) at all screwed ends, joints, entry of conduits into accessories and at all places where the entry of cement slurry during concreting, will cause interference with smooth drawing of wires. Besides the use of bitumen, the Contractor should also use methods he thinks fit to prevent ingress of cement slurry into areas where it is not supposed to penetrate.

Since concealed termination boxes are limited in position by shuttering, extension collars should be provided to make them effectively flush with finished wall or ceiling.

Conduits laid below flooring should be kept in position by GI saddles fixed to the slab by means of nylon plugs and MS screws, at intervals of not less than 75 cms and also at all critical bends.

Conduits recessed in walls should:

be installed before plastering is done.

be secured well by steel hooks or staples at intervals of 75 cms.

be installed only after chases and grooves are made of proper dimensions to ensure that all the conduits in the groove can be properly accommodated, so that the top surface of any conduit should be at least 25 mm below the finished surface of the wall.

All recessed control boxes, distribution boards, etc. should be firmly fixed in position by nylon plugs, set in machine drilled holes, and plated screws.

All pipe sleeves required to be put in place through slabs, beams, columns and other RCC structures, will not be part of the electrical contractor’s works.

Surface Wiring

Conduits should generally run in square and symmetrical lines. They should be fixed by heavy gauge GI spacers and saddles. The spacers should be fixed by means of plated screws in nylon plugs set in machined drilled holes.

Conduits should be joined by means of couplers and required approved accessories.

Bends in conduit runs should be done by a bending machine, and care should be taken that the original cross section area is largely maintained while making the bend. Inspection boxes or inspection bends should be used wherever pipe bends cannot be used.

Crossing of surface conduits will not be permitted and, wherever this takes place, adaptor boxes are to be used.

Installation

The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 20 mm Dia unless otherwise indicated or approved. Size of wires shall be as specified in the schedule of work / SLD.

Nominal dia of wires (mm)	Nominal Cross sec. area (sqmm)	20 S	mm B	25 S	mm B	32 S	mm B	38 S	mm B
1/2.40	1.50	4	3	8	6	15	9	-	-
1/1.80	2.50	4	2	6	4	10	8	-	-
1/2.24	4.00	2	2	4	3	8	6	-	-
1/2.80	6.00	1	-	4	3	6	6	-	-
1/3.55	10.00	1	-	3	2	5	4	6	5

S- runs of conduits which have distance not exceeding 4.25 m between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

B- runs of conduits, which have, deflect from the straight by more than 15 degree.

Conduits shall be kept at a minimum of 100 mm from the pipes of other non-electrical services.

Separate conduits shall be used for each of the following :

Normal lights and 6A 3 pin sockets on lighting circuit

Power outlets - 16A 6 pin socket

Emergency lighting

Telephones

Data outlets

Fire alarm system

Public address system

Call bell wiring

CCTV system

Access Control

Conduit layout shall be as approved of the Engineer. Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25m.

Point Wiring

Definition

A point shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB.

Ceiling rose or connector (in the case of points for ceiling / exhaust fan points, prewired light fittings, and call bells).

Ceiling rose (in case of pendants except stiff pendants).

Back plate (in the case of stiff pendants).

Lamp holder (in the case of goose neck type wall brackets, batten holders and fittings which are not prewired).

Scope

Following shall be deemed to-be included in point wiring.

Conduit/channel as the case may be, accessories for the same and wiring/cables between the DB and switch box, switch box and the point outlet, loop protective earthing of each fan/light fixture.

All fixing accessories such as clips, screws, Phil plug, rawl plug etc. as required.

Metal or PVC switch boxes for control switches, regulators, sockets etc, recessed or surface type, and phenolic laminated sheet covers over the same.

Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.

Any special block required for neatly housing the connector in batten wiring system.

Control switch or MCB, as specified.

3 pin or 6 pin socket, ceiling rose or connector as required. (2 pin and 5 pin socket outlet shall not be permitted).

Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.

Bushed conduit or porcelain tubing where wiring cables pass through wall etc.

Measurement

Point wiring (Other than socket outlet points)

Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, fan points, exhaust fan points, call bell points and power point. These shall be measured on unit basis by counting.

Point wiring for socket outlet points:

The light (6A) point and power (16A) point wiring shall be measured on linear basis, from the respective tapping point of live cable, namely, switch box, another socket outlet point, or the sub distribution board as the case maybe, up to the socket outlet.

The metal/PVC box with cover, switch/MCB, socket outlet and other accessories shall be measured and paid as a separate item.

Note: There shall normally be no "on the board" light plug point.

The power point outlet may be 16A/6 A six pin socket outlet, where so specified in the tender documents.

Group Control point wiring:

In the case of points with more than one point controlled by the same switch, such points shall be measured in parts i.e. (a) from the DB to switch board & the switch to the first point outlet as one point (Primary point)and for the subsequent points, the distance from that outlet to the next one and so on, shall be treated as separate point (Secondary point)

No recovery shall be made for non-provision of more than one switch in such cases.

Socket Outlets:

Socket outlets shall be 6A 3 pin, 16 Amp 3 pin or 16/6 Amp 6 pin. 5 pin socket outlets will not be permitted. The third pin shall be connected to earth through protective (loop earthing) conductor, 2 pin or 5 pin sockets shall not be permitted to be used.

Conductors connecting electrical appliances with socket outlets shall be of flexible type with an earthing conductor for connection to the earth terminal of plug and the metallic body of the electrical appliance.

Sockets for the power outlets of rating above 1 KW shall be of industrial type with associated plug top and controlling MCB.

Where specified, shutter type (interlocking type) of sockets shall be used.

Every socket outlet shall be controlled by a switch or MCB, as specified. The control switch/MCB shall be connected on the `live' side of the line.

5A/6A and 15A/ 16A socket outlets shall be installed at the following positions, unless otherwise specified.

Non-residential buildings - 23cm above floor level.

Kitchen - 23 cm above working platform and away from the likely positions of stove and sink. Bathroom - No socket outlet is permitted for connecting a portable appliance thereto. MCB/IC switch may be provided above 2 m for fixed appliances, and at least 1 m away from shower.

Rooms in residences - 23 cm above floor level, or any other level in special cases as desired by the Engineer-in-charge.

Unless and otherwise specified, the control switches for the 6A and 16A socket outlets shall be kept along with the socket outlets.

Mains & Submains wiring

Submain & Circuit (Mains) wiring:

Submain wiring:

Submain wiring shall mean the wiring from one main/distribution switchboard to another.

Circuit(Mains) wiring:

Circuit wiring shall mean the wiring from the distribution board to the tapping point inside the switch box, from where point wiring starts.

Measurement of submain and circuit wiring:

Circuit and submain wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all lengths from end to end of conduit or channel as the case maybe, exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement.

The length of circuit wiring with two wires shall be measured from the distribution. Board to the nearest switch box from which the point wiring starts. Looping of switch boxes also will-be counted towards circuit wiring, measured along the length of conduit/channel.

When wires of different circuits are grouped in a single conduit/ channel, the same shall be measured on linear basis depending on the actual number and sizes of wires run.

Protective (loop earthing) conductors, which are run along the circuit wiring and the sub main wiring, shall be measured on linear basis and paid for separately.

Note: Conduit carrying submain will not carry circuit/point wiring. Similarly conduit carrying circuit wiring will not carry submain/point wiring. Conduit carrying point wiring will not carry submain/circuit wiring.

Measurement of other wiring work:

Except as specified above for point wiring, circuit wiring and submain wiring, other types of wiring shall be measured separately on linear basis along the run of wiring depending on the actual number and sizes of wires run.

Wiring System:

Wiring shall be done only by the looping system. Phase/live conductors shall be looped at the switch box. For point wiring, neutral wire/earth wire looping for the 1 st point shall be done in the switch box; and neutral/earth looping of subsequent points will be made from point outlets.

In wiring, no joints in wiring will be permitted any where, except in switch box or point outlets, where jointing of wires will be allowed with use of suitable connector.

The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of linked switchgear.

Colour coding:-

Following colour coding shall be followed in wiring:-

Phase : Red/Yellow/Blue.(Three phase wiring)

Live : Red (Single phase wiring)

Neutral : Black

Earth : Green.

Termination of circuit into switchboard:-

Circuit will consist of phase/neutral/earth wire. Circuit will terminate in a switch board in following manner:-

Phase wire terminated in phase connector. Neutral wire terminated in neutral connector. Earth wire, terminated in earth connector.

The switchboard will have phase neutral and earth terminal connector blocks to receive phase/ neutral/earth wire.

RUN OF WIRING

i. The type of wiring shall be as specified in the tender documents namely, surface conduit/recessed conduit, steel/PVC, channel.

ii. Surface wiring shall run as far as possible along the walls and ceiling, so as to be easily accessible for inspection.

iii. Above false ceiling, in no case, open wiring shall be allowed. Wiring will be done in recessed conduit or surface steel conduit.

iv. In recessed conduit system, routes of conduit will be planned, so that various inspection boxes provided don't present a shabby look. Such boxes can be provided 5 mm above plaster level, and they can be covered with plaster of paris with marking of junction boxes.

v. Where number of electrical services like electrical wiring, telephone wiring, computer cabling, pass through corridors, it may be proper to plan such service with properly designed aluminium/PVC channels duly covered by a false ceiling, so that subsequently such service can be maintained and additional cables can be provided.

vi. Generally conduits for wiring will not be taken in floor slabs. When it is unavoidable special precaution to be taken to provide floor channels with provision for safety and maintenance. Alternatively false flooring can be provided.

Passing through walls or floors

i) When wiring cables are to pass through a wall , these shall be taken through at a protection (Steel/PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either end of such holes. The ends od metallic pipe shall be neatly bushed with porcelain, PVC or other approved material.

ii) All floor openings for carrying any wiring shall be suitably sealed after installation

JOINTS IS CABLES

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CAPACITY OF CIRCUITS

i) Lighting circuit shall feed light/fan/ call bell points. Each circuit shall not have more man 800 Watt connected load or more man 10 points. However, in case of CFL points where load per point may be less, number of points may be suitably increased.

ii) Power circuit in non-residential building will have only one outlet per circuit.

iii) Each power circuit in residential building can feed following outlets:

a) Not more than 2 Nos. 16A outlets.

b) Not more than 3 Nos. 6A outlets.

c) Not more than 1 No. 16A and 2 Nos. 6A outlets.

iv) Load more than 1KW shall be controlled by suitably rated MCB and cable size shall be decided as per calculations.

v) Power wiring with Bus trunking:

It is permitted to meet large-scale power requirement in a hall, or floor, with use of single phase or 3 phase bus bars running inside a metal enclosure. This, will be provided with careful design and use of factory fabricated bus-trunking of reputed make, conforming to relevant BIS standards and with standard accessories like End feed unit, tap off with necessary safety features like over current, short-circuit and earth fault protection. Such trunking will be of specified breaking KA rating.

Cables

i) Copper conductor cable only will be used for submain/circuit/point wiring.

ii) Minimum size of wiring:

Light Wiring: 1.5sq.mm.

Power Wiring: 4.0sq.mm.

Power circuit rated: More than 1 KW, Size as per calculation.

iii) Insulation:

Copper conductor-cable shall be PVC insulated, Fire retardant, low smoke (FRLS) type conforming to BIS Specification.

iv) Multi stranded: Cables are permitted to be used

WIRING ACCESSORIES

a. Control switches for point:

i) Control switches (single pole switch) carrying not more than 16A shall be modular type. The switch shall be 'On' when the knob is down.

ii) Modular type switches of reputed make along with matching mounting boxes, shall be used in non-residential buildings and residential quarters of all types. Modular type sockets, stepped type fan regulators shall be used. All such boxes, switches and accessories shall be of same make of modular switch manufacturer.

iii) It is recommended to provide double pole MCB in proper enclosure as power out let for window type AC units, geysers etc.

b. Switch Box:

i. Switch box shall be hot dip galvanized, factory fabricated. Suitable in size for surface/ recess mounting and suitable in size for accommodating the required number of switches and accessories (where required to be used for applications other then modular switches/ sockets).

C. Switch box covers (for application other than modular type):

Phenolic laminated sheets of approved shade shall be used for switch box covers. These shall be of 3mm thick synthetic phenolic resin bonded laminated sheet as base material and conforming to grade P-I of IS: 2036-1974.

Note: Specification for switch boxes is covered in the chapters on the various types of wiring.

d. Ceiling rose:

i) A ceiling rose shall not be used on a circuit, the voltage of which normally exceeds 250V.

ii) Only one flexible cord shall be connected to a ceiling rose. Specially designed ceiling roses shall be used for multiple pendants.

iii) A ceiling rose shall not embody fuse terminal as an integral part of it.

e. Lamp holders:

i) Lamp holders may be batten, angle, pendant or bracket holder type as required. The holder shall be made of brass and shall be rigid enough to maintain shape on application of a nominal external pressure. There should be sufficient threading for fixing the base to the lamp holder part so that they do not open out during attention to the lamp or shade.

ii) Lamp holders for use on brackets and the like shall have not less than 1.3 cm nipple, and all those for use with flexible pendant shall be provided with cord grips.

iii) All lamp holders shall be provided with shade carriers.

iv) Where center contact Edison Screw lamp holders are used, the outer or screw contact shall be connected to the 'middle wire', or the neutral conductor of the circuit.

f. Fan Regulators and Clamps

i) The metallic body of regulators of ceiling fans/ exhaust fans shall be connected to earth by protective conductor. Regulator shall be of electronic step type as indicated.

ii) The leading in wire shall be of nominal cross sectional area not less than 1.5 Sq.mm. & shall be protected from abrasion.

iii) The down rod for ceiling fan shall be of length as required at site & shall be included in the offer quoted.

CONDUITS

(i) All non-metallic conduit pipes and accessories shall be of suitable material complying with IS: 2509-1973 and 18:3419-1989 for rigid conduits and IS: 9537 (Part 5) 2000 for flexible conduits. The interior of the con 46 Conduits shall be free from obstructions. The rigid conduit pipes shall be ISI marked.

