



**TENDER DOCUMENT**

**Vol. I**

**(NIT, GCC, Special Conditions, Annexures & Appendix and Technical Specifications)**

Notice Inviting Tender for Civil, Interior Furnishing, Electrical, HVAC, Firefighting,  
CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur Vadodara, Gujarat.”

**BANK OF BARODA,  
FACILITIES MANAGEMENT  
DEPARTMENT,  
5th FLOOR, BARODA BHAVAN,  
ALAKPURI, BARODA – 390007**

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**VOLUME        -        I**

**CONDITION OF CONTRACT**

**Name of Work:- Notice Inviting Tender for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Indra Complex, Manjalpur, Vadodara, Gujarat.”**

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**SECTION A**

**NOTICE INVITING TENDER**  
**NIT REFERENCE NO. **BB/FM/113/05****

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## NOTICE INVITING TENDER

**Tender for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Indra Complex, Manjalpur, Vadodara, Gujarat..”**

Dear Sir,

- 1.1 **The Bank of Baroda (BOB)**, herein called the Employer / Owner, hereby invite tender from experienced contractors for **Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Indra Complex, Manjalpur, Vadodara, Gujarat.”** on item rate basis
- 1.2 The tender forms can be downloaded from bank’s website <https://www.bankofbaroda.in/tender.htm> from **09/12/2021** to **31/12/2021** up to **1100 hrs.**
- 1.3 **Submission of Tender**
- The Tenders are to be submitted in three separate envelopes, each sealed and clearly identified as to envelope number and contents as indicated below. The three envelopes shall be contained in a large envelope superscribed " **Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Indra Complex, Manjalpur, Vadodara, Gujarat.”**
- 1.4 Your tender duly filled in, signed and sealed, should be addressed and hand delivered to **The Asstt. General Manager, Facilities Management, Bank of Baroda, 5<sup>th</sup> Baroda Bhavan, Alkapuri, Vadodara 390 007** on or before **1100 hrs of 31/12/2021** or the tender box placed at **Ground floor Bank of Baroda, Baroda Bhavan, Alkapuri, Vadodara 390 007.**
- 1.5 Each Tenderer shall submit one copy of Conditions of Contract (Vol.-I), Specifications (Vol.- II) and One set of Drawings and 2 copies of Bill of Quantities(Price bid) (Vol.-III) for preparation of this





Tender. Tenderers shall submit the documents in Envelope No. 1, Envelope No. 2 and Envelope No. 3 as stated below.

1.6 (i) **Envelope No. 1**

Envelope No. 1 shall contain the following:

- a) **Earnest Money Deposit of Rs. 1,10,000/- ( Rupees One Lakh Ten Thousand only)** in the form of Demand Draft / Pay Order/Bank Guarantee only in favour of Bank of Baroda drawn/issued on any Nationalized / Scheduled Bank and payable at Vadodara. (Exempted for NSIC/MSME for valid certificate)

(ii) **Envelope No. 2**

- i. Vol. I and Vol. II alongwith set of the drawings duly stamped and signed on each page.
- ii. All submittals as per Clause 6 of **Information and Instructions to Tenderers.**
- iii. Any others as stated in tender Documents.

**This envelope shall be superscribed “Envelope No. 2 - Technical Bid for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat.”**

(iii) **Envelope No. 3**

Envelope No. 3 shall contain 2 copies (one marked ‘Original’ and other marked ‘Duplicate Copy’) of Priced Bill of Quantities duly filled in and signed on each page by the Tenderer. Rate quoted in the original copy of B.O.Q. shall be considered as valid. No commercial or technical condition or qualification of any sort shall be indicated by the tenderer in the Envelope No. 3 otherwise the tender shall be liable for rejection. **This envelope shall be superscribed "Envelope No. 3 - Priced Bid for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat.”**

1.7 **Late Tenders**

Tenders received late on account of any reason whatsoever and telegraphic tenders will not be entertained.

## 1.8 Opening of Tender

The Envelope No. 1 i.e. the Technical Bid of the Tender will be opened immediately after last date and hour of submission i.e. on **31/12/2021 at 1100 hrs** or any extended date duly intimated in presence of Tenderers who wish to be present. Representatives who wish to be present during the tender opening shall carry a proper letter of authority issued by the Competent Authority of the firm / company to attend the same, without which they shall not be allowed therein.

## 1.9 Prebid Meeting

BOB discourages the stipulation of any additional conditions by the Tenderer along with their offer. However, in case the Tenderer wishes to include any condition / stipulation / clarification in the tender document, he should submit the same in writing to Employer on or before **15/12/2021**. A prebid meeting will be held on **21/12/2021** at the office of **The Asstt. General Manager, Bank of Baroda, 5<sup>th</sup> Floor, Baroda Bhavan, Alkapuri , Vadodara 390 007** at **12:00 PM**. The clarifications / conditions etc. of all the Tenderers, if any, will be examined and after discussions with all the Tenderers in the prebid meeting, the conditions acceptable to BOB will be intimated to the Tenderers through Corrigendum/Addendum on bank's website only. In case any further clarifications are required by the Tenderers, they may notify the Employer or Architect at least 7 days prior to the deadline of submission of bids. Copy of the response for the above clarifications as well as any others at Employer's initiative will be forwarded to all tenderers through Addendum / Corrigendum but without identifying its source. The Tenderer shall return the above documents duly signed in Envelope No. 2 and this shall form part of the Tender document.

**1.10** The Tender without EMD will summarily be rejected.

**1.11** No other conditions shall be accepted thereafter and the Tenderer shall give a declaration accepting all the conditions given in the Tender or Addenda / Corrigendum if any. **Tender along with any conditions is likely to be rejected.**

## 1.12 Evaluation of Tender

The bidders who submit the documents as required as well as other criteria as stipulated in the Tender will be qualified for opening of their Price Bid.

## 1.13 Validity of Tender

The Tender shall be valid for a period of 90 days, from the last date of submission of the tender.



The tenders shall not be entitled during the said period of 90 days to revoke or cancel or vary the tender. In case of tenderer revoking or canceling or varying this tender, the EMD shall be forfeited.

1.14 **For any further information on the tender**, following offices / persons to be contacted :

**M/s. Bank of Baroda**, Facilities Management Dept. Head Office , Vadodara.

1. **Mr. Nishant Kawade**,  
Chief Manager (Electrical)  
Mobile No. : 7506647233  
Email : pe.bcc@bankofbaroda.com

1.15 BOB shall not be bound to accept the lowest tender and reserves the right to reject any or all the Tenders without assigning any reason therefor.

**SECTION B**

**Notice Inviting Tender for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5th floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat.”**

**IMPORTANT INSTRUCTIONS FOR Tendering**

B.1	<p>Important instructions for Tendering</p> <ul style="list-style-type: none"> <li>• This is an offline tender event of Bank of Baroda.</li> <li>• Bidders (Contractors firms) are requested to read the terms &amp; conditions of this tender before submitting their tenders.</li> <li>• Bidders who do not comply with the conditions with documentary proof (wherever required) will not qualify in the Tender process for opening of Commercial bid.</li> <li>• The intending bidders are required to submit their offer physically before the last date of submission of tender.</li> <li>• All the terms and conditions shall be as per NIT reference no. <b>BB/FM/113/05</b> available on Bank's website <a href="https://www.bankofbaroda.in/tender.htm">https://www.bankofbaroda.in/tender.htm</a></li> <li>• Complete Tender (Part I - Technical Bid) and (Part II - Commercial Bid) alongwith EMD shall be dropped in the tender box placed at Ground floor Bank of Baroda, Baroda Bhavan, Alkapuri, Vadodara before last date of submission of the tender.</li> </ul>
B.2	<p>Bid Submitting &amp; Opening</p> <ul style="list-style-type: none"> <li>• Part I Technical bid will be opened on specified date and time as given in the tender at Ground floor Bank of Baroda, Baroda Bhavan, Alkapuri, Vadodara. Interested Bidder(s) can attend the said bid opening.</li> <li>• Part II Commercial bid will be opened only those bidder(s) who's Part-I Technical Bid is found to be acceptable by Bank of Baroda. Such bidder(s) will be intimated date of opening of Part-II Commercial bid, through valid email confirmed by them.</li> <li>• All entries in the tender should be entered in Technical &amp; Commercial Formats without any ambiguity.</li> <li>• All notices /corrigendum shall be issued on the Bank's website only.</li> <li>• Tender cannot be accessed after the due date and time mentioned in tender.</li> <li>• The process Bidding for submission of Technical and Commercial Bid is offline.</li> </ul>
B.3	<p>Submission of Technical Bids and Commercial Bids</p> <p>The TENDER response shall be submitted in two parts. Part I shall comprise of Technical Bid and Part II shall contain Commercial Bid. These bids shall be dropped in the tender box placed at Ground floor Bank of Baroda, Baroda Bhavan, Alkapuri, Vadodara before last date of submission of the tender.</p>

	<ul style="list-style-type: none"> <li>➤ <b><u>The prices offered to the Bank must be Indian rupees</u></b></li> <li>➤ Any price variation on account of change in tax structure (+ or -) shall be payable/recoverable during the contract period.</li> <li>➤ No price increase on account of exchange rate fluctuations.</li> </ul> <p>Please note that any changes in the technical / prequalification criteria mentioned in this Tender Document shall be inserted as addendum in the tender section of Bank's Website <a href="https://www.bankofbaroda.in/tender.htm">https://www.bankofbaroda.in/tender.htm</a></p>
B.4	Opening of Technical Bids
	The Technical Bids will be opened on the last date of submission in the presence of Bank's authorized committee at Ground floor, Bank of Baroda, Baroda Bhavan, Alkapuri, Vadodara. The representatives of the bidders may remain present during the opening of Technical bids. No separate intimation will be given to the bidders in this regard.
B.5	Evaluation of Technical Bids
	Technical Bids will be evaluated on the basis of fulfilling Bidders Profile Details and compliance to Eligibility criteria, Technical specification, other terms and conditions stipulated in the tender document. Commercial Bids of only those bidders who qualify in the technical evaluation / demonstration, based on the criteria laid down hereinabove, will be opened. The Bank reserves the right to reject any or all the tenders without assigning any reason thereof.
B.6	Evaluation of Commercial Bids
	After the technical evaluation of the tenders, the price/commercial bid of only technically qualified bidders (as per the criteria mentioned hereinabove) shall be considered for price bid evaluation. The Bank reserves its right to seek and obtain substantiating data from the bidders for verification of the credentials submitted. The Date of opening of Price Bid shall be advised separately to all technically qualified bidders. Bank may at its discretion, request the shortlisted bidders to give a demonstration of their proposed system at their cost before opening of price bid. This will also be considered as a part of technical evaluation. Lowest quoted bidder (L-1) shall be awarded work subject to satisfying terms and conditions of tender.
B.7	Site address
	Bank of Baroda ,5 <sup>th</sup> floor Indra Complex, Manjalpur Vadodara, Gujarat.

**SECTION C**

**INTRODUCTION**

Sr.No.	Name of work	Approx. Project Cost (Rs.)
1	<b>Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV &amp; allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat..”</b>	<b>110 Lakhs</b>

The above Project of Bank of Baroda for ‘**Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat.”**

Firms who fulfill the following minimum pre- qualifying / eligibility criteria need only apply:

- Average Annual financial turnover of the firm during the last -3- years ending 31st March,2021, should be at least **Rs 33.00 Lacs**. Supported with audited balance sheets.
- Experience of having successfully completed similar works / job i.e. Office building, Commercial building, Institutional building, Interior Design mentioned hereinabove for Public Sector Undertaking, Govt. Project or Corporate Sector, Banks, reputed firms in commercial building and institutional building during last – 7 years (as on 30.11.2021) should be either of the following.
  - A) Three similar completed works each costing not less than **Rs 44 Lakhs**  
OR
  - B) Two similar completed works each costing not less than **Rs. 55 Lakhs**.  
OR
  - C) One similar completed work costing not less than **Rs.88 Lakhs**.

