

**E -Tender Document**

**PROPOSED “REPAIR/RENOVATION OF MPC BOARD’S REGIONAL OFFICE AND LABORATORY NAGPUR” LOCATED AT 5 TH & 6 TH FLOOR, UDYOG BHAVAN, NAGPUR, MAHARASHTRA 440001.**

**Tender No.:- MPCB/EE/03/25 Date – 17/4/2025**



**MAHARASHTRA POLLUTION CONTROL BOARD**  
**Kalpataru Point, 3<sup>rd</sup> & 4<sup>th</sup> Floor, Sion Matunga Scheme Road No.8**  
**Opp.Sion Circle, Sion (East), Mumbai-400 022**  
**Website: <http://mpcb.gov.in>**

**Price: Rs. 3540/- (Inclusive taxes)**  
**(Non Refundable)**

**(2025-26)**

**: ARCHITECTS & CONSULTANTS:**

**SANDEEP GOVALKAR DESIGN ASSOCIATES**

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**E – Tender are invited for Proposed Repair/Renovation of Regional Office and Laboratory at Udyog Bhavan on 5 th & 6 th At Civil Lines, Nagpur - 440001.**

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**Maharashtra Pollution Control Board**  
Kalpataru Point, 3rd & 4th Floor, Sion Matunga Scheme Road No.8  
Opp. Sion Circle, Sion (East), Mumbai-400 022  
**Website: <http://mpcb.gov.in>**

**Tender Notice**

**1) Tender Notice Details**

<b>Tender Reference no.</b>	<b>MPCB/EE/03/25 Date – 17/04/2025</b>
<b>Name of Work / Item</b>	<b>Repair and Renovation of MPC Boards Regional Office and Laboratory, Nagpur located at 5<sup>th</sup> and 6<sup>th</sup> floor, Udyog Bhavan, Nagpur, Maharashtra – 440 001.</b>
<b>Cost of blank tender document &amp; Mode of Payment</b>	<b>Rs. 3,540 incl. GST/- (Rupees Three Thousand Five Hundred Forty Only) (Non Refundable) to be paid through Online Payment Modes i.e. Net Banking during Tender Document Download Stage.</b>
<b>EMD Amount &amp; Mode of Payment</b>	<b>Rs. 3,16,693/- (Rupees Three Lakhs Sixteen Thousand Six Hundred Ninty Three Only) to be paid through Online Payment Modes i.e. Net Banking during Bid Preparation Stage.</b>
<b>Date ,Time and Place of Pre Bid Meeting</b>	<b>24/04/2025 15:00 Hrs at MPCB Conference Hall, Kalpataru Point, 4<sup>th</sup> Floor, Sion Matunga Scheme Road No.8, Opp. Sion Circle. Sion (E), Mumbai-400 022</b>
<b>Completion Period Of Project</b>	<b>06 Months</b>
<b>Venue of online opening of tender</b>	<b>MPCB Conference Hall, Kalpataru Point, 4<sup>th</sup> Floor, Sion Matunga Scheme Road No.8, Opp. Sion Circle, Sion (East), Mumbai - 400 022</b>
<b>Address for Communication</b>	<b>Member Secretary MPC Board, Kalpataru Point, 4<sup>th</sup> Floor, Sion Matunga Scheme Road No.8, Opp. Sion Circle, Sion (East), Mumbai - 400 022</b>
<b>Contact Telephone</b>	<b>Tel.No. – 022-24045589 Email - ee@mpcb.gov.in</b>
<b>e-Tendering Helpline Support:</b>	<b>24 X 7 Help Desk Toll Free No. 0120-4001 002, 0120-4001 005, 0120- 4493395</b>

## 2) E – TENDER TIME SCHEDULE

**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	17-04-2025	13.00	17-04-2025	17.00
2	RPF Document Download	17-04-2025	13.05	08-05-2025	17.00
3	Last Date of Submission of Pre-Bid Queries	17-04-2025	13.05	23-04-2025	17.00
4	Pre-Bid Meeting	24-04-2025 15.00 Hrs			
5	Bid Submission	17-04-2025	13.05	09-05-2025	15.00
6	Technical Bid Opening	13-05-2025	15.05	13-05-2025	15.05
7	Commercial Bid Opening	To be announce later			

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 Repair and Renovation of MPC Boards Regional Office and Laboratory, Nagpur located at 5<sup>th</sup> and 6<sup>th</sup> floor, Udyog Bhavan, Nagpur, Maharashtra – 440 001.**

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 [www.mahatenders.gov.in](http://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 [www.mahatenders.gov.in](http://www.mahatenders.gov.in)

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.

**e -Tendering Tool Kit for Bidders** (detailed Help documents, designed for bidders) has been provided on e-Tendering website in 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 etc 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.

If any assistance on the use of E-Tendering system, the User 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) TENDER DOCUMENT PURCHASE AND DOWNLOAD:-**

**4.1.** The tender document is uploaded / released on Government of Maharashtra, (GOM) etendering website [www.mahatenders.gov.in](http://www.mahatenders.gov.in) Tender document and supporting documents may be purchased and downloaded from above link of Mahatender site GoM, by making payment through **Online Payment Modes i.e. Net Banking etc**

**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:-

### 6.1. EARNEST MONEY DEPOSIT (EMD)

Bidders are required to pay Earnest Money Deposit (if applicable) through Online Payment modes i.e. **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.

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.

In case EMD is mandatory to all the bidders for a tender, offers made without EMD shall be rejected.

In Bid Preparation stage, bidders get access to Online Technical and Commercial Envelopes where they require uploading documents related to technical eligibility criteria and quote commercial offer for the work / item in respective online envelopes.

### 7) TECHNICAL BID:-

Following documents should be uploaded in Online Technical Envelope (T1) in PDF format, if required can be zipped as well and then uploaded during **Online Bid Preparation stage**.

The list of documents for Technical Envelope is as follows:

Sr. No	List of Document	Compulsory (C) / Additional (A)
	Pre-Qualification Documents to be submitted as per schedule – I:	
1	Preferences will be given to the Contractor who have ISO 9001-2015 certificate.	A
2	The Contractor shall submit experience certificate <b>of Similar work for execution</b> of single Interior, Electrical , HVAC, Laboratory works for any chemical industries or hospitals, Audio Visual with allied services works in any metropolitan region of Maharashtra state. One similar nature consisting of Interior, Electrical, HVAC & Allied works not less than Rs. 498 Lakhs OR Two similar works not less than 311 lacs Or Three similar works not less than 248 lacs in any Government/ Semi Government Department / local bodies such as MIDC/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. Also attach the TDS Certificates of these Projects.)	C

3	Professional Tax Registration Certificate for employees in E category for tenders without PQ and <b>both i.e. 'E' &amp; 'R' category for tenders where PQ is applicable.</b>	<b>A</b>
4	Registration Certification with GST Tax Deptt. Under GST Act 2017, of Govt. of Maharashtra.	<b>C</b>
5	Income Tax Returns for last 3 years & Certified by Chartered Accountant and copy of PAN card	<b>C</b>
6	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.	<b>C</b>
7	Goods & Service Tax Registration.	<b>C</b>
8	<b>Contractor shall do a Site Visit which is Compulsory</b> till a specific date & time.	<b>C</b>
9	Contractor shall have a MOU with AC Company for carrying out the specific work.	<b>C</b>
10	Contractor shall have a MOU with Electrical Licensed Agency for carrying out the specific work.	<b>C</b>
11	<b>Pre-Bid Meeting is Compulsory to attend with Tender fee receipt</b> and contractor shall upload minutes of Pre-bid meeting.	<b>C</b>

### 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) ONLINE BID SUBMISSION:-

In this stage, bidders who have successfully completed their Bid Preparation stage are required to transfer the data, already uploaded by them during Bid Preparation stage, from their custody to department's custody.



Note: During this stage, bidders won't have any capability to make any kind of changes or editing into technical as well as commercial data.

## **10) 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, Debit Card 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 documents and uploading those in the PDF format. This apart, bidders will have to quote commercial offer for the work / item, 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 pre-scribed schedule without which the tender will not be submitted.

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

Non-payment of processing fees will result in non-submission of the tender and Department will not be responsible if the tenderer is not able to submit their offer due to non- payment of processing fees to the e-tendering agency.

Detailed list of different modes of online payment to e-tendering service provider (**E-Payment Options**) has been provided under **E-Tendering Toolkit for Bidders** section of [www.mahatenders.gov.in](http://www.mahatenders.gov.in)

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 be entertained.

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

### **11) OPENING OF BID:-**

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 it's duly authorized representatives.

The bidder representatives who are present shall sign a register evidencing their attendance. Only one representative per applicant shall be permitted to be present at the time of opening the tender.

### **12) 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.

**13) 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.

**14) 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 fulfil 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.

Contractor who possess ISO 9001-2015 certificate will be considered as additional Qualification.

The Contractor shall submit **experience certificate of Similar works** for execution of single Interior, Electrical & HVAC with allied services works in Mumbai, Pune, Nagpur Region and Navi-Mumbai of similar nature consisting of Interior, Electrical, HVAC & Allied works not less than Rs. 498 Lakhs OR Two similar works not less than 311 lacs Or Three similar works not less than 248 lacs in any Government/ Semi Government Department / local bodies such as MIDC/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 five years signed by the Client not below the rank of Director.(Note: The weightage of costing for private works executed shall be considered 50% i.e. If the party has executed private work worth 100 lacs , then the same shall be considered as 50 lacs for the purpose of evaluation Subject to TDS Certificates of those projects to be attached.).

**Letter from one authorized channel partner from one OEM of approved make Air conditioning system authorization for giving full support for subjected tender in the name of the agency shall be submitted along with the tender.**

**“The Tender is open only to authorized distributors, dealers or resellers of the specified product/service. Direct submissions from the original Equipments**

**Manufacturer (OEM) will not be accepted and will be summarily rejected. Bidders are required to provide documentary evidence of their authorized status with the OEM, such as OEM authorization letter or a reseller agreement”.**

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 i.e. up to 31.03.2024 & certified copy Chartered Accountant & 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

Goods & Service Tax Registration

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

Contractor shall have a MOU with AC Company for carrying out the specific work

Contractor shall have a MOU with Electrical Licensed Agency for carrying out the specific work

Pre-Bid Meeting is Compulsory to attend with Tender fee receipt and contractor shall upload minutes of Pre-bid meeting

## **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	Interior jobs executed during last 3 years for Government/Semi Government and Private offices in Nagpur Region, Pune, Mumbai and Navi-Mumbai (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) in this case the Contractor must submit TDS Certificates.			
a	Interior, Electrical , HVAC & Audio-Visual, FF Systems jobs executed			
i	Interior works for office building (value bet. Rs. 5.00 crore to 2.50 crore in each case)		<b>15</b>	Copies of the orders executed in the designated period
	Upto 2 Nos	5		
	Upto 4 Nos	10		
	Over 4 Nos	15		
ii	Interior & HVAC works for offices (Area of job executed in Sqft)		<b>15</b>	
	Upto 7500 sqft	5		
	Upto 10000 sqft	7.5		
	Above 10000 sqft	9.		
	Upto 12000 sqft	10		
	Upto 15000 sqft	12.5		
	Upto 17500 sqft	15		

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2	Electrical, HVAC and Allied works executed			
a	Services work : (Value work should be above 0.35 crore in each case )		<b>10</b>	Copies of Work order
	Upto 2 Nos	5		
	Upto 4 Nos	7.5		
	Over 4 Nos	10		
3	Establishment of the firm in Nagpur Region, Mumbai, Pune and Navi-Mumbai (Max. 5 Marks)		<b>5</b>	Documentary evidence to be attached
	Upto 5 years	2.5		
	Upto 10 years	5		
4	Solvency certificate		<b>5</b>	Certificate from Bank
	2.5 Cr	2		
	More than 5 Cr	5		
5	Annual turnover of during last three years ( information must be supported with latest income tax certificate / Audited balance sheets )		<b>10</b>	Certificate from CA
a	Turnover of Rs. 15 to 20 Cr	5		
b	Turnover of more than Rs. 20 to 30 Cr	7.5		
c	Turnover of more than Rs. 30 Cr	10		
6	Permanent employee strength of the party ( should be working in the firm from past 2 years)		<b>5</b>	Salary register/ Bank payment statement
	Upto 20 Nos- Maximum of 15 labourers and 5 Engineering /Administration staff	2.5		
	Above 20 Nos- Minimum of 15 labourers and 5 Engineering / Administration staff	5		
7	Constitution of the Firm		<b>10</b>	
	Pvt Ltd Company	10		
	Partnership Firm	7.5		
	Proprietorship Firm	5		
8	Contractor having Workshop, machinery & equipment in		<b>10</b>	

	Nagpur Region, Mumbai, Pune and Navi-Mumbai.			
	Work Shop in Mumbai, Pune Nagpur Region & Navi Mumbai with Machinery & Equipment	5		
	Work Shop in Mumbai, Nagpur,Pune & Navi Mumbai	3		
	Machinery & Equipment	2		
9	Site Visit, Bar Chart, Program of work, Work Plan including Methodology & Quality Management plan.	5	<b>5</b>	
10	Technical presentation by the prospective Bidder	10	<b>10</b>	<b>A presentation has to be made by the Bidder to MPCB/Consultant/Architect</b> show casing the technical details of Project Completion Chart, Company Profile, Planning of works, Supporting work completion certificate . Contractor should provide a schedule of work along with duration.

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 0.60 of the Technical score and 0.40 of the Price score. The composite score (S) will be derived using following formula:

$$S = (S (t) * 0.60) + (S (p) * 0.40).$$

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. Sandeep Govalkar Design Associates** nominated by the employer 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 notwithstanding 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 nor do 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 unskilful 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**
- (c) **Third party Liability - Rs. 10.00 Lakhs (to be included in car policy)**

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 1<sup>st</sup> 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 ensue 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 Contractor 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 un-workman 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 2.5 % of accepted contract value by demand draft 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.

**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 thereof 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.

The contractor shall be entitled under the certificates to be issued by the Architect / consultant to the contractor within 10 working days from the date of certificate to payment from MPCB from time to time. The MPCB shall recover the statutory recovering other dues including the retention amount from the certificate of payment.

The final bill may be submitted by contractor within a period of one month from the date of virtual completion and Architect / consultant shall issue the certificate of payment within a period of two months. The MPCB shall pay the amount within a period of three months from the date of issue of certificate provided there is no dispute in respect of rates and quantities.

#### **41. Final payment**

The final measurement Certificate / Bill shall be prepared by the Consultants and Contractors within one 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.)
  - Clause 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. In case 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 inclusive GST, transportation, loading, unloading at site, wastage and any other levies etc.**

**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 03 Months
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, 3rd & 4th Floor, Sion  
Matunga Scheme Road No.8, Opp. Sion Circle, Sion (East), Mumbai - 400 022,  
Tel No. 022-24045589.

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 Rs.12, 50,000 as a security deposit in the form of BG / D.D. drawn in favour of **Maharashtra Pollution Control Board** which will be refundable, without interest, after the successful completion of the contract period.
72. In case of any dispute, the Mumbai is the jurisdiction.

Date:-

Place: -

(Name & Seal & Signature of Bidder)

## SPECIAL CONDITIONS OF CONTRACT (SCC)

### Scope of Work

The scope of Similar work consist of the work of **Proposed Repair/Renovation Of Regional Office And Laboratory At Udyog Bhavan On 5 Th & 6 Th At Civil Lines, Nagpur, Maharashtra 440001**.i.e. Interior, Plumbing, False Ceiling, Carpentry Work Fixed Furniture, Doors, Windows, Loose Furniture, **Laboratory Furniture**, HVAC, 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, Rodent repellent system, **State of the Art Audio-Visual Works for Conference room** & related Civil works 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. 06 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 an 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 of 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 including basement.

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 90 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/labour 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 90 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', 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.

39. **FACTORY INSPECTION**

**The Contractor should arrange for factory inspection of the HVAC machines (Make in India - Outdoor and Indoor units).** The HVAC machines offered for inspection shall be specific to MPCB project. The rate quoted shall include factory inspection for **4 persons inclusive of travelling expenses, boarding and food & Beverages etc.**

40 . **Additional Security Deposit**

If the cost bid/tender is less than 10% below of the estimated cost put to tender, then –

(A) Bank Guarantee/D.D. corresponding to the percentage over and above 10% and as per above 4.6.2 may be submitted in envelope no.2 along with bid/tender. (e.g. for Bid Offer of 14%, up to 10% below-1% and 14%-10%=4%, thus total = 1%+4%=5%). If this amount is less then Rs.1000/-, then Bank Guarantee /DD of minimum Rs.1000/- may be submitted.

(B) If bid/tender quoted is less than 15% below, then DD amount for the balance percentage over & above 15% be worked out at double rate and the same may be submitted (e.g. if the offer is 19% below, then (19-15=4% x2=8%).

## **ADDITIONAL TERMS AND CONDITIONS OF CONTRACT**

- a. 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.
- b. 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.
- c. 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.
- d. 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.
- e. 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.
- f. 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.

- g. Orders issued by the member secretary of MPCB from time to time regarding the conduct of the work shall be binding on the Contractor.
- h. 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.
- i. 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.
- j. Excavation items include, if met with, dewatering, whether specified or not and the rates quoted are deemed to be inclusive of this.
- k. 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.
- l. 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.
- m. 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.
- n. 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.
- o. Before staking any approved material, the same shall be freed from all foreign materials, if any. The material shall be stacked on cleared and levelled ground.
- p. The order of collection and utilization of materials will be decided by Engineer in charge so as to ensure orderly work.

- q. The materials will be stacked in a natural way without any attempt whatever to leave voids.
- r. The measurement of the road and building materials shall be without any deduction for voids.
- s. 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.
- t. 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 beforehand 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.
- u. 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 fit 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.
- v. 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.
- w. Under no circumstances shall any Contractor be entitled to claim enhanced rates for any items in this contract.
- x. 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, nallas topography etc. existing roads, means of communications & access to site of work etc.

- y. 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.
- z. 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.
- aa. 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.
- bb. 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.
- cc. 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.
- dd. The Contractor shall take all precautions, due care against by floods, rains, storms, outbreak 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.



## SAFETY CODE

- i. First aid appliances including adequate supply of sterilized dressings and cotton wool shall be kept in a readily accessible place.
- ii. An injured person shall be taken to a public hospital without loss of time, in cases where the injury necessitates hospitalization.
- iii. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from ground.
- iv. 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.
- v. 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.
- vi. No floor, roof or other part of the structure shall be so overloaded with debris or materials as to render it unsafe.
- vii. 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.
- viii. Those engaged in welding works shall be provided with welder's protective eye shields and gloves.
- ix. (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.
- x. 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.
- xi. Hoisting machines and tackles used in the works, including their attachments, anchorage and supports shall be in perfect condition.