(ii) The conduits shall be circular in cross-section. The conduits shall be designated by their nominal outside diameter. The dimensional details of rigid non-metallic conduits are given in Table-Il.

(iii) No non-metallic conduit less than 20mm in diameter shall be used.

(iv) Wiring capacity

The maximum number of P VC insulated aluminium/copper conductor cables of 650/1100V grade conforming to IS: 694-1990 that can be drawn in one conduit of various sizes is given in Table-I. Conduit sizes shall be selected accordingly.

Conduit accessories

(i) The conduit wiring system shall be complete in all respect including accessories.

(ii) Rigid conduit accessories shall be normally of grip type.

(iii) Flexible conduit accessories shall be of threaded type.

(iv) Bends, couplers etc. shall be solid type in recessed type of works, and may be solid or inspection type as required, in surface type of works.

(v) Saddles for fixing conduits shall be heavy gauge non-metallic type with base.

(vi) The minimum width and the thickness of the ordinary clips or girder clips shall be as per Table III.

(vii) For all sizes of conduit, die size of clamping rod shall be 4.5 mm (7 SWG) diameter.

TABLE I

Maximum number of PVC insulated 650/1100 V grade aluminium / copper Conductor cable conforming to IS: 694-1990.

Nominal cross Sectional Area of Conductor in sq.mm	20mm		25mm		32mm		38mm		51mm		64mm	
	S	B	S	B	S	B	S	B	S	B	S	B
1	2	3	4	5	6	7	8	9	10	11	12	13
1.50	5	4	10	8	18	12						
2.50	5	3	8	6	12	10						
4	3	2	6	5	10	8						
6	2	-	5	4	8	7						
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35							3	2	6	5	8	6
50									5	3	6	5
70									4	3	5	4

Note:

The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.

The columns headed'S' apply to runs of conduits which have distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit, which deflect from the straight by an angle of more than 15 degrees.

Conduit sizes are the nominal external diameters.

TABLE II

Dimensional details of rigid non – metallic conduits

(All dimensions in mm)

Sr. No.	Nominal. outside diameter (in mm)	Maximum outside-diameter (in mm)	Minimum inside-diameter (in mm)	Maximum permissible eccentricity (in mm)	Maximum permissible ovality (in mm)
1.	20	20 +0.3	17.2	0.2	0.5
2.	25	25 +0.3	21.6	0.2	0.5
3.	32	32 +0.3	28.2	0.2	0.5
4.	40	40 +0.3	35.8	0.2	0.5
5.	50	50 +0.3	45.0	0.4	0.6

TABLE III

Ordinary Clips or girder clips

Size of Conduit	Width	Thickness
1) 20mm & 25mm	19 mm	20 SWG (0.9144 mm)
2) 32mm & above	25 mm	18 SWG (1.219 mm)

TESTING OF INSTALLATION:

Before a completed installation is put into service, the following tests shall be complied with:

INSULATION RESISTANCE:

The insulation resistance shall be measured by applying 500 volt megger with all fuses/ MCB in places, circuit breaker and all switches closed.

The insulation resistance of an installation, measured shall not be less than 50 megohms divided by the number of points on the circuit.

The insulation resistance shall be measured between

EARTH TO PHASE

EARTH TO NEUTRAL

PHASE TO NEURAL

PHASE TO PHASE

EARTH CONTINUITY PATH:

The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed the value specified in IS .

POLARITY OF SINGLE POLE SWITCHES :

A test shall be made to verify that every no-linked, single pole switch is connected to one of the phase of the supply system.

COMPLETION CERTIFICATES:

All the above tests shall be carried out in presence of engineer in charge and the results shall be recorded in prescribed forms. Any default during the testing shall be immediately rectified and that section of the installation shall be re tested. The completed test result from shall be submitted to the engineer in charge in required set of copies..

On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority.

Samples

Samples of the items to be supplied under the Contract shall be submitted for the approval of the Owner. Material complying with the approved samples only shall be procured.

Drawings

All drawings should have the following data:

Client’s name.

Project title.

Purchase Order No. & Date.

The following drawings should be furnished by the contractor:

General arrangement drawings showing principal dimensions, feeder arrangements, front view, plan and foundation details for switchgear and control panels.

Single line diagrams of power circuits giving rating of various equipment.

Schematic and control wiring diagram for control circuits, also indicating ferrule & terminal markings.

Drawings giving the schedule of components incorporated, with details of rating, make, catalogue/type number, etc.

Shop Floor Drawings

`AS EXECUTED’ drawings for :

substations showing positions of equipment, cable routing, earthing details, etc.

all other works carried out, but not specifically mentioned above.

It is the duty of the contractor to get the installation approved by the competent authorities and for this purpose all paperwork, drawings, etc. that are required, will have to be done by the contractor. The employer will reimburse the statutory payments made for this purpose on production of receipts in original.

Four copies of general arrangement, single line, schematic & control wiring diagrams are to be submitted for approval within 3 weeks of receipt of order. The manufacture should commence work only after receipt of approval of drawings.

Documentation

Four sets of the following items should be submitted, each set duly bound (for all equipments, including bought out components).

Test certificates.

Instruction manuals for installation, operation and maintenance.

Spare parts list and prices.

AS EXECUTED’ drawings.

LIGHTING FIXTURES

Scope

The scope of work shall cover the supply, installation, testing and comissioning of various types of light fixtures. The scope also includes the supply of motion sensors and day light sensors.

Standards

The following standards and rules shall be applicable :

IS 3646 - 1960 Code of practice for interior illuminator.

IS 1913 - 1969 General and Safety requirements for electric lighting fittings.

Indian Electricity Act and Rules issued there under.

All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Indian Standard Code of Practice or the relevant British Standard Code of Practice in the absence of Indian Standard.

Technical Specifications

Supply of LED luminaries complete with pressure die cast/extruded aluminum housing and adhering to the following specifications and lighting design requirements will be as per the actual application:

1. The driver card shall cut off at 270 V and shall resume normal working when nominal voltage is applied again. This is to ensure protection of luminaries from neutral faults and error in connection at sites.

2. Efficiency of driver electronics shall be more than 90%

3. The LEDs should be driven at the suitable current and within the permissible limits specified by the LED chip/lamp manufacturer

4. LED Driving current shall be less that or equal to test current in LM80 report

5. The fixture shall be designed so as to have lumen maintenance of at least 70% at the end of 50,000 hours

6. The luminaries should be operable with auto adjustable 100-270V supply Voltage using the same driver.

7. Power Factor of the electronic driver should be at least > 0.95 with THD <10%.

ELECTRONIC COMPONENTS

The electronic components used shall be as follows:

a. IC (Integrated Circuit) shall be of industrial grade.

b. The resistors shall be preferably made of metal film of adequate rating.

c. The conformal coating used on PCBs should be cleared and transparent and should not affect color code of electronic components or the product code of the company.

d. The heavy components shall be property fixed. The solder connection should be with good finish.

CONSTRUCTION

a. Extruded aluminum and pressure die cast aluminum (sand/gravity casting not to be considered). Aluminum grade LM 6063-T5 or LM 6 as applicable or above high conductivity heat sink material. Heat sink must be made of pressure die cast Al Only. Efforts shall be made to keep the overall outer dimensions and weight as minimum as possible.

b. All light fittings shall be provided with toughened glass of sufficient strength under the LED chamber to protect the LED and luminaries.

c. Suitable number of LED Lamps shall be used in the Luminaries.

d. Suitable reflector/lenses shall be provided to modify the illumination angle.

e. The connecting wires used inside the luminaries. shall be low smoke halogen free, fire retardant-beam/PTFE cable and fuse protection shall be provided in input side.

f. The control gear shall be designed in such a way that the junction temperature of LED should not be more than 25 C with respect to ambient temperature.

g. The luminaries shall be such that the glare from individual LED is restricted and shall not cause inconvenience to the public.

h. All the material used in the (Luminaries) shall be halogen free and fire retardant confirming to UL 94.

i. The fixture should be impact resistant with suitable protection by cover for driver and LED's

j. The fixture should have designed for IP54 ingress protection .

HIGH POWER AND HIGH LUMEN EFFICIENT LED'S SUITABLE FOR FOLLOWING FEATURES SHALL BE USED:

a. LED Chips of Cree/Osram /Phillips/Nischiya/Samsung make shall be used for the purpose. No. other make shall be accepted. The manufacture shall submit the proof of procurement of LEDs from above OEMs at the time of supply.

b. The efficiency of the LED lamps at 110 C junction temperature shall be more than 80%

c. LED Junction temperature should not cross more than 90 C for longevity of luminaries. d. Solder point temp should not cross 75 C.

e. The working life of the lamp at junction temperature of 90 C for 350 mA current shall be more than 50,000 hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day these shall be supported with the suitable section of the LM80 report from the manufacturer of LED.

f. Color temperature of the proposed white color LED shall be 5000K-6500K

g. The output of LED shall be of minimum 100 lumen per watt at operating current.

h. The color rendering index (CRI) shall be of more than 75 with cool while light output.

i. Variation in illumination level shall be + - 2% is allowed in input voltage range from 180VAC to 250VAC

j. The illumination shall not have infra-red and ultra-violet emission. The test certificate from the NAB approved laboratory shall be submitted.

k. Electronic efficiency shall be more than 90%

SPECIFICATION CHART:

Sr No	Parameters	Specified value	Bidders input
1	Input Voltage	90-270V AC	
2	Input Frequency	50 Hz	
3	Total Harmonic Distortion (THD)	<10%	
4	Power factor (P.F.)	>0.95	
5	Colour Temperature	warm white	

6	Working Humidity	10% to 90% RH	
7	Working Temperature	50deg C to 50 deg C	
8	Ingress Protection	IP-54	
9	Total System power consumption (includes LED & drive part) in watts	Should be submitted for individual light fixture	
10	Color Rendering Index (CRI)	>75	

CERTIFICATIONS:

The following certificates should be submitted before procuring the lighting fixtures so that the performance of the light fixtures can be evaluated.

1.LM-79 - To evaluate luminaires efficiency (photometric data)

2.LM-80 - To evaluate LED Chip manufactures data.

GENERAL REQUIREMENTS:

1. All fittings should be as per the reference images shown in the Bill of quantities. Any other model suggested should be submitted to approval of Consultant/Architect/Client prior to procurement.

2. All fittings should have guarantee of three years & guarantee cards of all the fittings duly filled with stamp of manufacturer and contractor are to be submitted along with bill.

3. Fixtures and lamps shall be as per the catalogue number, where indicated in the bill of quantity. Any deviation should be made only after receivingcencent from the Architect/Consultant.

4. Fixtures and lamps shall be provided with all such accessories as are required to satisfy the working condition whether specifically mentioned in the specifications, drawings or not.

5. All fixtures shall be complete with accessories and fixings necessary for installation whether so detailed under fixture description or not.

6. Fixture shall be installed at mounting heights as detailed on the drawings or instructed on site by the client's representative.

7. Fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the fixture. Design of hangers and method of fastening specified shall be submitted to the client's representative for approval.

8. Fixture shall be completely wired and constructed to comply with the regulations and standards for Electric Lighting Fixtures, unless otherwise specified. Fixtures shall bear manufacturer’s name and the factory inspection label unless otherwise approved.

9. Lighting fixtures shall be designed for minimum glare and for continuous operation under specified atmospheric condition.

10. All fixtures shall be complete with accessories like power factor improvement capacitors, ballast, ignitor etc.

DATA and telephone NETWORKING

Scope

The scope of the Contractor shall include structured cabling for data outlets by means of CAT 6 cabling. The scope of the Contractor shall include the passive components ie. 4port patch panels, 1 metre and 3 meter patch cords, data outlets (dust proof shuttered type) and racks.

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to furnish, and to install a complete cabling infrastructure supporting data. The intent of this section is to provide pertinent information to allow the vendor to bid the labour, supervision, tooling, materials, and miscellaneous mounting hardware and consumables to install a complete system.

Applicable Documents

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below (or the latest revisions) has bearing on the desired cabling infrastructure are incorporated into this specification by reference:

1) This Technical Specification and Associated Drawings

ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001

4) ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998

5) ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993

6) ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

Cabling System and Component Specifications

Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2

1	Conductors	23 AWG solid bare copper or better
2	Insulation	Polyethylene
3	Jacket	Flame Retardant PVC
4	Pair Separator	Cross-member fluted Spline.
5	Approvals	UL Listed
		ETL verified to TIA / EIA Cat 6
6	Operating temperature	-20 Deg. C to +60 Deg. C
7	Frequency tested up to	Minimum 600 MHz
8	Packing	Box of 305 meters
9	Delay Skew	45ns MAX.
10	Impedance	100 Ohms + / - 15 ohms, 1 to 600 MHz.
11	Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

UTP Jacks

Type	PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Durability	
Modular Jack	750 mating cycles

Wire terminal	200 termination cycles
Accessories	Strain relief and bend-limiting boot for cable
	Integrated hinged dust cover
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphorous bronze, plated with 1.27micro-meter thick gold
Approvals	UL listed
Performance Characteristics to be provided with bid	Attenuation, NEXT, PS NEXT, FEXT and Return Loss

UTP Patch Panels

Type	24-port / 48-port, PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Ports	24 / 48
Port arrangement	Modules arranged as per standard
Category	Category 6
Circuit Identification Scheme	Icons on each of 24-ports
Port Identification	9mm or 12mm Labels on each of 24-ports (to be included in supply)
Height	1 U (1.75 inches)
Durability	

Modular Jack	750 mating cycles
Wire terminal (110 block)	200 termination cycles
Accessories	Strain relief and bend limiting boot for cable
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphhorous bronze, plated with 1.27micro-meter thick gold
Panel	Black, powder coated steel
Approvals	UL listed
Termination Pattern	TIA / EIA 568 A and B;
Performance Characteristics to be provided along with bid	Attenuation, NEXT, PS NEXT, FEXT and Return Loss

Workstation / Equipment Cords

Type	Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2
Conductor	24 AWG 7 / 32, stranded copper
Length	7-feet
Plug Protection	Matching colored snag-less, elastomer polyolefin boot
Warranty	25-year component warranty
Category	Category 6
Plug	

Housing	Clear polycarbonate
Terminals	Phosphor Bronze, 50 micron gold plating over selected area and gold flash over remainder, over 100 micron nickel underplate
Load bar	PBT polyester
Jacket	PVC
Insulation	Flame Retardant Polyethylene

Warranty

Owner seeks warranty for the installed cable plant from the OEM equipment supplier. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years and shall cover the system performance, application assurance and the costs of the supply of components and installation.