**Note : Similar type of work means- Work having Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied etc. executed for Office building, Commercial building, Institutional building, Interior Design mentioned hereinabove for Public Sector Undertaking, Govt. Project or Corporate Sector, Banks, reputed firms in commercial building and institutional building during last – 7 years (as on 30.11.2021) (For Costing-Multiple Projects/multiple location shall not be considered)**

**i. Tenders by those bidders who do not submit Performance Certificates from their previous employers /clients with relevant details i.e. Project cost, date of completion of project, shall be liable to be summarily rejected.**

ii. The proposed work shall be executed by bidder and not as Joint Venture, tie-ups etc.

Duly filled & signed application /offers/Tender shall be submitted y.

Prequalification and Final selection of Contractor will be the ultimate choice of Bank. The Bank reserves the right to accept or reject any or all the application/s without assigning any reasons whatsoever.

<b>Basic Information</b>			
	<b>Description</b>	<b>Bidders response</b>	<b>Documents required</b>
1	Name of the Bidder/Organization		
2	Full address of the Registered office		
3	Full address of the Localoffice (if any)		
4	Contact no.		
5	Email id		
6	Year of Establishment		
7	Type of Organization(Whether sole proprietorship, Partnership, Private Ltd. of Ltd Co.		
8	Registered/empanelment with Govt. /Semi Govt./PSU Organization		
9	Name and qualification of the Proprietor / Partners /Directors of the Organization / Firm		
a	Name		
	Qualification		
b	Name		
	Qualification		
C	Name		
	Qualification		
10	Single point contact from Bidder side		
	Name		
	Contact no.		

	Email id		
11	Avg. Annual Turnover, in last 3 years (Up to 2021) should not be less than Rs 33 lakhs		
	2018-19		
	2019-20		
	2020-21		
12	Three projects (costing not less than Rs 44 lacs)		
a. 1	Complete address of the Project		
a. 2	Address of office from where completion certificate is issued		
a. 3	Contact number		
a. 4	email id		
a.5	Designation of signatory of completion certificate		
a.6	Area of the building		
a.7	Final project cost		
a.8	Date of completion of project		
a.9	Completion certificate issuance date		
a.10	Scope of work		
b.1	Complete address of the Project		
b.2	Address of office from where completion certificate is issued		
b.3	Contact number		
b.4	email id		
b.5	Designation of signatory of completion certificate		
b.6	Area of the building		
b.7	Final project cost		
b.8	Date of completion of project		
b.9	Completion certificate issuance date		
b.10	Scope of work		
c.1	Complete address of the Project		



c.2	Address of office from where completion certificate is issued		
c.3	Contact number		
c.4	email id		
c.5	Designation of signatory of completion certificate		
c.6	Area of the building		
c.7	Final project cost		
c.8	Date of completion of project		
c.9	Completion certificate issuance date		
c.10	Scope of work		
13	Two projects (costing not less than Rs 55 lacs)		
a.1	Complete address of the Project		
a.2	Address of office from where completion certificate is issued		
a.3	Contact number		
a.4	email id		
a.5	Designation of signatory of completion certificate		
a.6	Area of the building		
a.7	Final project cost		
a.8	Date of completion of project		
a.9	Completion certificate issuance date		
a.10	Scope of work		
b.1	Complete address of the Project		
b.2	Address of office from where completion certificate is issued		
b.3	Contact number		
b.4	email id		
b.5	Designation of signatory of completion certificate		
b.6	Area of the building		
b.7	Final project cost		

b.8	Date of completion of project		
b.9	Completion certificate issuance date		
b.10	Scope of work		
14	One completed project (costing not less than Rs 88 lacs)		
a.1	Complete address of the Project		
a.2	Address of office from where completion certificate is issued		
a.3	Contact number		
a.4	email id		
a.5	Designation of signatory of completion certificate		
a.6	Area of the building		
a.7	Final project cost		
a.8	Date of completion of project		
a.9	Completion certificate issuance date		
a.10	Scope of work		
15	No. of years of experience in the field		
16	Valid solvency certificate from Bank		
	Name of Bank		
	Amount		
	Validity		
17	GST No.		
18	PAN No.		
1	Whether any Civil Suit / litigation arisen in contracts executed / being executed during the last 10 years. If yes, please furnish the name of the project, employer, Nature of work, Contract value, work order and brief details of litigation. Give name of court, place,		

9			
	status of pending litigation.(Attach separate sheet if required)		
20	Information relating to whether any litigation is pending before any Arbitrator for adjudication of any litigation or else any litigation was disposed off during the last ten years by an arbitrator. If so, the details of such litigation are required to be submitted		
21	References with Address & Telephone Numbers of two persons, Email (Engineers, or top officialsof an organization) for whom you have executed similar works, who may be directly contacted by the Bank about the ability, competence or capability of your organization.		
22	Any other information		
23	Section A, B, E : Seal and signed by Bidder attached		
24	Section D: Bidders eligibility criteria attached		
25	Section F : duly seal and signed on letter head		
26	Annexure K (Part of Section I): Pre Contract Integrity Pact) duly seal and signed		

**SECTION D**

**ELIGIBILITY CRITERIA**

All the supporting Documents are required to be submitted alongwith technical part 1. Details filled in this form must be accompanied by sufficient documentary evidence, in order to verify the correctness of the information. **All the documents submitted should be attested by the bidder.**

E.	Prequalification Criteria for Bidder who is submitting the bid.		
	Prequalification Criteria	Bidders Response Yes/No.	Documents Required
E.1	Bidder's Average Annual turnover of last three years should not be less than Rs 33 Lakhs i.e. 2018-19 ,2019-20,2020-21		
D.2	Bidder should have Experience of having successfully completed similar works / job i.e. Office building, Commercial building, Institutional building, for Public Sector Undertaking, Govt. Project or Corporate Sector, Banks etc. Area not less than 5000 sq.ft. (for single project) during last – 7 years (as on 30.11.2021) should be either of the following.		
D.3	The bidders should have satisfactorily executed the work of similar nature in Semi Govt. /Govt. & Public / Private Sector Organizations during last seven (7) years (up to 30.11.2021)		
	<p>A) Three similar completed works each costing not less than Rs. 44 Lakhs.</p> <p>OR</p> <p>B) Two similar completed works each costing not less than Rs. 55 Lakhs.</p> <p>OR</p> <p>C) One similar completed work costing not less than Rs. 88 Lakhs.</p>		

**Proforma 1**

**DETAILS OF KEY PERSONNEL, GIVING DETAILS ABOUT THEIR TECHNICAL QUALIFICATION & EXPERIENCE INCLUDING THAT IN YOUR ESTABLISHMENT**

Sr. No.	Name and Designation	Age	Qualification	Experience	Nature of Works handled	Name of the projects handled costing over Rs.52 Lacs.	Date from which Employed in your organization	Indicate details of Experience for similar projects
1	2	3	4	5	6	7	8	9
1	Details of qualified in-house Civil Engineer							
2	Details of qualified In-house Interior Decoration supervisor/Jr. Civil Engineer/Jr. Electrical/Mechanical Engineer, with details of experience in similar works.							
3	If the applicant is Having existing association/collaboration or likely to form a consortium of/ with other Consulting							

	<p>Engineers/ Contractor for the special work, the details of the intended setup shall be given along with details of Technical Staff similar lines to the above.</p>								
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**Notes:**

1. Information has to be filled up specifically in this format. Please do not write remark "As indicated in Boucher".
2. Indicate other points, if any, to show your technical and managerial competency to any important point in your favour.

**Proforma 2**

**Work capability and details of works in hand.**

B) List of important works ON HAND not less than Rs.52 lacs for civil, Interior& Furnishing work, HVAC,Electrical, CCTV ETC.

Sr. No	Name of the project & location.	Name & full postal address of the owner. Also indicate whether Govt. Semi-Govt. Private body or Financial Institution with full postal address & details of contact person of the owner.	Contract Amount (Rs.) for interior furnishing work only with copy of Work Order	Completion Period Stipulated (Year)	Actual (Year) of completion	Any other relevant information.
1	2	3	4	5	6	7
1)						

Notes :

1. Information has to be filled up specifically in this format.Please do not write remark “Asindicated in Brochure”.



## **SECTION - E**

# **INFORMATION AND INSTRUCTIONS TO TENDERERS**

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**BANK OF BARODA**

## **INFORMATION AND INSTRUCTIONS TO TENDERERS**

### **1. Scope of Work :**

- 1.1 The brief description of work to be carried out and its scope are given in the General Condition of Contract and the "**Special Conditions of Contract**" of these documents.

### **2. Site Inspection and Information :**

- 2.1 The tenderer must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of making a tender and for entering into a contract and must examine the Drawings, inspect the site of the work and acquaint himself with all the information about all the local conditions, means of access to the work, nature of the work and all matters pertaining thereto.
- 2.2 Access to the Site will be given during the Tender period by appointment on application to the Asstt. General Manager, Facilities Management Department, Bank of Baroda, 5<sup>th</sup> floor, Baroda Bhavan, Vaododara. The tenderer shall ascertain the location, size and condition of the areas available for his use as working areas and all other information affecting this Tender.
- 2.3 The Employer will not be responsible and will not reimburse any expenses which may be incurred or losses to person or property suffered by any Tenderer in connection with visits to and examination of the site and in the preparation of his tender for submission.
- 2.4 The tenderers should note that information, if any, as regards to the site and local conditions, as contained in these tender documents has been given merely to assist the tenderers and is not deemed to be complete.
- 2.5 The tenderers should note and bear in mind that the Employer shall bear no responsibility for the lack of acquaintance of the site and other conditions or any information relating thereto, on their part. The consequences of the lack of any knowledge, as aforesaid, on the part of the tenderers shall be at their risk and cost and no charges or claims whatsoever consequent upon the lack of any information, knowledge or understanding shall be entertained or payable by the Employer either during tender stage or during the construction period.

3. **Rates & Discrepancies etc. :**

- 3.1 The contractor shall quote the rate after careful examination Tender documents & drawings.
- 3.2 The tenderers shall quote the rates both in figures and words. If some discrepancies found between the rates quoted in figures and words, the following procedure shall be adopted for checking and arithmetic calculation:
- i) When there is difference between the rates in figures and words, the rates, which correspond to the amount worked out by the tenderer, shall be taken as correct.
  - ii) When the rates quoted by the tenderer in figures and words tally but amount is incorrect, the rate quoted by the tenderer in words shall be taken as correct.
  - iii) When it is not possible to ascertain the correct rate by either of the above methods, the rates quoted in words shall be taken as correct.
  - iv) All erasures and alterations made while filling the tender must be attested by initials of the tenderer. Overwriting of figures is not permitted and failure to comply with either of these conditions will render the tender void at the Employer's option. No advice of any change in rate or conditions after opening of the tender will be entertained.
  - v) **In case the contractor has not quoted both rate and amount for any items, then the maximum of the quotes for that item by other bidders shall be taken for assessing the value of his tender. Further, in case he is awarded the work, the rate for the said item shall be payable as per the lowest rate quoted by other bidders.**
  - vi) The rate quoted shall be inclusive of all material, labour, profit, tools and tackles, lead and lift, transportation, cutting etc complete including all the taxes, duties, cess, excise, octroi, LBT, VAT, etc. The GST will be paid over and above quoted rates as per the prevailing rates to the contractor on production of necessary documents.
- 3.3 The Contractor shall not be entitled to any compensation for any loss suffered by him on account of delays, in commencing or executing the work, whatever the cause of delays may be, including delays arising out of modifications to the work entrusted to him or in any sub- contract connected therewith or delays in awarding contracts for other trades of the project or incommencement of completion of such works or in procuring Government controlled or other building materials or in obtaining water and power connections for construction purposes or for any claim in respect thereof. The Employer does not accept liability for any sum towards loss of overheads & profits of the contractor besides the accepted amount, subject to such variations as are provided for herein or as deemed fit to Employer. However, necessary time extension will be allowed if the delay is not attributable to contractor.