- xii. 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

**PRICE SCHEDULE**

**NAME OF WORK: PROPOSED REPAIR/RENOVATION OF REGIONAL OFFICE AND LABORATORY AT NAGPUR.**

ARCHITECT / CONSULTANT					
SANDEEP GOVALKAR DESIGN ASSOCIATES				DATE :- 14/01/2025	
CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD					
PROJECT: - PROPOSED REPAIR/RENOVATION OF REGIONAL OFFICE AND LABORATORY AT NAGPUR.					
<b>BILL OF QUANTITIES</b>					
<b>NAME OF WORK: PROPOSED REPAIR/RENOVATION OF REGIONAL OFFICE AND LABORATORY AT NAGPUR.</b>					
<b>ABSTRACT</b>					
SR NO	DESCRIPTION	QTY	UNIT	RATE (Rs.)	AMOUNT (Rs.)
	<b>Sub Estimate No.1 - Demolition &amp; Civil works</b>				
1	Removing doors and windows of any size and type with frame, mild steel/ wrought iron grill work and stacking the same in compound or as Directed.	54	Nos		
2	Removing teak wood panelled/ partly glazed or veneer partitions carefully without damaging the frame or panels and stacking the same as and where directed.	450	Sqm		
3	Removing false ceiling in all types of ceiling i.e. Gypsum, Acoustical, Calcium silicate board, metal etc. including stacking the materials as directed with all leads & lifts.	962	Sqm		
4	Pulling down burnt brick masonry (in cement mortar) with plaster including sorting out serviceable bricks and stacking the same and debris separately up to a required distance meters or spreading the debris etc. complete.	45	Cum		

5	Removing the old cement concrete or any type of tiled flooring including leveling the surface, cleaning the site including sorting out serviceable tiles and stacking the same and debris disposing with all lead and lift.	962	Sqm		
6	Dismantling old existing electrical works including switch, socket, wire etc with all lift & leads etc. complete as per directed.	1	Job		
7	Removing the existing cement plaster of any thickness without causing dust nuisance and stacking the debris upto a distance of 50 metres or spreading in the compound and cleaning the site etc. complete.	700	Sqm		
8	Removing existing water proofing treatment such as I.P.S./Brick bat coba etc. from terrace/toilet block without damage to structure, leveling and cleaning the surface for providing new specialized water proofing treatment etc complete.	460	Sqm		
9	Providing and constructing 200mm thick steam cured cellular (aerated) concrete block masonry with steam cured cellular concrete block confirming B.I.S. 6041/6042/6441/ 3809 having density not less than 640 Kg. per Cum. in Cement Mortar 1:6/ Self curing Polymer modified block jointing mortar including adequate plasticizer for non-bearing portion including racking out joints scaffolding & curing etc. complete.	15	Sqm		
10	Providing and constructing 150mm thick steam cured cellular (aerated) concrete block masonry with steam cured cellular concrete block confirming B.I.S. 6041/6042/6441/ 3809 having density not less than 640 Kg. per Cum. in Cement Mortar 1:6/ Self curing Polymer modified block jointing mortar including adequate plasticizer for non-bearing portion including racking out joints scaffolding & curing etc. complete.	260	Sqm		
11	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:4 without neeru finish to concrete or brick surfaces in all positions including scaffolding, and curing complete.	400	Sqm		

12	Providing internal cement plaster 6 mm thick in single coat in cement motar 1:4 without neeru finish to concrete surface in all positions including scaffolding, curing complete.	718	Sqm		
13	Providing waterproofing in W.C. and bath including brick bat coba in all position including providing and laying 12mm bedding in cement mortar 1:3 on concrete slab with waterproofing compound @ 1kg/per bag of cement laying brick bat coba of required thickness in cm 1:5 with waterproofing compound 1 kg/bag of cement grouting and finishing the top layer with 20mm thick brick bedding in cm mortar 1:3 with waterproofing compound 1 kg/per bag of cement and testing the treated portion for 48 hours by pond test and covering ten years' guarantee on requisite stamp paper including all leads, lifts and curing etc. complete <b>(Considering avg. depth of 200 mm)</b>	20	Cum		
14	Providing waterproof plaster in Washroom/Pantry areas 12 mm thick for dado in cement mortar 1:3 with neat finishing, floating using waterproofing compound at the rate of 1 kg. per bag of cement of approved make and manufacturer and curing etc. complete.	150	Sqm		
15	Chipping the R.C.C. surface and cleaning the rusted reinforcement and exposed surface by wire brush mechanical device or any other established method and applying rust removing solution of approved make and quality with cotton waste swab to reinforcement and allowing to dry the same for 24 hours, brushing of loose particle and applying 1st coat of rust preventive coating of polymer and cement slurry in 1:1.5 proportion with soft brush without adding water including applying another coat of rust preventing after 4 hours allowing Air Curing for 48 hours etc. including scaffolding etc. complete.	30	Sqm		

16	Providing and applying priming cum bonding coat of polymer of approved make and quality as approved by Engineer-in-charge and cement slurry in 1:1 proportionate by weight to concrete area by brush or any other established method etc. complete.	30	Sqm		
17	Providing and applying 15 mm thick polymer mortar to load carrying R.C.C member in two layers in proportion of 1:5:15 by weight Polymer of approved quality and make, cement and wash quartz sand with required W.C. ratio for desired consistency and applying and finishing by floating, curing after initial setting time etc. as per manufactures specification etc. complete.	35	Sqm		
18	Providing sand face plaster externally to concrete, stone or brick surfaces using approved screened sand including preparing the base, watering and applying base coat of 15 mm thick in cement mortar 1:4 using Supercorn-100 as melamine based super plastizer 1% by weight of cement, krifib synthetic fiber a additions at 125 gm per bag of cement and Sufumex-100D of Krishna Conchem Products or of approved manufacturer i.e. Natural Amorphous microsiliceours admixture @ 2% by weight of cement curing the same for not less than two days and keeping the surface of base coat rough to receive the sand faced treatment not to exceed 8 mm thickness in cement mortar 1:4 and finishing the surface by taking out grains and curing for 14 days and scaffolding etc. complete.	40	Sqm		
19	Providing & laying <b>Anti-Skid Stone Finish Vitrified tiles flooring for toilet area</b> of size 600mm X 600mm, 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 (Basic Rate 100 / Sqft)	64	Sqm		

20	Providing & laying Double Charged <b>Polished Finish Vitrified tiles flooring for office area</b> of size 800mm X 800mm, 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. (Basic Rate 95 / Sqft)	636	Sqm		
21	Providing & laying chemical resistant <b>tiles flooring for lab area</b> of size 600mm X 600mm X 20mm, 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. (Basic Rate 175 / Sqft)	160	Sqm		
22	Providing & fixing in position <b>Vitrified Tile Dado</b> in approved shape, size 600mm X 600mm & colour and pattern in dado truly in plumb up to part or full height of wall with machine cut top edge as per the drawings over cement, sand. backing coat plaster of 15mm / required thickness in CM 1:4 proportion, including fixing with cement paste of required consistency to avoid any possibility of hollowness behind the tiles, filling the joints with white cement and matching color pigments including curing, scaffolding etc. complete as per drawing, specifications and as directed by the Engineer - In - Charge. (Basic Rate 100 / Sqft)	94	Sqm		
23	Providing & fixing in position <b>Vitrified Tile Dado</b> in approved shape, size 300mm X 600mm & colour and pattern in dado truly in plumb up to part or full height of wall with machine cut top edge as per the drawings over cement, sand. backing coat plaster of 15mm / required thickness in CM 1:4 proportion, including fixing with cement paste of required consistency to avoid any possibility of hollowness behind the tiles, filling the joints with white cement and matching color pigments including curing, scaffolding etc. complete as per drawing, specifications and as directed	824	Sqm		

	by the Engineer - In - Charge. (Basic Rate 75 / Sqft)				
24	Providing and fixing in position & in stepped manner one side mirror polished machine cut Granite slab Jamblining for Door / Window frames of width upto 300mm 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 jamblining. (Basic Rate 275 / Sqft)	380	Rmt		
25	Providing and fixing solid Prelaminated 10-12 mm thk wooden flooring matching to veneer/wood as per the area Design and as directed & Approved by the architect / bank engineer.(Basic Rate of wooden tile - Rs. 150 /- Per Sqft) (area – RO Cabin)	80	Sqm		
26	Providing and fixing solid wooden skirting of 2nd class, well-seasoned C.P teak wood (wood shall be chemically treated in plant) matching to veneer of size 6" X 0.75" as per design with 3coats of silk melamine polish matching to veneer/wood as per the area and as directed by the architect / bank engineer. (area – RO Cabin)	62	Rmt		
27	Providing and laying carpet tile of the approved make machine tufted textured loop pile , 600x600 mm or 500x500 mm	30	Sqm		

	size, 600-700 gms /sq.mtrs, pile thickness min. 8mm, 100% solution dyed nylon, antimicrobial , and of approved make & shade work includes removing the existing old flooring etc. As directed. The rates shall be inclusive of all taxes, freight charges, fitting, fixing by manufacturers approved adhesive, wastage etc. The payment will be made as per actual measurement .making cut-outs for junction boxes etc. Complete as directed.(Basic Rate of carpet tile - Rs. 150 /- Per Sqft)				
28	Providing and laying 16mm-18mm thick machine mirror polished granite slab of approved colour and approved texture in 1:4 cement mortar bedding of average 25 mm thick in proper line and level including cement slurry and filling the joints with roff/balendura make joint filling compound of the same shade of the granite on walls. The rate includes costs of all materials, equipments, labour charges, curing, rubbing, washing, cleaning the surface etc. Complete as per instructions of banks engineer / architect. Etc. Complete. (Basic cost of polished granite slab rs.225/- per sft) (area -passage)	55	Sqm		
	<b>Total For Sub Estimate No. 1</b>				
	<b>Sub Estimate No. 2 - Plumbing Works</b>				
1	Providing and fixing chlorinated Poly Vinyl Chloride (CPVC) Pipes, having thermal stability for hot and cold water supply including all CPVC plain & brass threaded fittings i/c fixing the pipe with clamps at 1.00 mtr spacing. This includes jointing of pipe				
	Same as above for concealed including cutting, drilling holes in walls/slab etc. and remaking well the demolished portion neatly. (Internal concealed work) <b>Note: Add 10% in respective rate for concealed piping.</b>				
a	15mm nominal OD pipe	45	Rmt		
b	20mm nominal OD pipe	30	Rmt		



2	Providing and fixing 15 mm dia Piller cock with guarantee sensor, against any manufacturing defect including socket, union nuts etc. complete. As per direction of Engineer - in - Charge. (Basic Rate - Rs. 9000/nos)	12	Nos		
3	Providing and fixing European type commode including outlet, inter connections through walls including all fittings etc. complete. As per direction of Engineer - in - Charge. (Basic Rate - Rs. 11900/nos) Toilet	9	Nos		
4	Providing and fixing counter top wash hand basin, conforming to IS:2556 (Part IV) 1994 with nickel / chrome plated fittings inlet and outlet connection, nickel plated pillar cock, bottle Trap, down take GI pipes etc complete as per direction of EIC (Basic Rate - Rs. 8000/nos) Toilet	12	Nos		
5	Providing and fixing 10 cm cast iron Nahani Trap with fixed cast iron grating, cast iron plug bend and piece of cast iron pipe upto plug bend etc. complete. (Basic Rate - Rs. 1000/nos)	20	Nos		
6	Providing and fixing <b>Soap Dispenser with Glass bottle</b> with all types of fixtures including labour charges including transport charges etc. complete. (Basic Rate - Rs. 1600/nos)	9	Nos		
7	Providing and fixing 15 mm dia 2 Way BIB cock long body with flange, guarantee against any manufacturing defect including socket, union nuts etc. complete. As per direction of Engineer - in - Charge. (Basic Rate - Rs. 1900/nos) 2 Way Bib Cock	9	Nos		
8	Providing and fixing Jet Spray with guarantee against any manufacturing defect including socket, union nuts etc. complete. As per direction of Engineer - in - Charge. (Basic Rate - Rs. 1400/nos) Jet Spray	9	Nos		
9	Providing and fixing <b>Flush Valve (Urinal)</b> of approved quality etc complete. As per direction of Engineer - in - Charge. (Basic Rate - Rs. 1200/nos) <b>Flush Valve</b>	5	Nos		

10	Providing and Fixing of Mirrors with S.S. Framing 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. <b>Mirror Paneling</b>	10	Sqm		
11	Supplying, Providing and fixing in position of approved make first quality, recessed, roller type <b>or</b> box type white glazed <b>toilet paper holder with flap</b> etc complete as per direction of Engineer - in - charge. (Basic Rate - Rs. 900/nos)	9	Nos		
12	Urinal (Flat Back) : Providing & fixing flat back urinal with Sensotronic Sensor Flushing valve for urinal of size 710 x485 x 300 mm of approved quality make & colour conforming to relevant IS latest revision, including outlet & inlet connections, flush walls all necessary fitting, fixtures etc (Basic Rate - Rs. 10000/nos)	5	Nos		
13	Providing and laying <b>UPVC pipes</b> of standard make in line and level including necessary labour, bends, tees, fixtures etc. and testing the pipes complete.				
	100 mm diameter	5	Rmt		
	75 mm dia	12	Rmt		
	50 mm dia	30	Rmt		
14	Providing and fixing Chromium Plated Alluminium Towel Rail 750 mm (2'6") long, 20mm (3/4") dia and of approved quality fixed on chromium plated bracket including providing teak wood gutties in masonry etc complete as per direction of Engineer - in - charge (Basic Rate - Rs. 1600/nos)	7	Nos		
15	Providing and fixing 15 mm dia Angle cock with guarantee against any manufacturing defect including socket, union nuts etc complete as per direction of Engineer - in - charge. (Basic Rate - Rs. 1400/nos)	17	Nos		
16	<b>Providing and fixing in position Double coat hooks</b> as per instructions from EIC/Architect <b>(Basic Rate - Rs. 425/nos)</b>	9	Nos		

17	<b>Providing and fixing in position Hand dryer</b> as per instructions from EIC/Architect (Basic Rate - Rs. 8250/nos)	6	Nos		
18	<b>Providing and fixing in position Urinal Partition of 12 mm thk toughened frosted glass 3' x 2' as per design &amp;</b> instructions from EIC/Architect	3	Nos		
19	<b>Providing and fixing in position SS sink for kitchen / pantry</b> as per instructions from EIC/Architect ( <b>Basic Rate - Rs. 3300/nos</b> )	2	Nos		
20	Providing and fixing 15 mm dia Piller cock for Sink with guarantee against any manufacturing defect including socket, union nuts etc. complete. As per direction of Engineer - in - Charge. (Basic Rate - Rs. 2200/nos)	2	Nos		
	<b>Sub Estimate No. 3 - Painting work</b>				
1	<b>POP Wall Punning</b>	685	Sqm		
	Providing & Applying <b>Plaster of Paris Punning</b> 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 directions of Engineer - In - Charge.				
2	Providing and applying <b>TEXTURED paint</b> of approved colour & shade to old and new surface including scaffolding preparing the surface to finishing with 2 coats etc complete as per direction of Engineer - in charge. (Basic Rate - Rs. 85/ sft)	20	Sqm		
3	Providing & Applying superior quality of Luster Paint of approved make & shade, using roller to get approved Textured surface in 3 or more coats including preparation of surfaces, applying cement primer of approved make & shade etc. complete as per directions & manufacturer's specifications & instructions of Engineer - In - Charge.	210	Sqm		

4	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 over primers, including scaffolding, preparing the surfaces to receive the paint and applying putty etc. complete.	425	Sqm		
5	Providing and applying washable oilbound distemper in three coats to old/new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface to receive the paint by brushing and brooming down and applying putty etc. complete.	30	Sqm		
<b>Total For Sub Estimate No. 3</b>					
<b>Sub Estimate No. 4 - Carpentry Works.</b>					
1	<b>Aluminium Frame Work for Partitions /Paneling</b>				
	Providing and fixing in position Aluminium Frame Work of Square hollow sections of given size for partitions, panelling, boxing, soffits etc. with vertical & horizontal members at not more than 600 mm center to center. All complete including necessary additional supports, bracing, runner etc. so that lateral movement is arrested. as per instructions of Architect. Frame work will be measured and paid as per actual measurement on site. Rates quoted shall include the cost of providing and fixing supports up to ceiling. All complete as per detail drawing, as specified and as directed by Architect.				
a	Size 50 x 50 x 1.62 mm	620	Sqm		
b	Size 50 x 25 x 1.62 mm	85	sqm		
2	<b>SKINNING / PANELING / BOXING /PARTITION</b>				
	Providing & Fixing in position on new frame work including all materials, labour etc. complete. Item to be completed in all respects as per drawings & instructions from Engineer - In - Charge.				
	<b>a) 9mm thk Marine plywood</b>	1240	Sqm		

	<b>b) 12 mm thk Marine plywood</b>	150	Sqm		
	<b>c) 19 mm thk Marine plywood</b>	22	Sqm		
3	<b>VERNEER: 3mm - 4mm thk</b>				
	Providing and fixing 3mm - 4mm thick group matching Decorative Veneer of approved quality and make, of required size and width as per site condition including surface preparation pasting with approved adhesive and finishing it evenly to get flat surface. The cost of openings for switches, AC Facia, any other cut-out etc. shall be included in the rates quoted. Complete as per detail drawing & directions by Architect. No extra payment will be made towards providing any pattern .The item includes finishing the surface with 3 or more coats of melamine polish as per the direction by Architect. (Basic Rate for veneer: Rs.125 per sft.)	170	Sqm		
4	Providing and fixing <b>1.5 MM thick group matching Laminate</b> of approved quality and make, of required size and width as per site condition including surface preparation pasting with approved adhesive and finishing it evenly to get flat surface. The cost of openings for switches, AC Facia, any other cutout etc. shall be included in the rates quoted. complete as per detail drawing & directions by Architect. No extra payment will be made towards providing any pattern .(Basic Rate for laminate: Rs.55 per sft.)	1240	Sqm		

5	Providing and fixing full height glazed partition made out of 12mm thick toughened approved make glass as per drawing. The work includes machine edge polish with approved make (ozone/Dorma XL-C/ Enox/ Archis) patch fitting with required hardware complete.( all hardware & patch fittings to be finished with s.s brushed /Antique brass finish).	70	Sqm		
6	<b>Storage Works</b>				
	Providing & fixing in position 460 mm deep storage / Wardrobe unit along with partitions etc with 1) sides,top,bottom shelves made out of 19 mm marine plywood 2)6 mm thk. marine ply backing panels 3) Shutters made out of 19 mm thick block board & 6 mm thick teakwood leaping with egde moulding of approved profile if any shall be provided in all exposed ply edge surfaces & be finished with melamine polish / PU coating.4) Finish 1mm thk laminate inside & outside as per below mention. 5) hardware such as heavy duty hinges of size 100 x 19 x 25 mm, brass body locks(approved make) with extra-large group key of approved quality, magnetic ball catchers, handles of dia 12mm x 128mm, tower bolt 150mm etc. All exposed woodwork to be finished with 3 coats of melamine polish / PU coating & all internal surface finished with approved 1 mm thk laminate. All as per detailed drgs and instructions of EIC / Architect. Size in front elevation will be measured for payment.				
a	Low height storage with laminate finish (LST)	20	Sqm		
b	Overhead storage laminate finish	10	Sqm		
c	Full height storage with laminate finish (FST)	230	Sqm		
d	Low height storage with Veneer finish (LST)	7	Sqm		
7	Wardrobe finish in veneer as per drawing and direction of EIC.	32	Sqm		
8	COMPACTOR SYSTEM				

	<p>Providing, Supplying &amp; Installing of Mobile Storage System consisting of -:</p> <p>1) 7 Nos. of Mobile Unit Double face each of size Length 3352mm x Width 660mm x Height 2590mm.</p> <p>2) 1 Nos. of Mobile Units Single face each of size Length 3352mm x Width 457mm x Height 2590mm.</p> <p>3) 1 Nos. of Fixed Units Single face of size Length 1830mm x Width 457mm x Height 2150mm.</p> <p>The system will be of Knock Down System, Unit will have 5 Nos. adjustable shelves. The unit to have mechanical assisted drive. The whole system should be made of various component each of them should be treated by antirust treatment before applying the approved coloured powder coating. The whole system should be as per the approved drawing and detailed specification mention in the tender document with 12 months Guarantee. The rates coated should be inclusive of all taxes, freight and transportation etc complete as per drawings &amp; direction of Engineer - in - charge.</p>	1	Lot		
	<b>Total of Sub Estimate No. 4</b>				
	<b>Sub Estimate No. 5 - Doors &amp; Windows Works</b>				
1	<b>35mm thk Partly Glazed Partly Solid Door one side veneer &amp; one side Laminate -</b>	1.6	Sqm		
	<p>Providing &amp; fixing door in position Partly Glazed Partly Solid door made up Phenol bonded of 35 mm thk approved flush door of approved size &amp; 08 mm toughened glass approved beading, grooves, approved moulding, lipping patti including necessary hardware, approved adhesive, fitting &amp; fixture Handle, Lock, Floor Spring / Concealed Door Closer etc. melamine polish to all exposed surfaces etc complete as per detail drawing as specified &amp; as directed by Engineer-in charge.</p>				
2	<b>35mm thk Flush Door one side veneer &amp; one side Laminate -</b>	1.6	Sqm		

	Providing & fixing 35mm thk. Phenol bonded Flush door finish with one side 1.5 mm thk. Laminate and one side 3 - 4 mm thk Veneer as per approved pattern. All edges should finish with teak wood lipping, moulding with melamine polish. All complete as per instructions & approval of EIC. Note: The rate of all doors shall include all hardware such as door handles, hinges, door closures/floor spring, dead lock, PVC door buffer, door stopper, latches etc. as required.				
<b>3</b>	<b>35mm thk Flush Door both side Laminate -</b>	28	Sqm		
	Providing & fixing 35mm thk. Phenol bonded Flush door finish with 1.5mm thk. Laminate on both sides as per approved pattern. All edges should finish with teak wood lipping, moulding with melamine polish. All complete as per instructions & approval of EIC. Note: The rate of all doors shall include all hardware such as door handles, hinges, door closures/floor spring, dead lock, PVC door buffer, door stopper, latches etc. as required.				
<b>4</b>	<b>35mm thk Flush Door both side Veneer</b>	5.7	Sqm		
	Providing & fixing 35mm thk. Phenol bonded Flush door finish with 3 - 4mm thk. Veneer on both sides as per approved pattern finish with polish. All edges should finish with moulding, teak wood lipping with melamine polish. All complete as per instructions & approval of EIC. Note: The rate of all doors shall include all hardware such as door handles, hinges, door closures/floor spring, dead lock, PVC door buffer, door stopper, latches etc. as required.				
<b>5</b>	Providing & fixing Service Trap Doors made out of required Aluminium framework, 19mm thk plywood finished with material 1.5 mm thk laminate from outside and 1mm thk laminate from inside with moulding, lipping patti etc required to complete the work. Site modification as per requirement has to be undertaken without any extra cost.	5	Sqm		