UTP PATCH CORD

Material:

Assembly (conforming to EIAITIA 568B-2-1) of Cat 6 type 4 unshielded twisted pair 24-

26AWG (0.51mm-0.40mm), each pair separated by a PE former (Star shaped) 100 ohms stranded wire PVC insulated cables with modular RJ-45 polycarbonate UL94V housing 15milliohms gold over nickel contacts (superior three piece connector) crimped on both ends with T568A & T568B wiring schemes with 8P8C connection. The cord shall be branded. The cords shall be used in structured cabling in accordance with following table

Sr. No.	Length	Usein
1	1m	from switch to patch panel
2	3m	From information outlet to Ip phone and from phone to computer

All patch cords shall exceed TIAIEIA and ISOIIEC Category 6/Classs E specifications.

All patch cords shall be backward compatible with Category 5 and Category 5E systems.

The patch cords shall incorporate an anti-snag feature that provides maximum protection from snagging during moves and re-arrangements.

Patch cords shall be UL listed, UL-C certified and AUSTEL approved.

Patch cords shall support network line speeds in excess of 1 gigabit per second.

Method of construction:

The patch cord shall be erected for making connections from switch to patch panel or from computer /phone to information outlet.

UTP CONNECTOR (RJ 45)

Material:

Assembly of Gold over nickel contacts with 1.5A current carrying capacity, 30V with 15milli ohms contact resistance, 8P8C connection easy to crimp with crimping tool in polycarbonate UL94V housing.

Method of construction:

The UTP cable shall be spliced, untwisted not more than 12mm, inserted into the connector with sequence as per EIAITIA 568 8.2-1 & crimped firmly with crimping tool. For connecting computers to wired LAN or external wireless Ethernet interface in Wireless LAN.

12 U RACK(SERVER RACK)-TYPICAL

SPECIFICATIONS:

Rack Height	42U
Color	Black
Units per Pallet	1
Vertical Posts	16 gauge

Front Door	16 gauge
Rear Door	18 gauge
Roof	18 gauge
EIA Mounting Rails	14 gauge
Side Panels	18 gauge
Regulatory Approvals	EIA-310-D
Standards	UL 60950
Environmental Compliance	RoHS
Protection Class	IP 20

TELEPHONE NETWORKING

SCOPE

Scope of this section covers the supply, laying and testing of telephone conduits, Telephone Tag Blocks,telephone sockets, Telephone cables in conduits. Telephone cables shall be supplied and laid for inter-communication system as required.

TELEPHONE CABLES

Telephone cables shall be 4 pair 0.5 sq mm FR PVC insulated copper conductor, unarmoured telephone cable as specified.

The type, size and pairs shall be as given in the Bill of Quantities.

All telephone distribution cables shall be laid in G.I./M.S./PVC Conduits as stipulated in the B.O.Q. Separate conduits shall be used for external and intercommunication systems. The extended runs of conduits shall be fitted with 150 mm x 75 mm MS pull boxes. Pull boxes shall be suitably painted for easy identification and shall be provided at intervals of 5 Meters. Pull boxes shall be of the surface mounting type or flush-mounting type as specified.

Telephone cable should be solid annealed tinned electrolytic copper high conductivity conductor insulated and sheathed with PVC compoundas per BS: 6746, unarmoured twisted pairs with proper colour code bundled together in concentric layers and wraped with melinix or PVC tape with nylon ripcord. Ripcord is layed longitudinally under the sheath as an effective means of slitting the sheath to facilitate removal. The lay is chosen so as to minimize cross talk

in cable. Manufactured to standard for indoor telephone wiring conductor resistance at 20 deg celcius max 98 ohms/Km, conductor diameter 0.5 mm.

Tag blocks

The telephone tag blocks shall be KRONE or equivalent suitable for the multicore telephone cables and shall accommodate tin-plated phosphor bronze connectors providing economical and reliable splicing. Connectors shall splice unskinned cables upto 0.6 mm dia and shall terminate both 'in' & out lines.

The tag blocks shall be mounted inside fabricated galvanised sheet steel boxes with removable hinged covers and shall be fully accessible.The enclosure shall be painted with 2 coats of red oxide and stove enameled.

SYSTEM OF CABLING

All cabling, wiring for the telephone system shall be provided in conduits.

RJ 11 SOCKET

PVC / box with LED indicator,RJ 11 jack, facility for fixing on the wall

TELEVISION SYSTEM

The office area shall be provided with Television outlet points at certain locations viz. the cabin of director , reception area etc.

The scope of work shall include providing TV outlet points at cabin and reception areas.

The RG 11 wiring shall be done from the antenna to the Main Splitter and RG 6 wiring shall be done from the Main splitter to the TV outlets in raceways or conduits.

UPS System

Scope

This specification covers the requirement of design, manufacture, testing, supply, packing & forwarding, transportation and supervision of erection & commissioning of 1 No of online UPS (Uninterrupted Power Supply) system of 2 KVA .

The system shall use components of adequate ratings & better quality to provide an expected service life of five years continuous duty & next two years without component replacement, excluding fans and batteries. The system shall contain no continuously moving parts other than cooling fans which shall have permanently lubricated bearings.

Electrical Supply System

Voltage	:	415 V + 6%
Frequency	:	50 Hz. + 3%
No. of phases	:	1 Phase
Neutral Grounding	:	Solid

Site Condition

Altitude above MSL	:	Less than 1000 mtrs
Temperature	:	45oC
Humidity	:	90%

Codes & Standards

The UPS system shall conform to the latest editions of Indian Standard (IS) specification including, but not limited to the following:

IS 2147	Degree of protection provided by enclosures for low voltage switchgear and control gear.
IS 4237	General requirements for switchgear and control gear for voltages not exceeding 1000 V.
IS 8623	Factory built assemblies of switchgear and control gear for voltages upto including 1000 V AC and 1200 V DC.

General

The Contractor shall provide, install, test, commission and set up the ON-LINE (continuous operation UPS) uninterruptible power supply to be located at a provded space. The system and installation shall comply with BS EN 50091 or equivalent Indian standard or IEC 60950. UPS shall also confirm to UL 1778 safety conformance.

The UPS is intended and shall be primarily for the protection of critical loads (the loads which require regulated continuous AC power and which are connected to the output of the UPS module). The unit shall feed mains AC power to a transformer, rectifying it to direct current and shall use it to charge up the backup battery & also as input to the inverter.

The inverter shall convert DC Power from either the rectifier/charger or storage battery to regulated & filtered AC Power which shall be supplied to the critical loads through static transfer switch.

Static Transfer Switch shall automatically transfer the critical loads, without Interruption, from the inverter output to the alternate AC Power source in the event of an overload or degradation of the inverter’s performance.

Maintenance Bypass Switch shall be used to connect the alternate AC power source to the critical loads while electrically isolating the static transfer switch & inverter for maintenance purposes.

Storage Battery system shall provide DC power to the inverter input when the normal AC input power to the UPS module fails or in the event of failure of the rectifier/charger.

The rectifier/charger shall consists of an input disconnect breaker, surge suppressors & a solid state single phase rectifier with control circuitry using Digital Signal Processors to provide: constant voltage/constant current regulation, ramping current walk –in on start up of the rectifier/charger, overcurrent protection, equalizing capability, independent battery recharge current limit, overall DC current limit, battery self test capability (optional), and temperature compensated battery charging (optional).

The input of the rectifier/charger shall be protected by an automatic circuit breaker.

The output of the rectifier/charger shall be both fused & electronically current limited to protect the connections to the inverter input and to prevent damage to the battery in case of failure.

The rectifier/ charger shall be furnished with surge suppressors on the secondary side of the input transformer, on the battery, to assure proper operation of the UPS module in the events spikes or surges are present in the normal input power or battery source.

The inverter shall have an active on line PWM filter to maintain the total harmonic distortion (THD) of the output voltage to the specified limit as well as minimize switching transients.

The unit shall regulate the total condition of the mains reaching the load, eliminating spikes, surges, drop outs, brown outs and complete blackouts.

The UPS shall have the following electrical characteristics:

The unit shall have an autonomy time 30 minutes.

The unit shall have current harmonics distortion less than 10%

The unit shall be rated to not less than 30 KVA @ 0.80 power factor.

The unit shall be rated at 415 V, 3 phases / 220 V 1 phase, 50Hz @ 0.95 efficiency as specified.

The batteries shall have a design life of not less than 10 years and shall be capable of delivering power at 45ºC without degrading.

The noise level of the UPS shall not be greater than 60dBA at a distance of 1.0 mtr under full rated load.

The unit shall be of split bypass configuration for maintenance purposes.

The output from the UPS shall be fed to a distribution board.

The inverter and rectifier of the ups should be IGBT based.

The isolation transformer should be inbuilt and should be K rated.

The UPS shall be complete with independently regulated phase voltages.

The UPS shall have overload 150% for 15 minutes at rated output.

Fabrication Requirements

General

The frame of individual vertical panels shall be fabricated using pressed and shaped CRCA sheet steel 14/16 SWG thickness or by using suitable MS structural sections.

All load bearing sections / Doors shall be of 14 SWG sheets. Only inside partitions shall be 16 SWG.

The Panel base frame shall be of 6 mm thick and 75 mm height and shall be suitable for directly bolting with the help of foundation bolts and shall be suitable for tack welding at two diagonally opposite points to the Purchasers embedded base frame. All openings, covers and doors shall be provided with neoprene gaskets around the perimeters to make the panel dust and vermin proof. Panel doors construction shall be of double bent type.

All hardware shall be corrosion resistant. All joints and connections of the panel members shall be made by galvanized, zinc passivated or cadmium plated high quality steel bolts, nuts and washers, secured against loosening.

Suitable lifting hooks and/or jacks shall be provided on each panel or shipping section for ease of lifting of the Panel.

Indicating Lamps

All indicating lamps shall be of the LED cluster type suitable for continuous operation on 220 V AC supply with surge protection and low voltage glow protection.

The lamps shall have red, green, blue, amber and white covers made out of temperature resistant prismatic glass or plastic.

Cable Entry

Cable entries shall be from the “top” for incoming and outgoing feeders with removable gland plate of required size of XLPE Cable.

Name Plates

Name plate with the UPS designations shall be fixed at the top of the center panel. Engraved name plates giving feeder details shall be provided for each compartment.

Engraved name plate shall be provided for each item such as (lamp, switch, relay, auxiliary contactor etc.) mounted on the panel. Special warning plates one each on front of a shipping section shall be provided on removable covers/doors giving access to cable terminals and busbars. Special warning labels shall be provided inside the panel also, wherever necessary. Name plates shall be of Aluminium with white letters on black background.

Finishing

All metal surfaces shall be thoroughly cleaned and degreased to remove mill scale, rust, grease and dirt. Fabricated structures shall be prepared as per 8 tank process. The under surface shall be prepared by applying a coat of phosphate paint and coat of yellow zinc chromate primer. The under surface shall be made free from all imperfections before undertaking the finishing coat.

After preparation of the under surface, the switchboard shall be 'Powder coated'. Shade of colour shall be RAL 7032. Total thickness of painting shall be atleast 90 microns. The finished panels shall be dried in stoving ovens in dust free atmosphere. Panel finish shall be free of imperfections like pinholes, orange peels, run off paint etc. The vendor shall furnish painting procedure details along with the bid.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent rust formation. If these parts are moving elements, they they shall be greased.

Battery

The battery equipment shall be offered complete with all parts that are necessary or usual for their operation. The batteries shall be Sealed Maintenance free type confirming to latest international standards. All the batteries shall be mounted on racks. The racks shall be rigid free standing type with wheels, free from all twist and shall be constructed from MS Epoxy painted with two coats of acid resisting paint. The racks will be in tiers suitable to accommodate the batteries specified with all accessories. Vendor shall submit the actual dimensions with drawings for approval.

The battery voltage shall be as required by the inverter. Battery voltage limits shall be as required based on UPS model.

Battery Charger

The charger equipment shall be suitable to operate for 230 V +/- 10% & 50 Hz +/- 3%. It shall be suitable for quick charging the battery without undercharging or overcharging the end cells and

at the same time maintaining normal voltage at the D.C. bus. Charger shall comprise a float charger and a boost charger in the same cabinet. The change over from float charging to boost charging shall be automatic. Provision for manual change over shall also be provided. For the above operation static control methodology shall be applied. The vendor shall submit CH diagram explaining the above operations. The battery charger shall also comprise safety protection systems which include over voltage/ under voltage, Overload and Overcharging protections.

The charger/rectifier shall be furnished with output filtering to limit ripple voltage into the battery to less than 2 % RMS of the DC battery Voltage with no battery connected.

Inverters

Inverters shall be IGBT based feedback control type capable of accepting the output of the battery to provide the desired alternating current output. The output of the inverter shall be given to a filter which besides transforming the square wave to sine wave also regulates the A.C. output voltage.

Overload capacity (on inverter) shall be 150% of rated output power (KW) for 15 minutes @ 40 Deg C.

The inverter input shall have DC Surge Protection to assure proper operation in the event that there are surges or spikes on the inverter input. The inverter input shall be protected against a 4000 Volt transient for 100 microseconds from a 40 Ohm dynamic source impedance.