3.4 The Tenderers shall before tendering carefully examine the Tender Documents including these Information's & Instructions to Tenderers, General Conditions of Contract, Special Conditions of Contract, General Particulars & Requirements to Specifications, Detailed Specification, Drawings and other matters referred to therein, the Schedules and the Bill of Quantities and if there should be or appear to be any ambiguity in / or discrepancy between any of these documents or between figured and measured dimensions and other aspects upon the Drawings, he shall immediately refer the matter to the Employer / Architect **for clarification before submission of Tender. However, in case of any discrepancies between Drawings, Specifications and B.O.Q. items, B.O.Q. item shall supersede the others for quoting of rates.**

#### 4.0 **Forms & Documents :**

- i) The tenderer must use only the forms issued by the Employer to fill the rates.
- ii) The Tender Form and the documents attached to it shall not be detached one from the other, and no alteration or mutilation (other than filling in all the blank spaces) shall be made in any of the documents attached hereto.
- iii) All documents of the tender are to be read in conjunction with each other and rates quoted by the tenderer shall take this aspect into consideration.

#### 5.0 **Signing of Documents:**

- i) Each page of the tender documents should be signed by the person or persons submitting the tender in token of his / their having acquainted himself / themselves with the General Conditions of Contract, Specifications, Special Conditions, etc., as laid down. Any tender with any of the documents not signed will likely be rejected.
- ii) The tender submitted on behalf of a firm shall be signed by all the partners of the firm or by a person who has the necessary authority on behalf of the firm to enter into the proposed contract. Otherwise, the tender may be rejected by the Employer
- iii) Tender shall contain full address, Telephone Nos., Fax No. for serving notices / addendums required to be served to the Tenderer in connection with the Tender.
- iv) Power of Attorney in the name of person(s) who has / have signed the tender document.

#### 6.0 **The Tender shall accompany the following information and documents:**

- a) A construction programme in the form of Bar chart showing the sequence of operation together with the estimated time for major activities.
- b) Full details of any special methodology or technique the Tenderer proposes to use for the construction or for any other purpose.
- c) List of Proposed Technical man-power including their qualification & experience.
- d) List of proposed specialized contractors / associate if any, along with their credentials in respect to the trades of works together with their address.
- e) Information regarding any changes from the previous submission made by the Tenderer for prequalification in respect of following aspects
  - Details of Business & Technical Organization
  - Financial resources
- f) **DELETED.**
- g) The Tenderers shall attach to their tender a copy, duly authenticated by a notary, of the documents containing the constitution of the consortium, company or firm by which the Tender is submitted so as to indicate by what persons and in what manner a contract may be entered by the consortium, company or firm and what persons would be directly responsible for the due performance of the Contract and can give valid receipt on behalf of the consortium, company or firm.
- h) List of the equipment, formwork and staging to be erected / installed / deployed at the site for timely completion of the works.

## 7.0 Earnest Money

No Tender will be considered as responsive which is not accompanied by a sum of **Rs. 1,10,000/- (Rupees One Lakh Ten Thousand only)** as Earnest Money Deposit (EMD) in the form of Demand Draft / Pay Order drawn in favour of BOB or by way Bank guarantee from a Nationalised /scheduled bank. In the event of the Tenderer withdrawing his Tender before the expiry of 90 days from the date fixed for receiving the Tenders or such other extended dates as agreed to or if the tender is accepted, the Contractor fails to pay the security deposit as stipulated/or if he fails to commence the work within stipulated time, the Earnest Money will be forfeited. The Demand Draft/Pay order/Bank guarantee submitted against the Earnest Money Deposit will be returned without any interest to the unsuccessful Tenderers within **180 days** after



the date fixed for receiving tenders. **The Tender without EMD/valid NSIC/MSME certificate will be summarily be rejected.**

#### **8.0 Initial Security Deposit:**

The successful Tenderer shall deposit a sum equal to 2% of the accepted Contract value, in the form of DD / BG from nationalized Bank within 7 days of issue of letter of Acceptance / Work Order failing which the employer at his discretion may revoke the letter of Acceptance / Work order and forfeit the Earnest Money Deposit.

#### **9.0 Performance Guarantee**

The successful tenderer to whom the Contract is awarded shall deposit a sum equal to 5% of the accepted contract value in the form of Bank Guarantee from a **Nationalised or Scheduled Bank**. The Performance Guarantee shall be deposited within 14 days from the date of issue of Letter of Acceptance / Work Order failing which the Employer at his discretion may revoke the Letter of Acceptance / Work Order and forfeit the Earnest Money Deposit. The Bank Guarantee for Performance Guarantee shall be valid till the issue of Virtual Completion Certificate.

10.0 The Tenderer (whether or not he submits a tender) shall treat the details of the documents as secret and confidential. In case a tenderer does not submit his tender, he shall return the blank Tender documents and drawings.

#### **11.0 Examinations & Evaluation of Tenders:**

Employer will examine each Tender to satisfy whether - i) has been properly signed, ii) is accompanied by required security and documents and their correctness. A substantially responsive Tender is one, which conforms to all terms, condition and specifications of Tender Documents without material deviation or reservation. The Tender Evaluation will be as under:-

- i) The Tender which does not fulfill the submission of documents as specified in Sl. No. – 6 of Information & Instruction to Tenderers or elsewhere in the Tender document will be treated as unqualified and will be rejected.
- ii) The Tenders whose documents are found in order and satisfactory as stated above will be treated as responsive Tenders and the Price Bid of responsive Tenders will only be opened.

During evaluation employer may ask for any clarification or documents including breakdown



of unit rates to the tenderer but no change in the price or substance of the bid will be sought.

**12.0 Award of Contract :**

Subject to **Clause no. 13** herein below Employer will award the contract to the Bidder whose bid has been determined to be substantially responsive and whose offer has been found lowest after arithmetical checking.

13.0 The Employer does not bind himself to accept, the lowest or any tender and reserves to itself the right to accept or reject any or all the tenders, either in whole or in part, without assigning any reasons for doing so. The Employer also has the right to re-invite the tender at his sole discretion.

13.1 **Bank have right to award the work to more than one contractors. Keeping in view of the quantum of work, work may be divided among L1, L2 & L3. Ratio of the work division among L1, L2 & L3 will be 60:20:20 OR among L1 & L2 in 60:40. But L2 & L3 should carry out the work at the rate of L1.**

14.0 Throughout all the documents the term 'Bid' and 'Tender' and their derivatives like Bidders, Tenderer are synonymous.

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**SECTION - F**

**FORM OF TENDER**

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PLACE :

DATE : . . .2021

To,

**The Asstt. General Manager,  
Bank of Baroda,  
Facilities Management  
Department, 5<sup>th</sup> floor, Baroda  
Bhavan, Alakpuri Baroda –  
390007.**

Dear Sir,

Having examined the Drawings, Specifications, Designs and Bill of Quantities relating to the works specified in the memorandum hereinafter set out and having examined the site of the works specified in the said memorandum and having acquired the requisite information relating thereto as affecting the tender, I / We hereby offer to execute the works specified in the said memorandum within the time specified at the rates mentioned in the Priced Bill of Quantities or any agreed rates on negotiation and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in conditions of contract, Appendix to the form of Tender, articles of agreement, Addenda, Bill of Quantities and with such materials as are provided for, by, and in all other respects in accordance with such conditions so far as they may be applicable.

#### MEMORANDUM

- (a) Description of works : Tender for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat..”
- (b) Earnest Money Deposit : Rs. 1,10,000/- (Rupees One Lakhs Ten Thousand Only).  
(Exempted for valid certificate of NSIC/MSME)
- (c) Initial Security Deposit : 2% of the Contract Value by Bank Demand Draft within 7 days of issue of LOA / Work Order.
- (d) Performance Guarantee : 5% of Contract Value in the Form of Bank Guarantee from any Nationalized Bank within 14 days of issue of LOA / Work Order.



- (e) Retention Money / Security Deposit : Retention Money to be deducted in cash @ **8%** of each Interim Bill subjected to total Security Deposit i.e. Retention Money and Initial Security Deposit does not exceed 5% of Contract Value or final Actual Value of work whichever is greater.
- (d) Time allowed for completion : **-3- (Three) calendar months** from date of commencement
- (e) Splitting of the work : **Bank has right to split / award the work to more than one contractors. Keeping in view of the quantum of work, work may be divided among L1, L2 & L3. Ratio of the work division among L1, L2 & L3 will be 60:20:20 OR among L1 & L2 in 60:40. But L2 & L3 should carry out the work at the rate of L1.**
2. Should this tender be accepted, I / We hereby agree to abide by and fulfill the terms and provisions of the said Conditions of Contract annexed hereto so far as they may be applicable or in default thereof to forfeit and pay to **Bank of Baroda** the amount mentioned in the said conditions.
3. I / We have deposited a sum of Rs. 1,10,000/- (Rupees One Lakh Ten Thousand Only) as earnest money in the form of Demand Draft with the **Bank of Baroda, payable at Vadodara** should I / We fail to execute the contract when called upon to do so, I / We do hereby agree that this sum shall be forfeited by **Bank of Baroda**.
4. Our bankers are: (With full address):
- (i)
- (ii)
- The names of partners of our firm are:(i)
- (ii)
- Names of the partner(s) of the firm authorised to sign



Name of person having power  
Attorney to sign the  
Contract (Certified true  
copy of the Power of  
Attorney should be  
attached)

Yours faithfully,

Signature of Contractor

(Signatures and addresses of witnesses)

(i)

(ii)

## APPENDIX TO FORM OF TENDER

Item	Reference Clause No.	Description
Contract Value / Tender Value	1 (xxii) of GCC	Total value of the Tender as accepted by the Employer.
Date of Commencement	5 (iii) of GCC	7 (seven) days from the date of issue of the acceptance letter / work order or the date of handing over of site whichever is later.
Time of Completion	32 of GCC	3 months from the date of commencement.
Liquidated Damages for Delay	37 of GCC	0.5% of Contract Value per week or part thereof
Limit of Liquidated Damages	37 of GCC	5% of Contract Value.
Defects Liability Period	36 of GCC	365 days from the date of virtual Completion Certified by the Engineer-in-Charge / Architect.
Earnest Money Deposit	7 of IIT	Rs. 1,10,000/- (Rs One Lakh Ten Thousand Only) in the form of Demand Draft/BC/Bank Guarantee from Nationalised/scheduled Bank in favour of Bank of Baroda payable at Vadodara
Insurance	41 of GCC	As per <b>41 of GCC</b>
Mobilisation Advance	31 (i) of GCC	Maximum 10% of Contract Value against irrevocable Bank Guarantee as specified.
Recovery of Mobilisation Advance	31 (i) of GCC	To be recovered with 12% rate of interest from Contractors Interim Bills in 3 equal installment or 50% of value of work completed whichever is earlier.
Secured advance on Materials at site	31 (ii) of GCC	75% of the cost of materials or 60% of the relevant item rate whichever is less as determined by the Engineer. Sole decision of Bank whether accept or reject the request.

<b>Item</b>	<b>Reference Clause No.</b>	<b>Description</b>
Minimum Value of Work for Interim certificate	31 (iii) of GCC	Rs. 50.00 Lakhs for each Interim Bills.
Payment of Interim Bill	31 (iii) of GCC	Adhoc payment of 75% of the net payment to be released within 10 working days from the date of receipt of Architect's certificate. Balance 25% to be released after 15 working days from the date of receipt of Architect's Certificate.
Initial Security Deposit	8 of IIT	2% of Contract Value in the form of Demand Draft / BG from a Scheduled Bank within 7 days from the date of issue of LOA / Work Order .
Performance Guarantee	9 of IIT	5% of Contract Value in the form of Bank Guarantee from Nationalized & Schedule Bank within 14 days from the date of issue of LOA / Work Order.
Submission of Final Bill	31 (iv) of GCC	Within 30 days from the date of virtual completion as certified by the Engineer.
Payment of Final Bill	31 (iv) of GCC	Within 30 days from the date of submission of the bill by the Contractor along with complete information & voucher.
Retention Money / Security Deposit from Interim bills	30 of GCC	To be deducted in cash @ 8% of each Interim Bill subjected to total Security Deposit i.e. total of Retention Money & Initial Security deposit does not exceed 5% of Contract Price or Final Actual Value whichever is greater.
Release of Security Deposit	30 of GCC	50% upon issue of certificate of virtual completion and 50% after issue of no dues certificate subject to <b>Clause no. 35 of GCC (after DLP)</b> .