6	<p>Providing and fixing factory made Upvc glazed / wire mesh windows comprising of lead free uPVC multi-chambered frame, sash and mullion / coupler(whenever required) extruded profile in any shape color and design duly reinforced with galvanized mild steel reinforced , uPVC extruded glazing beads, interlocks and inline sash adaptor(whenever required) of appropriate dimension, EPDM gasket, hardware, SS 304 grade fasteners of minimum 8 mm dia with countersank head, plastic packers, plastic caps and necessary stainless steel screws etc. Profile of frame, sash &amp; mullion (if required) shall be cut and fusion welded/mechanically jointed duly sealed at all corners, including drilling of holes for fixing hardware and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weatherproof silicon sealant over backer rod of approved size and quality, all complete as per approved drawing &amp; direction of Architect/Project In-charge. Section of steel reinforcement and cross sections shall be designed approved by Architect/Project In-charge. Providing, assembling and supplying vision glass panels (IGUs) comprising of hermetically-sealed 6-12-6 mm insulated glass (double glazed) vision panel units of size and shape as required and specified, comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface of approved colour and shade, an inner Heat strengthened clear float glass 6mm thick, spacer tube 10-12mm wide, desiccants, including primary seal and secondary seal (structural silicone sealant), UPVC frames and Sliding channel etc. all complete for the required performances etc, as per the direction of Architect/Project In-charge, as per the approved shop drawings, as specified and as directed by the Architect/Project In-charge. The IGUs</p>	109	Sqm		
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	shall be assembled in the factory/workshop of the glass processor. (Payment for fixing of IGU Panels in the curtain glazing is included in cost) For payment, only the actual area of glass on face of the glass panels provided and fixed in position, shall be measured in sqm. (As per Typical Drawing Attached) of Approved make. Contractor: Warranty Certificate from Glass Processor and original manufacturer shall also be submitted.				
7	Providing and fixing aluminium louvered windows consisting of vertical arm (40x12mm) with holders, Rat Jali, lever and locking arrangement weighing at 0.91 Kg/Rmt. with 3mm thick sheet glass louvers including filling the gaps in joints of cladding and external/internal adjoining portion with plaster silicon jelly with gun etc. complete.	7.5	Sqm		
8	Providing and fixing mild steel grill work for window, ventilator weighing 15 kg per Sqm. As per drawing including necessary welding and painting with one coat of Red Oxide Zinc Chromate primer and two coat of synthetic enamel paint etc. complete.	110	Sqm		
9	M.S. frame work of screen	200	kg		
	<b>Total For Sub Estimate No. 5 - Doors Works</b>				
	<b>Sub Estimate No. 6 - False Ceiling</b>				
1	M/F Suspended Plain Ceiling includes				

<p>Gypserra™ Perimeter Channel {Material-GI(IS513), YS-260Mpa, Finish- Galvanised 150GSM (IS27) } is fixed along the perimeter of existing wall/ partition with the help of HILTI HPS - 1(6x40) impact anchor, at 600mm centres. Gypserra™ Ceiling Angle {Material-GI(IS513), YS-260Mpa, Finish Galvanised 150GSM (IS277)} is suspended by fixing it to the Gyproc® soffit cleat {GI(IS513)YS-260Mpa, Finish-Galvanised 150GSM(IS277) }. Soffit Cleat and Gyproc® Rawl Plug-ø8x45mm {Material-IS 513 CR2 grade, Zinc coating (7 to 8 microns) pull out load- 6.8kn for M30 concrete grade} creating 1220mm x 1220mm grid. Gypserra™ Intermediate channel {Material-GI(IS513), YS-260Mpa, Finish-Galvanised 150GSM(IS277) } is fixed to the Gypserra™ Ceiling Angle with M6 x 12mm Hex Bolt &amp; Hex Nut arrangement {Material-As per EN 10083 Finish- Zinc Plating} or with 2 Nos of Ø4.2x13 Gyproc® metal to metal screw {Material-Carbon steel EN-ISO 7049/50 Finish- Zinc Coating Thickness- 4.14micron.}</p>				
<p>The Gypserra™ Ceiling Section {Material-GI(IS513), YS-260Mpa, Finish-Galvanised 150GSM(IS277)} is then fixed to the Gypserra™ Intermediate Channel {Material-GI(IS513), YS260Mpa, Finish-Galvanised 150GSM(IS277)} with the help of Gyproc® Connecting Clip {Material-High carbon spring steel wire(BS970Gr.En42)-46-48HRC, Finish- Zinc plating 4-6 micron} and in direction perpendicular to the Intermediate channel at 457mm c/c. Single layer of 12mm tapered edge Gypboard® Plain (conforming to IS 2095-Part 1:2011, Certified board) is then screw fixed to ceiling section with 25mm drywall screws {Material-Carbon steel EN-ISO 7049/50, Finish-Case hardened Grey Phosphating} at 230mm centres on ceiling section &amp; 150mm at periphery of ceiling. Finally square and tapered edges of the boards are to be</p>				

	jointed and finished so as to have a flush look which includes filling and finishing with Gyproc® Pro-Fill Jointing compound (Conforms to ASTM C475), Gyproc® Joint Paper tape. Serrated section has effective thickness of 2T ( 2xdepth), better load carrying capacity, enhanced screw retention, Improved acoustic performance & fire resistance as compared to plain steel section. All Gypserra™ metal components are patent applied for.				
	12 mm thk Gypsum Ceiling	425	Sqm		
<b>2</b>	<b>Acoustical false ceiling area</b>				
	Providing & Fixing of Approved Mineral Fibre Acoustical Suspended Ceiling System with (Micro look) Edge Tiles With Approved 15mm Exposed GRID. The tiles should have Humidity Resistance (RH) of 95%, NRC 0.9 - 1.0, Light Reflectance ≥85%, Colour White, Fire Performance UK Class 0 / Class 1 (BS 476 pt - 6 & 7) in module size of 600 x 600 x 15mm with Bio Block coating on the face of the tile, suitable for Green Building application, with Recycled content of 66% GW & 74% RW%. The tile shall be laid on Approved profile grid system with 15mm white flanges incorporating a 6mm central reveal in white/black colour and with a web height of 45mm and a load carrying capacity of minimum 15.68 Kgs/M2. Silhouette, Main Runners & Cross Tees to have mitred ends & “birds mouth” notches to provide mitred cruciform junctions. The T Sections have a Galvanizing of 90 grams per M2 & passed through 500 hrs of Salt test. The Tile & Grid system used together should carry a 15 year warranty. (Contractor should submit a performance certificate from Approved Manufacturers)	300	Sqm		
<b>3</b>	<b>12 mm thk moisture resistance board</b>	240	Sqm		
	M/F Suspended MR Ceiling includes Gypserra™ Perimeter Channel {Material GI (IS513), YS-260Mpa, Finish-Galvanised 150 GSM (IS27 )} is fixed				

along the perimeter of existing wall/partition with the help of HILTI HPS - 1 (6x40) impact anchor, at 600mm centres. Gypserra™ Ceiling Angle {Material GI (IS513), YS-260Mpa, Finish-Galvanised 150GSM (IS277)} is suspended by fixing it to the Gyproc® soffit cleat {GI (IS513) YS-260Mpa, Finish-Galvanised 150GSM (IS277)}. Soffit Cleat and Gyproc® Rawl Plug- Ø8x45mm {Material- IS 513 CR2 grade, Zinc coating (7 to 8 microns) pull out load- 6.8kN for M30 concrete grade} creating 1220mm x 1220mm grid. Gypserra™ Intermediate channel {Material- GI (IS513), YS-260Mpa, Finish Galvanised 150GSM (IS277)} is fixed to the Gypserra™ Ceiling Angle with M6 x 12mm Hex Bolt & Hex Nut arrangement {Material- As per EN 10083 Finish – Zinc Plating} or with 2 Nos of Ø4.2x13 Gyproc® metal to metal screw {Material- Carbon steel EN-ISO 7049/50 Finish- Zinc Coating Thickness- 4.14micron.} The Gypserra™ Ceiling Section {Material- GI (IS513), YS-260Mpa, Finish Galvanised 150GSM (IS277)} is then fixed to the Gypserra™ Intermediate Channel {Material- GI (IS513), YS-260Mpa, Finish- Galvanised 150GSM (IS277)} with the help of Gyproc® Connecting Clip {Material- wire (BS970 Gr. En42)-46-48HRC, Finish Zinc plating 4-6 micron} and in direction perpendicular to the Intermediate channel at 457mm c/c. Single layer of 12.5mm tapered edge Gyproc® MR (conforming to IS 2095 Part 1:2011/ EN 520:2004, Type-A & H1/ASTM C1396) is then screw fixed to ceiling section with 25mm drywall screws {Material- Carbon steel EN-ISO 7049/50, Finish- Case hardened Grey Phosphating} at 230mm centres on ceiling section & 150mm at periphery of ceiling. Finally square and tapered edges of the boards are to be jointed

	and finished so as to have a flush look which includes filling and finishing with Gyproc® Pro-Fill Jointing compound (Conforms to ASTM C475), Gyproc® Joint Paper tape. Serrated section has effective thickness of 2T (2xdepth), better load carrying capacity, enhanced screw retention, Improved acoustic performance & fire resistance as compared to plain steel section. All Gypserra™ metal components are patent applied for .				
4	Providing and fixing Wooden rafter (2"X4") at all height including providing and fixing of aluminium frame work and rafter made up of ply using 19 mm finish with laminate as per requirement with complete hardware fitting etc complete as per direction of Engineer - in - charge (Basic Rate - Rs. 300/ Rft)	70	Rmt		
5	Providing and fixing Wooden ceiling finish with veneer at all height including providing and fixing of aluminium frame work and rafter made up of ply using 12 mm with complete hardware fitting etc complete as per direction of Engineer - in - charge	25	Sqm		
<b>Total for Sub Estimate No. 6 -</b>					
<b>Sub Estimate No. 7 - Loose Furniture</b>					
1	<b>RO Cabin Table Finished with Veneer in table size 2500 mm x 1200 mm x 750 mm) side table (size 1100 mm x 450 mm x 700 mm)</b>	1	Nos		

<p>Providing &amp; 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 &amp; 12mm thk in rear &amp; sides and bottom in 6 mm thk. Plywood Internal surfaces to be veneer with PU Coat. Table tops, drawer unit fronts &amp; sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings &amp; 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 &amp; exposed woodwork to be in teak wood. Approved make Foot rest shall be provided, all molding shall be finish in PU Coat. All the tables shall have keyboard drawers to accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.</p>				
<p>drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a approved veneer.</p>				
<p>Providing &amp; 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 &amp; from inside. Item to be completed in all respects as per drawing &amp; instructions from EIC. The item shall include a set of drawer and openable shutters, as per the drawing and 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</p>				

	approved shade and make. All complete with necessary hardware, like key board, CPU, Trolley, cable manger etc completed as per drawing & approval of Engineer - In - charge.				
2	<b>Cabin Table Finished with corian top in table size 1800 mm x 900 mm x 750 mm) side table (size 1000 mm x 450 mm x 750 mm)</b>	10	Nos		
	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 and 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 and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.				
	drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a approved laminate.				



	<p>Providing &amp; 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 &amp; French polish from inside. Item to be completed in all respects as per drawing &amp; instructions from EIC. The item shall include a set of drawer and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolley, cable manger etc complected as per drawing &amp; approval of Engineer - In - charge.</p>				
3	<p><b>officer Table Finished with Core Laminate top in table size 1500 mm x 750 mm x 750 mm) side table (size 1000 mm x 450 mm x 750 mm)</b></p>	19	Nos		
	<p>Providing &amp; 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 &amp; 12mm thk in rear &amp; sides and bottom in 6 mm thk. Plywood Internal surfaces to be laminate. Table tops, drawer unit fronts &amp; sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings &amp; 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 &amp; exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to</p>				

	accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.				
	drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a 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 & 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 and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolley, cable manger etc complected as per drawing & approval of Engineer - In - charge.				
4	<b>Staff Table Finished with Core Laminate top in table size 1350 mm x 750 mm x 750 mm) side table (size 1000 mm x 450 mm x 750 mm)</b>	6	Nos		

<p>Providing &amp; 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 &amp; 12mm thk in rear &amp; sides and bottom in 6 mm thk. Plywood Internal surfaces to be laminate. Table tops, drawer unit fronts &amp; sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings &amp; 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 &amp; exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.</p>				
<p>drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a approved laminate.</p>				

	<p>Providing &amp; 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 &amp; French polish from inside. Item to be completed in all respects as per drawing &amp; instructions from EIC. The item shall include a set of drawer and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolley, cable manger etc complected as per drawing &amp; approval of Engineer - In - charge.</p>				
5	<p><b>receptionTable Finished with Corian top in table size 1500 mm x 750 mm x 750 mm)</b></p>	1	Nos		
	<p>Providing &amp; 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 &amp; 12mm thk in rear &amp; sides and bottom in 6 mm thk. Plywood Internal surfaces to be laminate. Table tops, drawer unit fronts &amp; sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings &amp; 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 &amp; exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards and mouse</p>				

	wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.				
	drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a 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 & 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 and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolly, cable manger etc complected as per drawing & approval of Engineer - In - charge.				
6	<b>securityTable Finished with Core Laminate top in table size 1500 mm x 750 mm x 750 mm)</b>	2	Nos		

<p>Providing &amp; 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 &amp; 12mm thk in rear &amp; sides and bottom in 6 mm thk. Plywood Internal surfaces to be laminate. Table tops, drawer unit fronts &amp; sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings &amp; 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 &amp; exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.</p>				
<p>drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a approved laminate.</p>				

	<p>Providing &amp; 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 &amp; French polish from inside. Item to be completed in all respects as per drawing &amp; instructions from EIC. The item shall include a set of drawer and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolley, cable manger etc complected as per drawing &amp; approval of Engineer - In - charge.</p>				
7	<p><b>sample receiving Table Finished with Core Laminate top in table size 2400 mm x 750 mm x 750 mm) side table (size 1650 mm x 450 mm x 750 mm)</b></p>	1	Nos		
	<p>Providing &amp; 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 &amp; 12mm thk in rear &amp; sides and bottom in 6 mm thk. Plywood Internal surfaces to be laminate. Table tops, drawer unit fronts &amp; sides to be finished as per drawings. The front modesty panel etc shall be finished as per drawings &amp; 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 &amp; exposed woodwork to be in teak wood. Foot rest shall be made out of 19 mm plywood frame work with 6 mm top and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall</p>				

	have keyboard drawers to accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.				
	drawings and also shall include CPU unit as shown in the drawings approved by EIC. 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 a 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 & 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 and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolly, cable manger etc complected as per drawing & approval of Engineer - In - charge.				
8	<b>Conference table (Size 9000 x 2100 x 750mm)</b>	1	Nos		
	Providing and fixing in position <b>Conference Room Table</b> of approved shape shown in drawing. Table top made out of 19 X 19 mm & 50 X 38 mm T.W. frame work with both side 6mm thk marine plywood in two layers finished with approved veneer with polycoat finish. Apron made out of 50 X 50 mm T.W. frame work with both side 9 mm thk marine plywood finished with approved veneer with polycoat finish. Edge of Table finished with 50 X 50 mm				



	T.W. moulding with melamine polish. Footrest & skirting made out of 19 mm thk marine plywood finished with approved veneer with polycoat finish. Edge of footrest finished with 25 mm thk wooden half round moulding with melamine polish. 50 x 50 mm wooden connecting members.				
	Rate including cost of wooden beadings, mouldings, inlays, etc. Top should be finished with approved laminate. Sides finished with approved laminate, complete as per detail drawing, as specified and as directed by Architect.				
9	<b>securityTable Finished with Core Laminate top in table size 900 mm x 600 mm x 750 mm)</b>	2	Nos		
	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 and 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 and shall be finished with matching laminate all molding shall be finish in 3 coats of melamine polish. All the tables shall have keyboard drawers to accommodate keyboards and mouse wherever necessary as per drawing. Rate include of all hardware, like hinges, drawer channel, handles, lock, moulding, lipping patti etc.				

	drawings and also shall include CPU unit as shown in the drawings approved by EIC. No separate 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 a 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 & 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 and openable shutters, as per the drawing and 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 and make. All complete with necessary hardware,like key board, CPU,Trolley, cable manger etc complected as per drawing & approval of Engineer - In - charge.				
	<b>Total For Sub Estimate No 7</b>				
	<b>Sub Estimate No. 8 - Chairs Works</b>				
1	<b>Executive Chair</b>				
	Providing and placing in required position Very High Back Chair of size (49.0cm. (W) X 48.0cm. (D) With 75.0 cm (D) including necessary approved type and colour fabric complete as per manufacturer specifications and as per instruction of Engineer in charge. (Basic Rate- 25000/ nos)	4	Nos		
2	<b>Executive Visitor Chair</b>	9	Nos		
	Providing and placing in required position Mid Back Chair of size size 50.0cm W X 49.5cm (H) with 75.0 cm (D) including necessary approved type and colour fabric complete as per				

	manufacturer specifications and as per instruction of Engineer in charge. (Basic Rate- 17000/ nos)				
3	<b>Conference room chair</b>	28	Nos		
	Providing and placing in required position Mid Back Chair of size 50.0cm W X 49.5cmH with 75.0 cm D including necessary approved type and colour fabric etc complete as per manufacturer specifications and as per instruction of Engineer in charge. (Basic Rate- 20000/ nos)				
4	<b>Conference room chair</b>	28	Nos		
	Providing and placing in required position Low Back Chair without castor of size 50.0cm W X 49.5cmH with 75.0 cm D including necessary approved type and colour fabric etc complete as per manufacturer specifications and as per instruction of Engineer in charge. (Basic Rate- 12000/ nos)				
5	<b>Staff Chair</b>	34	Nos		
	Providing and placing in required position <b>Mid Back</b> chair the seat and back are made up of 1.2 cm. thick hot-pressed plywood, upholstered with fabric upholstery covers and moulded Polyurethane foam. The back foam is designed with contoured lumbar support for extra comfort. The seat has extra thick foam on front edge to give comfort to popliteal area. BACK SIZE: 47.5 cm. x 58.0cmH SEAT SIZE: 47.0 cm. W x 48.0 cm. D (Basic Rate- 10000/ nos)				
6	<b>Staff visitor chair</b>	28	Nos		
	Providing and placing in required position <b>Visitor Low Back Chair</b> , the seat and back are made up of 1.2 cm. thick hotpressed plywood, upholstered with fabric upholstery covers and moulded Polyurethane foam. The back foam is designed with contoured lumbar support for extra comfort. The seat has extra thick foam on front edge to give comfort to popliteal area. BACK SIZE: 47.5 cm. (W) x 58.0cm. (H) SEAT SIZE: 47.0 cm. (W) x 48.0 cm. (D) with the Polyurethane foam is moulded with density = 45 +/-2 kg/m <sup>3</sup> and Hardness				

	= 20 +/- 2 on Hampden machine at 25% compression. TWIN WHEEL CASTORS: The twin wheel castors are injection moulded in 30% Glass Filled black Nylon. complete as per manufacturer specifications and as per instruction of Engineer in charge. (Basic Rate- 7000/ nos)				
7	<b>Dining chair (Basic Rate- 5000/ nos)</b>	8	Nos		
	Without Armrest light and portable chair, and can be stacked one atop another, with poly-propylene edging is injection-moulded in situ.				
8	<b>Dining stool (Basic Rate- 7000/ nos)</b>	5	Nos		
	Multipurpose stool with a cushioned seat and a manual height adjustment feature that can be easily locked at any position with an ergonomic and cushioned backrest to aid prolonged sitting & with a revolving stool base.				
9	<b>Dining table (Basic Rate- 18000/ nos)</b>	2	Nos		
	Stackable in PU- coated top (with powder-coated understructure) and membrane top (with Stainless steel understructure) in four seater configuration.				
10	Providing & supplying multi seated sofas with teakwood internal frame out of size min. 70x40mm as mentioned in drawing with necessary spring / rubberized 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 Seated Sofa (Basic Rate- 18000)	3	Nos		

	b) Three Seated Sofa (Basic Rate-42000)	3	Nos		
	c) Two Seated Sofa (Basic Rate-30000)	5	Nos		
	<b>Total For Sub Estimate No 8</b>				
	<b>Sub Estimate No. 9 - Miscellaneous Works</b>				
1	<b>L - shape PELMETS / Jamb lining : (upto 300 mm wide)</b>				
	Supplying, Providing & fixing in position of required size pelmets / jamb lining made out of 19mm thick marine plywood finished with approved finish mention below and 1mm thk laminate finish for inside surface as per the direction by Architect. Item to be completed in all respect as per the drawing & instruction from Architect.				
	1.5 mm thk Laminate Finish	133	RMT		
	Veneer Finish	50	RMT		
2	<b>Soffit:</b>				
	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, lipping patti, groove. Item to be completed in all respects as per drawings & direction by Architect.				
	Laminate Finish	80	RMT		
	Veneer Finish	32	RMT		
3	<b>Soft board:</b>				
	Providing and fixing in position 12mm thk soft board panelling with approved adhesive, partition surface including fabric cover, wood beading finished with melamine polish of approved shade etc. complete as per drawings & directions by Architect.(Basic Cost of Fabric- 250/ Rmt)	160	Sqm		
4	<b>Dust Bin (350mm Dia)</b>				
	Providing & arranging in position S.S. dust bins out of perforated (min Size 350 mm dia x 400 mm Height). Item to complete in all respect as per drg & directions.	55	Nos		
5	<b>Roller blinds (Black out)</b>	250	Sqm		