Display

The UPS shall be provided with microprocessor based full colour touch screen LCD display & control panel. The mimic diagram (optional) shall be displayed on the colour LCD only if specified. The control panel shall be Menu driven to select & display status of any sub modules of the system or the system as a whole. All the metering & event display shall be real time & true RMS with a 1 % accuracy of metering functions. All operator controls and monitoring shall be accessible through the touch screen and on the front door. The alarms & metering shall be displayed in colour coded alphanumeric display.

Additional features of the monitoring system shall include:

Real time clock (time & date stamp).

Alarm history color coded with time and date stamp

Battery backed up nonvolatile memory

Metering and multiple points in the UPS system.

All set –points and thresh holds are set/monitored digitally.

Smart tests on battery & static switch

Service Notebook.

Configuration & hardware setup

Online “HELP” text.

Control & Control Wiring

All communications &/or control wiring in the UPS shall be of ribbon type or fiber optic or similar to ensure high level of noise immunity.

Provisions shall be made for testing the control circuits while the critical loads are bypassed. All adjustments shall be possible without the use of a Volt-ohm-milliampere meter and oscilloscope. Test Points and diagnostic lights shall be provided to allow easy monitoring of the controls. Control circuits shall be based on principle of improved reliability through reduced component count.

Minimum following controls shall be provided:

Rectifier-IGBT based/ Charger

Input automatic circuit breaker

Battery non automatic circuit breaker

The following settings are accessible through the LCD Touch screen.

UPS start

UPS stop

Modbus communications

Transfer to bypass

Preferred/Alternate control

Date, time & time zone set

Audible Alarm Enable/Disable.

Default screen Option

Password Protection, Multiple levels

Rectifier Output Voltage window

Rectifier output High/Low Voltage Alarm Setpoints

Rectifier Start – UP only.

Battery Voltage Low alarm

Battery test Parameters

Battery Equalize Parameters

Inverter Output Voltage Window

Inverter Output Voltage High / Low voltage Alarm

Inverter saturation Trip Restart : Enable/Disable

Return to preferred : Enable/Disable

Inverter Auto Start : Enable/Disable

Transfer to bypass on Inverter Fail

Synchronization Fail Transfer : Enable/Disable

STS Test control

Alarm Contacts

Alarm contacts (volt free) shall be provided for following four important alarms:-

On battery

Low battery

Summary over temperature

Summary alarm.

Modbus Communications

Modbus communications for remote monitoring of the UPS shall be standard via an appropriate communications Port. The following system information shall be down loaded to a remote terminal:

Metering Menu

Status/Alarm

Event Log.

Technical Data for UPS

1	General	
a)	Rate Power KVA	AS per requirement
b)	Power Factor	0.80
c)	Technology	High frequency, microprocessor controlled
2.	Double Conversion Efficiency in %	
a)	100% load (COS□ = 0.8 incl)	97
b)	50% load (COS□ = 0.8 incl)	96
c)	100% load (Resistive COS□ = 1)	95
d)	50% load (Resistive COS□ = 1)	94
e)	Heat Dissipation. 100% load COS□ = 0.8	AS per requirement
f)	Heat Dissipation. 100% resistive load	AS per requirement
g)	Audible noise with 100% load(dBA)	60-72
h)	Autonomy Time Standard (100% load)	AS per requirement
3.	Ambient Temperature for UPS (°C)	0-45
4.	Ambient Temperature for Battery (°C)	18-23
5.	Storage temperature (°C)	-15 to + 50
6.	Input cooling air temperature	Maximum 35
7.	Battery storage time -	Max 06 months at ambient temperature.

8.	Cooling	Fan assisted based on monitoring of temperature in battery cabinet
9.	Relative Humidity (%)	Maximum 95
10	Protection Degree	IP 20
11	Transport Pallet	To be provided with UPS
12	Colour	RAL 2002 (to be confirmed)
13	Mains Input Connection	Hard wired
14.	Output Mains Connection	Hard wired
15.	Cabling of UPS	To suit site and room layout.
16.	Dry Port (Volt-Free contacts)	Remote signaling of UPS failure
17.	Smart Port (RS-232/RS -485)	Remote signaling / integration in Network Management System
18	Rectifier	IGBT
a)	Input voltage (v)	230V
b)	Input frequency (Hz)	45 – 65
c)	Input power factor	0.75 minimum lagging at Full load & Nominal input Voltage.
d)	Input current form	Sinewave (THD < 10%)
e)	Input current Limited by soft	start circuit
19	Battery	
a)	Battery type	Sealed lead. Acid maintenance free.
b)	Battery cells (12V) for Standard Autonomy)	As per standards

c)	Battery test facility	YES
d)	Battery charging characteristics	IU (DIN41773) or as per Indian standard
e)	Battery saver charger	No ripples
f)	Battery healthy/ unhealthy indication	YES
g)	Automatic battery test facility at every 02 weeks with fault indication	YES
20	Inverter	
a)	Nominal output power KVA	AS per requirement
b)	Nominal output voltage	2320 V 1Phase ,50 Hz.
c)	Output voltage tolerance	As per Indian standard
d)	Output waveform	Sinewave
e)	Output frequency	50 Hz
f)	Output frequency slew rate	1.0 Hz/sec maximum.
g)	Overload capability % - 15 minutes	150 % of rated power (KW).
h)	Crest factor	1 : 3

Testing & Inspection

Representatives of the Purchaser shall have free access to vendor's works to inspect, expedite and witness shop tests. Any materials or work found to be defective or which does not meet the requirement of the specification will be rejected and shall be replaced at supplier's cost.

Purchaser reserves the right to carry out stage wise inspection of fabrication, painting and components.

Tests shall be carried out on various equipment / components mounted on the Panel as per relevant Indian Standard Specifications:

Information / Data/ Drawings

Data/Documents to be Submitted for Approval before Commencement of Work

GA Drawing with part description and overall dimensions including weight of the assembly.

Deviation to the specification if any. Absence of list of deviations shall be construed as compliance of specification in to.

Bill of materials with make, type, model, range/rating etc. with technical literature from manufacturer.

Quality assurance plan.

Documents for Approval before Procurement of UPS System (4 copies each)

GA Drawing & Foundation / fixing details, total load details of shipping section etc.

Single Line Diagram indicating ratings of all components.

Typical control schematic diagram.

Detailed Bar chart.

Quality assurance plan.

Provide the calculation for Battery Capacity proposed.

Documents before Dispatch for Erection/ Maintenance (4 copies each)

Installation, operation and maintenance manuals.

Relay coordination curves and relay setting charts.

Bill of materials giving details for internal and external wiring.

Internal inspections & acceptance reports.

Test & Guarantee certificates.

Technical catalogues of all bought outs.

Instructions manuals

Warranty certificates for batteries.

Guarantee

UPS shall be guaranteed for trouble free operation for a period of 12 months and batteries for 24 months from the date of handing over.

Any defect due to faulty material/bad workmanship shall be rectified free of cost to the entire satisfaction of the purchaser.

Performance Guarantee runs shall be conducted after one month of continuous trouble free operation. All guarantees from equipment suppliers will be vested in the client.

Packing

Equipment shall be dispatched to site packed in full wooden case. It shall be wrapped in polyethylene sheets before putting in cases and it shall be ensured that damage to the equipment does not occur during handling/transportation. Lifting hooks shall be provided for unloading at site.

Data Sheet to be filled by Contractor for 2 KVA UPS

Sr. No.	Description	To be filled in by contractor
	Inverter efficiency	
	25% capacity	**
	50% capacity	**
	75% capacity	**
	100% capacity	**
	Overall efficiency	**
	Steady state voltage	**
	Harmonic Distortion at	
	Linear load	**
	Non Linear load	**
	Power Factor	**
	Time period for overload	
	110%	**
	125%	**

Sr. No.	Description	To be filled in by contractor
	150%	**
	Dynamic Voltage response	**
	Transfer time inverter to Mains & Vice Versa	
	Synchronous Mode	**
	Un-synchronous Mode	**
	Frequency stability	
	Synchronous Mode	**
	Un-synchronous Mode	**
	Max. rate of change of Frequency during Synchronization	**
	Noise level	**
	RFI/EMI Susceptibility	**
	No. of Alarms/indication	**
	Features	
	Software for PC monitoring	**
	Remote control panel	**
	Autodialing Facility	**
	Expandable/Redundancy for power shall be possible	**

Note: ** Data to be filled by contrac

INSTALLATION, TESTING AND COMMISSIONING

General

Scope

The Scope Includes Supply (wherever called for) installation, testing and commissioning of entire electrical work from the point of Electrical distribution board. The scope includes, supervision work for civil work for electrical. The scope includes the liaison work for requirement of approval from licensee, statutory authorities for the scope of electrification under this tender.

The all required material supply, except for free supply items from Employer shall be included in the scope of work of contractor even if not mentioned, but required to complete the electrification work under this work shall be included. No separate claim for such item shall be claimed by contractor. If such items are identified by contractor for any clarifications, ambiguity, the same shall be clarified prior to final offer from Contractor. Contractor shall not claim on any extra item than after.

Equipment Erection Details

For equipment interconnection, the surfaces of equipment terminal pads, copper tube, conductor & terminal clamps and connectors shall be properly cleaned. After cleaning, contact grease shall be applied on the contact surfaces of equipment terminal pad, copper tube /conductor and terminal clamps to avoid any air gap in between. Subsequently bolts of the terminal pad/terminal connectors shall be tightened and the surfaces shall be cleaned properly after equipment interconnection.

Cutting of the pipes wherever required shall be such as to avoid flaring of the ends. Hence only a proper pipe cutting tool shall be used. Hack saw shall not be used.

Handling of equipment shall be done strictly as per manufacturer’s/supplier’s instructions/instruction manual.

Handling equipment, sling ropes etc. should be tested periodically before erection for strength.

The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc.

Storage

The Contractor shall provide and construct adequate storage shed for proper storage of equipments, where sensitive equipments shall be stored indoors. All equipments during storage shall be protected against damage due to acts of nature or accidents. The storage instructions of the equipment manufacturer/Owner shall be strictly adhered to.

Earthing

Scope

The scope includes supply, install, test and commissioning with all items required for earthing.

The earthing shall be done in accordance with requirements given here under and drawings. Measurement of soil resistivity and earth mat design calculations for switchyard area shall be submitted by contractor for review by client. The main earth mat shall be laid in the switchyard area in accordance with the approved design requirements.

Neutral points of systems of different voltages, metallic enclosures and frame works associated with all current carrying equipments and extraneous metal works associated with electric system shall be connected to a single earthing system unless stipulated otherwise.

Earthing and lightning protection system installation shall be in strict accordance with the latest editions of Indian Electricity Rules, relevant Indian Standards and Codes of practice and Regulations existing in the locality where the system is installed.

a) Code of practice for Earthing IS: 3043

b) Code of practice for the protection of Building and an allied structure against lightning IS: 2309.

c) Indian Electricity Rules 1956 with latest amendments.

d) National Electricity Safety code IEEE publication.

Earthing Conductor Layout

Earthing conductors in outdoor areas shall be buried at least 900 mm below finished ground level unless stated otherwise.

Tap-connections from the earthing grid to the equipment/structure to be earthed shall be terminated on the earthing terminals of the equipment/structure as per “Earthing Details”.

Earthing conductors or leads along their run on cable trench, ladder, walls etc. shall be supported by suitable welding/cleating at intervals of 750 mm. Wherever it passes through walls, floors

etc., galvanised iron sleeves shall be provided for the passage of the conductor and both ends of the sleeve shall be sealed to prevent the passage of water through the sleeves.

Earthing conductor around the building shall be buried in earth at a minimum distance of 1000 mm from the outer boundary of the building. In case high temperature is encountered at some location, the earthing conductor shall be laid minimum 1500 mm away from such location.

Earthing conductors crossing the road shall be laid 300 mm below road or at greater depth to suit the site conditions.

Earthing conductors embedded in the concrete shall have approximately 50 mm concrete cover.

Equipment and Structure Earthing

Earthing pads shall be provided for the apparatus/equipment at accessible position. The connection between earthing pads and the earthing grid shall be made by two short earthing leads (one direct and another through the support structure) free from kinks and splices. In case earthing pads are not provided on the item to be earthed, same shall be provided in consultation with Owner.

Whether specifically shown in drawings or not, steel/RCC columns, metallic stairs etc. shall be connected to the nearby earthing grid conductor by two earthing leads. Electrical continuity shall be ensured by bonding different sections of hand-rails and metallic stairs.

Metallic pipes, conduits and cable tray sections for cable installation shall be bonded to ensure electrical continuity and connected to earthing conductors at regular interval. Apart from intermediate connections, beginning points shall also be connected to earthing system.

Metallic conduits shall not be used as earth continuity conductor.

Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam conduits, etc. and steel reinforcement in concrete it shall be bonded to the same.

Jointing

Earthing connections with equipment earthing pads shall be bolted type. Contact surfaces shall be free from scale, paint, enamel, grease, rust or dirt. Two bolts shall be provided for making each connection. Equipment bolted connections, after being checked and tested, shall be painted with anti corrosive paint/compound.

Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protections, the welds should be treated with red lead and afterwards coated with two layers bitumen compound to prevent Corrosion.

Steel to copper connections shall be brazed type and shall be treated to prevent moisture ingression.

Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.

All ground connections shall be made by electric arc welding. All welded joints shall be allowed to cool down gradually to atmospheric temperature before put- ting any load on it. Artificial cooling shall not be allowed.

Bending of earthing rod shall be done preferably by gas heating.

All arc welding with large dia. conductors shall be done with low hydrogen content electrodes.

The 50x6mm GS flat shall be clamped with the equipment support structures at 1000mm interval.

Power Cable Earthing

Metallic sheaths and armour of all multi core power cables shall be earthed at both equipment and switchgear end. Sheath and armour of single core power cables shall be earthed at switchgear end only.