## ARTICLES OF AGREEMENT

(On Non Judicial stamp paper of Rs. 500/-)

ARTICLE OF AGREEMENT made on this ..... day of \_\_\_\_\_ Two Thousand Twenty One BETWEEN the Bank of Baroda, ..... hereinafter called "Employer" (which expression shall include its successors and assigns wherever the context or meaning shall so require or permit) of the one part and \_\_\_\_\_

\_\_\_\_\_ hereinafter called the "Contractor" (which expression shall include its successors and assigns wherever the context or meaning shall so require or permit) of the other part.

WHEREAS the Employer is desirous of carrying out Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat..”

AND WHEREAS the Contractor has agreed to execute upon and subject to the conditions set forth herein and to the conditions set forth in the special conditions and in the Bill of Quantities and Conditions of Contract (all of which are collectively hereinafter referred to as "The said terms & conditions") the works, shown upon the said drawings and or described in the said specifications and included in the said bill of quantities at the respective rates therein set forth amounting to the sum as therein arrived at or such other sum as shall become payable there under (herein after referred to as the said "Contract Value").

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. In consideration of the said Contract Value to be paid at the times and in the manner set forth in the said terms & conditions, the contractor shall upon and subject to the said terms & conditions execute and complete the works shown on the said drawings, and described in the specifications and / or bill of quantities.
2. The Employer shall pay the contractor The Said Contract Value or such other sum as shall become payable at times and in the manner specified in the said terms & conditions.
3. The said terms & conditions and Appendices thereto shall be read and construed as forming part of this Agreement and the parties hereto shall respectively abide by submit themselves to the said terms & conditions and perform the agreements on their part respectively in the said terms & conditions contained.
4. This Contract is neither a fixed Lump sum Contract nor a Piece Work Contract but is a Contract to carry out the work in respect of the entire work as defined in the contract



documents to be paid for according to actual measured quantities at the rates contained in the bill of quantities or as provided in the said Contract documents.

5. The Contractor shall afford every reasonable facility for the carrying out of all works relating to Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work” in the manner laid down in the said terms & conditions.
6. The Employer reserves to itself the right of altering the Drawings and nature of the work by adding to or omitting any items of work or having portions of the same carried out without prejudice to this Contract.
7. Time shall be considered as the essence of this Contract and the Contractor hereby agrees to commence the work within 7<sup>th</sup> day of the date of issue of Acceptance letter or the date of handing over of site whichever is later as provided for in the said terms & conditions to complete the entire work within 3 months subject nevertheless to the provisions for extension of time.
8. All payments by the Employer under this contract will be made only at Vadodara, Gujarat.
9. All disputes arising out of or in any way connected with this agreement shall be deemed to have arisen at Vadodara and only courts in Vadodara shall have jurisdiction to determine the same.
10. That the several parts of this Contract have been read by the Contractor and fully understood by the Contractor. The Contractor shall not be entitled for the payment for the quantities beyond the tendered quantities unless ordered for by specific written instructions from the engineer.

IN WITNESS WHEREOF THE Employer and the Contractor have set their respective hands to these presents and two duplicates hereof the day and year first hereinabove written. (If the contractor is a partnership or an individual).

IN WITNESS WHEREOF the Employer has set its hands to these presents through its duly authorized official and the Contractor has caused its common seal to be affixed hereunto and the said two duplicates / has caused these presents and the said two duplicates hereof to be executed on its behalf, the place, day, month and year first hereinabove written (If the contractor is a Company).

Signature Clause.

SIGNED AND DELIVERED by the

---



Bank of Baroda by the hand of Shri

\_\_\_\_\_  
(Name and Designation)

in the presence of

(i) \_\_\_\_\_

Address \_\_\_\_\_

(2) \_\_\_\_\_

Address \_\_\_\_\_

Witness

SIGNED AND DELIVERED by----

-----

(If the party is a partnership firm or an individual should be signed by all or on behalf of all the partners.)

in the presence of

(i) \_\_\_\_\_

Address \_\_\_\_\_

(2) \_\_\_\_\_

Address \_\_\_\_\_

Witness

The COMMON SEAL OF CONTRACTOR

was hereunto affixed pursuant to the resolutions passed by its Board of Directors at the meeting held on -----in the presence of

-----

(If the contractor signs under its common seal the signature clause should tally with the sealing clause in the Articles of Association)

**Form of Tender**

**F - 9**

Seal & Signature of Bidder



(1)-----

(2)-----

Directors who have signed these presents in token thereof in the presence of

(1)-----

(2)-----.

SIGNED AND DELIVERED BY the Contractor by the hand of

Shri \_\_\_\_\_  
and duly constituted attorney

(If the contractor is signing by the hand of power of attorney whether a company or individual.)

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## **SECTION - G**

## **GENERAL CONDITION OF CONTRACT**

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## GENERAL CONDITIONS OF CONTRACT

### 1. Definitions & Interpretations

In construing these conditions, the Specifications, Bill of quantities and Contract Agreement etc. the following words shall have the meaning herein assigned to them except where the subject or context otherwise requires.

- (i) a. **"Employer" / "Owner"** means **Bank of Baroda. (BOB)** a Corporate Body constituted under Banking and Companies (Acquisition and Transfers of Undertaking) Act 1970 and having its Head Office at Mandvi, Vadodara with its dealing office at Bank of Baroda, Facilities Management Department, 5<sup>th</sup> floor, Baroda Bhavan, Alkapuri, Vadodara 390007..
- b. **"Deleted"**
- c. **"Engineer-In-Charge (EIC) / Client"** means authorized representative of Bank of Baroda.
- d. **" Architect "** means., ..... , having its office at ..... India and their authorised nominees & representatives or such other firms / persons, as shall be nominated by the Employer.
- e. **"Deleted"**.
- (ii) **"Contractor" shall mean :-**
- a) In the case of a Partnership firm :- ----- and ----- trading as partners in the name and style of ----- and having a place of business at ----- and shall include the partners for the time being of the said firm and the legal representatives of a deceased partner.
- b) In the case of individual Contractor :- Shri \_\_\_\_\_ trading in the name and style of \_\_\_\_\_ and shall include his heirs, successors & legal successors & legal representatives.
- c) In the case of Company :- \_\_\_\_\_ a company incorporated under \_\_\_\_\_ 20\_\_\_ and having its registered office at \_\_\_\_\_ and office at \_\_\_\_\_ and shall

include its successors and assignee.

- (iii) **"Site"** shall mean the site of the contract works including any building and erections thereon and any other land (inclusively) as aforesaid allotted by the Employer for the Contractor's use.
- (iv) **"Contract"** shall mean the following documents, all duly signed, collective in that order of precedence.
- Articles of Agreement
  - Letter of acceptance of Tender / Award of Work
  - The Bid including Appendix to Bid, Addendum if any
  - Special Conditions of Contract
  - General Conditions of Contract
  - Priced Bill of Quantities
  - Technical Specifications (including any further instructions by Engineer / EIC during construction work)
  - Drawings (Tender drawings / Working drawings issued during construction)
- (v) **"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 received) by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered.
- (vi) **"Act of Insolvency"** shall mean any Act of Insolvency as defined by the Presidency Towns insolvency Act, or the Provincial Insolvency Act or any Act amending such original.
- (vii) **"Net Prices"** : If in arriving at the contract amount, the Contractor shall have added to or deducted from the total amount of the items in the Tender any sum, either as a percentage or other wise, then the net price of any item in the tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the Tender as the price of that item and similar percentage or proportionate sum provided always that in determining the percentage or proportion of the sum so added or deducted by the Contractor, the total amount of any Prime Cost items and provisional sums of money shall be deducted from the total amount of the tender. The expression "net rates" or "net prices" when used with reference to the contract or accounts shall be held to mean rates or prices so arrived at.
- (viii) **"Works"** means the permanent works described in the "Scope of Work" and / or to be executed in accordance with the Contract and includes materials, apparatus, equipment,

temporary supports, fittings and things of all kinds to be provided, the obligations of the Contractor hereunder and work to be done by the Contractor under the contract.

- (ix) **"Drawings"** means the drawings prepared by the Interior Designer s and issued by the Engineer-in-Charge / Engineer & referred to in the Specifications and any modification of such drawings and such other drawings as may be issued by the Engineer from time to time.
- (x) **"Bill of Quantities"** means the Schedule and Quantities of items, materials & rates, summaries, etc. as finally accepted.
- (xi) **"Specification"** means the specifications given in these documents including relevant Indian standard specification where so required and where such a specification is not available, the specification will be provided and approved by the Interior Designer//Employer/ARCHITECT.
- (xii) **"Temporary Works"** means all temporary works of every kind required in or about the execution, completion or maintenance of the works.
- (xiii) **"Materials"** means the materials, apparatus, equipments, fittings, fixtures and all such other material which are incorporated in the 'work'.
- (xiv) **"Virtual Completion of the Works"** means the completion of the whole of the works substantially in all respects as evidenced by issuance of a Certificate of Completion by the Engineer-in-Charge / Architect.
- (xv) **"Period of Maintenance / Defect Liability Period"** shall mean the period of 365 (Three hundred Sixty Five) days calculated from the date of virtual completion of the works as certified by the Engineer-in-Charge / Architect.
- (xvi) **"Urgent Works"** means any urgent works, which in the opinion of the Engineer-In-Charge / Engineer becomes necessary at the time of execution and / or during the progress of work to obviate any risk of accident or failure or to obviate any risk of damage to the structure or services or required to accelerate the progress of work for which becomes necessary for safety and security or for any other reason, the Engineer / Employer may find it necessary.
- (xvii) **"Market Rate"** means the rate as decided by the Engineer-in-Charge / Engineer on the basis of cost of materials at site inclusive of any tax, duty, octroi etc. at the time of execution of work.

- (xviii) "**Approved**" means approved in writing; "Approval" means approval in writing.
- (xix) "**Month**" means calendar month.
- (xx) "**Week**" means seven consecutive calendar days.
- (xxi) "**Day**" means a calendar day beginning and ending at 00 Hours and 24 hours respectively,
- (xxii) "**Contract Value / Tender Value**" means the total value of the tender as accepted by the Employer.
- (xxiii) **Interpretations / Marginal Note / Heading / Catch Lines.**

The Marginal Notes, Headings and in the catch lines hereto and in the annexures hereto are meant only for convenience of reference and shall not in any way be taken into account in the interpretation of these presents and the annexures hereto. The Contractor will have to carry out and complete the said work in every respect in accordance with this contract.

Words imparting the singular only also include the plural and vice versa where the context requires.

## 2. **Language and Law**

The language in which the Contract documents shall be drawn up shall be English only and the law governing the Contract is the law of Union of India.

## 3. **Errors, Omissions and Discrepancies**

In all cases of errors, omissions and / or doubts or discrepancies in any of the items or specifications, a reference shall be made to the Engineer whose elucidation, elaboration or decision shall be considered as authentic. The Contractor shall be held responsible for any error that may occur in the work through lack of such reference and precaution.

## 4. **Scope of Contract**

The Contract comprises the construction, completion and maintenance of the works and except in so far as the Contract otherwise stipulates the provision of all labour, materials, constructional plant, machinery temporary works and everything whether of a temporary or permanent nature required in and for such construction, completion and maintenance so far as

necessary for providing the same as specified in or reasonably to be inferred from the Contract.

5. (i) **Letter of Acceptance / Award**

Before signing of the Contract, the Employer shall issue by registered post or by otherwise depositing at the registered office of the Contractor, Letter of Acceptance / Award to enter into a Contract with the Contractor for the execution of the works in accordance with the contract. Until a formal contract agreement is prepared and executed, the tender documents i.e. Volume I, II, III & set of drawings together with the relevant correspondence exchanged from receipt of the tender to acceptance and together with the Employer's letter of Acceptance / Award shall constitute a binding contract between the parties.

(ii) **Contract Agreement**

On receipt of intimation from the Employer of the acceptance of his / their tender, the successful tenderer shall be bound to implement the contract & within seven **days thereof**, the successful tenderer shall sign an agreement in accordance with the draft agreement. The Contract shall be executed in quadruplicate and the Employer, the ARCHITECT, the Interior Designer and the Contractor shall be entitled to one executed copy each for their use.