	<p>Providing and fixing BLACKOUT Fabric with composite material of High Tenacity Polyester Yarn Fabric with PVC Coating &amp; Fungistatic Treatment of Hunter Douglas, B99 Serge Ferrari, MAP, Softlite Impex, Mado approved make manual Roller blinds with end brackets, components, bottom bar &amp; fabric with manual operation and warranty of minimum 5 years and Green guard</p> <p>Certificate – UL 2818 Gold Certification as per specifications. Fabric to be as per approved sample. Manual system to include chain ball operation. Composition: 39% Polyester / 61% PVC, Weight: 540 g/m<sup>2</sup> (+/-5%), as per Fungistatic Treatment: Degree 0, Excellent (EN ISO 846-A) Fire Retardancy: B1/DIN 4102-1, METHOD 2/NFPA 701, EuroCLASS B-s2,d0, Reflection solar radiation: 25% to 69%, Solar Absorption: 28%-31%, Solar Transmission-0%, Tensile Strength (Wrap/Weft)-160/170 daN / 5cm, Quality Management ISO9001. All complete as per approval of designer &amp; instruction of Engineer-in-charge. (Basic Cost :- Rs. 1750 / smt)</p>				
6	<b>Wall Paper</b>	80	Sqm		
	<p>Providing, fixing, applying by Company Trained Technicians, premium Wall Covering (Wall Fabric), as per details in attached specifications, or as per detailed specifications and colours attached, or approved equivalent, of approved colour, texture and design, including base and sub-base preparation (on top of existing P.O.P surface), all complete, in a neat and workman like manner, as per directions of Engineer-In-Charge. (Basic Cost :- Rs. 1150 / smt)</p>				
7	<p>Providing &amp; fixing Artifact like Artificial Plant, Picture Frame etc. as per shown in drawing &amp; manufacturers specification</p>				
	a) Picture Frame (Basic Cost :- Rs. 5000 / Nos.)	25	Nos		

	b) Planters (Basic Cost :- Rs. 10000 / Nos.)	12	Nos		
8	<b>T.W MOULDING</b>				
	Providing and fixing in position mouldings out of <b>T.W Moulding</b> complete as per profile given in the detail drawing or as explained out of wooden sections of sizes given below. All should be finished with melamine polish of approved shade & color with minimum 3 coats. This item will operate only for those mouldings which are to be fixed independent of any other item as mentioned in the Bill of Quantities and not measured under any other item etc. complete as per detail drawing, as specified and as directed by Architect / Engineer				
	SIZE 15 X 15 MM	32	Rmt		
	SIZE 25 X 50 MM	55	Rmt		
	SIZE 50 X 50 MM	60	Rmt		
9	<b>Wooden Facia</b>				
	Providing & fixing Wooden facia made out of 19mm thk marine plywood and finished with decorative veneer / Laminate and melamine polish wtc complete as per drawing and direction of Engineer – in - charge.				
	100mm x 75 mm	25	Rmt		
	150 mm x 25 mm	15	Rmt		
10	<b>Roller blinds</b>	750	Sqm		
	Providing and fixing composite material of High Tenacity Polyester Yarn Fabric with PVC Coating, Aluminium Backing, & Fungistatic Treatment of approved make manual Roller blinds with end brackets, components, bottom bar & fabric with manual operation and warranty of minimum 5 years and Green guard				

	Certificate – UL 2818 Gold Certification as per specifications. Fabric to be as per approved sample. manual system to include chain ball operation. Composition: 39% Polyester / 61% PVC with Aluminium Backing,Weight: 290 g/m2 (+/-5%) as per Fungistatic Treatment: Degree 0, Excellent (EN ISO 846-A) Fire Retardancy:B-s2,d0/EN 13501-1, CLASS A/ASTM E84., Color: as per selected color Openness factor: 3%, Reflection solar radiation: 9% TO 65%, Light transmission: 2%-4%,Solar Absorption : 22% - 88%,Solar Transmission-3% - 13%,Tensile Strength (Wrap/Weft)-160/170 daN / 5cm.All complete as per approval of designer & instruction of Engineer-in-charge. (Basic Cost :- Rs. 1350 /smt.)				
11	<b>SIGNAGES</b>				
11.1	SIZE 2.5" X 5"	2	Nos		
11.2	SIZE 4" X 12"	5	Nos		
11.3	SIZE 4" X 8"	36	Nos		
12.3	SIZE 4" X 15"	2	Nos		
13.3	FIRE EXIT Reflective STICKERS	12	Nos		
12	Providing and laying in place synthetic door mats as per approved sample				
a)	Size -1800X600	2	No		
b)	Size -900 X 450	6	No		
	<b>Total For Sub Estimate No 9</b>				
	<b>Sub Estimate No. 10 - Electrical Works</b>				
<b>1</b>	<b>Metering</b>				
1.1	Supplying and erecting static energy meter 440 V 50 Hz. 400A ISI mark meter AC 3 phase 4 wires LCD/LED display complete erected on polished teak wood board duly wired with	4	Nos		



	required size of weather proof PVC wires duly tested for class II accuracy by electric supply company.				
1.2	Supplying and erecting calcium silicate 15/16 mm thick fixed to wall or on provided panel board with necessary materials such as screws, wall fasteners, supports, nut bolts etc. complete.	3	Sqm		
<b>2</b>	<b>Distribution Board</b>				
2.1	Supplying and erecting triple pole and neutral distribution board (TPNDB) surface/ flush mounted suitable for SPMCB of 24 ways on iron / GI frame (horizontal busbar type) as per specification no.SW-SWR/MCBD.	6	Nos		
2.2	Supplying and erecting triple pole and neutral distribution board (TPNDB) surface/ flush mounted suitable for SPMCB of 36 ways on iron /GI frame (horizontal busbar type) as per specification no. SW-SWR/MCBDB	6	Nos		
2.3	Supplying and erecting single pole and neutral distribution board (SPNDB) with door surface/flush mounted with 2 ways for incoming and 6 ways for outgoing SP MCB's on iron/ GI frame as per specification no. SW-SWR/MCBDB	6	Nos		
2.4	Providing, erecting and commissioning 2 pole RCCB only of electromagnetic type with 30/100/300 mA sensitivity and having capacity of 16/ 25A complete as per specification no. SWRCCB/RCCB	36	Nos		
2.5	Supplying, fixing and commissioning 2 pole,RCBO (residual current breaker with overcurrent short circuit 10 kA and earth leakage protection),with 30/100/300 mA sensitivity and having capacity of 6/10/16/20/25A, as per specification no SWRCCB/RCBO	6	Nos		
2.6	Supplying, erecting & marking SPMCB 6A to 32A, C-series (for motor/power) in provided distribution board as per specification No. SW-SWR/MCB	324	Nos		
2.7	Supplying, erecting & marking SPMCB 6A to 32A, B- series (for lighting) in provided distribution board as per specification no. SWSWR/MCB	120	Nos		

2.8	Supplying, fixing and commissioning 4 pole RCBO (residual current breaker with overcurrent short circuit 10 kA and earth leakage protection), with 30/100/300 mA sensitivity and having capacity of 63A as per specification no SWRCCB/RCBO	4	Nos		
<b>3</b>	<b>LT Cables</b>				
3.1	Supplying, erecting & terminating XLPE armoured cable 3½ core 50 sq. mm. aluminium conductor with continuous 5.48 sq. mm. (12 SWG) G.I. earth wire complete erected with glands & lugs, on wall/ trusses/pole or laid in provided trench/ pipe as per specification no. CBLT/AL	100	Rmt		
3.2	Supplying, erecting & terminating XLPE armoured cable 3½ core 25 sq. mm. aluminium conductor with continuous 5.48 sq. mm. (12 SWG) G.I. earth wire complete erected with glands & lugs, on wall/ trusses/pole or laid in provided trench/ pipe as per specification no. CBLT/AL	200	Rmt		
3.3	Supplying, erecting & terminating XLPE armoured cable 3½ core 210 sq. mm. aluminium conductor with continuous 5.48 sq. mm. (12 SWG) G.I. earth wire complete erected with glands & lugs, on wall/ trusses/pole or laid in provided trench/ pipe as per specification no. CBLT/AL	100	Rmt		
3.4	Supplying, erecting & terminating XLPE armoured cable 4 core 4 sq. mm. aluminium conductor with continuous 5.48 sq. mm. (12 SWG) G.I. earth wire complete erected with glands & lugs, on wall/trusses/pole or laid in provided trench/ pipe as per specification no. CBLT/AL	160	Rmt		
3.5	Supplying, erecting & terminating XLPE unarmoured cable 1 core 25 sq. mm. copper conductor complete erected with provided lugs, laid in provided control panel /distribution boards / pipe as per specification no. CB-LT/CU	160	Rmt		

	Supply and making terminal joints for the following sizes of 1.1KV grade XLPE Insulated armoured/Unarmoured Aluminium/ Copper conductor cables including providing heavy duty tinned copper terminal lugs, crimping type, insulation tape, heavy duty single compression type brass glands effecting terminal connection to the equipment/Panel complete as required as per final direction and approval of the Owner/Consultant.				
3.6	3.5 Core x 210 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	8	Nos		
3.7	3.5 Core x 50 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	8	Nos		
3.8	3.5 Core x 25 sq.mm., XLPE Insulated Aluminium Conductor Armoured Cable	10	Nos		
3.9	4 Core x 4 sq.mm., XLPE Insulated copper Conductor Armoured Cable	16	Nos		
3.10	1 Core x 25 sq.mm., XLPE Insulated copper Conductor Flexible Cable	18	Nos		
<b>4</b>	<b>Cable Tray</b>				
4.1	Providing & erecting Hot dipped galvanized perforated type cable tray manufactured from 16 swg (1.6 mm thick) GI sheets of 150 mm width & 75 mm height complete with necessary coupler plates & hardware in approved manner.	50	Rmt		
<b>5</b>	<b>Mains in PVC Conduit (WG-MA/PC)</b>				
5.1	Supplying & erecting mains with 2x1.5 sq.mm. and earth wire 1.5 sq.mm FRLSH PVC copper wire, in HMS PVC conduit min. 20mm dia as per specification No: WG-MA/PC.	2200	Rmt		
5.2	Supplying & erecting mains with 2x2.5 sq.mm. and earth wire 1.5 sq.mm FRLSH PVC copper wire in HMS PVC conduit min. 20mm dia. as per specification No: WG-MA/PC.	1100	Rmt		
5.3	Supplying & erecting mains with 2x4 sq.mm. and earth wire 2.5 sq.mm FRLSH PVC copper wire in HMS PVC conduit min. 20mm dia, as per specification No: WG-MA/PC.	220	Rmt		
5.4	Supplying & erecting mains with 2x6 sq.mm. and earth wire 4 sq.mm FRLSH PVC copper wire, in HMS PVC conduit	100	Rmt		

	min.20mm dia, as per specification No: WG-MA/PC.				
	<b>Bunch of Wires (WG-MA/BW)</b>				
5.5	Supplying & erecting mains with 2x1.5 sq.mm FRLSH copper PVC insulated wire laid in provided conduit/trunking/inside pole/Bus bars or any other places as per specification No: WGMA/BW	350	Rmt		
5.6	Supplying & erecting mains with 2x2.5 sq.mm FRLSH copper PVC insulated wire laid in provided conduit/trunking/inside pole/Bus bars or any other places. as per specification No: WGMA/BW	2200	Rmt		
	<b>Point Wiring (WG-PW)</b>				
5.7	Point wiring for light/fan/bell in 20 mm ISI marked HMS PVC conduit with 1.5 sq.mm (2+1E) FRLSH grade copper wire with flush type switch and required accessories as per specification No: WG-PW/SW	389	Point		
5.8	Secondary point wiring for additional light/ bell point, concealed type in min 20 mm PVC conduit with 1.5 sq.mm. (2+1E) FR/FRLSH grade copper wires with required accessories as per specification No: WG-PW/CW	250	Point		
<b>6</b>	<b>Modular switches and Accessories</b>				
6.1	Supplying and erecting ISI mark modular type switch 6A / 10A duly erected on provided plate and box with wiring connections complete.	550	Nos		
6.2	Supplying and erecting ISI mark modular type switch 16A duly erected on provided plate and box with wiring connections complete.	95	Nos		
6.3	Supplying and erecting ISI mark modular type 3 pin 6A multi sockets with safety shutter, duly erected on provided plate and box with wiring connections complete.	285	Nos		
6.4	Supplying and erecting ISI mark modular type 3 pin 6 / 16A multi socket with safety shutter, duly erected on provided plate and box with wiring connections complete.	48	Nos		
6.5	Supplying and erecting ISI mark modular type T.V. sockets single outlet,	10	Nos		

	duly erected on provided plate and box with wiring connections complete.				
6.6	Supplying and erecting ISI marked modular type telephone socket one gang with safety shutter, duly erected on provided plate and box with wiring connections complete.	60	Nos		
6.7	Supplying and erecting ISI mark modular type computer jack RJ 45 with safety shutter, duly erected on provided plate and box with wiring connections complete.	70	Nos		
6.8	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 1 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background..	50	Nos		
6.9	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 2 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background.	40	Nos		
6.10	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 3 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background.	100	Nos		
6.11	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 4 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background.	10	Nos		
6.12	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 6 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background.	35	Nos		

6.1 3	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 8 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background.	75	Nos		
6.1 4	Supplying and erecting unbreakable concealed type modular switch box with double mounting plate for 12 module duly erected flush to wall with required chiselling and finishing with cement mortar / POP as per required to match the background.	10	Nos		
<b>7</b>	<b>CEILING FANS &amp; EXHAUST FANS</b>				
7.1	Supplying and erecting five star rated energy saving Ceiling fan 230 V A.C. 50 cycles 1200 mm complete erected in position as per specification no. FGFN/CF	22	Nos		
7.2	Supplying and erecting ISI mark modular type (two module) electronic step regulator for fan, duly erected on provided plate and box with wiring connections complete.	22	Nos		
7.3	Supplying and erecting fan hook box of 10 mm M.S. round bar bounded to the R.C.C. bars upto 50 mm length each side and pierced through a 16 S.W.G. thick aluminium/M.S. Bowl 100 mm dia.or equivalent square size and having depth upto 75 mm complete erected with duly painted by one coat of red oxide paint and two coats of paint erected in position and without any leakage of slurry of cement concrete on either side of the box and positioned to the bottom level of the slab.	22	Each		
7.4	Supplying and erecting 'B' grade G.I. pipe / M.S. pipe down rod duly painted for fan complete erected with PVC three core flexible cable 1 sq. mm copper PVC wire.	11	Rmt		
7.5	Supplying and erecting fresh air cum exhaust fan of light duty 250 V A.C. 50 cycles 300mm. 1400 RPM rust proof body & blades, wire mesh, duly erected in an approved manner.	15	Nos		
<b>8</b>	<b>Under floor raceway</b>				

8.1	Supplying and embedding of following sizes of under floor trunking made out of 1.6 mm thick Hot Dip Galvanised Steel sheet having below mentioned compartments including Jointing sleeves, floor fixing supports, chipping and levelling that portion of the floor etc in the floor / in recess etc as per specifications complete as required.				
8.1.1	50mm x 38mm	100	Rmt		
8.1.2	75mm x 38mm	100	Rmt		
8.1.3	100mm x 38mm	130	Rmt		
8.1.4	150mm x 38mm	170	Rmt		
8.1.5	225mm x 38mm	50	Rmt		
8.1.6	300mm x 38mm	25	Rmt		
8.2	Supplying and fixing of following sizes of under floor junction boxes made out of 2 mm thick pre-galvanised sheet steel, top cover with 2.5 mm thick pre-galvanized steel plate alongwith changeover fly-overs including chipping and levelling that portion of the floor etc as per specifications complete as required.				
8.2.1	150mm x 150mm x 65-90mm	48	Nos		
8.2.2	225mm x 225mm x 65-90mm	16	Nos		
8.2.3	300mm x 300mm x 65-90mm	10	Nos		
8.2.4	400mm x 400mm x 65-90mm	12	Nos		
<b>9</b>	<b>Data &amp; Telephone Networking</b>				
9.1	Supplying, erecting & commissioning junction box suitable for 50 pairs as per specification No. WG-TW	2	Nos		
9.2	Supplying & installing UTP networking cat-6 cable suitable for LAN / WAN Computer net-working as per specification No. WG-COC/NC	3500	Rmt		
9.3	Supply, Installation, Testing and Commissioning of jack panel MAKE : D-LINK 24-Port for network system .	5	Nos		

9.4	Cat 6 Patch cord factory crimped molded (2m) (D-Link make)	60	Nos		
9.5	Cat 6 Patch cord factory crimped molded (1m) (D-Link make)	60	Nos		
9.6	Cat 6 data cable of D-Link make	2000	Rmt		
9.7	Supply , Installation, Testing and Commissioning of Switch MAKE : D-LINK 24-Port Switch for network system .	4	Nos		
9.8	Net work cum server rack 42 U aluminum profiled with all	2	Nos		
9.9	accessories.				
9.10	Supply , Installation, Testing and Commissioning of wire manager for network system .	4	Nos		
9.11	Supply , Installation, Testing and Commissioning of Switch MAKE : D-LINK / TP LINK 8-Port Gigabit Switch for wifi router .	4	Nos		
9.12	Supply , Installation, Testing and Commissioning of MAKE : D-LINK / TP LINK ACCESS WIFI Router for wifi .	4	sets		
<b>10</b>	<b>LIGHT FITTINGS</b>				
10.1	Supplying and erecting LED square / circular 15 / 18W down lighter having pressure die-cast aluminium housing, opal translucent cover, mounting arrangement with board for surface type or spring loaded mounting clips for flush type complete.	190	Nos		
10.2	Supplying and erecting 2'X 2' square shaped CRCA /diecast aluminium powder coated housing LED panel (slim edge-lit) light suitable for 36W with provision for plane front frame with translucent cover fixed to the housing complete.	40	Nos		
10.3	Supplying and erecting LED Mirror Light with integrated driver including 14W to 18W lamp with polycarbonate housing and opal diffuser to be fixed above mirror or as required on clamps complete.	10	Nos		
10.4	Supplying & erecting Recessed LED 25W tube light fitting (4 feet) with aluminium housing, heat sink, integrated HF electronic driver complete.	12	Nos		
10.5	Supplying & erecting Surface LED 20W tube light fitting (2 feet) with aluminium	6	Nos		



	housing, heat sink, integrated HF electronic driver complete.				
10.6	Supplying and erecting decorative oval bulk head edge-lit 10W LED luminaire comprising of high brightness LED Fitting on provided PVC block / wooden board.	4	Nos		
10.7	Supplying and erecting LED flexible strip light 5m length upto 25W conforming IP 65 of any colour with driver complete.	30	Nos		
10.8	Supplying and erecting 3 Watts LED Eyeball type Light to highlight paintings. LED-3W-38 degree Beam angle-110 Lumens -700mA	10	Nos		
10.9	Supplying and erecting 12 Watts LED Bracket Light to highlight paintings.	5	Nos		
10.10	Supplying and erecting LED Circular suspended Light fully diffused Luminaire complete. (basic rate: - Rs. 10000)	2	Nos		
10.11	Supplying and erecting LED Circular suspended Light fully diffused Luminaire complete. (basic rate: - Rs. 12000)	8	Nos		
10.12	Supplying and erecting decorative wall mounted bracket Aluminium body & arm anodised / powder coated with decorative glass shade fixed on wall.	4	Nos		
10.13	Supplying & erecting ceiling suspended linear LED 36W tube light fitting (4 feet) with aluminium housing, heat sink, integrated HF electronic driver complete.	2	Nos		
10.14	Supplying & erecting ceiling suspended Circular LED fitting . (basic rate: - Rs. 12000)	4	Nos		
10.15	Supply, Installation & Testing of Occupancy sensors for Cabins.	19	Nos		
10.16	Supply, Installation & Testing of Motion sensors for washroom and allied areas PIR occupancy sensor.	8	Nos		
10.17	LED PROFILE LIGHT	50	Rmt		
10.18	Chandeliers (basic rate: - Rs. 12000)	5	Nos		
11	<b>Earthing</b>				

1 1.1	Supply, Installation, Testing and commissioning of maintenance free earthing comprising of Electrode of 17.2 mm diameter Low Carbon Steel with 250 micron molecular copper bonded earthing rod of Length 3m along with 25 kg Carbon based environment friendly back fill ground enhancing compound required to fill up the excavated earth with required quantity complete. Specification no. EA-MOBI	4	Nos		
1 1.2	Supplying and erecting copper strip of required size used for earthing on wall and/or any other purpose with necessary copper clamps fixed on wall painted with bituminous paint in an approved manner with joints required. As per specification No EA-EP.	70	Kg		
1 1.3	Supplying and erecting GI strip of required size used for earthing on wall and/or any other purpose with necessary GI clamps fixed on wall painted with bituminous paint in an approved manner with joints required. As per specification NoEA-EP.	70	Kg		
1 1.4	Supplying and erecting G. I. Earth Wire of high purity of different sizes used for earthing or any other purposes on wall with necessary G. I. Clamps fixed on wall/cable/ conduit with screws in an approved manner.	60	Kg		
<b>12</b>	<b>Electrical Panels</b>				
	General Specification for Power Panels				
	Notes:				
	i)The Electrical panels should be procured from Central Power Research Institute(CPRI) approved Panel manufacturer.				
	ii)All the Electrical panels shall be subjected to Megger tests and HV tests at site in the presence of Client/ Consltant as per the requirement of Client/Consultant.				
	iii)The Contractor should submit 3 sets of as built drawings of the Electrical panels.				
	iv)The Electrical panel's feeders should be properly labelled using engraved black anodized labels.Also, night glow				

	radium labels shall be provided for each feeder specifying the name of the load.				
	v) The detailed specifications missing in the BoQ should be followed from the Specifications and Electrical Single line diagram in ACAD format.				
	vi) Contractor should submit the fabrication drawing, single line diagram and control logic system to Consultant/Client for approval before fabrication of all panels.				
	vii) The Electrical panel's main body, doors, partitions should be fabricated out of 2mm thick MS steel sheet.				
	vii) Appropriate size knock out holes should be provided in the panels as per the size of the incoming and outgoing cables.				
	viii) Transient Voltage Surge Suppressor (TVSS) should be installed in all the electrical panels.				
	Design as per technical specifications and obtain approval of drawings, prior to manufacturing, manufacture, insure, pack with PVC sheets, transport to site, store, erect in proper position, testing and commissioning of Indoor Duty and having IP 52 Rating LT panel cubicle and extendible type front and back operated having Top/Bottom Bus-Bars and Top/bottom Cable/Bus Duct entry, & fabricated using 14 gauge, CRCA sheet steel for main frame, door and partitions, dust and vermin proof lockable doors and carrying the control wiring using approved make FRLS colour coded Wires of minimum 2.5 sq.mm and using approved make push on terminals. The panel shall be wall mounting type, all complete with interconnections by using electrolytic grade tinned copper Bus Bars of 99.95% purity for all the other panels, colour coded heat shrinkable PVC sleeves.				