Earthing Conductors

General

All conductors buried in earth and concrete shall be of galvanised steel. All conductors above ground level and earthing leads shall be of galvanised steel, except for cable trench earthing.

Constructional Features of Galvanised Steel

a) Steel conductors above ground level shall be galvanised according to IS: 2629.

b) The minimum weight of the zinc coating shall be 610 gm/sq. m. and minimum thickness shall be 85 microns.

c) The galvanised surfaces shall consist of a continuous and uniformly thick coating of zinc, firmly adhering to the surfaces of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

Tests

In accordance with stipulations of the specifications galvanised steel shall be subjected to four one minute dips in copper sulphate solution as per IS: 2633.

Procedure for Soil Resistivity Measurement

Soil resistivity measurement should be carried out with the earth tester. Please check the calibration report before performing the measurement. Also check

The measurement should be strictly followed as per procedure given in IS 3043 (Wenner method of measurement)

Some Guidelines

The depth of burial of electrode 1/20th of electrode separation

Electrodes to be in straight line & co-planar

Minimum spacing 0.5 m to 1.0 m

Preferred electrode spacing;

0.5, 1, 2, 4, 8, 16, 20, 32 (Small station) or

0.5, 1, 2, 5, 10, 20, 50 (Large station) etc

Resistivity should be measured in all 8 directions

For good contact stand electrode in tamped mud or pour a little water around it

If resistivity reading is inconsistent repeat it by varying ‘s’

Ensure current and potential circuits do not have excessive resistance due to poor connection or excessive resistance near electrodes

Lay wires to electrodes to minimize mutual inductance

Avoid recently filled area

Resistivity measured for electrode spacing ‘a’ is a measure of resistivity up to depth ‘a’

Prepare graph of resistivity versus electrode spacing, which reflects variation of soil resistivity with respect to depth

Distribution Boards

Erection

Electrical panels and bus duct shall be delivered in convenient shipping section. The contractor shall make his own arrangement for safe transportation of all the items to the erection site and also carry out complete loading/unloading during transportation. The contractor shall be responsible for final assembly and inter connection of bus bar / wiring. Foundation channel shall be grouted in the flooring by the contractor. Switchgear shall be aligned and leveled on their base channels and bolted or tack welded to them as per the instructions of the Engineer-in-charge. The earth bus shall be made continuous throughout the length. Loosely supplied relays and instruments shall be mounted and connected on the Switchgear. The contacts of the draw-out circuit breakers shall be checked for proper alignment and interchangeability.

After erection the switch board shall be inspected for dust and vermin proof. Any hole which might allow dust or vermin etc. to enter the panel shall be plugged suitably at no extra cost.

If the instrument transformers are supplied separately they shall be erected as per the direction of the Engineer-in-charge. The contractor shall fix the cable glands after drilling the bottom/ top plates of all switch boards with suitable holes at no extra cost.

Range of overload relays/timers etc. shall be checked with requirement of motor actually to be connected at site and shall be provided accordingly.

The bus duct shall be suitably supported between switchgear and transformer. The opening in the wall where the duct enters the switchgear room shall be sealed to avoid rain water entry. The foundation of the switchgear shall be raised suitably for minor adjustment to ensure proper alignment and connection of the bus duct at no extra cost. Expansion joints, flexible connection, etc. supplied by the manufacturer / contractor of the bus duct shall be properly connected.

TESTING:

Before electrical panel is energised, the insulation resistance of each bus shall be measured from phase to ground. Measurement shall be repeated with circuit breakers in operating positions and contacts open.

Before switchgear is energised, the insulation resistance of all control circuits shall be measured from line to ground.

The following tests shall be performmed on all circuit breakers during erection.

Contact alignment and wipe shall be checked and adjusted where necessary in accordance with the breaker manufacturer's instructions.

Each circuit breaker shall be drawn out of its cubicles, closed manually and its insulation resistance measured from phase to phase and phase to ground.

iii. All adjustable direct acting trip devices shall be set using values given by the Engineer-in-charge / manufacturer.

iv. Close and trip the circuit breaker from its local control switch push button or operating handle. Switch gear control bus may be energized to permit test operation of circuit breaker with AC closing with prior permission of the Engineer-in-charge.

v. Test tripping of the electrically operated circuit breaker by operating mechanical trip device.

vi. Test proper operation of circuit breakers latch, check carriage limit switch if provided.

vii. Test proper operation of lock-out device in the closing circuit. Wherever provided by simulating conditions which would cause a lock-out to occur.

viii. Trip beaker either manually or by applying current or voltage to each of its associated protective relays.

ix. Before switchgear is energised, the tests covered above shall be repeated with each breaker in its normal opera-ting position.

x. Capacitor banks shall be tested as per manufacturer's instructions. In addition, test for output and /or capacitance, Insulation resistance test and test for efficiency of discharge device shall be carried out.

xi. All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

PROFORMA FOR LT PANELS, DB, AND CONTROL PANEL TEST.

Insulation resistance test (contacts open, Breaker racked in position).

between each phase of bus : Mega ohm

between each phase & earth : Mega ohm

DC and AC control & auxiliary circuits. : Mega ohm

between each phase of CT/PT and : Mega ohm

Between CT & PT circuit if any

CT ratio.

CT secondary resistance.

CT polarity check.

Check for contact alignment and wipe.

Check / Test all releases / relays.

Check mechanical interlocks.

Check electrical interlocks.

Check switchgear / control panel wiring.

Check breaker / contractor circuit for

closing-local and remote (wherever applicable)

Tripping-local and remote (wherever applicable)

Opening time of breaker/ contractor

Closing time of breaker/ contractor

This proforma shall be jointly signed by the Engineer-in-charge and the contractor in duplicate.]

Cabling Along With Accessories

CABLING

The scope of HT cabling is from INDOOR SUB STATION/ source station of supply authority to 11 KV VCB BREAKER PANEL at Sub station within the premises. The HT Cable shall be laid underground in an approved Manner.

TRENCHING for LAYING OF CABLES (UNDERGROUND SYSTEM):

The cable trench work involves earth excavation in all types of soil, murum, hard rock and asphalted road surface. back filling and removal of excess earth from site. The work site shall be left as clean as possible.

Cables shall be so laid in trench in such away, that it shall not interfere with other underground structure. Like water pipes, sewage lines or other structures. The services which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded / diverted as directed by the engineer in charge

Cable shall be laid at minimum depth of 1200 mm. for H.T and LT cable from ground level. The width of trench shall be sufficient for laying of required no. of cables.

Sand bedding 75 mm. thick shall be made below and above the cables. Layer of precast RCC tiles shall be laid above sand bedding to cover cable completely. More than one cable can be laid in the same trench by providing adequate clearance between two cables. However, the relative location of cables in trench shall be maintained till termination. The surface of the ground after back filling the earth shall be made good so as to conform in all respects to the surrounded ground and to the entire satisfaction of the engineer in charge / consultant.

For all underground cables, route markers should be used:

Separate route markers should be used for LT, HT and telephone cables.

Cable markers should be installed at an interval not exceeding 30 mtr. Along the straight routes of cables at a distance of 0.5 mtr. Away from centre of cable with the arrow marked on the cable markers plate indicating the location of cable. Cable markers should also be used to identify change in direction of cable route and for location of every joint in underground cable.

RCC hume pipe for crossing road in cable laying shall be provided by employer. No deduction shall be made for cable laying in hume pipe for not providing tiles , sand and excavation. RCC hump pipe at the ends shall be sealed by bituminous compound after laying and testing of cables by electrical contractor without any extra charge.

The trench shall be excavated using manual and mechanical methods as per field conditions. Most main roads are of asphalt surface and some of the roads with cement concrete surface.

An air compressor with pneumatic drill or equivalent mechanical tool will be essential if the road crossings are to be speedily made. Special system of laying hume pipe under road without digging the surface may be adopted if feasible.

Where paved footpaths are encountered, the pavement slabs shall be properly stored and reinstated. Identification markers of other services shall be properly stored and restored.

The sides of the excavated trenches shall, wherever required, be well shored up with timber and sheeting.

Suitable wooden/ sheet steel barriers should be erected between the cable trench and pedestrian/ motorway to prevent accidents. The barrier could be made out of sheet steel or wood planks. These could be portable types of size 1.5 m long by 1.2 m (height). These should be painted with red and white coloured cross stripes. Warning and caution boards should be conspicuously displayed. Red lights as warning signal should be placed along the trench during the nights.

The excavated material shall be properly stored to avoid obstruction to public and traffic movement.

The bottom of the excavated trench should be leveled flat and free from any object, which would damage the cables. Any gradient encountered shall be gradual.

CABLE TAGS AND MARKERS

Each cable and conduit run shall be tagged with numbers that appear in the cable and conduit schedule.

The tag shall be of aluminum with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS: 280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables.

Location of cables laid directly underground or in PVC ducts shall be clearly indicated with cable marker made of galvanized iron plate/cast iron (applicable).

Location of underground cable joints shall be indicated with cable marker with an additional inscription “Cable joints”.

The marker shall project 150 mm above ground and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road and drain crossings.

Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry and at each end & turning point in cable tray/trench runs. Cable tags shall be provided inside the switchgear, motor control centers, control and relay panels etc., wherever required for cable identification, where a number of cables enter together through a gland plate.

Cable Supports and Cable Tray Mounting Arrangements

The Contractor shall provide embedded steel inserts on concrete floors/walls to secure supports by welding to these inserts or available building steel structures.

The supports shall be fabricated from standard structural steel members.

Insert plates will be provided at an interval of 750 mm/ as required , wherever cables are to be supported without the use of cable trays, such as in trenches, while at all other places these will be at an interval of 2000 mm or as per site condition ..

CABLE TERMINATION AND CONNECTIONS

The termination and connection of cables shall be done strictly in accordance with cable and termination kit manufacturer's instructions.

The work shall include all clamping, fittings, fixing, plumbing, soldering, drilling, cutting, taping, heat shrinking (wherever applicable), connecting to cable terminal, shorting and grounding as required to complete the job.

Supply of all consumable, material, shall included in the scope of work and quoted offer by the Contractor.

The equipment will be generally provided with un-drilled gland plates for cables/conduit entry. The Contractor shall be responsible for drilling of gland plates as required using proper tools, painting and touching up. Holes shall not be made by gas cutting.

Control cable cores entering control panel/switchgear/ MCCB/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with nylon strap or PVC perforated strap to keep them in position.

The Contractor shall tag/ferrule control cable cores at all terminations, as instructed by the engineer in charge. In panels where a large number of cables are to be terminated and cable identification may be difficult, each core ferrule may include the complete cable number as well.

Spare cores shall be similarly tagged with cable numbers and coiled up.

All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively closed.

Double compression type nickel plated (coating thickness not less than 10 microns) brass cable glands shall be part of the quoted work .All power and control cables shall be provided with dust and weather proof terminations.

The cable glands shall conform to IS: 6121. They shall comprise of heavy duty brass casting, machine finished and nickel plated, to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and of tested quality. Cable glands shall be of approved make.

The cable glands shall also be suitable for dust proof and weather proof termination. The test procedure, for cable gland shall be as per manufacturer.

If the cable-end box or terminal enclosure provided on the equipment is found unsuitable and requires modification, the same shall be carried out by the Contractor, as directed by the engineer in charge.

Crimping tool used shall be of approved design and make.

Cable lugs shall be tinned copper solder-less crimping type conforming to IS-8309 & 8394. Bimetallic lugs shall be used depending upon type of cables used.

Solder-less crimping of terminals shall be done by using corrosion inhibitory compound. The cable lugs shall suit the type of terminals provided.

STORAGE AND HANDLING OF CABLE DRUMS

Cable drums shall be unloaded, handled and stored in an approved manner .Rrolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum.

DIRECTLY BURIED CABLES/ CABLES LAID IN DUCTS UNDERGROUND

The Contractor shall construct the cable trenches required for directly buried cables. The scope of work shall include excavation in all type of soils, hard rock, murum and road, preparation of sand bedding, soil cover, supply and installation of pre cast concrete protective covers, PVC/RCC Pipes, back filling and ramming, supply and installation of route markers and joint markers and construction of chamber etc.. The Bidder shall ascertain the soil conditions prevailing at site, and include the costing in the quoting.

The cable (power and control) between LT stations, control room, DG set/ building and fire lighting, pump house shall be laid in the cable trenches. In addition to the above, for lighting purpose also, buried cable trench can be used in outdoor area with cables laid in ducts, underground etc.

Cable route and joint markers and RCC warning covers shall be provided wherever required. The voltage grade of cables shall be engraved on the marker.

Cables wherever are to be placed in ducts shall be placed on cable jacks. They shall be guided through the ducts by means of the draw rope where possible. Threading shall be from one manhole or joint box or hand hole or chamber to the adjacent one, one span at a time. Cable shall not be allowed to rub excessively against the walls of the duct whilst being threaded in to avoid damage. The cable ends must be properly sealed. Any joints when necessary must be made at the manhole or joint box only and on no account will there be a joint outside these. Cables must have straight runs between manholes or chambers.

Tension as specified by the cable manufacturer for a particular type of cable shall only be put on a cable whilst pulling it into a duct.

INSTALLATION OF CABLES

Cabling in the control room shall be done on ladder type cable trays while cabling in switchyard area shall be done on angles in the trench and for Electrical to container terminal it will be done in PVC conduits laid underground.

All cables from bay cable trench to equipments including and all internal, cables (both power and control) for all equipment, shall be laid in PVC pipes of required diameter as per IS: 4985 which shall be buried in the ground at a specified depth below finish formation level. Separate PVC pipes shall be laid for control and power cables.

Cables shall be generally located adjoining the electrical equipment through the pipe insert embedded in the floor. In the case of equipments located away from cable trench either pipe inserts shall be embedded in the floor connecting the cable trench and the equipment or in case the distance is small, notch/opening on the wall shall be provided. In all these cases necessary to maintain the bending radius as recommended by the cable manufacturer.

Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminum paint. The red oxide and zinc chromate shall conform to IS: 2074.

Suitable arrangement should be used between fixed pipe / cable trays and equipment terminal boxes, where vibration is anticipated.

Power and control cables in the cable trench shall be laid in separate tiers. The order of laying of various cables shall be as follows, for cables other than directly buried.

a) Power cables on bottom tiers.

b) Control instrumentation and other service cables in top tiers.

Power and control cables shall be securely fixed to the trays/supports with self locking type nylon ties with de-interlocking facility at every 5 meter interval for horizontal run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminum strip clamps at every 2m.

Cables shall not be bent more then the minimum permissible limit. The permissible limits are as follows:

Cable and Minimum bending radius

Power cable 12 D, above 60mm dia15 OD

Control cable 10 D

D is overall diameter of cable

In each cable run some extra length shall be kept at a suitable point to enable one (for LT cables)/two (for H.T. cables) straight through joints to be made in case the cable develop fault at a later date.

Selection of cable drums for each run shall be so planned as to avoid using straight through joints. Cable splices will not be permitted except where called for, unavoidable or where permitted by the engineer in charge. If straight through joints are unavoidable, the Contractor shall use the straight through joints kit of reputed make. The cost of the same shall be deemed to have included in the respective cable item

Control cable terminations inside equipment enclosures shall have sufficient lengths so that changing of termination in terminal blocks can be done without requiring any splicing.

Metal screen and armour of the cable shall be bonded to the earthing system of the station, wherever required. Rollers shall be used at intervals of about two meters while pulling cables.

All due care shall be taken during unreeling, laying and termination of cable to avoid damage due to twist, kinks, sharp bends, etc.

Cable ends shall be kept sealed to prevent damage. In cable vault, fire resistant seal shall be provided underneath the panels.

Inspection on receipt, unloading and handling of cables shall generally be in accordance with IS: 1255 and other Indian Standard Codes of practices.

Wherever cable pass through floor or through wall openings or other partitions, GI/PVC wall sleeves with bushes having a smooth curved internal surface so as not to damage the cable, shall be supplied, installed and properly sealed by the Contractor at no extra charges.

Contractor shall remove the RCC/Steel trench covers before taking up the work wherever provided and shall replay the covers after the erection-work in particular area is completed or when further work is not likely to be taken up for some time.

Contractor shall furnish three copies of the report on work carried out in a particular week, indicating cable numbers, date on which laid, actual length and route, testing carried out, terminations carried out, along with the marked up copy of the cable schedule and interconnection drawing wherever any modifications are made. Contractor shall paint the tray identification number on each run of trays at an interval of 10 m.

In case the outer sheath of a cable is damaged during handling/installation, the Contractor shall repair it at his own cost to the satisfaction of the engineer in charge . In case any other part of a

cable is damaged, the same shall be replaced by a healthy cable at no extra cost to the Owner, i.e. the Contractor shall not be paid for installation and removal of the damaged cable.

All cable terminations shall be appropriately tightened to ensure secure and reliable connections. The Contractor shall cover the exposed part of all cable lugs whether supplied by him or not with insulating tape, sleeve or paint.

The cable end seals shall be checked after laying and, if found damaged, shall immediately be resealed. Sufficient number of heat shrinkable cable end sealing caps shall be stocked at site stores for testing and jointing work. The integrity of the outer sheath shall be checked after the cable is laid in position.

RCC HUME PIPE

RCC hume pipe shall be of NP2 class dia as specified in the BOQ complete with collar jointing, excavation in all types of soil, hard rock, murrum etc… up to a depth of 1 metre including back filling & sealing of ends to avoid choking of pipes.

The jointing of pipes shall be only through collar joints with cementing at end of the collars.

CABLE TRAYS

i) The cable trays shall be of G.I .sheet and minimum thickness of sheet shall be 2mm. or as specified.

ii) The Contractor shall perform all tests and inspection to ensure that material and workmanship are according to the relevant standards. Contractor shall have to demonstrate all tests as per specification, and equipment shall comply with all requirements of the specification.

iii) Tests

TEST FOR GALVANISING (ACCEPTANCE TEST)

DEFLECTION TEST: (TYPE TEST)

A 2.5 meter straight section of 300mm, 600mm wide cable tray shall be simply supported at two ends. A uniform distributed load of 76 kg/m shall be applied along the length of the tray. The maximum deflection at the mid-span shall not exceed 7mm.

PROFORMA FOR TESTING CABLES:

Drum No. from which cable taken.

Cable from ---- to -----

Length of run of this cable --------metre

Insulation resistance test

between core 1 to earth	:	Mega ohm
between core 2 to earth	:	Mega ohm
between core 3 to earth	:	Mega ohm
between core 1 to core 2	:	Mega ohm
between core 2 to core 3	:	Mega ohm
between core 1 to core 3	:	Mega ohm

High voltage test

Between core an earth.

Between individual cores

This proforma shall be jointly signed by the Engineer-in-charge and the contractor in duplicate.

INSTALLATION OF LIGHTING FIXTURES

Scope of work under this item shall start from light point, with a connector/ ceiling Rose , 3core 1.5 mm.^{2} PVC insulated wires from the point to the connector inside the lighting fixture, connections, fixing of lighting fixture complete with all accessories including supports, down rods , lamps on wall / roof / steel truss etc. testing the lighting fixture and commissioning.

INSTALLATION OF EXHAUST FANS

Scope of work under this system shall start from exhaust fan point, with a ceiling rose, 3core 2.5 mm.^{2} PVC insulated wire from ceiling rose to connector of exhaust fan, connections, including fixing of fan with all accessories and supports complete with testing and commissioning.

Completion Tests

After supply and installation of complete project or a particular building / area, following tests shall be carried out by the contractor before switching on the power to installation and the results shall be recorded and submitted to the Site-Engineer. If results are not satisfactory / as per

standards set herewith, the contractor shall identify the defects / short coming and shall rectify the same. Nothing extra shall be paid for carrying out these tests and contractor has to arrange all necessary instruments.

Insulation Resistance To Earth:

This is to be measured with all fuse links in place, all switches ON, all lamps and appliances in position by applying a voltage not less than twice the working voltage (subject to a limit of 500 V). Insulation resistance of the whole or any part of the installation to earth must not be less than 50 mega-ohms divided by the number of outlets (points and switch positions) except that it need not exceed one mega-ohm for the whole installation.

Insulation Resistance Between Conductors

Tests to be made between all the conductors connected to one pole or phase conductor of the supply and all the conductors connected to the middle wire or neutral or the other pole or phase conductors of the supply. For this test, all lamps shall be removed and all switches put ON. The result of the test must be 50 mega-ohms divided by the number of outlets (points and switch positions) but need not exceed 1 mega-ohm for the whole installation.

Polarity Of Single Pole Switches

Tests shall be made to verify that all non-linked single pole modular switches are on phase conductor (live) and not on neutral or earth conductor. This can be done by connecting test lamps between two terminals of switch and earth. If the lamp lights up when switch is ON and either terminal is touched, the switch is correctly installed.

Safety Precautions While Testing

The following points to be taken care for safety purpose before testing: -

The work shall be carried out with the equipment dead or energised at a safe voltage or current.

The equipment shall not to be left unattended on live. There shall be no exposed live parts that are hazardous

The test personnel should be able to supervise the working area at all times to prevent danger to others.

The test personnel should be competent, posses authorised license i.e. adequately trained, experienced and knowledgeable to do the work safely and ensure that others are not put at risk.

The test personnel will be required to design and/or manufacture any special test equipment; they should know what standards or guidance should be followed and are these documents readily available.

Physical safeguards should be applied to the equipment under test to avoid danger and prevent injury e.g. the use of temporary or permanent screens or enclosures.

Routine maintenance shall be carried out on the hardware used in testing.

Check whether it is necessary to set up a permanent test area where equipment is taken or a temporary test area around the equipment and how will this be done.

Check the size of the unit under test and how much space is required around it to avoid congestion while testing.

Additional emergency switching, off, devices to be provided at easily accessible places.

MINIMUM TOOL BOX

HT Equipments & Cables

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
UNDERGROUND CABLING				
	Insulated Crow Bar	5 feet steel rod with nylon insulated grip for half length	Qty as per number of gang members	
2	Rollers for cable pulling	Steel rollers fixed on frame used at 2m interval and at turnings (valid for cable laid directly in ground). For cables laid in ducts pulleys to be provided.	Qty as per length of cable trench	
3	Jack for cable drums	Jacks with suitable strength for lifting cable drum through one feet height	At least one set	
SAFETY GADGETS				
1	Helmets	Yellow without flap	Qty as per number of gang members	
		White normal	For Engineer/supervisor	
2	Road barricades	2m x 1.5m (H) pipe structure	At regular intervals as	

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
		painted yellow	per site requirement	
3	Red Flag	Red cotton cloth of adequate size to indicate danger	As per site requirement	
4	Luminous Warning Board		Minimum 2 Nos	
5	Caution Tape	Red printing on white back ground	Running Cable length	
6	First Aid Kit		Minimum one set	
7	Safety Shoes		Qty as per number of gang members	
TESTING & MEASURING EQUIPMENTS				
1	HV Tester	0-30/60kV, 0-100mA	1 No	
2	Megger	5kV, Hand Held manual driven	1 No	Electronic megger is optional
HT EQUIPMENTS				
Sr. No	Item Description	Item Specification	Qty per Gang minimum	Remarks
1	Crimping Tool	25-400sqmm	1 No	
2	Cutting Pliers	8" insulated grip	1 No	
3	Screw Driver	9" power grip	1 No	
4	Screw Driver	4" power grip	1 No	

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
5	Adjustable Spanner	24mm	1 No	
6	Spanner	25/9 Ring Spanner set of 25	1 No	
7	Hack Saw Frame and Blade	12"	1 No	
8	Knife	6"	1 No	
9	Pedestal Type ladder		1 No	
10	Welding Machine with suitable cable	415V, 5kVA, 400A	1 No	
11	Torches	5 Cell	1 No	
12	Vice	8”	1 No	
13	Drill Machine	½” Drill bits	1 No	
14	Bamboo/ FRP Ladder	3m local	1 No	
SAFETY GADGETS				
1	Helmets	Yellow without flap	Qty as per number of gang members	
		White normal	For Engineer / supervisor	
2	Discharge Rods	20', 3 connectable fiber pipes	2 sets	
3	Caution Board	Red letters on white back ground on plastic base board (300x400mm)		

Sr No	Item Description	Item Specification	Qty per Gang	Remarks
4	Hand Gloves	15kV Rubber Grip	One pair	
5	First Aid Kit		1 No	
6	Rubber Sheets	10mm x 5’ x 3’	1 No	
7	Earthing Spikes	2 feet, local make	1 No	For additional earthing
TESTING & MEASURING EQUIPMENTS				
1	Tester	230V	1 No	
2	Measuring metal tape	3m	1 No	
3	Clip on meter	0-1000A	1 No	For engineers
4	CMRI	as per specifications	1 No	For engineers
5	Cell Tester	3-0-3V	1 No	
6	Insulation Tester	1kV	1 No	
7	Insulation Tester	5kV	1 No	
8	Earth resistance tester	4 Terminal Type	1 No	

LT Equipments

Sr. No	Item Description	Item Specification	Qty per Gang minimum	Remarks
TOOLS				
2	Crimping Tool	25-400sqmm	1 No	
	Cutting Pliers	8" insulated grip	1 No	
3	Screw Driver	9" power grip	1 No	
4	Screw Driver	4" power grip	1 No	
5	Adjustable Spanner	24mm	1 No	
6	Spanner	24mm	1 No	
7	Hack Saw Frame and Blade	12"	1 No	
8	Knife	6"	1 No	
9	Bamboo/ FRP Ladder	3m local	1 No	
SAFETY GADGETS				
1	Helmets	Yellow without flap	Qty as per number of gang members	
		White normal	For Engineer/ supervisor	
2	Discharge Rods	20', 3 connectable fiber pipes	2 sets	
3	Caution Board	Red letters on white back ground on plastic base board	2 sets	

Sr. No	Item Description	Item Specification	Qty per Gang minimum	Remarks
		(300x400mm)		
4	Hand Gloves	15kV Rubber Grip	One pair	
5	First Aid Kit		1 No	
	For additional earthing	2 feet, local make	1 No	
TESTING & MEASURING EQUIPMENTS				
1	Tester	230V	1 No	
2	Measuring metal tape	3m	1 No	
3	Clip on meter	0-1000A	1 No	For engineers
4	CMRI	as per specifications	1 No	For engineers
5	Earth resistance tester		1 No	Optional Item

LIST OF PREFERRED MAKES OF EQUIPMENT/ MATERIAL

Preferred makes of equipment and materials are given below. Although the preferred makes are given, the Contractor shall submit samples of all materials other than heavy equipment and obtain prior approval of the Architect/ Consultants (whose decisions shall be binding) for the make of each item before ordering the same. This condition is also applicable to all items of equipment and material for which makes are not given in this specification:

SR. NO.	MATERIAL	APPROVED MAKE
	ELECTRICAL WORK APPROVED MAKE LIST	
1	HT SWITCHGEAR	SIEMENS/SCHNIDER /ABB /LAURITZ KNUDSEN-formerly by L&T
2	MSEDCL/TATA/RELIANCE METERING KIOSK	HUPHEN OR EQUVIVALENT (MSEDCL APPROVED)/
3	XPLE CABLE JOINTS (H.T.)	RAYCHEM/ REPL/3M
4	XPLE CABLS (H.T.)FRLSH Earthed	FINOLEX /POLYCAB/KEI/APAR/RR CABLE/ HAVELLS
5	HT/LT JOINTING KIT & TERMINATION KIT	REYCHEM/ XICON/ 3M/ DENSON/ M SEAL
6	DRY TYPE TRANSFORMERS ENERGY EFFICIENT AS PER LATEST IS STANDARDS OF ECBC	SUDHIRPOWER/ SCHNEIDER / HITACHI / ESENNAR/ RAYCHEM RPG/ KIRLOSKAR ELECTRIC/VOLTAMP
7	AUTOMATIC CHANGEOVER SWITCH	ABB/ELMEASURE/LAURITZ KNUDSEN-FORMERLY BY L&T/SOCOMEC/ SCHNIDER-ASCO/ SEIMENS
8	PANEL BUILDER (MANUFACTURER) OR CPRI APPROVED PANEL BUILDER	MANSHU COMTEL/ ENTECH INDUSTRIES/ POWER MATRIX SOLUTION PVT. LTD. / PLASMA ENGINEERING /POWERCON ARROW ELECTRICALS INDIA PVT LTD / ESFRO SOLUTION PVT LTD WITH CPRI APPROVED PANEL BUILDER ONLY
9	L.T. AIR CIRCUIT BREAKER. INCOMING OF PANELS MDB,(ICS=ICU=ICW FOR 1SEC)	LEGRAND/ABB-EMAX2 /LAURITZ KNUDSEN-FORMERLY BY L&T – OMEGA/ SIEMENS – 3WL/ SCHNEIDER – NW MASTER PACT. M.P. BASED

10	INSULATED BUSDUCT RISING MAINS SANDWHICH TYPE, PLUG IN BOXES/MCCB/END FEED UNITS/END FEED FLANGE/ SUPPORTING ALLIED ACCSESSORIES	LEGRAND/ABB/LAURITZ KNUDSEN-FORMERLY BY L&T/SCHNIDER/LEGRAND
11	MOULDED CASE CIRCUIT BREAKER.(ICS =100%ICU)	ABB-TMAX /LAURITZ KNUDSEN-FORMERLY BY L&T / SIEMENS / SCHNEIDER/ LEGRAND / MICROPROCESSOR BASED AND THERMAL MAGNETIC AS PER SLD
12	MCCB WITH TVSS ENCLOSURE WITH ALL ACESS.	ABB/LAURITZ KNUDSEN-FORMERLY BY L&T / SIEMENS / SCHNEIDER/ LEGRAND / MICROPROCESSOR BASED AND THERMAL MAGNETIC AS PER SLD
13	L.T. FUSES / CONTACTOR	LEGRAND/ ABB/LAURITZ KNUDSEN-FORMERLY BY L&T /SIEMENS /SCHNEIDER/ABB
14	PANEL METERS (ANALOG) / DIGITAL/MFM	LEGRAND/ ABB/LAURITZ KNUDSEN-FORMERLY BY L&T /SIEMENS /SCHNEIDER/ABB
15	PANEL CTS RESIGN CAST	AMOL/ NEWTECH/AE/GYRO/PRESIZE
16	AMMETER/VOLTMETER/LOAD MANAGER / KWH METER WITH RS 485 PORT	LEGRAND/ ABB/LAURITZ KNUDSEN-FORMERLY BY L&T /SIEMENS /SCHNEIDER/ABB
17	INDICATING LAMPS (LED ONLY)	ABB/ALTOS / TEKNIK / SUMO/LAURITZ KNUDSEN-FORMERLY BY L&T -ESBEE
18	PUSH BUTTONS	ABB/ALTOS / TEKNIK / RASS/LAURITZ KNUDSEN-FORMERLY BY L&T -ESBEE
19	TERMINALS	WAGO/ ELMEX /CONNECTWELL
20	PANEL CONTROL WIRES FRLSHZ	FINOLEX/KEI/RRKABLE/ POLYCAB/LAPP CABLE/POLYCAB /APAR/KENTER
21	PANEL BUSBAR AL/CU	ELECTROLYTE BUSBAR AS PER SPECIFICATION
22	RELAYS (PROTECTIONS)	ABB/LAURITZ KNUDSEN-FORMERLY BY L&T /SIEMENS /SCHNEIDER/ABB EE / AVKSCGC/RISHABH/SHREEM
23	DETUNED REACTORS	LEGRAND/SUBHODAN/SIEMENS/SCHNEIDER./ABB/LA URITZ KNUDSEN-FORMERLY BY L&T/EPCOS/SHREEM
24	THYRISTOR	SUBHODAN/SIEMENS/SCHNEIDER./ABB/LA URITZ KNUDSEN-FORMERLY BY L&T/EPCOS/SHREEM

25	CAPACITORS	LEGRAND/ /SIEMENS/SCHNEIDER./ABB/LA URITZ KNUDSEN-FORMERLY BY L&T/EPCOS/
26	APFC RELAY	LEGRAND/ ABB/LAURITZ KNUDSEN-FORMERLY BY L&T /SIEMENS /SCHNEIDER/ABB
27	SPACE HEATERS	EVERST IS APPROVED
28	CABLES (L.T.) FIRE SURVIVAL FRLSZH AL/CU	FINOLEX / KEI/RR KBALE / HAVELLS/ POLYCAB/APAR / KENTER
29	MCB / RCCB / MCCB/ RCBO IN DB /DISTRIBUTION BOARD.	LEGRAND / SCHNEIDER/HAGER
30	BRASS FLANGE TYPE GLAND, DOUBLES COMPRESSION	DOWELS / HMI./COMET / COMMEX / GRIPWELL
31	CABLE LUGS & GLANDS	DOWELL / COMET / SIEMENS / ELECTROMAC / BRACO
32	PVC GLANDS	HENSEL OR EQUVIVALENT
33	SPD/TVSS	ZOTUP /ABB/ SIEMENS/ EMERSON/ LEGRAND/OBO BETTERMAN
34	BATTERIES FOR HT EQUIPMENTS BACKUP	EXIDE /AMARON/ AMARAJA / STANDARD / PANASONIC
35	BATTERY CHARGER FOR HT EQUIPMENTS BACKUP	UPTRON / VOLSTAT ELECTRONICS / STATCON / AE
36	LED/LIGHTING FIXTURES & LED LAMPS INDOOR	PHILIPS-SIGNIFY / WIPRO/HAVELLS/ AND **AS PER LIGHT FIXTURES SCHDULE.**
37	DECORATIVE ARCHITECTURAL LIGHTINGS	PHILIPS-SIGNIFY/ REGENT/ HAVELLS/ WIPRO **AS PER LIGHT FIXTURES SCHDULE.**
38	LED/LIGHTING FIXTURES & LED LAMPS OUTDOOR LANDSCAPE & FAÇADE	PHILIPS-SIGNIFY / REGENT/ HAVELLS AND **AS PER LIGHT FIXTURES SCHDULE.**
39	LIGHTING MANAGEMENT SYSTEM	LEGRAND/ CRESTRON / LUTRON
40	AUTOMATION SYSTEM	LEGRAND/ SCHNEIDER/ CHRSTRON/ELAN/ CONTROL4/LUTRON
41	CURTAIN CONTROL	SOMFY /HELVAR/FOREST

42	DAYLIGHT SENSORS, DAYLIGHT, OCCUPANCY SENSORS/ DALI 2DAY LIGHT SENSORS	LEGRAND/TRIDONIC / OSRAM / TECHNOSENSE /THEBEN / CRESTRON / NUTRON
43	BLDC CEILING FANS / WALL FAN / AIR CIRCULATOR / PEDASTAL FANS	CROMPTON /HAVELLS /ORIENT/ ATOMBERG
44	EXHAUST FANS	KIMCO / MICO/ AIRFLOW/ CROMPTION/HAVELLS/ C.G.
45	INDUSTRIAL SOCKETS (METAL CLAD)/ ABS PLASTIC INDUSTRIAL SOCKETS/ 1 PHASE & 3 PHASE COMBINED	LEGRAND / SCHNEIDER / HENSEL/LAURITZ KNUDSEN-formerly by L&T
46	CONVENTIONAL PLATE & PIPE FREE EARTHINGS	ATHRVA, /ASHLOK/ JEF TECHNO/RAPID/ SEEMA ELECTRODE/INDELEC INDIA
47	MAINTENANCE FREE EARTHINGS	ATHRVA, /ASHLOK/ JEF TECHNO/RAPID/ SEEMA ELECTRODE/INDELEC INDIA
48	LIGHTNING PROTECTION AS PER IEC62305	CAPE/OBO/JEF TECHNO/AXIS/APS SYSTEM(ALLIED POWER)
49	STREET LIGHT POLES & SMART POLES	TRANSRAIL/ VALMONT/KASLEK/SURYA ROSHNI/K-LIGHT
50	PVC CONDUIT & ACCESSORIES	PRECISION / DIAMOND, CIRCLE
		ARK,/POLYCAB
51	CASING CAPING	LEGRAND/MODI / PRECISION / DIAMOND, CIRCLE ARK,
52	WIRES (FRLSHZ-ZHFR ONLY) FOR WIRING	FINOLEX / RR CABLE/ POLYCAB/HAVELLS/KEI/APAR
53	MODULAR SWITCH / PLATES / SOCKETS / BOX /CELLING ROSE /HOLDER & ACCESSORIES (MEDIUM RANGE FOR HOSPITAL)	LEGRAND / MK- HONEYWELL/ SCHINDER/CRABTREE- HAVELLS **(RANGE SHOULD BE HIGHER COMMERCIAL RANGES FOR CORPORATE OFFICE)**
54	DWC HDPE – DOUBLE WALL CORRUGATED PIPES	REX/ GEMINI / GEORG FISCHER/ELMEX/ CONNECTWELL/ESSEN/ WAGO
55	HOT DIPPED GALVANISED CABLE TRAY (PERFORATED/LADDER)	ELCON / ASIAN ANCILIARY CORPORATION, INDIANA/PROFAB/AKG/S. S. INDUSTRIES PUNE/OBO / BRAVO/JAYPEE
56	WIRE MESH TYPE TRAY	LEGRAND/WBT NVENT/COPPER B-LINE
57	**UPS** 1:1 INBUILT/EXTERNAL 'X'MER ISOLATION	VERTIV /EATON/ DELTA/TMEC/SCHINDER/ NUMERIC

58	INVERTER	POWERTRONICS/LUMINOUS/SUKAM/MICRO TECK/EATON/ NUMERIC
59	TUBULAR/ SMF MAINTENANCE FREEBATTERY	EXIDE / AMARON /AMAR RAJA/QUANTA
60	D.G.SET WITH CANOPY	SUDHIR POWER / STERLING GENSET / CUMMINES POWERICA/ CATERPILLER FG WILLSON/ CATERPILLAR
61	D.G. ENGINE	CUMMINS / CATERPILLER /ASHOK LAYLAND/KIRLOSKAR
62	ALTERNATOR	STAMPFORD / LARY-SOMAR /ASHOK LAYLAND
63	GI FLOOR TRUCKING SLOTTED OR NON SLOTTED RACWAYS/ JUCTION BOXES	LEGRAND/OBO
64	PVC TRUNKING	MK-HONEYWELL/LEGRAND
65	FIRE GAS SUPPRESION SYSTEM	KANEX/SAFEX/MINIMAX/SEASEFIRE
	SOLAR GRID SYSTEM	
67	SOLAR MODULES	HAVELLS/ BENQ /TATA/WAREE
68	SOLAR INVERTER WITH REMOTE MONITORING.	SILING/SOLIS/GROWWATT
69	AJB	LEPL/ TRINITY TOUCH/ ADLER STANDARD WITH LAURITZ KNUDSEN-FORMERLY BY L&T & SCHINDER MAKE
70	ACDB	LEGRAND/ LEPL/ TRINITY TOUCH/ ADLER STANDARD WITH LAURITZ KNUDSEN-FORMERLY BY L&T & SCHINDER MAKE
71	DC CABLE LESS THAN 3 % VOLTAGE DROP	POLYCAB/SIECHE M/LAPP/RR KABLE
72	AC CABLE LESS THAN 3 % VOLTAGE DROP	HAVELLS/POLYCAB/RR KABLE
73	LIGHTING ARRESTOR	OBOBETTERMANN/ ERICKO/ GE/JEFF TECHNO / ALLIED POWER SYSTEM
74	EQUIPOTENTIAL BONDING	OBOBETTERMANN/ ERICKO/ GE/JEFF TECHNO / ALLIED POWER SYSTEM
75	MCCB FORGRID PANEL	ABB/LAURITZ KNUDSEN-BY L&T /SIEMENS /SCHNEIDER/ABB
76	SYSTEM INTIGATOR	ORIANA INDIA/ SOLITIES ELECTRICAL/

	LIST OF APPROVED MAKELIST FOR PASSIVE NETWORK SOLUTION	
77	UTP COMPONENTS FOR STRUCTURE CABLING SYSTEM CAT6 / CAT A	LEGRAND/ SYSTIMAX/ PANDUIT
78	MDF BOX	KRONE/LEGRAND/DLINK/ UNIFY/ ALCATEL
79	FIBER OPTIC CABLE COMPONENTS FOR STRUCTURE CABLING SYSTEM:	LEGRAND/ SYSTIMAX/ PANDUIT
80	COPPER CABLE FOR FIRE ALARM, PUBLIC ADDRESS, JELLY FILLED ARMOURED, ETC	FINOLEX / POLYCAB / RR KABEL/BELDON /DELTON
81	FLOOR MOUNT NETWORK ENCLOSURES	APW/ VALRACK-LEGRAND/ RITTAL
82	NETWORK ROUTER	CISCO/ JUNIPER/NETGEAR/HP-ARUBA
	LIST OF APPROVED MAKELIST FOR ACTIVE NETWORK, ACCESS POINT SOLUTION & UTM SOLUTION	
83	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI CONTROLLER, SFP MODULES ETC.) CORE SWITCH	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
84	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI CONTROLLER, SFP MODULES ETC.)DISTRIBUTION SWITCH	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
85	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
	CONTROLLER, SFP MODULES ETC.) 24/48 PORT ACCESS SWITCH WITH 4 10G UPLINK	