(iii) **Commencement of Works**

Contractor shall commence the work within 7 days from the date of issue of the Acceptance Letter / Work Order issued to the Contractor or the date of handing over of site which ever is later.

(iv) **Possession of Site**

Save in so far as the Contract may prescribe the extent of portions of the Site of which the Contractor is to be given possession from time to time and the order in which such portions shall be made available to him and subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will within 7 days from the date of issue of acceptance letter / work order give to the Contractor possession of so much of the Site as may be required to enable the Contractor to commence and proceed with the programme and otherwise in accordance with such reasonable proposals of the Contractor as he shall, by notice in writing to the Engineer, make and will from time to time as the Works proceed give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the construction of the Works in accordance with the said programme or proposals (as the case may be).

If the Contractor suffers delay or incurs expense from failure on the part of the Employer to give possession in accordance with the terms of this clause the EIC shall grant an extension of time for the completion of the works on approval from Employer.

(v) **Wayleaves, etc.**

The Contractor shall bear all expenses and charges for special or temporary wayleaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional accommodation outside the Site required by him for the purpose of the Works.

6. **Custody of Drawings & Specifications**

The Contractor will be given free of cost two copies of Drawings during the progress of the works. Any further copies of such Drawings required by the Contractor shall be obtained by him from the Engineer on payment of necessary charges to be fixed by the Interior Designer. The Contractor shall keep one copy of all Drawings at the works site and the Employer / Interior Designer / ARCHITECT shall at all reasonable time have access to the same. Before the issue of the final certificate to the Contractor, he shall forthwith return to the Employer all Drawings and Specifications. No drawings shall be taken as in itself an order for execution unless, in addition to the Interior Designer signature, it is marked "Fit for Construction" by ARCHITECT.

7. **Disruption of Progress**

The Contractor shall give adequate but not less than 4 weeks time written notice to the Engineer whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval, is required to be issued by the Engineer. The notice shall include details of the drawing or order required explaining why and by when it is required and of any delay or disruption likely to be suffered if it is late.

8. **Further Drawings and Instructions**

The Contractor shall carry out and complete the said work in every respect in accordance with this Contract and with the directions of and to the satisfaction of the Employer / Interior Designer / ARCHITECT. The Engineer may in his absolute discretion or in consultation with Employer / Interior Designer and from time to time issue further drawings and / or written instructions, details, directions and explanations which are hereafter collectively referred to as "Engineer's Instructions" in regard to:-



- (a) The variation or modification of the design, quality or quantity of items of works or the addition or omission or substitution of any item.
- (b) Any discrepancy in the Drawings or between the Bill of Quantities and / or Drawings and / or Specification.
- (c) The removal from the site of any material brought thereon by the Contractor and the substitution of any other material therefore.
- (d) The removal and / or re-execution of any works executed by the Contractor.
- (e) The dismissal from the works of any persons employed thereupon.
- (f) The opening up for inspection of any work covered up.
- (g) The amending and making good of any defects.

The Contractor shall forthwith comply with and duly execute any work comprised such Engineer's instructions provided always that verbal instructions, directions and explanations given to the Contractor or his representative upon the works by the Engineer shall, if involving a variation, be confirmed in writing by the Contractor within three days & if not dissented from in writing within a further three days by the Engineer, such shall be deemed to be Engineer's instructions within the scope of the Contract.

9. **Duties of Project Management Consultant (ARCHITECT)- Deleted**

ARCHITECT duties are to watch and supervise the works of and to test any materials to be used or workmanship employed in connection with the works, quality control, Project Scheduling and monitoring and co-coordinating with all other Agencies and Civil Contractor & MEPF contractors/ agencies, recording of measurements, certification of bills, preparing extra/deviation items, excess/ saving statement, preparing Minutes of Meeting etc. They shall have no authority either to relieve the Contractor of any of his duties or obligations under the contract or except those expressly provided hereunder, to order any work involving delay or any extra payment by the Employer or any variation of or in the work.

The ARCHITECT shall have no power to revoke, alter, enlarge or relax any requirements of



this contract or to sanction any day work, additions, alterations, deviations or omissions unless such an authority may be confirmed by written order/ instructions of the employer.

The ARCHITECT shall act in consultation with the Structural Consultant/ Architect in regard to the quality of all structural aspects of work and in consultation with the Interior Designer for Interior decoration work, will finalise the selection of finishing materials. The ARCHITECT shall jointly record the measurements with Contractor's representative for all items of works and on completion hand over the records to the Employer.

The ARCHITECT shall have the power to give notice to the Contractor or his Engineer-In-Charge, about the non-approval of any work or materials and such works shall be suspended or the use of such materials should be discontinued until the decision of the Interior Designer / Employer but such examination shall not in any way exonerate the Contractor from the obligation to remedy any defects which may be found to exist at any stage of the work or after the same is completed. Subject to the limitations of this clause, the Contractor shall take instructions only from the Interior Designer/ Employer as the case may be through ARCHITECT.

The ARCHITECT shall have such other power and discharge other functions as are specifically provided in this contract included such incidental or consequential powers or duties, subject always to such specific instructions or directions of the Employer, which shall be duly notified to the Contractors.

#### 10. **Contractor's General Responsibilities**

The Contractor shall provide at his cost everything necessary for the proper execution of the works according to the intent and meaning of the Drawings, Bill of Quantities and Specifications taken together with whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred therefrom, and if the Contractor finds any discrepancy in the Drawings or between the Drawings, Bill of Quantities and Specifications, he shall immediately and in writing refer the same to the Engineer.

The successful tenderer is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the Bill of Quantities and rates. Instructions in respect of such additional items and their quantities will be issued in writing by the Engineer on approval from Employer.

The Contractor must co-operate with the other contractors appointed by the Employer so that the work shall proceed smoothly to the satisfaction of the Engineer.

The Contractor must bear in mind that all the work shall be carried out strictly in accordance with the Specifications as given in these documents and also in compliance of the requirements of the local public authorities and to the requirements / satisfaction / direction of the Engineer and no deviation on any account will be permitted.

The Contractor shall have to use materials from the makes / manufacturers specified in the list of materials of approved brand and / or manufacture contained in contract documents and as approved by Engineer in Consultation with Employer.

#### 11. **Safety of Site Operations**

The Contractor shall take full responsibility for the safety, stability and adequacy of all site operations and methods of construction including all temporary works, provided that the Contractor shall not be responsible, except as may be expressly provided in the Contract, for the design or specification of the permanent works.

The integration of MEPF services above and below false ceiling shall be co-operated / co-related during the execution of the work and final integration drawing incorporating all services shall be prepared by Interior Contractor/ Agency before and after undertaking interior decoration/ furnishing and furniture work.

#### 12. **Watching & Lighting**

The Contractor shall in connection with the Works provide and maintain at his own cost adequate lights, guards, fencing, warning signs and watch & ward staff when and where necessary or as directed by the Engineer or as directed by duly constituted authority for the protection of the works or for the safety and convenience of the public or pilferage of materials from site.

#### 13. **Care of Works**

From the commencement to the certified completion of the whole of Works, the contractor shall take full responsibility for the care thereof and of all Temporary Works and in case any damage loss or injury shall happen to the works or to any part thereof or to any Temporary Works from any cause whatsoever. Contractor have to protect the existing carpet/workstations/tables/lighting fixtures and other items by covering PVC sheet without and cost. If any damages are happen, recovery shall be carried out from the bills of contractor.

The Contractor shall at his own cost repair and make good the same so that on completion, the works shall be in good order and condition and in conformity to every respect with the requirements of the Contract and the Engineer's instructions. The Contractor shall also be liable for any damage to the Works occasioned by him including his subcontractors in the course of any operations carried out by him for the purpose of completing any outstanding work and complying with his obligations under **Clause no. 36** hereof. The Contractor shall indemnify the Employer from all risks on this account.

14. (i) **Contractor's Senior Representative for Execution & Co-ordination of Works**

The Contractor shall have on site at all times during working hours throughout the course of the Contract at least one competent senior representative who shall be empowered to make decisions binding on the Contractor in respect of all matters likely to arise in connection with the execution & coordination of the Works at site and shall keep the Engineer and the Employer informed at all times about the name and designation of such representative.

Any directions, explanations, instructions or notices given by the Engineer to such representative shall be held to be given to the Contractor.

(ii) **Contractor's Employees**

The Contractor shall provide and employ after approval from the Engineer on the site in connection with the execution, completion and maintenance of the Works all Engineering staff / technical assistants as are qualified, skilled and experienced in their respective trades, foremen and leading hands as are competent to give proper supervision, ensuring quality & output to the work they are required to supervise, and also such skilled, semi-skilled and unskilled labour as are necessary for the proper and timely execution, completion and maintenance of the works. The contractor must be appoint Project Manager having civil Engineering degree / Interior decoration Post Graduate Diploma having minimum 5 yrs. experience. The supervisory / Jr. Engineering staff shall be minimum 3 yrs. experience in execution of such works.

(iii) **Removal of Contractor's Employees**

The Contractor shall on the direction of the Engineer immediately dismiss from the works any person employed thereon by him who may, in the opinion of the Engineer, be incompetent or misconduct himself and such person shall not be again employed on the works without the permission of the Engineer (EIC).

(iv) **Unauthorised Persons**

No unauthorised persons are to be allowed on the site. The Contractor shall instruct all such persons to keep out and shall take steps to prevent trespassing.

15. **Compliance with Statutes, Regulations, Etc.**

The Contractor shall conform to the provisions of any Act of the legislature relating to the works and to the regulations and bye-laws of any authority, and of any water, electric supply GIFT, local and other companies and / or authorities with whose systems the structure is proposed to be connected, and shall, before making any variations from the Drawings or Specifications that may be necessitated by so regulations, give to the Engineer written notice,

specifying the variation proposed to be made and the reason for making it and apply for instructions thereon. In case, the Contractor shall not within ten days of submission of such notice, receive such instructions, he shall proceed with the work conforming to the provisions, regulations, or bye-laws in question, and any variation so necessitated shall be dealt with under **Clause no. 29** thereof.

The Contractor shall bring to the attention of the Engineer all notices required for execution by the said Acts, regulations or bye-laws to be given to any authority and pay to such authority, or to any public office all fees that may be properly chargeable in respect of the works, and lodge the receipts with the Engineer.

**16. Setting Out**

The Contractor shall set out the works and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof. If at any time any error in this respect shall appear during the progress of the works or within the defects liability period the Contractor shall, if so required, at his own expense rectify such error to the satisfaction of the Engineer.

**17. (i) Quality of Materials & Workmanship & Test**

All materials and workmanship shall be the best of the respective kinds described in the Contract and in accordance with the Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication or on the Site or at Government recognized / any approved testing laboratory

The Contractor shall upon the instruction of the Engineer furnish him with documentation to prove that the materials and goods comply with the requirements of contract and for requirement stated above. The Engineer may issue instruction in regard to removal of material from site or any work, if these are not in accordance with the Contract. The Contractor shall provide such assistance instruments, machinery, labour and materials as are normally required for examining, measuring, sampling and testing any material or part of work before incorporation in the Works for testing as may be selected and required by the Engineer.

**(ii) Samples**

All samples of adequate numbers, sizes, shades & pattern as per specification shall be supplied by the Contractor without any extra charge. Apart from adhering to any special provision made in the specifications regarding submission of samples the contractor shall provide to the Engineer samples alongwith the detailed literature of all materials he proposes to use in the building irrespective of the fact that a specific make / material might have been stipulated atleast before 90 days of their incorporation in

work. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site, detailed literature / test certificate of the same shall be provided instead to the satisfaction of the Engineer. Before submitting the samples / literature the contractor shall satisfy himself that the material / equipment for which he is submitting the samples / literature meet with the requirement of the specification. The Engineer shall check the samples and give his comments and / or approval to the same. Only when the samples are approved in writing by the Engineer, the contractor shall proceed with the procurement and installation of the particular material / equipment. The approved samples shall be signed by the Engineer for identification and shall be kept on record at site office until the completion and acceptance of the work and shall be available at the site for inspection / comparison at any time. The contractor shall keep with him a duplicate of such samples to enable him to process the matter.