	MCCB. 400 A and above MCCB shall have Micro processor release with overload,short circuit,Earth fault and Neutral protection with fault rating of appropriate KA.Below 400 A MCCB shall have Thermo magnetic release with overcurrent and short circuit protection with fault rating of appropriate KA.Three/Four Pole Moulded Case Circuit Breaker with built in over current and short circuit The MCCB shall be suitable for 415 Volts 50 Hz., AC supply				
	BUSBAR Uniformly rated, continuous duty, 415 V AC, 3 Phase and 100% fully rated Neutral electrolytic grade 99.95% Purity tinned Copper with colour coded heat sink sleeves supported on SMC type grip supports. The Horizontal / Vertical sections of the busbars should all be uniformly rated for specified current rating.				
	All panels shall be Cubicle type with front operated and cable end boxes at the rear complete factory wired and tested in Cubicle type design with powder coated and paint process as per technical specifications and the panel board fabricated as per technical specifications all complete and as per final direction and final approval of the Consultant/ Owners.				
12.1	LT Panel-1				
	Incomer				
1 2.1. 1	Providing & erecting 4 Pole MCCB upto 400A, 415V, with short circuit rating 50 kA (Ics=100% of Icu ),adjustable thermal (overload) setting and fixed magnetic setting with provided leads, provision for installation of shunt/ UV/ trip alarm contact and MCCB should have phase barriers both sides, in provided enclosure on iron /GI frame as per specification no.SW-SWR/MCCB	1	Nos		
1 2.1. 2	Supplying & erecting LED type indicating pilot lamp with LED colours red / yellow / green, 230 / 250V on provided box / panel with necessary material, wiring & connections etc.	1	Set		

	Outgoing				
1 2.1. 3	Supplying, erecting & marking FPMCB 40A to 63A in provided distribution board as per specification no. SW-SWR/MCB	7	Nos		
1 2.1. 4	Supplying, erecting & marking DPMCB 6A to 32A, C- series (for motor/power) in provided distribution board as per specification no. SW-SWR/MCB	7	Nos		
1 2.1. 5	Supplying, erecting & marking TPMCB 6 A to 32A in provided distribution board as per specification no. SW-SWR/MCB	8	Nos		
1 2.1. 6	Supplying & erecting LED type indicating pilot lamp with LED colours red / yellow / green, 230 / 250V on provided box / panel with necessary material, wiring & connections etc.	15	Set		
1 2.1. 7	Supplying and erecting 5 kVAr, 440 V 3 phase, 50 Hz., thyristor switched micro APFC passive filter panel, consisting of suitable steps of APP type capacitor units with harmonic filter reactors, as per specification no CP-ED/APFC	10	Nos		
1 2.1. 8	Supplying and erecting GI sheet 1.25 mm (18 SWG) to be used for fabrication of boxes panel boards etc. including cutting, bending, drilling, welding, riveting etc. and painting with one coat of red lead paint and 2 coats of enamel paint.	6	Sqm		
1 2.1. 9	Supplying and erecting GI sheet 1.6 mm (16 SWG) to be used for fabrication of boxes panel boards etc. including cutting, bending, drilling, welding, riveting etc. and painting with one coat of red lead paint and 2 coats of enamel paint.	12	Sqm		
1 2.1. 10	Supplying and erecting bus bar chamber triple pole with neutral with four copper bars, 500V, 400A complete as per specification no. CPBB	8	Rmt		
1 2.1. 11	UPS O/P PANEL FOR 2 NOS 08 KVA UPS	2	SET		
a	<u>Incomer:</u> - 1Nos 125Amps 4 Pole MCCB.				
a1	<u>Outgoing:</u>				
	4 Nos 63Amps 4 Pole MCB with interconnection, Digital parameter etc.				

	3 Nos - 150/5, Class-1, 15 VA CTs				
	1 No. Load Manager for various parameteres				
	3 Nos ndicating Lamps - LED type				
	6 Nos - Control Fuses				
	1 No. 150/5, Class - 1, 15 VA				
	SLD with GA drawings shall be submitted by the contractor for prior approval by				
	the consultant before fabrication.				
12.2	LT Panel-2				
	Incomer				
1 2.2. 1	Providing & erecting 4 Pole MCCB upto 400A, 415V, with short circuit rating 50 kA (Ics=100% of Icu ),adjustable thermal (overload) setting and fixed magnetic setting with provided leads, provision for installation of shunt/ UV/ trip alarm contact and MCCB should have phase barriers both sides, in provided enclosure on iron /GI frame as per specification no.SW-SWR/MCCB	1	Nos		
1 2.2. 2	Supplying & erecting LED type indicating pilot lamp with LED colours red / yellow / green, 230 / 250V on provided box / panel with necessary material, wiring & connections etc.	1	Set		
	Outgoing				
1 2.2. 3	Supplying, erecting & marking FPMCB 40A to 63A in provided distribution board as per specification no. SW-SWR/MCB	7	Nos		
1 2.2. 4	Supplying, erecting & marking DPMCB 6A to 32A, C- series (for motor/power) in provided distribution board as per specification no. SW-SWR/MCB	7	Nos		
1 2.2. 5	Supplying, erecting & marking TPMCB 6 A to 32A in provided distribution board as per specification no. SW-SWR/MCB	8	Nos		
1 2.2. 6	Supplying & erecting LED type indicating pilot lamp with LED colours red / yellow / green, 230 / 250V on provided box / panel with necessary material, wiring & connections etc.	19	Set		
1 2.2. 7	Supplying and erecting 5 kVAr, 440 V 3 phase, 50 Hz., thyristor switched micro APFC passive filter panel, consisting of suitable steps of APP type capacitor	10	Nos		

	units with harmonic filter reactors, as per specification no CP-ED/APFC				
1 2.2. 8	Supplying and erecting GI sheet 1.25 mm (18 SWG) to be used for fabrication of boxes panel boards etc. including cutting, bending, drilling, welding, riveting etc. and painting with one coat of red lead paint and 2 coats of enamel paint.	6	Sqm		
1 2.2. 9	Supplying and erecting GI sheet 1.6 mm (16 SWG) to be used for fabrication of boxes panel boards etc. including cutting, bending, drilling, welding, riveting etc. and painting with one coat of red lead paint and 2 coats of enamel paint.	12	Sqm		
12. 2.1 0	Supplying and erecting bus bar chamber triple pole with neutral with four copper bars, 500V, 100A complete as per specification no. CPBB	8	Rmt		
<b>13</b>	<b>Uninterrupted Power Supply</b>				
1 3.1	Supplying & erecting on line UPS pure sine wave of 8 kVA capacity complete with standard features, along with necessary SMF batteries for 30 mins battery backup, as per specification no. AP-UPS	2	Nos		
<b>14</b>	<b>INTELLIGENT ADDRESSABLE FIRE ALARM SYSTEM</b>				
14. 1	Supply, fixing, testing, commissioning of Addressable Four zone Fire Alarm Panel, for below refered devices , LCD Display, Voice evacuation facility, Battery Charger & Battery Backup for 8 Hrs as per spec`s. with battery charger complete, as specified in	2	Nos		
14. 2	Supplying, installing, testing and commissioning heat detector complete on box as per specification no. FF-FAS/HD	6	Nos		
14. 3	Supplying, installing, testing and commissioning optical type smoke detector complete on box as per specification no. FFFAS/SD	50	Nos		
14. 4	Supplying, installing, testing and commissioning manual call point (Pill box) with break glass push button in	4	Nos		

	metal enclosure complete as per specification no. FF-FAAS/MCP				
14.5	Supplying, installing, testing and commissioning hooters with CRCA enclosure complete as per specification no. FF-FAAS/HTR	4	Nos		
14.6	Supplying, installing, testing and commissioning remote response indicators complete as per specification no. FF-FAAS/RRI	20	Nos		
14.7	Supplying, installing, testing and commissioning FR, XLPE armoured cable 2 core 1.5 sq.mm. copper conductor complete erected on wall/ceiling complete as per specification no. CBLT/CU	1250	Rmt		
14.8	Demolishing, resifting, installing, testing and commissioning the existing fire fighting system with all necessary required material and accessories to complete the work as per the drawing and direction of Architect / PMC / Client for 5th & 6th Floor.	2	Job		
14.9	Dry Chemical Power (ABC) Type fix Extinguisher of 6Kg capacity having B.I.S. certificate mark	12	Nos		
14.10	compressed CO2 gas Type fix Extinguisher of 4.5Kg capacity having B.I.S. certificate mark	17	Nos		
<b>15</b>	<b>CCTV SYSTEM</b>				
	Supply & Installation CCTV system comprising of following:				
1	Supply, Installation, Testing and Commissioning of Network Video Recorder having Minimum 16 Channel Input and 1 SATA support up 8 TB by each SATA slot. Resolution : Minimum 1920*1080, Audio Output : Yes with latest Ports	2	set		
2	supply, installation , testing & commissioning of cctv cameras 2.0 MP IR dome camera with required accessories , 1/2.7 " 2MP CMOS sensor , H. 264/H.265HP /MP/BP/M-JPEG Encoding , triple stream , upto 1920 x 1080 HIGH Resolution , IR LEDs : 20M -40M.	40	Nos		



3	Supply, Installation, Testing and Commissioning of 6U rack for wall mounting CCTV.	2	set		
4	Supply , Installation, Testing and Commissioning of Switch MAKE : D-LINK 24-Port Gigabit Switch	3	set		
5	Supply , Installation, Testing and Commissioning of HDMI CABLES - 25 MTRS LENGTH	2	set		
6	Supply & laying of cat -6 wire in 25mm PVC conduit.	2000	Rmt		
7	43" Colour LED android smart TV for above workstations	2	Nos		
8	RG-6 coaxial cable for Video conferencing	150	Rmt		
9	RG-6 coaxial adoptor with splitter	4	set		
<b>16</b>	<b>RODENT REPELLANT SYSTEM</b>				
16.1	Main Rodent Controller with (QR) LED Display, suitable to connect maximum 12 Satelites @ 300 sq.ft each,networkable on RS 485 with facility to integrate with GUI Software for entire reporting capabilities or BMS Coonectivity for Server room.Safety Compliance as per IRPA (International Radiation Protection Association)	4	Nos		
16.2	SITC of Transducer Satellite Stations capable of Emitting Ultrasonic sound of frequencies 20 Khz and higher, with blinking LED Indication & shall capable to covering area of minimum 300 Sq ft in all voids.	40	Nos		
16.3	FRPVC - 20 mm Medium Grade Conduits with following Cables,ittings ISI Marked:	250	Rmt		
16.4	2C x 14/40 SWG Copper Cable in above conduit	600	Rmt		
<b>17</b>	<b>Public Address System</b>				
17.1	Supply & commissioning of 6 Watts Ceiling / Wall Mounted Voice Evacuation Speaker having power taps upto 2W and frequency response of 400 to 4000Hz for Voice Evacuation and as	50	Nos		

	per attached specifications complete etc. as required				
17.2	Supply & installation of Main control panel Bosch (Plena Amplifier) with 6 zone & 240 W inbuilt amplifier with BGM Provision.	2	Nos		
17.3	Providing, fixing, testing & commissioning Microphone & zone selection Keypad for 6 zones, connection from Main controller to Announcement console maximum 100 metre Cat-6 Cable Bosch (in Administration Area)	2	Nos		
17.4	Providing, fixing, testing & commissioning Call Station Key Pad with connections & all accessories.	2	Nos		
17.5	Providing & laying of armoured 2C x 0.75 sqmm Cu. Cable with required fixing arrangements etc.	1600	Rmt		
<b>18</b>	<b>ACCESS CONTROL</b>				
18.1	Supply , Installation, Testing and Commissioning of eSSL multi - Biometric time Attendance & Access control system with facial recongnition , RFID , fingerprint , ip65 dust & waterproof rating .	2	set		
18.2	ACCESS CONTROL - ELECTROMAGNETIC LOCK	3	set		
	Supply, Installation, Testing and Commissioning of EM LOCK with all required accessories on define Door, 12V capacity, Electromagnetic mechanism for interlocking with all required Components.				
	<b>Total For Sub Estimate No. 10</b>				
	<b>Sub Estimate No. 11 - HVAC Works</b>				
	<b>Supply of Variable Refrigerant Flow system Air conditioners - R-410 (Mitsubishi electric / Daikin / O General)</b>				
<b>1</b>	<b>Supply of Outdoor Units</b>				

	<p>Supplying, erecting, testing and commissioning VRF / VRV air conditioning system, out door unit (ODU) complying type-IV OEM standards working on HFC free refrigerant R410A or other required/suitable green equivalent refrigerant, for cooling capacity delivering 100% at 47 deg. celcius and non stop cooling even at 56 deg. celsius and coefficient of performance (COP) 3.00 to 4.00, modular type horizontal/vertical hot air discharge suitable for total piping length upto 1000 metre operation in cooling mode with inverter based VRF/VRV technology microprocessor based control compressor starter/control panel complete with scroll compressor, air cooled anti corrosive copper condenser coil of suitable shape for increasing maximum heat transfer area, built in oil separator, accumulator and oil receiver, copper tube aluminium fin air cooled condenser, condenser fan with motor suitable for 415V <math>\pm</math> 10%, 50 Hz, 3 phase power supply, internal copper refrigerant piping, internal wiring and first charge of refrigerant, etc. all housed in powder coated weather proof cabinet on provided angle iron frame or suitable foundation connected to the system in approved manner complete.</p>				
a	10 HP Side Discharge	1	Nos		
a	12 HP Side Discharge	1	Nos		
a	14 HP Side Discharge	2	Nos		
a	18 HP Side Discharge	2	Nos		
<b>2</b>	<b>Supply of Indoor Units</b>				

	Supply, installation, testing and commissioning of VRF/VRV based ceiling suspended 1Way / 4 Way cassette indoor unit (IDU) compact / standard size, having EER as per BEE standards and specifications, suitable as per site requirement with swing louvers and adjustable blades from sides. Indoor Units complete with in-built drainage arrangements, fan, refrigerant liquid and refrigerant piping, cordless remote control, and fresh air port etc. IDU shall have anticorrosive coating suitable for coastal area complete in all respects, to operate on 1-phase, 230V, 50Hz, AC input supply, consisting with any additional refrigerant and oil charge as per requirement during installation and connected to the system complete.				
a	1.0 TR One Way Cassette Unit	4	Nos		
b	1.3 TR One Way Cassette Unit	7	Nos		
c	1.3 TR Four Way Cassette Unit	1	Nos		
d	2.0 TR Four Way Cassette Unit	11	Nos		
e	2.5 TR Four Way Cassette Unit	3	Nos		
f	3.0 TR Four Way Cassette Unit	8	Nos		
<b>3</b>	<b>SUPPLY OF EXHAUST UNITS</b>				
a	500CFM	1	Nos		
b	700CFM	1	Nos		
c	2000CFM	1	Nos		
d	2600CFM	1	Nos		
6	<b>Decorative Panel</b> For Ceiling Cassettes with receiver Kit	34	Nos		
<b>4</b>	<b>Miscellaneous Item</b>				
a	Supplying, laying / fixing, testing and commissioning of appropriate nominal refrigerant copper pipe for liquid line / suction line supply and return piping of suitable gauge ( hard drawn copper pipe for liquid main line and for refrigerant ) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19 mm thick elastomeric nitrile rubber along with application of multicoating suitable for use with VRV / VRF piping for protection against	1295	Rmt		

	mechanical damages, fungal growth, flame spread, water permeance and ultra violet radiations complete with OEM standards of VRV / VRF air conditioning system.				
5	Drain U-PVC Pipe Fully Insulated with 9 mm rubber nitrile insulation (Include core cutting, tray and any item to complete the work)				
i	25mm	930	Rmt		
ii	32mm	670	Rmt		
ii	40mm	230	Rmt		
6	Control Cabling				
	Supply and installation of control cabling with UPVC conduit from indoor units to outdoor units etc complete with the direction of EIC				
i	4c x 16 sqmm (Supply, Installation & Testing of Power Cabling from Local isolator to OD Unit)	70	Rmt		
ii	3c x 1.5 sqmm (Supply, Installation & Testing of Power Cabling from Local isolator/ switch socket to indoor unit including supply & fixing of plug top if required to match the receptacle provided)	117	Rmt		
ii	3c x 1.0 sqmm shielded cable. (Supply, Installation & Testing of Communication cable Between Indoor and Outdoor Unit.)	1620	Rmt		
7	Exhaust Fan Installation	1	Nos		
8	Supplying and installation of high pressure grade required size copper connection Y or T- Joints / refnet for liquid and suction line complete erected on wall/ceiling with supports/raceways, Nitrile rubber insulation, painting etc. with brazing and testing for leakages confirming the normal operation of the VRV / VRF air conditioning system. (For IDU & ODU)	32	Nos		
9	Supplying and erecting circular flexible / rigid PVC pipe duct of size 150 mm dia, 4 mm thickness with required couplers, reducers, T-joints, Y-joints elbows and necessary supports etc with sealing complete with provided control/ air flow	30	Rmt		

	regulating valves / dampers, filters at position.				
10	Supply, fabrication, installation an testing of flexible canvass connections constructed between ductable unit / dampers / ducting of required size with fire resist flexible double canvas sleeve complete.	1	Nos		
11	Supplying, erecting, testing and commissioning centralised programmable remote control panel (HMI) touch manager controls minimum 16 system of minimum 64 ODU's can be controlled and up to 992 IDU's can be individually mounted and controlled indoor units having minimum 200 mm size colour LCD touch panel, yearly schedule, power proportional distribution function, temperature limitation, history function complete erected on wall with an arrangement to integrate with provided fire alarm system.	2	Nos		
12	SUPPLY OF CORDLESS REMOTE CONTROL	34	Nos		
13	MS STAND				
13.1	Supply & Installation of MS Structure for installing VRF/ VRV outdoor units with 2 coats of red oxide paint and black paint.	6	Nos		
14	Supply & Gas R 410 A charging of Refrigerant Gas	135	K.G		
15	COLD ROOM WORKS HIGH SIDE				
15.1	Refrigeration Unit With Temp. Controller IDU unit 2Nos BM44 WITH HICOOL ODU unit 2Nos KHR530PQE Single Phase unit	2	Nos		
16	COLD ROOM WORKS LOW SIDE				
16.1	10*10*8=60 MM THICK PUF PANEL				
16.2	60 mm Thick PUF Panel with Cam Lock				
a	0.4 mm Thick PPGI Sheet Inclusive Flashing Silicon Sealant Rivets and Cam Lock Plug 60 mm Thick Hinge Type Flush Door Size - W 860 mm X H 1980 mm 3 Side Frame Bottom	1	Nos		

	With Sweeper Gasket 2 Nos Hinges Door Closer Handle with Lock Emergency exit from i				
b	Installation and testing commissioning freezer 40 ft copper pipe	2	Nos		
17	Lifting & Shifting Charges.	3	LOT.		
	<b>Total For Sub Estimate No. 11</b>				

SEAL AND SIGN OF CONTRACTOR

ARCHITECT / CONSULTANT					
SANDEEP GOVALKAR DESIGN ASSOCIATES DATE: - 14/01/2025					
CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD					
PROJECT: - PROPOSED LABORATORY WORK OF MPCB AT NAGPUR					
BILL OF QUANTITIES					
Sr. No.	PARTICULARS	QTY	UNIT	RATE	TOTAL AMOUNT
				(Rs)	(Rs)
<b>BACTERIOLOGY SECTION</b>					
1	R.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	1	Nos.		
2	R.H. 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	2	Nos.		
3	L.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	1	Nos.		
4	L.H. 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	2	Nos.		
5	Common 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	2	Nos.		
6	1500 Module Length Horizontal Members	4	Nos.		
7	1460 End Sink Unit Module Length Horizontal Members	1	Nos.		
8	Filler Panel For End Sink Unit Side	2	Nos.		
9	End Sink Unit Side Cover Panel	2	Nos.		
10	1540 Depth Island With Upright & Without Upright End Cover Panel	2	Nos.		
11	2100 Ht.Island Upright With Cutout & Plain Cover (Without Cutout)	1	Nos.		
12	2100 Ht.Island Upright With Cutout & Cover With Cutout	1	Nos.		
13	2100 Ht.Island Plain Upright & Cover With Cutout	1	Nos.		
14	1500 Module Length Island Electrical Boom - Cutout : 6 Module + 6 Module	2	Nos.		
15	1500 Module Length Glass Reagent Shelf For Island	12	Nos.		
16	WFU-SU-2S-600W-635H	1	Nos.		
17	WFU-2S-1D-750W-635H	4	Nos.		
18	WFU-1S-RH-445W-635H	1	Nos.		
19	WFU-1S-LH-445W-635H	1	Nos.		
20	Pp Drop-In Sink Model S 06 560 Mm (W) X 355 Mm (D)	1	Nos.		
21	3 Way Faucet Bench mounted 3 way water fittings with 8" swing gooseneck	1	Nos.		
22	Jet Black Granite (Sq.Mt.) 20 (±2) Mm Thk	6	Sq.Mtrs.		
23	Silicon Sealant - Black	1	Nos.		