86	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI CONTROLLER, SFP MODULES ETC.) 24/48 PORT POE+ ACCESS SWITCH WITH 4 10G UPLINK	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
87	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI CONTROLLER, SFP MODULES ETC.) 10 GIGABIT SFP MODULES	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
88	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI CONTROLLER, SFP MODULES ETC.) WIRELESS CONTROLLER	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
89	ACTIVE COMPONENTS (ROUTERS, FIREWALL, SWITCHES, WIFI ACCESS POINTS, WIFI CONTROLLER, SFP MODULES ETC.) WIRELESS ACCESS POINTS	HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
90	FIREWALL / UNIFIED THREAT MANAGEMENT SYSTEM	SOPHOS, CHECKMATE, CISCO, FORTINATE, SONICWALL
91	RACK	NETRACK/ RITTAL / APW/ VALRACK-LEGRAND
92	NETWORK MANAGEMENT SOFTWARE	RITS/HP ENTERPRISE- ARUBA, CISCO ENTERPRISE, EXTREME NETWORK/NETGEAR
93	COAXIAL WIRES RG6/RG11	FINOLEX/ DELTON/ SKYTONE/ L&T/ KEI/GLOSTER/ RR KABEL
94	WORKSTATIONS, STORAGE	HP/ DELL/ IBM
	LIST OF APPROVED MAKELIST FOR UNIFIED VOICE COMMUNICATION SOLUTION	
95	IP-EPABX SYSTEM	CISCO, UNIFY, AVAYA, MATRIX
96	IP PHONE TYPE & PUSH BUTTON	CISCO, UNIFY, AVAYA, MATRIX

97	**LIST OF APPROVED MAKELIST FOR ACCESS CONTROL & TIME ATTENDANCE SOLUTION**	
98	FINGER & CARD BASED CONTROLLER	MATRIX, HONEYWELL, SMART-EYE,SPECTRA
99	CARD BASED READER	MATRIX, HONEYWELL, SMART-EYE,SPECTRA
100	ACCESS CONTROL & TIME ATTENDANCE SOFTWARE	MATRIX, HONEYWELL, SMART-EYE,SPECTRA
101	TIME ATTENDANCE MODULE	MATRIX, HONEYWELL, SMART-EYE,SPECTRA
102	ACCESS CONTROL MANAGEMENT MODULE	MATRIX, HONEYWELL, SMART-EYE,SPECTRA
103	ELECTRO DOOR MAGNET SINGLE & DOUBLE	ALGATECH/EBLECO/ASSAABLOY/BELL
104	NETWORK RACK	NETRACK/ APW/ VALRACK-LEGRAND
	LIST OF APPROVED MAKELIST FOR PHYSICAL SECURITY	
105	SWING RECTRACTABLE FLAP BARRIER	MAGNETIC / AUTOMATIC SYSTEMS / WOLPAC / MAGTECH/MOTWANE/ /RAPISCAN/GARRETT/GANNEBO
106	MOTORISED VEHICLE BARRIER	MAGNETIC / AUTOMATIC SYSTEMS / WOLPAC / MAGTECH/MOTWANE/ /RAPISCAN/GARRETT/GANNEBO
107	UVSS	MAGNETIC / AUTOMATIC SYSTEMS / WOLPAC / MAGTECH/MOTWANE/ /RAPISCAN/GARRETT/GANNEBO
108	HHMD & DFMD	MAGNETIC / AUTOMATIC SYSTEMS / WOLPAC / MAGTECH/MOTWANE/ /RAPISCAN/GARRETT/GANNEBO
109	XRAY BAGGAGE SCANNER	MAGNETIC / AUTOMATIC SYSTEMS / WOLPAC / MAGTECH/MOTWANE/ /RAPISCAN/GARRETT/GANNEBO
110	**LIST OF APPROVED MAKELIST FOR VIDEO SURVEILLANCE SYSTEM SOLUTION**	
111	IP HD VERIFOCAL DOME CAMERA	BOSCH / AXIS /SONY/AVIGILON/MOBOTIX

112	IP HD VERIFOCAL BULLET CAMERA	BOSCH / AXIS /SONY/AVIGILON/MOBOTIX
113	IP HD IR PTZ CAMERA	BOSCH / AXIS /SONY/AVIGILON/MOBOTIX
114	VIDEO MANAGEMENT WITH HIGHER ANLYTICS SOFTWARE WITH VIDEO ANALYTICS SOFTWARE	GENETEC/MILESTONE/CAMERA OEM
115	MANAGEMENT SERVER	HP, DELL, CISCO,Q-NAP SYNOLOGY
116	RECORDING SERVER	HP, DELL, CISCO,Q-NAP SYNOLOGY
117	STORAGE HDD	SEGATE/WD/TOSHIBA
118	VIDEO WALL SCREEN/HD TV	SAMSUNG, LG, SONY
119	NETWORK RACK	NETRACK/ APW/ VALRACK-LEGRAND
120	**LIST OF APPROVED MAKELIST FOR VIDEO CONFERENCE AND INTERACTIVE DISPLAY SOLUTION**	
121	VIDEO CONFERENCE SOLUTION	CISCO / POLYCOM / AVAYA
122	INTERACTIVE DISPLAY SOLUTION	PANASONIC / LG / SAMSUNG/LOGIC
	LIST OF APPROVED MAKELIST FOR BUILDING MANAGEMENT SYSTEM	
123	SYSTEM INTEGRATION UNIT / SOFTWARE	HONEYWELL (Trend)/SCHNIDER/JCI (Metasys)/ENLITE Research
124	PROGRAMMABLE & APPLICATION DDC ENCLOSURE IP54 WEATHERPROOF	HONEYWELL (Trend)/SCHNIDER/JCI (Metasys)/ENLITE Research
125	IMMERSION TEMPERATURE SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
126	DUCT TEMPERATURE SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
127	OUTSIDE AIR TEMPERATURE SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
128	ROOM TEMPERATURE SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
129	DUCT HUMIDITY SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
130	ROOM HUMIDITY SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
131	PRESSURE TRANSMITTERS	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
132	ELECTROMAGNETIC / ULTRASONIC FLOW METER	KAMSTRUP / SHENITECH / GREYSTONE/ NEXTON / JCI/KELE

133	DIFFERENTIAL PRESSURE SWITCHES	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
134	DIFFERENTIAL PRESSURE SWITCHES	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
135	WATER FLOW SWITCHES	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
136	CO SENSOR & CO2 SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
137	AIR VELOCITY SENSOR	HONEYWELL/GREYSTONE/NEXTON/JCI/KEL
138	LEVEL SWITCHES	RADIX/SONTAY/FILPRO/VEKSELER/ NEXTO
139	LEVEL TRANSMITTERS	RADIX/SONTAY/FILPRO/VEKSELER/NEXTO
140	CPU WORKSTATION COMPUTER WITH HIGHEND GRAPHICS CARDS	HP/ DELL/ LENOVO
141	COLOUR MONITOR	HP/ DELL/ LENOVO/SAMSUNG/LG
142	PRINTER	HP/ DELL/ CANON/ EPSON
143	MOUSE	HP/ DELL/ LENOVO
144	COPPER CONDUCTOR CONTROL CABLE WITH RODENT PROOF	BELDON/AGILON/APAR/RR KABLE
145	COMMUNICATION CABLES / SIGNAL CABLE, WITH RODENT PROOF	BELDON/AGILON/APAR/RR KABLE
146	FRLSZH CABLES / WIRES	FINOLEX / KEI/RR KBALE / HAVELLS/ POLYCAB/APAR / KENTER
147	HOT DIPPED GALVANISED CABLE TRAY (PERFORATED/LADDER)	ELCON / ASIAN ANCILIARY CORPORATION, LEGRAND, INDIANA/PROFAB/AKG/S. S. INDUSTRIES PUNE/OBO
148	WIRE MESH TYPE TRAY	ELCON / ASIAN ANCILIARY CORPORATION, LEGRAND, INDIANA/PROFAB/AKG/S. S. INDUSTRIES PUNE/OBO

Note: Any other item not mentioned but required at site will be as per the final approval of Client / PMC.

LIST OF PREFERRED MAKES OF EQUIPMENT/ MATERIAL

Preferred makes of equipment and materials are given below. Although the preferred makes are given, the Contractor shall submit samples of all materials other than heavy equipment and obtain prior approval of the Architect/ Consultants (whose decisions shall be binding) for the make of each item before ordering the same. This condition is also applicable to all items of equipment and material for which makes are not given in this specification:

Sr. No	Material	Approved Make
A	**ADDRESSABLE FIRE DETECTION SYSTEM**	
1	Fire Alarm Panel, Repeater Panel	BOSCH / ESSAR / GAMEWEL
2	Loop Cards	BOSCH / ESSAR / GAMEWEL
3	Photelectric Smoke Detectors	BOSCH / ESSAR / GAMEWEL
4	Heat Detectors	BOSCH / ESSAR / GAMEWEL
5	Multisensor Detectors	BOSCH / ESSAR / GAMEWEL
6	Interface Modules : Monitor / Relay / Control / Zone Monitor etc.	BOSCH / ESSAR / GAMEWEL

7	Sounders / Sounder cum Flashers / Strobes / Annunciation devices	BOSCH / ESSAR / GAMEWEL
8	Manual Pull Stations / Manual Call Point	BOSCH / ESSAR / GAMEWEL
9	Power Supplies	BOSCH / ESSAR / GAMEWEL/MEANWELL
B	**PUBLIC ADDRESS SYSTEMS**	
1	Main Controller	Bosch PAVIRO / Honeywell VARIODYN / TOA
2	Router	Bosch PAVIRO / Honeywell VARIODYN / TOA
3	Amplifier	Bosch PAVIRO / Honeywell VARIODYN / TOA
4	Volume Control	Bosch PAVIRO / Honeywell VARIODYN / TOA
5	Background music source	Bosch PAVIRO / Honeywell VARIODYN / TOA
6	Call Station	Bosch PAVIRO / Honeywell VARIODYN / TOA
7	Speakers	Bosch PAVIRO / Honeywell VARIODYN / TOA
C	**FIRE EXTINGUISHERS**	
1	Carbon Di-oxide type Extinguishers	SAFEX / KANNEX / MINIMAX
2	ABC type Fire Extinguishers	SAFEX / KANNEX / MINIMAX
3	Clean Agent Fire Extinguishers	SAFEX / KANNEX / MINIMAX
4	Mechanical Foam type Extinguishers	SAFEX / KANNEX / MINIMAX

5	Panel Suppression System	SAFEX / KANNEX / MINIMAX
D	**RODENT REPELLENT SYSTEM**	
1	Satellite Stations / Transducers	R Scat
2	Controller	R Scat
3	Wire	As Manufactures Requirement
4	Conduit	Precision / Supreme / Asian, Eqv ISI
E	**SELF CONTAINED EMERGENCY EXIT SIGNAGES**	
1	Self contained Emergency Exit Signages	INNOWARE / TEKNOWARE / SPT / COOPER
F	**WET SPRINKLER SYSTEM**	
1	Sprinklers	Victaulic /Tyco/ Reliable
2	Pipes	Jindal/TATA/Apollo
3	Valves	INTERVALVE / ZOLOTO / AUDCO
4	Ball Valves	HD Fire/Audco/Tyco /Lehry / Intervalve
5	SS Flexible Drops	Victaulic /Tyco/ Gilpro/ Reliable
6	Paddle type Flow Switch	SYSTEM SENSOR / HONEYWELL
7	Pressure Guage	Victaulic/H Guru / Omega / Waree / Fiebig
8	Non Return valves	Audco / Zoloto / Leader

9	Test Valve Drain kit	Victaulic /TYCO / Giacomini
10	Air Vent Valve	Giacomini / Zoloto / Tyco
11	Anchor Fastner & Rod (Hi-Tech Support)	Hilti / Chili / Fischer
12	Welding Rod	L&T / Advani / Esab
13	Paints (Low VOC)	Asiants / Berger / Shalimar
G	**HIGH SENSITIVITY SMOKE DETECTION SYSTEM**	
1	High Sensitivity Smoke detection unit	Xtralis / Securiton / Protec
2	Air Sampling Piping Sch. 40	Precision / Garware / Eqv
3	Capillary Tubes & Sampling Points	Xtralis / Securiton / Protec
4	Remote Display Module	Xtralis / Securiton / Protec
H	**WATER LEAK DETECTION SYSTEM**	
1	Water Leak sensing Cable & Accessories	Synopsis
2	Main Water Leak Panel	Synopsis
3	Hooter	Dixi / Senje / Eqv.

I	**FIRE CURTAIN SYSTEM**	
1	Fire Curtain	STOBICH FIRE CURTAIN / KONEBA FIRE CURTAIN / ORIENT
2	Controller	STOBICH FIRE CURTAIN / KONEBA FIRE CURTAIN / ORIENT
3	Hooter	Dixi / Senje / System Sensor
4	Manual intermittent button	Insyn, ESSL
J	**CABLES AND CONTAINMENT**	
1	FRLS Cat-6e ,shielded, PVC sheathed Armoured FRLS Cable	Legrand/Systimax/Pamduit
2	Perforated GI Cable tray, Medium Duty	Legrand/Panduit
3	GI Trunking	Legrand/Panduit
4	I/Os, Patch cord, Patch Panel	Systimax/Legrand/Panduit
5	Server Rack, other Racks	Systimax/Legrand/Panduit
K	**HVAC Works**	
1	VRV / VRF Equipment	Daikin, Mitsubishi, O-General
2	Refrigerant Copper Piping	Mandev, Rajco, Mexflow, Daikin
3	PVC Drain Pipe	Prince, Supreme
4	Electrical Cable	Polycab, KEI, RR

5	MS Stand Material	Tata, Jindal
6	Anchor Fastener	Fisher / Hilti
7	Insulation -Nitrile Rubber	ARMAFLEX /A- Flex / K-Flex

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