For items of work where the samples are to be made at the site, the same procedure shall be followed. All such samples shall be prepared at a place where it can be left undisturbed until the completion of the project.

The Engineer shall communicate his comments / approval to the Contractor to the samples at his earliest convenience. Any delay that might occur in approving of the samples for reasons of its not meeting with the specifications or other discrepancies, inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials / equipments, etc. shall be to the account of the contractor. In this respect the decision of the Engineer shall be final.

On delivery of the supplies of materials / equipment for permanent works at the site, the contractor shall specifically arrange to get the supply inspected by the Engineer and compared with the approved sample and his specific approval obtained before using the same in the work.

(iii) **Inspection & Testing During Manufacture**

The Engineer shall be entitled during manufacture to inspect, examine and test on the Contractor's premises during working hours the materials and workmanship and check the progress of manufacture of all fabrication materials to be supplied under the Contract, and if part of the said materials is being manufactured on other premises the Contractor shall obtain for the Engineer permission to inspect, examine and test as if the said Plant were being manufactured on the Contractors premises. Such inspection, examination or testing if made shall not relieve the Contractor from any obligation under the Contract.

(iv) **Dates for Inspection & Testing**

The Contractor shall agree with the Engineer the date on and the place at which any plant / works will be ready for testing as provided in the Contract and unless the Engineer shall attend at the place so named on the date agreed the Contractor may proceed with the tests, which shall be deemed to have been made in the Engineer's presence, and shall forthwith forward to the Engineer duly certified copies of the test readings. The Engineer shall give the Contractor 24 hours notice in writing of his intention to attend the tests.

(v) **Facilities for Testing at Manufacturer's Works**

Where the Contract provides for tests on the premises of the Contractor or of any sub-contractor the Contractor shall provide such assistance, labour, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such tests efficiently.

(vi) **Certificate of Testing**

As and when fabrication materials shall pass the tests referred in this, the Engineer shall furnish to the Contractor a certificate in writing to that effect.

(vii) **Rejection**

If as a result of such inspection, examination or test of the works the Engineer shall decide that such material is defective or not in accordance with the Contract he shall notify the Contractor accordingly stating in writing his objection and reasons therefore. The Contractor shall with all speed make good the defect or ensure that the material complies with the Contract. Thereafter, if required by the Engineer, the tests shall be repeated under the same terms and conditions and that all reasonable expenses to which the Employer may be put by the repetition of the tests shall be deducted from the Contract Sum.

(viii) **Delivery of Materials & Equipment**

Unless the Engineer shall otherwise direct, no material shall be delivered to site until the Engineer shall have issued, in respect of such material, a certificate under **Clause no. 17** above. Likewise Fabrication Materials or Contractor's Equipment shall be delivered to Site only upon an authorisation in writing applied for and obtained by the Contractor from the Engineer.



The Contractor shall be responsible for the reception on site of all Materials and Contractor's Equipment delivered for the purposes of the Contract.

(ix) **Inspection & Testing and Re-inspection & Retesting**

All deficiencies revealed by testing and inspection shall be rectified by the Contractor at his own expense and to the satisfaction and approval of the Engineer. Rectified components shall be subject to retesting and re-inspection.

(x) **Inspection Reports**

The Contractor shall provide the Engineer with 3 copies of reports of all inspections and tests.

(xi) **Cost of Tests**

The cost of making any test shall be borne by the Contractor if such test is intended by or provided for in the Specification or Bill of Quantities or required as per standard practice of the trade / BIS and as advised by architect/ Employer (EIC).

(xii) **Costs of Tests not provided for, etc.**

If any test is ordered by the Engineer which is either

- (a) not so intended by or provided for or not required as per standard practice / BIS.
- (b) (in the cases above mentioned) is not so particularised, or
- (c) though so intended or provided for but ordered by the Engineer to be carried out by an independent person authorised by Engineer at any place other than the site or the place of manufacture / fabrication and shows the materials, plants not to be in accordance with the provision of contract then the cost of such test shall be borne by the Contractor.

18. **Absence of Specification**

If the specifications do not contain particulars of materials and works which are obviously necessary for the proper completion of the works, and the intention to include, which is inferred, all such materials and works shall be supplied and executed by the Contractor without extra charge. If the Contractor requires additional information, he shall request in writing well in advance to commencement of the particular work to the Engineer who will issue such detailed information as necessary within a reasonable time. Generally, in absence of any specification BIS code, CPWD and PWD Specification shall be followed in order of preference.

19. **Obtaining Informations Related to Execution of Work**

No claim by the contractor for additional payment will be entertained which is consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the works, nor will any misunderstandings or the obtaining of incorrect information or the failure to obtain correct information relieve him from any risks or from the entire responsibility for the fulfillment of the contract.

20. **Contractor's Superintendence**

The Contractor shall give all necessary personal superintendence during the execution of the works, and as long, thereafter, as the Engineer may consider necessary until the expiry of the "Defects Liability Period" stated hereto.

21. **Access for Inspection**

The Employer, Interior Designer, Engineer and their respective representatives shall at all reasonable times have free access to the work and / or to the workshops, factories or other places where materials are lying or from which they are being obtained and the Contractor shall give to the Employer, Interior Designer, the Engineer and their representatives every facility necessary for checking measurements, inspection and examination and test of the materials and workmanship. No person not authorised by the Employer, Interior Designer or the Engineer except the representatives of public authorities shall be allowed on the works at any time.

22. (i) **Examination of Work Before Covering Up**

No work shall be covered up or put out of view without the approval of the Engineer and the Contractor shall afford full opportunity for the Engineer to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer of any such work or foundations is or are ready or about to be ready for examination and the Engineer shall without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such work or for examining such foundations.

(ii) **Uncovering and making openings**

The Contractor shall uncover any part or parts of the Works or make openings in or through the same as the Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer. If any such part or parts have been covered up or put out of view after compliance with the requirements of sub-clause (i) of this Clause and are found to be executed in accordance with the



contract the expenses of uncovering, making openings in or through reinstating and making good the same shall be borne by the Employer but in any other case all such expenses shall be borne by the Contractor and shall be recoverable from him by the Employer or may be deducted by the Employer from any monies due or which may become due to the Contractor.

**23.(i) Assignment**

The whole of the works included in the contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign or sublet the contract or any part / share thereof or any interest therein without the prior written consent of the Employer & no undertaking shall relieve the Contractor from the full & entire responsibility of the contract or from active superintendence of the works during their progress.

**(ii) Work is to be Carried Out to the Satisfaction of Employer / Engineer**

The Contractor shall carry out all the works strictly in accordance with Drawings, detailed Specifications and instructions of the Engineer. If in the opinion of the Employer or EIC changes have to be made in the works the Contractor shall carry out the same, and payment, if any, arising out of these shall be made as per the terms of the contract.

**(iii) Removal of Improper Work & Materials**

The Engineer shall, during the progress of the works, have power to order in writing from time to time the removal from the works within such reasonable time or times as may be specified in the order, of any materials which in the opinion of the Engineer are not in accordance with the Specifications or the instructions of the Engineer, the substitution of proper materials, and the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the Drawings and Specifications or instructions, and the Contractor shall forthwith carry out such order at his own cost. In case of default on the part of the Contractor to carry out such order, the Employer shall have the power to employ and pay other persons to carryout the same, and all expenses consequent thereon, or incidental thereto, as certified by the Engineer shall be borne by the Contractor, or may be deducted by the Employer from any moneys due, or that may become due, to the Contractor.

**(iv) Urgent Repairs**

If by reason of any accident or failure or other event occurring to in or in connection with the Works, or any part thereof, either during the execution of the Works or during the Period of Defect Liability / Maintenance any remedial or other work or repair shall, in the opinion of the Engineer / Employer or their representative be urgently necessary for security and safety of life or for the works or of adjoining property, and the Contractor is unable or unwilling at once to

do such work or repair, the Employer may employ his own or other workmen do such work or repair, as the Engineer / EIC or their representative may consider necessary. If the work or repair so done by the Employer which is in the opinion of the Engineer, the Contractor was liable to do at his own expense under the Contract, all costs and charges incurred by the Employer in so doing shall on demand be paid by the Contractor to the Employer or may be deducted by the Employer from any amount due or which may become due to the Contractor. Provided always that the Engineer or the Engineer's representative (as the case may be) shall, as soon after the occurrence of any such emergency, as may be reasonably practicable notify, the Contractor thereof in writing.

(v) **Default of Contractor in Compliance**

If the Contractor after receipt of written notice from the Engineer / EIC requiring compliance within ten days fails to comply with such further drawings and / or Engineer's instructions the Employer may employ and pay other persons to execute any such work whatsoever that may be necessary to give effect thereto, and all costs incurred in connection therewith shall be recoverable from the Contractor by the Employer on the Certificate of the Engineer as a debt or may be deducted by him from any moneys due to the Contractor.

24. (i) **Prime Cost Items- Deleted**

The material(s) required for execution of any item for which a sum has been provided as a prime cost price in the tender, shall be procured by the contractor or supplied by the Employer at the sole discretion of the Employer. Every sum in the bill of quantities, which contains either as a whole or part the amount, as prime cost price of the materials shall be varied by substitution of the actual cost of the materials.

No variation shall be made in respect to the percentage quoted for labour and to cover for overheads & profits, work contract taxes, service taxes on account of variation in the prices, as above. Prime cost items will not be considered for Price Variation Adjustment.

(ii) **Provisional Sums**

**DELETED.**

(iii) **Use of Provisional Items**

**DELETED.**

(iv) **Production of Vouchers, Etc.**

The Contractor shall when required by the Employer / Engineer produce all quotations, invoices, vouchers and accounts or receipts in connection with expenditure in respect of

Prime Cost items.

(v) **Nominated Specialist Agencies / Objection to Nomination**

All Specialists, Merchants, Tradesman and others executing any work of supplying and fixing any goods for which prime cost items or provisional sums are included in the Bill of Quantities and / or Specification who may be nominated or selected by the Engineer are hereby declared to be sub-Contractors employed by the Contractor and are herein referred to as nominated Sub-Contractors.

No nominated Sub-Contractor shall be employed on or in connection with the works against whom the Contractor shall make reasonable objection or who will not enter into a contract providing:

- (a) That the nominated Sub-Contractor shall indemnify the Contractor against the same obligations in respect of the Sub-Contract as the Contractor is under in respect of this contract.
- (b) That the nominated Sub-Contractor shall indemnify the Contractor against claims in respect of any negligence by the Sub-Contractor, his servants or agents or any misuse by him or them of any scaffolding or other plant, the property of the Contractor or under any Workmen's Compensation Act in force.
- (c) Payment shall be made to the nominated Sub-Contractor by the contractor within fourteen days of his receipt of payment from the Employer provided that before any Certificate is issued, the Contractor shall upon request furnish to the Engineer proof that all nominated Sub-Contractor's accounts included in previous certificates have been duly discharged, in default whereof the Employer may pay the same upon a Certificate of the Engineer and deduct the amount thereof from any sums due to the Contractor. The exercise of this power shall not create privity of contract as between Employer and Sub-Contractor.

25. **Quantities and Variation**

- i) The Bill of Quantities (BOQ), unless otherwise stated shall be deemed to have been prepared in accordance with the Indian Standard Method of Measurement and quantities in B.O.Q. are to be considered as estimated and not accurate. The rates quoted shall remain valid for variation of quantity against each individual item by + 25%.
- ii) Variation Exceeding 25% of Tender Quantity : When the quantity of any item varies by + 25% of Tender Quantity, the rate for such item of works will be determined on the basis Cl. No. 29 (c) hereof or as decided by the Employer / EIC. No compensation for deletion or non-execution of item will be considered.

**26. Works to be measured**

The Engineer may from time to time intimate to the Contractor that he requires the works to be measured & the Contractor shall forthwith attend or send a qualified Representative to assist the Engineer in taking such measurements and calculations and to furnish all particulars or to give all assistance required by any of them.

Should the Contractor not attend or neglect or omit to send such Representative, then the measurement taken by the Engineer or a person approved by him shall be taken to be correct measurements of the works. Such measurements shall be taken in accordance with the Mode of Measurements detailed in the Specifications.