24	Masking Tape	1	R.Mtrs.		
25	6 MM Self Adhesive Natural Rubber Strip	30	R.Mtrs.		
26	6/16A, 6 Pin Shutter Socket - Model No: M1332	16	Nos.		
27	6 Module Plate - Model No: Cs956M-S	8	Nos.		
28	16A, 1 Way Switch Model No: M0130	16	Nos.		
<b>CHEMICAL STORE ROOM</b>					
1	resilience 1000 x 1500 x 486	7	Nos.		
2	MS Apparatus Storage Cabinet [with top cover plate] 900W X 560D X 1800H	1	Nos.		
<b>EYE SHOWER</b>					
1	Ss Emergency Safety Shower With Eye / Face Wash Complete Ss Construction	1	Nos.		
<b>HAZARDOUS WASTE SECTION</b>					
1	R.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	2	Nos.		
2	R.H. 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	4	Nos.		
3	L.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	2	Nos.		
4	L.H. 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	4	Nos.		
5	Common 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	4	Nos.		
6	1500 Module Length Horizontal Members	8	Nos.		
7	1460 End Sink Unit Module Length Horizontal Members	2	Nos.		
8	Filler Panel For End Sink Unit Side	4	Nos.		
9	End Sink Unit Side Cvr Panel	4	Nos.		
10	1540 Depth Island With Upright & Without Upright End Cover Panel	4	Nos.		
11	2100 Ht.Island Upright With Cutout & Plain Cover (Without Cutout)	2	Nos.		
12	2100 Ht.Island Upright With Cutout & Cover With Cutout	2	Nos.		
13	2100 Ht.Island Plain Upright & Cover With Cutout	2	Nos.		
14	1500 Module Length Island Electrical Boom - Cutout : 6 Module + 6 Module	4	Nos.		
15	1500 Module Length Glass Reagent Shelf For Island	24	Nos.		
16	WFU-SU-2S-600W-635H	2	Nos.		
17	WFU-2S-1D-750W-635H	8	Nos.		
18	WFU-1S-RH-445W-635H	2	Nos.		

19	WFU-1S-LH-445W-635H	2	Nos.		
20	Pp Drop-In Sink Model S 06 560 Mm (W) X 355 Mm (D)	2	Nos.		
21	3 Way Faucet Bench mounted 3 way water fittings with 8" swing gooseneck	2	Nos.		
22	Jet Black Granite (Sq.Mt.) 20 (±2) Mm Thk	12	Sq.Mtrs.		
23	Silicon Sealant - Black	2	Nos.		
24	Masking Tape	2	R.Mtrs.		
25	6 MM Self Adhesive Natural Rubber Strip	50	R.Mtrs.		
26	6/16A, 6 Pin Shutter Socket - Model No: M1332	32	Nos.		
27	6 Module Plate - Model No: Cs956M-S	16	Nos.		
28	16A, 1 Way Switch Model No: M0130	32	Nos.		
<b>HOT ZONE</b>					
1	R.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	1	Nos.		
2	L.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	1	Nos.		
3	1500 Module Length Horizontal Members	1	Nos.		
4	770 Depth Wall Side Without Upright End Cover Panel	2	Nos.		
5	Outer Cover For Single-Sided Electrical Trunking	2	Nos.		
6	1500 Module Length Single Side Electrical Trunking - Cutouts: 6 Module + 6 Module + 6 Module	1	Nos.		
7	WFU-2S-1D-750W-635H	1	Nos.		
8	Jet Black Granite (Sq.Mt.) 20 (±2) Mm Thk	2	Sq.Mtrs.		
9	Silicon Sealant - Black	1	Nos.		
10	Masking Tape	1	R.Mtrs.		
11	6 MM Self Adhesive Natural Rubber Strip	10	R.Mtrs.		
12	6/16A, 6 Pin Shutter Socket - Model No: M1332	6	Nos.		
13	6 Module Plate - Model No: Cs956M-S	3	Nos.		
14	16A, 1 Way Switch Model No: M0130	6	Nos.		
<b>INSTRUMENT / AIR SECTION</b>					
1	R.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	4	Nos.		
2	L.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	4	Nos.		
3	Common 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	16	Nos.		
4	1350 Module Length Horizontal Members	20	Nos.		

5	1540 Depth Island With Upright & Without Upright End Cover Panel	4	Nos.		
6	Outer Cover For Double-Sided Electrical Trunking	4	Nos.		
7	Island Without Upright C-Frame Joining Bracket	10	Nos.		
8	1350 Module Length Double Side Electrical Trunking - Cutouts: 6 Module + 6 Module + 6 Module	10	Nos.		
9	WFU-2S-1D-750W-635H	20	Nos.		
10	Jet Black Granite (Sq.Mt.) 20 (±2) Mm Thk	22	Sq.Mtrs.		
11	Silicon Sealant - Black	3	Nos.		
12	Masking Tape	3	R.Mtrs.		
13	6 MM Self Adhesive Natural Rubber Strip	90	R.Mtrs.		
15	6/16A, 6 Pin Shutter Socket - Model No: M1332	120	Nos.		
16	6 Module Plate - Model No: Cs956M-S	60	Nos.		
17	16A, 1 Way Switch Model No: M0130	120	Nos.		
<b>WATER ANALYSIS SECTION</b>					
1	R.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	4	Nos.		
2	R.H. 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	4	Nos.		
3	L.H. 900 Ht.C-Frame Assy. For Table Depths 770 Wall Side Without Upright , 1540 Island Without Upright & 920 Wall Side With Upright	4	Nos.		
4	L.H. 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	4	Nos.		
5	Common 900 Ht.C-Frame Assy. For Table Depth 1540 Island With Upright	4	Nos.		
6	1500 Module Length Horizontal Members	8	Nos.		
7	1460 End Sink Unit Module Length Horizontal Members	2	Nos.		
8	1200 Module Length Horizontal Members	2	Nos.		
9	Filler Panel For End Sink Unit Side	4	Nos.		
10	End Sink Unit Side Cvr Panel	4	Nos.		
11	770 Depth Wall Side Without Upright End Cover Panel	4	Nos.		
12	1540 Depth Island With Upright & Without Upright End Cover Panel	4	Nos.		
13	1200 module length back cover panel	2	Nos.		
14	2100 Ht.Island Upright With Cutout & Plain Cover (Without Cutout)	2	Nos.		
15	2100 Ht.Island Upright With Cutout & Cover With Cutout	2	Nos.		
16	2100 Ht.Island Plain Upright & Cover With Cutout	2	Nos.		
17	1500 Module Length Island Electrical Boom - Cutout : 6 Module + 6 Module	4	Nos.		
18	1500 Module Length Glass Reagent Shelf For Island	24	Nos.		
19	WFU-SU-2S-600W-635H	2	Nos.		

20	WFU-2S-1D-750W-635H	8	Nos.		
21	WFU-2S-1D-600W-635H	2	Nos.		
22	WFU-1S-RH-445W-635H	2	Nos.		
23	WFU-1S-LH-445W-635H	2	Nos.		
24	Pp Drop-In Sink Model S 06 560 Mm (W) X 355 Mm (D)	2	Nos.		
25	3 Way Faucet Bench mounted 3 way water fittings with 8" swing gooseneck	2	Nos.		
26	Emergency Eye Wash - 1 Way Deck mounted (Drench hose unit) with braided stainless steel hose	2	Nos.		
27	Jet Black Granite (Sq.Mt.) 20 (±2) Mm Thk	14	Sq.Mtrs.		
28	Silicon Sealant - Black	2	Nos.		
29	Masking Tape	2	R.Mtrs.		
30	6 MM Self Adhesive Natural Rubber Strip	60	R.Mtrs.		
31	6/16A, 6 Pin Shutter Socket - Model No: M1332	32	Nos.		
32	6 Module Plate - Model No: Cs956M-S	16	Nos.		
33	16A, 1 Way Switch Model No: M0130	32	Nos.		

**TOTAL BASIC PRICE**

**SEAL AND SIGN OF CONTRACTOR**

<b>ARCHITECT / CONSULTANT</b>					
<b>SANDEEP GOVALKAR DESIGN ASSOCIATES</b>					
<b>CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD</b>					
<b>PROJECT: - PROPOSED LABORATORY WORK OF MPCB AT NAGPUR</b>					
<b>BILL OF QUANTITIES</b>					
<b>Sr. No.</b>	<b>PARTICULARS</b>	<b>QTY</b>	<b>UNIT</b>	<b>RATE</b>	<b>TOTAL AMOUNT</b>
<b>HOT ZONE</b>					
<b>6 Feet ABP BT</b>					
<b>Superstructure</b>					
1	6 FEET BENCHTOP ABP AEOLUS FUME HOOD WITHOUT ANY ACCESSORIES	1	PCS		
<b>Sub-Total</b>					
<b>Accessories</b>					
1	Airflow monitor for Fumehood	1	Nos		
2	<b>Distribution Board With Rocker Switch For Aeolus Fumehood</b>	1	Nos		
3	LED LIGHT FOR 4 TO 6 FT AEOLUS FUMEHOOD	1	Nos		
4	20AMP BCH IND.SOCKET WITH TINY TRIP FOR AEOLUS FUME HOOD	1	Nos		
5	3 Module Plate With Socket & Tiny Trip For Aeolus Fume Hood	1	Nos		
6	Apparatus Grid For 6 Feet Benchtop Aeolus Fumehood (Epoxy)	1	Nos		
7	Raw Water (Flexible Tubing Service Valves For Benchtop Aeolus Fumehood) (RHS)	1	Nos		
8	Compressed Air (Flexible Tubing Service Valves For Benchtop Aeolus Fumehood) (RHS)	1	Nos		
9	Nitrogen (Flexible Tubing Service Valves For Benchtop Aeolus Fumehood) (RHS)	1	Nos		
<b>Sub-Total</b>					
<b>Ceiling Panel</b>					
1	Ceiling Front Cover Panel For 6 Feet Aeolus Fumehood	1	Nos		
2	Ceiling LH/ RH Side Cover Panel For Aeolus Fumehood	1	Nos		
<b>Sub-Total</b>					
<b>Understorage</b>					
1	FIXED TYPE APPARATUS STORAGE CABINET FOR BENCH TOP AEOLUS FUME HOOD (900 WIDTH)	2	Nos		
2	Rear Support Panel Offixed Type Apparatus Storage Cabinet For Benchtop Aeolus Fumehood	1	Nos		
<b>Sub-Total</b>					
<b>6 Feet ABP BT</b>					
<b>Superstructure</b>					
1	6 FEET BENCHTOP ABP AEOLUS FUME HOOD WITHOUT ANY ACCESSORIES	1	PCS		
<b>Sub-Total</b>					

<b>Accessories</b>				
1	Airflow monitor for Fumehood	1	Nos	
2	Eco Panel (2 Hp) With TI/ BI For Aeolus Fumehood	1	Nos	
3	LED LIGHT FOR 4 TO 6 FT AEOLUS FUMEHOOD	1	Nos	
4	20AMP BCH IND.SOCKET WITH TINY TRIP FOR AEOLUS FUME HOOD	1	Nos	
5	3 Module Plate With Socket & Tiny Trip For Aeolus Fume Hood	1	Nos	
6	Apparatus Grid For 6 Feet Benchtop Aeolus Fumehood (Epoxy)	1	Nos	
7	Raw Water (Flexible Tubing Service Valves For Benchtop Aeolus Fumehood) (RHS)	1	Nos	
8	Compressed Air (Flexible Tubing Service Valves For Benchtop Aeolus Fumehood) (RHS)	1	Nos	
9	Nitrogen (Flexible Tubing Service Valves For Benchtop Aeolus Fumehood) (RHS)	1	Nos	
<b>Sub-Total</b>				
<b>Ceiling Panel</b>				
1	Ceiling Front Cover Panel For 6 Feet Aeolus Fumehood	1	Nos	
2	Ceiling LH/ RH Side Cover Panel For Aeolus Fumehood	1	Nos	
<b>Sub-Total</b>				
<b>Understorage</b>				
1	FIXED TYPE APPARATUS STORAGE CABINET FOR BENCH TOP AEOLUS FUME HOOD (900 WIDTH)	2	Nos	
2	Rear Support Panel Offixed Type Apparatus Storage Cabinet For Benchtop Aeolus Fumehood	1	Nos	
<b>Sub-Total</b>				
<b>TOTAL BASIC PRICE</b>				
<b>IMP BLOWER &amp; DUCTING WILL BE PROVIDED ON ACTUALS AS PER SITE REQUIREMENTS. THE RATE FOR THE PP FRP DUCT IS RS. 1000SQ.FT. (BASIC RATE) and TAXES APPLICABLE ON THIS</b>				
<b>SEAL AND SIGN OF CONTRACTOR</b>				

<b>ARCHITECT / CONSULTANT</b>		
<b>SANDEEP GOVALKAR DESIGN ASSOCIATES</b>		<b>DATE: - 14-01-2025</b>
<b>CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD</b>		
<b>PROJECT: - PROPOSED LABORATORY WORK OF MPCB AT NAGPUR</b>		
<b>BILL OF QUANTITIES – LABORATORY WORKS</b>		
<b>SR.NO.</b>	<b>PARTICULARS</b>	<b>AMOUNT</b>
<b>Furniture</b>		
1	BACTERIOLOGY SECTION	
2	CHEMICAL STORE ROOM	
3	EYE SHOWER	
4	HAZARDOUS WASTE SECTION	
5	HOT ZONE	
6	INSTRUMENT / AIR SECTION	
7	WATER ANALYSIS SECTION	
<b>Fumehood Superstructures</b>		
8		
9	HOT ZONE	
10	<b>GRAND TOTAL (EXCLUDING GST)</b>	
<b>SEAL AND SIGN OF CONTRACTOR</b>		

ARCHITECT / CONSULTANT								
SANDEEP GOVALKAR DESIGN ASSOCIATES								
CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD								
PROJECT: - PROPOSED AUDIO VISUAL WORKS OF MPCB NAGPUR								
<b>MPCB - Conference Room - AV System Vers 2.0</b>								
SR NO	PRODUCT DESCRIPTION	MAKE	QTY	UOM	UNIT PRICE	TOTAL PRICE	GST %	TOTAL WITH GST
	<b>Display</b>							
1	98" Interactive Display, Smart Interactive 4K display   Size: 98"   7H Hardness   Anti Glare + Anti-Fingerprint + Antimicrobial Tempered Glass   500 nits   In built Android 11.0 with Android Safe Mode, RAM 4GB, ROM 32GB, Upgradable to 64GB   CPU (4 Core + 4 Core)   10 points Touch in Android & 20 points touch in Windows   Embedded Blue Eye Filter   Anti-Microbial Surface   Smart Object recognition and responsive multi-touch   4ms Touch Response time   Multiple Inputs/Outputs for connectivity   40W Speakers   Slimmer Frame   Type C Connectivity   Customize GUI with Secure User Profiles   Inbuilt Software for Casting /Broadcasting /Display Remote Management   Advance white boarding Features with Onscreen Annotation	Samsung / Newline	1	Nos			18%	
2	Wall Bracket for above display	Custom	1	Nos			18%	
	<b>VC System</b>							



3	Poly EEIV-12X Camera PTZ	Poly	1				18%	
4	Partner Poly Plus, One Year, Poly EEIV-12X	Poly	1				18%	
<b>Wireless Presentation</b>								
5	Wireless presentation Gateway with room scheduling application: The AirMedia® Series 3 Receiver 100 (AM-3100-WF) enables secure wireless collaboration in the modern digital workspace. Easy to deploy and manage, install the Receiver in conference rooms, huddle rooms, lounges, lobbies, or almost any space to establish a productive meeting environment.	Crestron	1	Nos			18%	
<b>Audio</b>								
6	Ceiling microphone with patented beamforming technology ,Optimize your digital workflows with software. The microphone can be easily controlled and monitored from anywhere in the corporate network. For 100% connectivity - Connect the microphone via analogue or digital DANTE™ audio outputs to any conference system. Power-over-Ethernet (PoE) makes integration of the ceiling microphone very easy. An open media control protocol (API) allows you to make individual adjustments. With 28 pre-polarized condenser capsule.1 x 3-pin terminals (Phoenix contact MCVW 1.5-3-ST-3.81); 2 x Digital Dante Network Audio (RJ45) and should have in-built voicelift feature	Sennheiser	1	Nos			18%	

7	6.5" driver using polypropylene cone material,coaxial 2-way ceiling speakers featuring exceptional intelligibility and musical performance,100V line transformer with tappings for 24W, 12W, 6W and an 8 Ohm or 16 Ohm bypass connection	Audac	6	Nos			18%	
8	EPA254 - Quad-channel Class-D amplifier 4 x 250W, Energy-star certified, Frequency Response ( $\pm 3$ dB) 20 Hz - 20 kHz, Signal / Noise > 90 Db,Protection over DC Short circuit, Over Heating, Over Load,Signal Limiting. Outputs Connector 2-pin Euro Terminal Block (Pitch - 5.08 mm)	Audac	1	Nos			18%	
9	TesiraFORTÉ® a fixed I/O DSP with 32 bi-directional channels of Dante™ digital audio, 4 analog inputs, 4 channels of Acoustic Echo Cancellation (AEC) technology, and 4 analog outputs. It also includes up to 8 channels of configurable USB audio, a 2-channel VoIP interface and a standard FXO telephone interface. USB audio allows TesiraFORTÉ to interface directly with USB audio hosts, as well as to take full advantage of today's most sophisticated conferencing solutions	Biamp	1	Nos			18%	
10	The TesiraCONNECT TC-5D is a 5-port AVB-capable PoE+ network device which can be configured as a Dante or AVB interface to a Tesira system. While it retains all of the features of the original the TesiraCONNECT, the TC-5D also provides the ability to bridge AVB and Dante media networks.	Biamp	1	Nos			18%	
11	The EX-UBT is a compact remote expander that uses the networking protocol, to extend USB	Biamp	1	Nos			18%	

	and/or Bluetooth sources back to a rack-mounted Tesira server-class device						
12	<b>Switching</b>						
13	UCX 4x2 switcher with USB-C, HDMI 2.0 and USB 3.1 ports supporting 4K signal formats (4K UHD @ 60Hz RGB 4:4:4, up to 18 Gbps), secure control Ethernet interface. USB-C connectivity for 4K video, audio, control signals and power. Advanced automated room control features.	Lightware	1	Nos			18%
14	Under desk mounting for Taurus UCX devices.	Lightware	1	Nos			18%
15	Under desk mounting for Taurus UCX power supply.	Lightware	1	Nos			18%
16	USB-C to USB-C 3 m ( 10 feet ) cable. USB Full-Featured Type-C for USB 3.1 Gen 2	Lightware	1	Nos			18%
17	USB-C to USB-C 5 m ( 16 feet ) cable. USB Full-Featured Type-C for USB 3.1 Gen 2	Lightware	1	Nos			18%
18	Unilite Device Control Management for Auto Switching of the various Signals, Display Control, to analyse the signal flow. Its intuitive, user friendly, smarter and has a more modern interface. Dynamic crosspoint layout, new way of matrix handling, Device specific layouts, Cross platform support	Lightware + AVSI	1	Nos			18%
19	Cable Cubby Black Sand Blasted Anodized Aluminum Top, Cable cubby with 2X Universal Power, Wireless Charging and multi-format cables, 1 X LAN, 1X HDMI, 1X USB C etc pass through	Logic / Kramer	3	Nos			18%
	<b>Cables and Services</b>						
20	Lumsum Patch Cable, Audio ,Video, cat6 Cables	Kramer	1	Nos			18%

21	Lumsum Cables & Connectors, Heat Sink	Lumsum	1	Nos			18%	
22	12U x 600W x 600D, should have removable sides, Indian type PDU, Lock & key, Key Hole Distribution: three sides, Double Fans, black color, lockable wheels – 4nos., minimum three nos. of shelves , Suitable Rack mounting clamps / kit for mounting DSP, Network switch and Amplifier for mounting of into Rack.	WQ/ Netrack/ Valrack	1	Nos			18%	
23	Installation, Testing and commisioning	AVSI	1	Nos			18%	
24	Programming	AVSI	1	Nos			18%	
25	Documents & Design Drawing	AVSI	1	Nos			18%	
	<b>Total for -Conference Room</b>							

**SEAL AND SIGN OF CONTRACTOR**

ARCHITECT / CONSULTANT								
SANDEEP GOVALKAR DESIGN ASSOCIATES								
CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD								
PROJECT: - PROPOSED AUDIO VISUAL WORKS OF MPCB, NAGPUR.								
<b>MPCB - Conference Room - AV System Vers 2.0</b>								
SR NO	PRODUCT DESCRIPTION	MAKE	QTY	UOM	UNIT PRICE	TOTAL PRICE	GST %	TOTAL WITH GST
<b>Control System</b>								
1	Central Control Processor for Automation	AMX / Crestron	1				18%	
2	Apple iPad , 64 GB 10.2 inch with Wi-Fi Only (Space Grey / Silver )	Apple	2				18%	
3	Software Interface App for iPhone® , iPod , Table touch® Devices	Apple	2				18%	
4	Router for WiFi	Linksys	2				18%	
5	10 Port POE Network Switch	Dlink	1				18%	
<b>Cables and Services</b>								
6	Lumsum Patch Cable, Audio ,Video,cat6 Cables	Kramer / Dlink	1	Nos			18%	
7	Lumsum Cables & Connectors, Heat Sink	Lumsum	1	Nos			18%	
8	12U x 600W x 600D, should have removable sides, Indian type PDU, Lock & key, Key Hole Distribution: three sides, Double Fans, black color,	WQ/ Netrack	1	Nos			18%	

lockable wheels – 4nos., minimum three nos. of shelves , Suitable Rack mounting clamps / kit for mounting DSP, Network switch and Amplifier for mounting of into Rack.							
<b>Total for -Conference Room</b>							

**SEAL AND SIGN OF CONTRACTOR**

**ARCHITECT / CONSULTANT**  
**SANDEEP GOVALKAR DESIGN ASSOCIATES**  
**CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD**  
**PROJECT: - PROPOSED AUDIO VISUAL WORKS OF MPCB, NAGPUR.**

**MPCB - Displays Vers 2.0**

SR NO	PRODUCT DESCRIPTION	MAKE	QTY	UOM	UNIT PRICE	TOTAL PRICE	GST %	TOTAL WITH GST
	<b>Display</b>							
1	50" LED Display with 4K Resolution	Samsung / L.G.	6	Nos			28%	
2	Bracket for above display	Custom	6	Nos			18%	
	<b>Cables and Accessories</b>							
3	Faceplate with HDMI Connectivity	MX / NT / Logic	6	Nos			18%	
4	HDMI Patch Cable - 10 Meter	Kramer / Logic	6	Nos			18%	
5	HDMI Patch Cable - 1.8 Meter	Kramer / Logic	6	Nos			18%	
	<b>Services</b>							
6	Installation, Testing and commisioning	AVSI	6	Nos			18%	
7	Programming	AVSI	6	Nos			18%	
8	Documents & Design Drawing	AVSI	6	Nos			18%	
	<b>Total for -Conference Room</b>							

**SEAL AND SIGN OF CONTRACTOR**

<b>ARCHITECT / CONSULTANT</b>						
<b>SANDEEP GOVALKAR DESIGN ASSOCIATES</b>						
<b>CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD</b>						
<b>PROJECT: - PROPOSED AUDIO VISUAL WORKS OF MPCB NAGPUR</b>						
<b>Summary - MPCB NAGPUR - AV System Dated - 03/01/2025</b>						
<b>Sr.No</b>	<b>SUMMARY SHEET</b>	<b>Qty</b>	<b>Unit Cost Per Room without GST</b>	<b>Total Cost for All Rooms without GST</b>	<b>Total Cost With GST</b>	<b>Total Cost for All Rooms with GST</b>
1	Board Room	1				
2	Centralised Control System	1				
3	Display - 6 Nos	1				
	<b>TOTAL PROJECT COST</b>					
				<b>WITHOUT GST</b>		<b>With GST</b>
<b>SEAL AND SIGN OF CONTRACTOR</b>						



<b>ARCHITECT / CONSULTANT</b>
<b>SANDEEP GOVALKAR DESIGN ASSOCIATES</b>
<b>CLIENT : MAHARASHTRA POLLUTION CONTROL BOARD</b>
<b>PROJECT: - PROPOSED REPAIR/RENOVATION OF REGIONAL OFFICE AND LABORATORY AT NAGPUR.</b>
<b>BILL OF QUANTITIES</b>
<b>DATE: - 03/01/2025</b>

**SUMMARY SHEET**

<b>SR.NO.</b>	<b>DESCRIPTION</b>	<b>AMOUNT</b>
1	Sub Estimate No.1 – Demolition & Civil works	
2	Sub Estimate No. 2 – Plumbing Works	
3	Sub Estimate No. 3 – Painting work	
4	Sub Estimate No. 4 – Carpentry Works.	
5	Sub Estimate No. 5 – Doors & Windows Works	
6	Sub Estimate No. 6 – False Ceiling	
7	Sub Estimate No. 7 – Loose Furniture	
8	Sub Estimate No. 8 – Chairs Works	
9	Sub Estimate No. 9 – Miscellaneous Works	
10	Sub Estimate No. 10 – Electrical Works	
11	Sub Estimate No. 11 – HVAC Works	
12	Sub Estimate No. 12 – Laboratory Furniture	
13	Sub Estimate No. 13 – Audio Visual	
<b>14</b>	<b>TOTAL (EXCLUDING GST)</b>	
<b>15</b>	<b>GRAND TOTAL (INCLUDING GST)</b>	

**SEAL AND SIGN OF CONTRACTOR**

## **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 is 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 / equipment 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 shall 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 merchant. 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 of 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 any 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 in 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 these drawings with all revision shall be maintained as record drawings at site and all such revisions / corrections shall be reflected / incorporate 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 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 thereof) 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.

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## **SPECIFICATION FOR DEMOLISHING EXISTING STRUCTURE**

**A. Demolishing the existing Structure by using mechanical equipment's/ manually including sorting out the material i.e. damaged reinforcement, doors, windows, False Ceiling, Partition, electrical fixtures, AC Units, Plumbing 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.

**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.

## **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 conform 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 be 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 an 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 MIDC, 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 efflorescence, 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.

## **2.0 Cement Plaster**

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
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**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 1st 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 any 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 SiO<sub>2</sub>.

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 0.075 mm or a little less. Particles between 0.075 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 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	100	REF. TO METHOD OF IS: 2386 (Part-I)
2.36mm	90 to 100	
1.18mm	70 to 100	
600 micron	40 to 100	
300 micron	5 to 70	
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 efflorescence, 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 bulking.

**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 at least 150mm above the levelled ground, to avoid contact of surrounding earth with the mix. Size of the platform shall be such that it shall extend at least 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 include 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 m<sup>2</sup> 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.  
The Plaster Bands 30 cm wide under the Cornice Beading & architrave/moulded wholly in plaster.  
The 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  
The moulded cornices & curves shall be paid in M2 the area being arrived at by multiplying length by the girth.
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 m<sup>2</sup> 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 m<sup>2</sup> 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 m<sup>2</sup> in area and no additions shall be made either for the jambs, soffits and sills of such openings. When plastered on 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 vitrified 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 from 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  $\pm 3\%$  shall be allowed for the thickness. In respect of length and breadth of slabs a tolerance of  $\pm 2\%$  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 m<sup>2</sup>. 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 Jamb lining for Door / Window**

**Providing and fixing in position & in stepped manner one side mirror polished machine cut Granite slab Jamb lining for Door / Window frames of width up to 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 jamb lining.

**1.3.5 Mode of Measurement and Payment:** The Granite Jamb lining 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 Bevara, 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/m<sup>2</sup> ,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.**

#### **a) 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 conforming 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.

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**2.0 Providing and fixing of Counter top wash hand basin Bowl 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 from 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 from 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 from 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 or Approved Equivalent 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 or Approved Equivalent.
- c. Plain or semi perforated insulation board (Bitulux) shall be 12 mm thk. Board of Jolly Jolly Board Product or Sitatex Board or Approved Equivalent.
- d. Armstrong or Approved Equivalent 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 ceiling section 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 Consultant / 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 m<sup>2</sup> 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 in 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 thicken, 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 manufacturer'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 hygroscopic 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 m<sup>2</sup> 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.

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**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		Windows
		Single Shutter  (on each shutter )	Double Shutter	
1.	<i>Butt hinges (100mm long with stainless steel pin)</i>	3 nos.	3 nos.	2 nos.
2.	<i>Lowe Bolts (200mm long)</i>	2 nos.	2 nos.	2 nos.
3.	<i>Handles (150mm long)</i>	1 nos.	1 nos.	1 nos.
4.	<i>Aldrop (or mortice latch and lock) – 300mm long</i>	1 no.	1 no.	
5.	<i>Stoppers</i>	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 shall 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 conform 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 crosstongued 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 is to 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 machinability, 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 conform 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 separate 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,Trolley, 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-incharge/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,Trolley, cable manger etc completed 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 Modular Type Work Stations - L shape with circular one side corner In Admin area - type -1 - 1500 X 1100x600 deep**

**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 trolley,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. In case 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 with 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. Pedestal unit - 3 drawer pedestal unit of overall size 500 deep X 450 wide X 725 ht made out of 18 / 16 mm prelaminated board for carcass & 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 jointer & 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 MIDC. 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 Sofa /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 MIDC. 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 / Jamb lining : (upto 300 mm wide):-**

**Supplying, Providing & fixing in position of required size pelmets / jamb lining 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 MIDC. 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.

## **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 MIDC. 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.

## **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 MIDC. 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.

## 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, panelling, fascia, 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 Euro screws 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 post form 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 or As readymade with approval from EIC/Architect.**
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**

<b>SR. NO.</b>	<b>MATERIAL</b>	<b>APPROVED MAKE / SUBCONTRACTOR / SUPPLIERS</b>
<b>A</b>	<b>WOOD</b>	
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 for samples
4.	Hardwood	No specific supplier, contractor to obtain approval for samples
5.	Wood to match the veneers to be used	Anchor, Durian, Century , Samrat or Approved equivalent
<b>B</b>	<b>PLYWOOD / DOOR SHUTTER</b>	
1.	Commercial ply	Greenply, Century , Samrat or Approved equivalent
2.	Marine ply	Greenply, Samrat, Century or Approved equivalent
3.	Particle board	Samrat, Heritage, Asis, Asian
4.	MDF	Asis, Egger, Greenlam, Century
5.	Block board	Samrat, Greenply, Century
6.	Flush Door	Greenply, Century, Kutty
7.	Fire Rated Door	Sukri, Promat, Kenwood, Anchor

SR. NO.	MATERIAL	APPROVED MAKE / SUBCONTRACTOR / SUPPLIERS
<b>C</b>	<b>DECORATIVE VENEERS / LAMINATES</b>	
1.	Veneers	Anchor, Greenply (Decowood), Century
2.	Laminate	AICA-Sunmica, Formica, Merino, Century, Greenlam
<b>D</b>	<b>GLASS</b>	
1.	Glass	Asahi, Modiguard, Saint Gobain.
2.	Mirror	Modiguard, or Approved equivalent
3.	Tempering or toughening of glass	Tuff glaze India Pvt. Ltd., or Approved equivalent
4.	Glass blocks	Fishfa glass, Raj impex treading company.
5.	Back painted & Laminated Glass	Saint Gobain or equivalent
<b>E.</b>	<b>PAINT, POLISH, ADHESIVES &amp; PRESERVATIVES</b>	
1.	Paint-Plastic Emulsion/ Exterior/ OBD/ Luster/ Texture/ Primer & Cement Paint	Asian paint, ICI Dulux, Burger, Nerolac
2.	Adhesive	Pidilite Fevicol (Marine), Araldite, Makbond
3.	Wood preservative	Termiseal by pest Control India, Bison by British paints
5.	Polycoating	MRF, Solvosol
6.	Melamine	MRF, Solvosol
7.	Polishes	Touch wood of Asian Paint, Wudfin of Pidilite industries, Goodlas Nerolac
8.	Silicone Sealant	Dow Corning or equivalent

SR. NO.	MATERIAL	APPROVED MAKE / SUBCONTRACTOR / SUPPLIERS
<b>F.</b>	<b>FALSE CEILING</b>	
1	Gypsum board false ceiling	Gypsum India (Gypro) Or Approved equivalent
2.	Acoustical false ceiling, Sound Scape & Panelling	Armstrong / AMF/ Gyptech
3.	Moisture Resistance Board	Gypsum India OR Approved Equivalent
4.	Section for false ceiling (Internal GI framing)	Gypsteel - Gyproc (Gypsum India)
<b>G.</b>	<b>HARDWARE</b>	
1.	Screws	G.K.W. Nettle folds & approved equivalent.
2.	Hardware for Storages	Ozone,Hettich,Kich, Dorma, Hafele ,Enox
3.	Floor Springs/ door closers	Ozone,Hettich,Kich, Dorma, Hafele ,Enox
4.	Stainless steel handle, Stopper, Hinges, Mortise lock, Tower Bolt, drawer channel	Ozone,Hettich,Kich, Dorma, Hafele ,Enox
5.	KD – Fittings	Syntex / Grass / Mepla.
6.	Aluminium Section	Jindal, Hindalco, Nalco
7.	Stud Anchors & Anchor Fasteners	Hilti, Fischer, Bosh, AXE
<b>H.</b>	<b>SOFT FURNISHING</b>	
1.	Carpet	Tuntex, Flotex, Modulyss. CCIL, Milliken,Welspun
2.	Vinyl Flooring	Armstrong, LG, CCIL or Approved equivalent
3.	Wooden flooring	Vista, Armstrong, Ego or Approved equivalent
3.	Glass film for Tint/ safety/ frosting etc.	Garware ,3M & LG .
4.	Soft Board	Jolly board or equivalent
5.	Wall paper	Omexco,Marshall Or Approved 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
<b>SR. NO.</b>	<b>MATERIAL</b>	<b>APPROVED MAKE / SUBCONTRACTOR / SUPPLIERS</b>
<b>I.</b>	<b>BLINDS</b>	
1.	Blinds & Blackout Blinds	Vista, Mark, Serge Ferrai, Soflite, Implex or Approved equivalent
<b>J.</b>	<b>TILES</b>	
1.	Vitrified tiles (1 <sup>st</sup> Quality)	Kajaria, H & R Johnson, RAK, Somany.
2.	Cement	Ultra Tech, ACC, J.P. Cement, Ambuja
3.	White cement	Birla, J.K. or Approved equivalent

**Note:** Any other item not mentioned but required at site will be as per the final approval of Client / Consultant.

**Technical specifications**  
**Electrical Works**



## Technical Specification

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## **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 significantly increases the life span 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 connections 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  $\pm 6\%$  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
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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 articles.
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 buried, 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 reel 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 than 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 than 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 tiles 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
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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)

MPCB

## 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 Size(mm)	Trunking	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.
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## 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 mm		25 mm		32 mm		38 mm	
		S	B	S	B	S	B	S	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<sup>st</sup> 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 of 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 IN CABLES

- 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.

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#### CAPACITY OF CIRCUITS

i) Lighting circuit shall feed light/fan/ call bell points. Each circuit shall not have more than 800 Watt connected load or more than 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 than 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-II.
- (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 commissioning 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 than 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 colour 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 white 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 receiving consent 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
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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	Phosphorous 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	Attenuation, NEXT, PS NEXT, FEXT and Return Loss
to be provided along with bid	

#### 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 EIA/TIA 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 15millionths 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	Use in

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 TIA/EIA and ISO/IEC Category 6/Class 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 EIA/TIA 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 compound as per BS: 6746, unarmoured twisted pairs with proper colour code bundled together in concentric layers and wrapped with melinix or PVC tape with nylon ripcord. Ripcord is laid 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 enamelled.

#### 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 provided space. The system and installation shall comply with BS EN 50091 or equivalent Indian standard or IEC 60950. UPS shall also conform 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 consist 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 45°C 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 conforming 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 colour coded with time and date stamp

Battery backed up non-volatile 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 $\phi$ = 0.8 incl)	97
b)	50% load (COS $\phi$ = 0.8 incl)	96
c)	100% load (Resistive COS $\phi$ = 1)	95
d)	50% load (Resistive COS $\phi$ = 1)	94
e)	Heat Dissipation. 100% load COS $\phi$ = 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

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 contractor.

## INSTALLATION, TESTING AND COMMISSIONING

General

Scope

MPCB

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SIGNATURE OF CONTRACTOR

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 ingress.

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 putting 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  $1/20$ th 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 levelled 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 performed 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 breaker 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 operating 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 Between CT & PT circuit if any	:	Mega ohm

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 Substation 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 aluminium 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 centres, 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 include 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. Rolling 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 aluminium 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 aluminium strip clamps at every 2m.

Cables shall not be bent more than the minimum permissible limit. The permissible limits are as follows:

Cable and Minimum bending radius



Power cable 12 D, above 60mm dia 15 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.<sup>2</sup> 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.<sup>2</sup> 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, possess 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	
<b>SAFETY GADGETS</b>				
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	
<b>TESTING &amp; MEASURING EQUIPMENTS</b>				
1	HV Tester	0-30/60kV, 0-100mA	1 No	
2	Megger	5kV, Hand Held manual driven	1 No	Electronic is megger optional
<b>HT EQUIPMENTS</b>				
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	
<b>SAFETY GADGETS</b>				
1	Helmets	Yellow without flap	Qty per number ga of 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
<b>TESTING &amp; MEASURING EQUIPMENTS</b>				
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
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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 Blade	Frame and 12"		1 No
8	Knife 6"			1 No
9	Bamboo/ FRP local	Ladder 3m		1 No
SAFETY GADGETS				
1	Helmets	Yellow without flap	without	Qty per number ga of membe
		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
4	Hand Gloves	(300x400mm) 15kV Rubber Grip	One pair	
5	First Aid Kit		1 No	
	For additional earthing	2 feet, local make	1 No	
Testing & Measurement 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.	Product	Make (ISI marked)
	Power distribution boards	Schneider L and T Siemens Legrand
	LV Glands & Lugs	Dowell Electro Works Jainson Asian Comet
	LV Switchgear	MCB-C Curve: Legrand Siemens L&T Schneider Electric

Sr. No.	Product	Make (ISI marked)
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	LV Cables	Polycab Finolex KEI RR Kabel Havells
	Wires	Polycab Finolex KEI RR Kabel Havells
	Cable Tray	Profab Rico Steel Sadhana MK
	Underfloor raceways	MK-Honeywell Legrand
	PVC Conduits & accessories	Precision BEC AKG

Sr. No.	Product	Make (ISI marked)
	Switches / Sockets / TV Socket / Telephone sockets / Data sockets / Regulators etc.(Modular)	MK Honeywell -Elements Hager Havells (Crabtree) Legrand
	Industrial Socket Metal Clad	CG (Scame) Schneider Electric (Clipsal) C&S
	Industrial Socket Splash Proof	CG (Scame) Gewiss Schneider Electric (Clipsal) C&S
	Ceiling Fans/ Exhaust Fans	Orient Crompton Bajaj Usha Havells
	Lighting Fixture	Philips Wipro Bajaj CG

Sr. No.	Product	Make (ISI marked)
	Maintenance Free Earthing	Indelec Stormaster (Fast Track Enterprises) Ashlok
	UPS System	Numeric Emerson Schneider APC Socomec
	Cat 6 and fibre optic cable	Commoscope Tyco Molex
	LIU	Commoscope Tyco Molex
	48 and 24 port patch panel	Molex Tyco Commoscope
	Closed racks-12U	APC NetShelter SX or approved equivalent

Note: If make of any item is not mentioned above or is missed out, the same shall be approved by the Consultant/Architect.

**TECHNICAL SPECIFICATIONS**  
For  
**HVAC SYSTEM**



## **SYSTEM DESCRIPTION AND SCOPE OF HVAC WORK**

### **1.0 DESIGN CONSIDERATIONS:**

The following space of Cabin, Open office, Conference Room, Service Room ,Server Room etc. for MPCB shall be provided with VRF type HVAC System.

### **2.0 BASIS OF DESIGN:**

#### **2.1 Air Conditioning System:**

Ambient Conditions

Summer : 43°C DB & 34 °C WB

Winter : 22 °C DB & 8.0 °C WB

Relative Humidity : 90%

Lighting Load : 1.2 Watt/sq. ft. (or actual as per lighting design)

Fresh air : As per ASHRAE 62.1, or 1 ACPH, whichever is higher.

The VRV System should be designed to deliver 22deg C +/- 1deg C tolerance

### **3.0 PROPOSED AIR CONDITIONING SYSTEM:**

#### VRF system:

The office cabin, open office area, Conference room, Service room, Part of Laboratory , Server room etc. shall be covered by the VRF (Variable Refrigerant Flow) system. The Outdoor units of VRF system shall be placed on terrace. The indoor units in VRF system shall be Ceiling cassette type, placed in the false ceiling.

Refrigerant piping from terrace to each floor shall be run through service shafts provided in the building.

Refrigerant and drain piping shall run above false ceiling, on GI perforated cable trays.

The condensate drain shall be taken to toilet block and connected to floor traps.