The Engineer shall take joint measurements with the contractor and the measurements shall be entered in the measurement book / sheet by the Engineer's representative.

The Contractor or his Representative may at the time of measurement take such notes and measurements as he may require.

All authorized extra works, omissions and all variations made without the Engineer's knowledge, but subsequently sanctioned by him in writing (with the prior approval in writing of the Employer) shall be included in such measurements.

**27. Claims for additional expenses**

Contractor have to take prior approval in writing from EIC before execution of additional/nonscheduled work, no payment shall be paid for such type of work.

**28. Variations**

Any alteration, omission or variation ordered in writing by the Engineer shall not vitiate this contract. In case the Engineer / EIC think proper at any time during the progress of the works to make any alterations in, or additions to or omissions from, the works or any alteration in the kind or quality of the materials to be used therein, the Engineer shall give notice thereof in writing to the Contractor or shall confirm in writing within seven days of giving any such oral instructions. The Contractor shall alter, add to, or omit from, as the case may be, in accordance with such notice, but the Contractor shall not do any work extra to or make any alterations or additions to or omissions from the works or any deviation from any of the provisions of the Contract, stipulations, Specification or Contract Drawings without the previous consent in writing of the Engineer and the value of such extras, alterations, additions or omissions shall in all cases be determined by the Engineer in accordance with the provisions of **Clause no. 29** hereof, and the same shall be added to or deducted from the Contract value, as the case may be.

**29. Valuation of Variations**

No claim for an extra shall be allowed unless it shall have been executed under authority of the Engineer with the concurrence of the Employer as herein mentioned. Any such extra is herein referred to as authorised extra and shall be made in accordance with the following provisions.

- (a) Rates for all extra items, wherever possible, should be derived out of the accepted tender rates. The accepted net rates or prices in the contract shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced herein.
- (b) Where the extra works are not of similar character and / or not executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items or works are carried out, then the contractor shall within 7 days of the date of receipt of order to carry out the work, inform the Engineer of the rate which he intends to charge for such items of work, supported by analysis of the rate or rates claimed and the Engineer shall fix such rate or prices as in the circumstances in his opinion are reasonable and proper, based on the verification of market rate.
- (c) It is further clarified that for all such authorized extra items where rates cannot be derived from accepted tender rates, the Contractors shall submit rates supported by rate analysis worked on the "market rate basis", for material including all taxes, octroi and delivery at site, labour, hire / running charges of equipment and wastages etc. plus 20% towards establishment charges including water & electricity, contractor's overheads & profit or like. **GST will be paid extra as per the prevailing statutory norms.** In case of variation in items of works, which are subcontracted to specialist agencies, specialist agencies' profit and overhead is deemed to be included in above stated 20%. **Items derived from market rates shall not be eligible for escalation.**

The measurement and valuation in respect of the Contract shall be completed within the "Period of Final Measurement" stated in the Appendix.

### 30. Security Deposit / Retention Money

For due fulfillment of the contract by the Contractor, 8% of the value of each Interim Bill will be retained by the Employer towards Retention Money until the total Security Deposit including Initial Security Deposit amounts to 5% of the Contract Value or Actual Value of work whichever is higher. 50% of the security deposit shall be released to the contractor after issue of virtual completion certificate and balance 50% on issue of "No Dues Certificate" as per **Clause no 35**. The amounts retained by the Employer shall not bear any interest.

All compensation or other sums of money payable by the Contractor to the Employer under the terms of this contract may be deducted from the security deposit if the amount so permits and the Contractor shall, unless such deposit has become otherwise payable, within ten days after

such deduction make good in cash the amount so deducted.

The security deposit of the contractor will be forfeited if he fails to comply with any of the conditions of the contract.

### 31. Certificates & Payment

#### (i) Mobilisation Advance

- (a) On written application from the Contractor, the Employer may grant mobilization advance upto 10% of the amount of accepted tender less the value of probable costs for the Cement and Steel reinforcement bars. The mobilization advance will be released in two equal installments, each against production of Bank Guarantee for 110% of the amount requested as mobilization advance. The first installment shall be released after contractor has commenced the work at site and Contractor satisfies Architect / Employer with production of documentary evidence that this amount of Mobilisation Advance shall be used for procurement of materials / equipment / labour for the work. Second installment will be released by the Employer on satisfying 1<sup>st</sup> installment of mobilization advance was used for purpose for which it was granted. The advance shall attract simple interest at the rate of 12% per annum (applicable to both installment). The advance shall be secured by a Bank Guarantee from a Nationalized Bank for the 110% of amount of mobilization Advance plus interest at the rate of 12% per annum (inapproved Proforma), which will be recovered in the manner described hereinafter. Banks reserve right to accept or reject the request of the contractor for the same without assigning any reason.
- (b) The amount of mobilization advance, which may be given to the Contractor, shall be at the sole discretion of the employer.
- (c) The mobilization advance shall be utilized by the contractor for the purpose of this contract and for no other purpose.
- (d) Recovery of the mobilization advance and of interest there on shall be made by the deduction from the contractor's running account bills on pro-rata basis till completion of **50% of value** of work or from the first Eight (3 bills or final whichever is earlier) running bills whichever occurs earlier.
- (e) If any time the contractor fails to execute the contract to the satisfaction of the employer for any reason whatsoever the employer shall be entitled to reach forthwith the entire amount so advanced with interest, cost and legal expenses, etc. and/ or recover the whole balance amount as the case may be from the bill if any, payable to the contractor or by enforcing the Bank guarantee at the discretion of the Employer.



(ii) **Secured Advance on Materials at Site- Sole discretion of the Bank of Baroda/EIC**

The Contractor will be paid secured advance against cement, reinforcement steel & Structural steel and other non perishable and quantifiable material as decided by Engineer and stacked at site for use in permanent works and in the opinion of the Engineer are required to be procured in advance. The advance paid for the materials stacked at site shall be maximum 75% of the cost of the materials or **60% of the relevant item rate, whichever is less at the discretion of Employer** and the Contractor shall produce necessary vouchers / documents in support of cost of each material. No advance shall be admitted for perishable materials or cannot be stored and quantified properly and materials procured prematurely as decided by the Engineer. The secured advance so given to the Contractor will be recovered from nextthree (3) R.A. Bills.

Where in any Certificate (of which the Contractor has received payment), the Engineer has included the value of any unfixed materials intended for and / or placed on or adjacent to the works such materials shall become the property of the Employer and they shall not be removed except for use upon the works, without the written authority of the Engineer. The Contractor shall be liable for any loss of or damage to, such materials.

The materials shall also be in conformity with contract specifications and of approved quality as stated in relevant clauses hereof. These advances shall be made on the basis of the quantity of each material lying at site at the time of preparation of each interim bill. The Contractor shall sign Indemnity Bond as per **Annexure I** for any loss either due to theft or fire etc.

(iii) **Interim Bill**

- (a) The Contractor shall be paid by the Employer from time to time by installments under Interim Certificate to be issued by the Engineer to the Contractor on account of the works executed when in the opinion of the Engineer, work to the approximate value named in the Appendix to Form of Tender "Minimum value of Work for Interim Certificate" (or less at the sole discretion of the Engineer / Employer) has been executed in accordance with this contract, subject to a retention of the percentage of such value named in the Appendix to form of tender hereto as 'Retention Percentage for Interim Certificates' until the total amount retained shall reach the sum named in the Appendix to form of tender as 'Security Deposit'.
- b) The contractor shall generally be paid one Interim bill in a month satisfying the minimum value of work, which shall include work done and secured advance

against material. If in the opinion of the Engineer the progress of the work warrants a second payment in a month, the same shall be so arranged by the Employer.

- c) After submission of bill along with complete information, vouchers, etc. to the satisfaction of the Engineer and after making necessary deductions toward Income Tax, Work Contract Tax and other recoveries deductible at source, the bill will be paid as follows:
- i) An adhoc payment of 75% of the value of work done as assessed by the Engineer and vetted by EIC/ Architect shall be released within 7 working days by the Employer, after certification by the Engineer/ Architect who will certify within reasonable period from submission of Bill with necessary vouchers, documents etc.
  - ii) Balance amount shall be certified by the Engineer/ Architect on submission of bill and payment shall be released by the Employer within 15 working days of certificate receipt from the Engineer/ Interior Designer.
- d) All Interim Bill payment shall be regarded as payment by way of advance against the final payment only & not as payment for the work actually done.
- e) All payments under this Clause will be released after due checking & verification by EIC/ Architect.
- f) Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided, without prejudice to the right of the employer to take action under the terms of the contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.
- g) Deleted.
- (iv) **Payment Break-up - Deleted**
- (v) **Final Bill**
- a) The Contractor shall submit final bill within 30 days from the date of issue of



virtual completion certificate with all relevant informations, testing reports, copy of GST bills of material purchased and details, documents as-built drawing etc. complete.

- b) The Engineer within 30 days of submission of the final bill, shall issue a certificate of payment against the final bill to the Employer / EIC who shall thereupon, within 30 days from the date of receipt of the certificate, shall release the balance payment to the contractor after effecting all recoveries, including advances and payments against interim certificates.
- (c) The Engineer / EIC/ Interior Designer shall have power to withhold Certification if the works or any parts thereof are not being carried out to his satisfaction.
- (d) The Engineer / EIC/ Interior Designer may by any Certificate make any correction in any previous Certificate, which shall have been issued by him.
- (e) No payment shall be made to the Contractor if the Contractor fails to insure the works and keep them insured till the issue of the Virtual Completion Certificate.
- (f) Contractor have to submit the copy of GST bill for material purchased alongwith RA bills and final for certification of payment. Site address must be mentioned on the GST bill. If contractor fail to submit the GST bill if desired by bank ,than no payment shall be made for the particular items.
- (g) Contractor have to submit the copy of GST bill as mentioned above as and when demanded by bank, if fail, than no payment shall be made for the particular items.

### 32. Time for Completion

The entire work is to be completed in all respects within 3 months (90 Days) from the Date of Commencement as stated in Appendix to "Form of Tender" or such extended time as may be allowed under **Clause no. 33** hereof. Time is the essence of the contract and shall be strictly observed by the contractor.

**If required in the contract or as directed by the Architect/Engineer / Employer, the contractor shall complete certain portion of the work before the completion of the whole of the work. However the completion date for whole of the work shall not change for above.**

### 33. Extension of Time for Completion

- i. If the Contractor needs an extension of time for the completion of the work or if the completion of work is likely to be delayed for any reasons beyond the due date of

completion stipulated in the contract, the Contractor shall apply to the Employer for extension of time in writing at least 30 days before the expiry of the scheduled time and while applying for extension of time, Contractor shall furnish the reasons in detail and his justification, if any, for the delays.

- ii. If in the opinion of the Architect/Engineer the works be delayed for reasons beyond the control of the contractor, the Architect/Engineer with due consultation with Employer may make a fair and reasonable extension of time for completion of the contract works such time extension will be said as “Authorised Time Extension” which will not qualify for levy of liquidated damages.
- iii. If the works be delayed beyond the authorized time extension, the Architect/Engineer with due consultation with Employer may allow extension of time for completion of contract works but with levy of Liquidated damage as stated under **Clause no. 37**.

**Further, the contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not.**

- iv. The contractor shall be bound to extend validity of all insurance covers, Bank Guarantees till such period of completion as may be considered necessary at contract cost.

#### 34. **Virtual Completion Certificate**

Virtual Completion of works means the completion of whole of the work substantially in all respects including all types of testing, obtaining all necessary statutory approvals and is fit for occupation. The works shall not be considered as completed until the Engineer in Consultation with Employer has certified in writing that they have been virtually completed. The Defects Liability Period shall commence from the date of virtual completion as certified by the Architect/Engineer.

#### 35. **Approval Only by No Dues Certificate**

##### (i) **Final Completion Certificate**

On successful completion of entire works covered by the Contract to the full satisfaction of Employer / Architect/Engineer, the Contractor shall ensure that the following works have been completed to the satisfaction of Engineer : (a) clear the site of all scaffolding, wiring, pipes, surplus materials, Contractor's labour, equipment and machinery (b) demolish, dismantle and remove all Contractor's site offices and other temporary works, structures & constructions and other items and things whatsoever brought upon or erected at the site or any land allotted to the Contractor by the Owner and not incorporated in the permanent works (c) remove all rubbish, debris etc. from the site and the land allotted to Contractor and shall clear, level and dress, compact the site as required and said land to the satisfaction of the Engineer (d) shall put the Owner in undisputed custody and possession of the site and all land allotted by the Owner to

the Contractor (*e*) All defects / imperfections have been attended & rectified to full satisfaction of the Engineer during the Defect Liability Period.