A treated fresh air system shall be provided to supply cool filtered fresh air to the rooms covered by the VRF system through GI duct work running above false ceiling.

All Toilets should be provided with exhaust system with inline fans and accessories as in BOQ.

#### **4.0 SPECIFICATIONS**

All the equipment and ancillary work shall conform to the technical specifications and standards of workmanship described in Chapter on Technical Specifications.

#### **5.0 CONTRACTOR'S SCOPE**

Contractor shall be responsible to work out the heat load, capacity of all equipment and ducting, piping and insulation etc. based on the architectural drawings and the design basis indicated above, and shall be responsible to achieve the desired room conditions in all seasons.

All equipment and ancillary work shall conform to the technical specifications described in the next chapter. Contractor shall submit design calculations and detailed technical submittals for each equipment and material, and working drawings of layouts, piping and ducting, for approval of consultant before execution.

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## **TECHNICAL SPECIFICATIONS FOR HVAC SYSTEM WORK**

### **1.0 VARIABLE REFRIGERANT FLOW (VRF) SYSTEM**

The system shall be air-cooled, type central air conditioning system consisting of outdoor units, indoor units and refrigerant piping, cabling between indoor and outdoor units.

The system shall be based on refrigerant R-410.

#### **1.0 Outdoor Unit:**

The outdoor unit shall be a factory-assembled unit housed in a sturdy weatherproof casing constructed from rust proof galvanized powder coated steel panels. The compressors shall be hermetically sealed **100% Inverter driven variable speed type scroll** capable of changing the capacity in accordance to the cooling load requirement.

The unit shall be capable of assessing the requirement of refrigerant volumetric flow of each indoor unit at all times by means of a sophisticated microprocessor controller and generating the required total volume of refrigerant for supply to the indoor units.

The finned coils shall be constructed out of copper tubes mechanically bonded to aluminium fins. The surface of the condenser coil shall be coated with suitable chemical coating to prevent deterioration due to climate.

All necessary safety devices shall be provided to ensure safe operation of the system. The unit shall be located in open on a terrace with adequate clearance from nearby objects to ensure unobstructed air flow and easy approach for maintenance.

The noise level of the unit shall not be more than 65dB (A) measured horizontally 1 m away and 1.5 m above base level.

Unit should be equipped with a highly efficient oil separation system to ensure stable operation with long refrigerant piping.

The VRF outdoor unit shall be located in open on a terrace with adequate clearance from nearby objects to ensure unobstructed air flow and easy approach for maintenance

## **2.0 Indoor Units**

Each unit shall be selected as per the requirement of the cooling/heating load and interior layout in the respective space to be air-conditioned. The unit shall be equipped with an electronic expansion valve, which can communicate with the VRF controller in the condensing unit.

The fan shall be of the centrifugal type and statically and dynamically balanced to ensure low noise and vibration free operation.

Each indoor unit shall be equipped with cordless local control unit for setting the operating parameters. The address of the indoor unit shall be set automatically in case of individual and group control. Option of centralized control should also be achievable.

Controls shall be provided to maintain the set room temperature within close tolerance limits.

### **Ceiling Cassette type Indoor Unit:**

The unit shall be suitable for suspension from roof slab, recessed in the space above false ceiling. The bottom of the ceiling shall be flush with the false ceiling.

The unit shall house a circular cooling coil, centrifugal single inlet fan with motor, installed in a galvanized and powder coated sheet metal housing. The fan shall have vertical shaft and suction at the bottom. The fan motor shall be designed for low noise, maximum speed being limited to 900 RPM. Noise level of the unit at highest speed shall not exceed 45dBA.

A pulse type pump with level activated switch shall be provided for lifting of the condensate collected in the drain pan, by at least 600mm.

## **3.0 Refrigerant Piping:**

The refrigerant piping interconnecting to indoor & outdoor units shall be made out of hard copper tubes, in brazed construction. The refrigerant line sizing should be designed to achieve minimum pressure drop and avoid oil return problem. The pipe sizes and connections shall be designed such that the evaporator units do not face back pressure due to the functioning of the evaporator next to it.

The refrigerant piping for the VRF system shall be of minimum 18 gauge HARD copper. The copper pipe shall be internally chemically cleaned, free of dirt, dust, oxidation and

any other deposits. All joints shall be made by brazing. Inert gas purging shall be used during the brazing process to prevent oxidation.

Piping shall be insulated with 19mm thick sleeve made out of closed cell elastomeric nitrile rubber foam insulation of fire retardant 'O' class. Wiring interconnecting the indoor and outdoor unit shall be done with PVC insulated copper conductor flexible wires of appropriate rating.

U-bends shall be provided for efficient oil return in suction line, at appropriate locations.

All piping shall be supported on GI perforated cable trays, and covered by GI sheet channels from the top, to prevent accidental damage during work of other agencies. The GI covers and trays shall be fixed to MS angle supports by bolting, to facilitate removal of the trays for verification of pipe leaks.

All pipe supports/clamps shall be painted with red oxide primer followed by 2 coats of synthetic enamel finish paint.

All the wiring interconnecting the indoor and outdoor units shall be PVC insulated copper conductor flexible wires of appropriate rating, and shall be laid through PVC conduits.

The piping and wiring shall be laid such that it does not spoil the aesthetics of the premise.

#### **4.0 Drain Piping for Condensate**

The drain piping shall be made out of rigid PVC pipes of 10 Kg/cm<sup>2</sup> class in screwed construction. The piping shall be supported by clamping on an M.S. angle 25mm x 25mm x 3mm running continuously below the pipe.

The piping shall be insulated with 6 mm thick nitrile rubber sleeve tightly on the outer surface of the pipe. All insulation joints shall be sealed by BOPP adhesive tape. The drain pan shall be connected to rigid PVC pipe by braided PVC flexible pipe with appropriate adapters.

All pipes support/clamps shall be painted with red oxide primer followed by two coats of synthetic enamel finish paint.

## 9.0 SHEET METAL DUCT WORK

### 9.1 Material Specifications:

Ducts shall be made out of galvanized steel sheets of ducting quality. The galvanized sheet shall have thickness as specified below and zinc coating of minimum 120 gms/sqm.

### 9.2 Fabrication of Ducts:

The ducts shall be fabricated as per following specifications:

Max. Side (mm)	Min. Thickness of Sheet(mm)	Weight (Kg/Sqm.)	Type of joints	Bracing
Up to 750	0.63	4.9	25mm x 3mm MS Flange Angle	None
751 to 1000	0.80	6.4	40mm x 3mm MS Flange Angle	25mm x 3mm MS Angle at 1.2m centers.
1001 to 1500	0.80	6.4	40mm x 3mm MS Flange Angle	40mm x 3mm MS Angle at 1.2m centers.
1501 to 2250	1.0	7.8	40mm x 6mm MS Flange Angle	40mm x 6mm MS Angle at 1.2m centers.

### 9.3 Installation of Ducts:

Ducts shall be supported on hangers as per following specifications:

Duct Size (mm)	Spacing of Supports(m)	Size of M.S. Angle(mm)	Dia. of Hanger Rod (mm)
Up to 750	2.4	40 x 40 x 3	10
751 to 1500	2.4	40 x 40 x 6	10
1501 to 2250	2.4	50 x 50 x 6	15

Duct hangers shall be fixed to R.C.C. slab of the roof by means of anchor fasteners and M.S. angle cleats. Hangers for ducts running below pitched sheet roof shall be fixed to M.S. angle cleats welded to roof structure. Soft neoprene rubber gasket of uniform thickness and width shall be used as gasket between flange joints. The gasket will be fixed with a suitable adhesive to the flange.

Galvanized hexagonal full threaded nut-bolts of minimum 6mm dia. shall be used for fastening the flanges. Spacing between two nut-bolts shall not exceed 125mm.

All ducts shall be rigid and shall be adequately supported and braced where required with cross bracing of M.S. angle bracings of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

Ducting over false ceiling shall be supported independently from the roof structure above. In no case a duct shall be supported from the false ceiling hangers or be permitted to rest on a hung ceiling.

Bottom level of all ducts should be maintained as shown in the drawing. Leveling of ducts should be checked with a PVC tube water level from a reference point.

Fans shall be connected to duct work by a double canvass sleeve. Each sleeve shall be minimum 150mm long, securely bolted to duct and units. Each sleeve shall be made smooth and the connecting duct work rigidly held in line with unit inlet or outlet.

Ducts shall be supported on hangers using 2 nos. galvanized hangar rods and two half-round straps per support, as per following specifications:

<b>Duct Size (mm)</b>	<b>Maximum Spacing of Supports(m)</b>	<b>Size of G.I. Strap (mm)</b>	<b>Dia. of G.I. Hanger Rod mm)</b>
Up to 600	3	40 x 3	10
601 to 900	3	50 x 3	10
901 to 1250	3	50 x 6	12
1251 to 1500	3	65 x 6	12

Duct hangers shall be fixed to Steel structure of the roof by means of M.S. angles and hooks. Soft rubber gasket of uniform thickness and width shall be used as gasket between flange joints. The gasket will be fixed with a suitable adhesive to the flange. Suitable sealant shall be applied on the coupler surface of slip joint coupling, before assembly and self-tapping screws shall be used to secure the coupler in position.

Flanges shall be fastened with galvanized hexagonal full threaded nut-bolts of minimum 6mm dia. Spacing between two nut-bolts shall not exceed 125mm.

Level of all ducts shall be maintained as shown in the drawing. Levelling of ducts should be checked with a PVC tube filled with water, from a reference point.



**ROUND BENDS:** Bends shall be in segmental in construction. Segments shall be joined by gas welding. Welded joints shall be zinc sprayed and lacquered.

After completion of work all joints shall be visually inspected for proper gasketing and nutbolt tightness.

**BALANCING:** The entire air distribution system shall be balanced to supply the air quantities as required in various zones to maintain the specified room conditions. The final balancing of air quantity through each grille or diffuser shall be recorded and submitted to the CONSULTANT for approval.

**DAMPERS:** Dampers of round ducts shall be butterfly type, tight fitting, made from 16g G.I. sheet.

#### **9.4 Dampers:**

Dampers shall be opposed blade type louvered dampers of robust construction and tight fitting made from 16g G.I. sheet. The design, method of handling and control, shall be suitable for the location and service required.

Dampers shall be provided with suitable links, levers and quadrants as required for their proper operation, control or setting in any desired position. Dampers and their operating devices shall be made robust, easily operatable and accessible through suitable access doors. Every damper shall have indication device clearly showing the damper position, and a locking device to lock the damper in any position.

#### **9.5 Grilles & Diffusers:**

All diffusers shall be constructed out of extruded aluminium sections. All grills shall be in extruded aluminium adjustable vane type with double deflection construction duly powder coated.

Supply air grilles/diffusers shall be provided with volume control damper made out of extruded aluminium section and painted black. Return air grilles/diffusers shall be without volume control damper.

#### **9.6 Inspection & Balancing:**

After completion of work all joints shall be visually inspected for proper gasketing & nutbolt tightness.

The entire air distribution system shall be balanced to supply the air quantities as required in various zones and rooms to maintain the specified room conditions. The final balancing of air quantity through each grille or diffuser shall be recorded and submitted to the CONSULTANT for approval.

## 10.0 INSULATION WORK

### 10.1 Thermal Insulation of Ducting (With closed cell nitrile rubber foam)

#### a) Material Specifications:

**Insulation Material** : Closed Cell elastomeric Nitrile Rubber foam, Fire retardant  
Class 'O'

**Make** : Armacell / Aeroflex / or approved Equivalent

**Adhesive** : As recommended by manufacturer.

#### Application Procedure:

Clean the surface of the duct to be insulated free from dust grease and other matter.

Prepare the pieces of sheet as per the dimensions of the duct and apply the adhesive on the duct surface, the sheet surface as well as the edges of the sheets & leave it for 2-3 minutes for drying.

Once the adhesive is half dry and tacky, bring both the ends of insulation where the adhesive is applied in contact and stick them well. Ensure that both the surfaces are matched properly.

Apply self-adhesive black cotton tape on all the joints. Before fixing the tapes it must be ensured that all the joints are sealed properly.

## 11.0 M.S. WELDED PIPING FOR WATER DUTY

### 11.1 PIPES

Pipes shall be mild steel ERW (electric resistance welded) type in class-C (heavy class) construction as per IS 1239/IS 3589. For sizes of 150NB and lower, they will be in class-C (heavy class) construction as per IS 1239. For higher sizes, they will be conforming to IS 3589, and shall have wall thickness as below:

For size 200NB to 300 NB : 5.56mm

For sizes 350NB to 500NB : 6.35mm

Tolerance on thickness shall be +/- 10%. Tolerance on diameter will be +/- 0.75% max.

## 11.2 FITTINGS AND FLANGES:

All bends will have radius of 1.5D, unless stated otherwise. Bends shall be forged type, made out of pipe having the same specifications as the pipe being used for straight piping. Ends shall be bevelled suitable for butt- welding.

All tees and reducers shall be factory fabricated with ends suitable for butt- welding. For branching from pipes, only factory-fabricated tees shall be used. Puncturing of pipes and welding branch pipes shall not be permitted. Where the branch pipe size is substantially smaller than that of the main pipe, weld-o-lets shall be used for making the branch.

For pipe sizes of 40NB and below, socket-weld type forged tees, elbows and reducers shall be used.

All flanges will be made out of M.S. plates and shall conform to British standard Table-F

## 11.3 Valves:

Valves shall be of wafer type butterfly valves for 50 mm and higher sizes, and of ball type for lower sizes. Non-return valves shall be of wafer type for 50 mm and higher sizes, while for lower sizes gun-metal lift type check valves shall be used.

Material specifications of butterfly and wafer type non-return valves shall as follows:

Body and Disc: High grade cast iron as per IS:210, grade FG200/GG25, coated with epoxy or nylon.

Shaft : Stainless steel

Seat/seal Rings: EPDM

The butterfly valves shall be provided with suitable notch plate and lock for locking the valve in required position.

The wafer type non-return valves shall be preferably with a back-up spring to avoid the disc getting stuck in open position.

Ball valves shall be of 3-piece design and have the following material specifications.

Body : Cast steel ASTM A216 Gr. WCB

Ball & Stem: Stainless steel AISI 304/316

Seat & Seal : PTFE

Ball valves shall have screwed ends when used in GI screwed piping, while they will have socket weld ends when used in MS welded piping.

#### **11.4 Strainers:**

Strainers shall be of pot type for pipeline size of 150 NB and above, while the lower size lines shall have Y type strainers. Strainer body shall be of heavy duty cast iron as per IS 210 Gr. 20 close grained. The strainer element shall be made of brass or stainless steel. The end connections shall be flanged. The cover shall also be easily openable flanged cover.

Flush out cocks shall be provided on strainers of sizes 150 NB and above.

#### **11.5. Hardware:**

All nut-bolts shall be of reputed make, correct diameter and length as per the flange tables and requirements of the equipment. Nut-bolts shall be hot-dip galvanized to prevent corrosion

Gaskets shall be of fabric-reinforced non hardening rubber, 3mm thick.

#### **11.6 Fabrication of Piping:**

Piping scheme shall be as per the CONSULTANT's schematic drawing and duly approved VENDOR's drawing.

Pipe ends shall be cut by hacksaw only, and shall be beveled by grinding before making a butt-weld joint. After preparing the ends, the joint shall be tack-welded leaving a uniform gap between the ends for weld penetration. Grinding before starting the filler run shall clean the root run of the weld joint.

All welding work shall be carried out by generator type welding machines, using SUPERBOND-S or equivalent welding electrodes. All welders shall be pre-qualified by preparing sample joints.

Before starting full welding on the joints, the complete section of piping shall be fitted up in position for inspection and approval of the Engineer-in-charge. Finish welding shall be carried out only after getting approval of the fit-up.

All slip-on flanges shall be welded from outside as well as inside to the pipe. All welded joints shall be cleaned of flux and surplus metal deposition.

#### **11.7 Installation:**

Piping shall be supported on supports fabricated out of MS rolled section like channels and angles. Galvanized "U" clamps shall be provided at each support. Insulated piping shall be supported on two high density molded polyurethane half round sections as saddles and clamped. Wooden saddles shall be coated with termite proof paint.

All horizontal lines shall be in perfect level checked by a level gauge. All vertical lines shall be in perfect plumb. Lines shall run parallel or at exact right angles to the nearby lines and structures.

Spacing of supports shall not exceed the figures below:

Line size (MM NB)	:	25	50	75	100	125	150	200
Max. Spacing (Mtr.)	:	2	3	3.5	4	4.5	5	6

Purging/drain cocks shall be fixed at all highest/lowest points of the line wherever there are upward/downward loops in the line respectively, which can cause accumulation of air/dirt in the line.

### **11.8 Testing:**

After completion of installation, the pipelines shall be hydraulically tested for leaks by a test-pump. The entire line shall be visually inspected for leaks while it is under pressure. Minimum test pressure shall be 7 Kg/cm<sup>2</sup>.

All valves shall be fully open during the test. Delicate instruments and equipments shall be isolated during the test. All temporary supports shall be removed before leak testing.

### **11.9 Flushing:**

After completion of testing, the entire piping shall be flushed with water 3 times to clear it of any dirt inside, by filling the lines from highest point and draining them from the lowest point. Circulation pumps shall not be operated for flushing the lines.

### **11.10 Insulation of Piping**

Pipes shall be insulated with closed cell nitrile rubber foam. For pipe sizes 50NB and lower, sleeves shall be used. For higher sizes, sheets shall be used. Thickness of the insulation for chilled water piping shall be 38 mm, applied in two layers - 25mm+13mm.

The insulation shall be applied as follows:

- Clean the surface of the pipe to be insulated free from dust grease and other matter.
- In case of insulation with sleeves, select the correct ID of the insulation tube suitable for the pipe to be insulated and slit the pipe along its length using a sharp knife. Ensure that the cut is straight. Apply a thin coat of adhesive on both the cut surfaces of the insulation tubing and leave it for 2-3 minutes for drying.
- In case of insulation with sheets, prepare the pieces of sheet as per the circumference of the pipe and apply the adhesive on the pipe surface, the sheet surface as well as the edges of the sheets.
- Once the adhesive is half dry and tacky, bring both the ends of insulation tubing or sheets where the adhesive is applied in contact and stick them well. Ensure that both the surfaces are matched properly.
- Apply self-adhesive black cotton tape on both the longitudinal and the circumferential joints. Before fixing the tapes it must be ensured that all the joints are sealed properly.
- In case of pipes exposed to the atmosphere, one layer of reinforced Aluminium foil (HARVEY or equivalent) has to be fixed over the insulation. For sealing the joints Aluminium foil self-adhesive tape 1" width is to be used. For indoor pipes no finish is required.

### **11.11 Painting:**

After completion of the testing and flushing, the entire pipeline and the supporting structures shall be painted with two coats of red-oxide primer, followed by two coats of synthetic enamel paint of approved shade.

Piping which is to be insulated is to be painted with red-oxide primer only.

### **12.0 DRAIN PIPING**

The drain piping shall be made out of rigid PVC pipes of 10 Kg/cm<sup>2</sup> class. The piping shall be supported by clamping on MS angle 25mm x 3mm running continuously below the pipe. The piping shall be insulated with 9 mm thick nitrile rubber sleeve

tightly fixed on the surface of the pipe. All the insulation joints shall be sealed by BOPP adhesive tape.

The drain pan shall be connected to rigid PVC pipe by braided PVC flexible pipe with appropriate adapters.

All pipes support/clamps shall be painted with red oxide primer followed by two coats of synthetic enamel finish paint.

### **13.0 MANUAL BALANCING VALVES**

Valve should be a double regulated Globe type balancing valve. Should be min PN16 rated. Valve insert with hand-wheel and pre-setting display. Valve should have threaded ends up to sizes 50 mm and flanged for above 50 mm.

Valve shall be equipped with two pressure test cocks for differential measurements.

Material specifications of balancing valves shall as follows:

Body: High grade cast iron as per IS: 210,  
grade FG200/GG25, coated with epoxy or nylon.

Bonnet: Cast Iron.

Insert: Carbon Steel, chromium plated with PTFE seat ring

Gasket: Graphite

Stem: Stainless Steel.

Hand wheel: Ductile Iron

Balancing of the valves done by the hand held computer with digital display, integrated valve database and which is capable of calculating the actual flow rates in the valves. It should have Rechargeable batteries, it should have the possibility to connect up to two temperature sensors.

\* \* \* \* \*

### Chapter-3

#### LIST OF APPROVED MAKES

Sr.No.	Equipment/Material	Makes
1.	VRF System	: Hitachi / Daikin / Mitsubishi Electric (Make in India - non-China)
2.	Aluminium Grilles/Diffusers	: Caryaire / Cosmos /Air-pro
3.	Insulation: Nitrile Rubber Foam	: Armacell / Aeroflex
4.	G.I. Sheets	: SAIL/ Jindal/ Tata/ Essar
5.	MS/GI Pipe	: Tata/Zenith/Jindal.
6.	P.V.C. pipe and fittings	: Supreme/Prince.
7.	Welding Rods	: Advani Oerlikon
8.	Anchor Fasteners	: Hilti/Fisher
9.	Electric Cables	: CCI/Gloster/Universal/ICC
10.	Copper Piping	: Rajco / Mandev
11.	Underdeck Insulation	: Beardsell /U.P. Twiga