Unless the Contractor shall have fulfilled the provisions of the clause, the works shall not be deemed to have been completed.

Upon the satisfactory fulfillment by Contractor as stated above, the Contractor shall be entitled to apply to the Engineer for a Final Completion Certificate in respect of the entire work.

If the Engineer is satisfied of the completion of the work relative to which the Completion Certificate has been sought, the Engineer shall within 14 (fourteen) days of the receipt of the application for Completion Certificate, issue a Completion Certificate in respect of the works for which the Completion Certificate has been applied.

This issuance of a Completion Certificate shall be without prejudice to the Employer's rights and Contractor's liabilities under the Contract, including the Contractor's liability for the Defect Liability Period nor shall the issuance of a Completion Certificate in respect of the works or work at any site be construed as a waiver of any right or claim of the Employer against the Contractor in respect of work or the works at the site and in respect of which the Final Completion Certificate has been issued.

(ii) **No Dues Certificate**

The Contract shall remain valid and shall remain incomplete until no dues Certificate shall have been signed by the Architect/Engineer and delivered to the Employer with a copy to the contractor. Such a certificate shall be given by the engineer within 30 days of completion of defects liability period (the last period to be considered if different periods to be considered if different parts of the work) or within 30 days from the date of payment of final bill whichever is later.

36. **Defect Liability Period**

Any defect, shrinkage, settlement or other faults which may appear within the "Defects Liability Period" stated in the Appendix hereto or, if none stated, then within 365 days after the date of the virtual completion of the works as certified by the Engineer, arising in the opinion of the Engineer from materials or workmanship not in accordance with the contract, shall upon the direction in writing of the Engineer, and within such reasonable time as shall be specified therein, be amended and made good by the Contractor, at his own cost and in case of default the Employer may employ and pay other persons to amend and make good

such defects, shrinkage, settlements or other faults, and all damages, loss and expenses consequent thereon or incidental thereto shall be made good and borne by the Contractor and such damage, loss and expenses shall be recoverable from him by the Employer or may be deducted by the Employer, upon the Engineer's Certificate in writing, from any money due or that may become due to the Contractor, or the Employer may in lieu of such amending and making good by the Contractor deduct from any monies due to the Contractor, a sum, to be determined by the Engineer equivalent to the cost of amending such work and in the event of the amount retained under **Clause no. 30** hereof being insufficient, recover the balance from the Contractor, together with any expenses the Employer may have incurred in connection therewith. Should any defective work have been done or material supplied by any Specialist Agencies employed on the works who has been nominated or approved by the Engineer, the Contractor shall be liable to make good in the same manner as if such work or material had been done or supplied by the Contractor and been subject to the provisions of this Clause and **Clause no. 23 (ii)** hereof. The Contractor shall remain liable under the provisions of this Clause notwithstanding the signing of any certificate or the passing of any accounts, by the Engineer. The Contractor will not be responsible for defects arising out of fair wear & tear & damage caused by Employer's personnel during the use of the building after being occupied.

37. **Liquidated Damages for Delay**

If the Contractor fails to complete the works by the period stated in the Appendix or within any authorized extended time under **Clause no. 33** hereof and the Architect/ Engineer with due Consultation with Employer certifies in writing that in his opinion the same ought to have been reasonably completed by the original completion date or authorized extended completion date, as the case may be, the Contractor shall pay the Employer the sum named in the Appendix to Form of Tender as "Liquidated Damages" for the period during which the said works shall so remain incomplete or the Employer may deduct such damages from any monies due to the Contractor.

38. (i) **Default of Contractor**

It the Contractor being an individual or a firm, commits any "Act of insolvency" or shall be adjudged as insolvent or being an incorporated Company shall have an order for compulsory winding up or applies for voluntary winding up or subject to the supervision of the court and of the official Assignee or the Liquidator in such acts of insolvency or winding up shall be unable within seven days after notice to him requiring him to do so, to show to the reasonable satisfaction of the ARCHITECT /

Interior Designer that he is able to carry out and fulfill the Contract, and to give security therefore, if so required by the Architect/EIC

- i) Or if the contractor (whether an individual; firm or incorporated company) shall suffer execution to be issued, or shall suffer any payment under this contract. To be attached by or on behalf of any of the creditors of the Contract.
- ii) Or shall assign or sub-let the Contract without the consent in writing of the Architect/ Employer first obtained.
- iii) Or shall charge or encumber this Contract or any payments due or which might become due to the Contract or any payments due or which might become due to the Contractor there under.
- iv) Or if the Architect shall certify in writing to the Employer that the Contractor :
  - a) has abandoned the Contract, or
  - b) has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for seven days after receiving from the ARCHITECT written notice to proceed, or
  - c) has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be complete with the time agreed upon , or
  - d) has failed to remove materials from the site or to pull down and replace work for seven days after receiving from the ARCHITECT written notice that the said materials or work were condemned and rejected by the ARCHITECT under theses conditions, or
  - e) has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this Contract to be observed and performed. By the Contractor for seven days after written notice shall have been given to the Contractor requiring the Contractor to observe or perform the same or
  - f) has to the detriment of good workmanship or in defiance of the Architect instruction to the contrary sublet any part of the Contract.

Then in any of the said cases the Employer may not withstanding any previous waiver, after giving seven days notice in writing to the Contractor, determine the Contract but without thereby affecting the powers of the Interior Designer, or the obligations and liabilities of the Contractor, the whole of which shall continue in force as fully as if Contract has not been determined and as if the works subsequently executed had been executed by or on behalf of the Contractor. And further, the Employer, may enter upon and take possession of the work and all plant, tools, scaffoldings, sheds, machinery, seam and other power utensils and material lying

upon the premises or the adjoining lands or roads and use the same as his own property or may employ the same by means of his own servants and workmen carrying on and completing the works and the Contractor shall not in any way interrupt or to do any act, matter or things to prevent or hinder such other contractor or other person or persons employed for completing and finishing or using the materials and plant for the works. When the works shall be completed or as soon thereafter as convenient, the ARCHITECT/ Interior Designer shall give a notice in writing to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within a period of 14 days after receipt thereof by him the employer shall sell the same by public auction and shall give credit to the Contractor for the amount realized after deducting therefrom the costs of removal and sales by the Employer for the values of the said and the expenses or loss which the Employer shall have been put to in procuring the works to be completed and the amount, if any, owing to the Contractor and the amount which shall be so certified shall thereupon be paid by the Employer, to the Contractor, or, by the Contractor to the Employer, as the case may be, and the certificate of the Interior Designer / Employer shall be final and conclusive between the parties. On termination of the contract, the contractor shall forthwith remove himself and his workmen from the works site.

(ii) **Default of Employer**

- a) If payment of the amount payable by the Employer under the Certificates of the ARCHITECT / Interior Designer shall be in arrears and unpaid for 45 (forty five) days after notice in writing requiring payment of the amount shall have been given by the Contractor to the Employer, or the Employer commits any 'Act of Insolvency', or if the Employer being an individual or firm shall be adjudged insolvent or (being an incorporated company) shall have an order made against it or pass an effective resolution for winding up either compulsorily or subject to the supervision of the court or voluntarily, or if the official assignee of the Employer shall repudiate the contract, or if the official assignee or the liquidator in any such winding up fails within 15 (fifteen) days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Contractor that he is able to carry out and fulfill the Contract and to make all payments due, and to
- b) become due hereunder and if required by the Contractor, to give security for the same, or if the works be stopped for 3 (three) months under an order of the Architect or the Employer or by any injunction or other orders of any court of law, then and in any of the said cases the Contractor shall be at liberty to determine the Contract by notice in writing to the Employer, through the Architect, and he shall be entitled to recover from the employer payment for all works executed and for any loss he may



sustain upon any plant or material supplied or purchased or prepared for the purpose of the Contract.

In arriving at the amount of such payment, the net rates or prices quoted for Item rate work contained in the Contractor's original tender shall be followed or where the same may not apply, valuation shall be made in accordance with Clause No. 29 (c) of GCC.

39. (i) **Determination of Contract**

The Employer shall in addition to any other power enabling him to determine the Contract have power to determine the Contract at any time by giving not less than fourteen (14) days notice in writing to the Contractor and on the expiry of such notice the Contractor shall forthwith determine but without prejudice to the claims of either party in respect of any antecedent breach thereof.

(ii) **Compliance with Engineer's Direction on Determination**

If the Contract shall be determined under the provisions of the **Clause no. 39 (i)** the Contractor shall with all reasonable dispatch comply with the directions of the Architect/Engineer in respect to :

- (a) Cancellation of outstanding commitments
- (b) Performance of further work required for the protection of work executed
- (c) The removal of Constructional Plant Temporary Works and materials from the Site
- (d) Any other matters arising out of the Contract with regard to which the Engineer decides that directions are necessary or expedient.

(iii) **Payment on Determination**

In the event of the Contract being determined under the provisions of this Clause the sum payable to the Contractor shall be such sum as would have been payable under **Clause no. 43** hereof and

- (a) The reasonable cost of complying with the Engineer's directions under sub-clause (ii) hereof and
- (b) Such reasonable sum as may be agreed between the parties or in default of agreement settled by arbitration in respect of the Contractor's overheads including any sums properly and necessarily incurred as the direct result of such determination.

- (iv) The Architect/Engineer has a right to ascertain the happening of any contingency, including but not limited to the contingencies listed below, which would vest in the Employer certain powers including, but not limited to, taking possession of the work so far as it has been performed and to completing the work either by himself or by employing some other Agency, retaining property of the Contractor, such as materials, plant or money already due to the Contractor:
- a) Failure of Contractor to proceed with or complete the works in the time or manner stipulated
  - b) Contractor's bankruptcy
  - c) Failure of Contractor to commence the work
  - d) Failure of Contractor to regularly proceed with the work for a certain fixed period
  - e) Failure of Contractor to proceed to the satisfaction of the Employer or the Engineer
  - f) Failure of Contractor to proceed with the work for any reason independent of prevention by Employer
  - g) If in the Engineer's opinion, the Contractor is not exercising due diligence and proceeding with such dispatch as will enable the works to be duly completed in time
  - h) Failure of Contractor in complying with the orders and directions given by the Engineer
  - i) Failure of Contractor in complying with the Specification, stipulations, conditions or Drawings
  - j) The Contractor being guilty of any default in the fulfillment of the contract
  - k) The Contractor leaves the work unfinished
  - l) Failure of Contractor, after due notice, to rectify defective work
  - m) The Contractor renouncing materials from site and
  - n) Failure of Contractor to maintain the works

**40. Work by Other Agencies**

The Employer / Engineer reserves the right to use premises and any portions of the site for the execution of any work not included in this contract which it may desire to have carried out by other persons simultaneously, and the Contractor shall allow all reasonable facilities for the execution of such work, but shall not be required to provide any plant or material for the execution of such work except by special arrangement with the Employer. Such work shall be carried out in such manner as not to impede the progress of the works included in the Contract



and the Contractor shall not be responsible for any damage or delay which may happen to or occasioned by such work.

#### 41. Insurance Policies

##### **On commencement for the work :-**

- a) The contractor shall take out a suitable C.A.R. Insurance policy covering entire scope of the works under this contract for the value of work as per contract tender conditions and arrange to keep the policy valid till issue of virtual completion certificate/ handing over of the project..
- b) The contractor shall take out and submit to the Interior Designer and EMPLOYER, a suitable insurance policy against third party risks. The limit of liability of this insurance shall be limited to Rs.35 Lakh in respect of any one accident or series of accidents arising out of one event or Rs.25 Lakh in respect of any passer-by. The policy shall be kept valid, issue of virtual completion certificate/ handing over of the project..
- c) The contractor shall take out and submit to Employer a suitable Insurance Policy against Workmen's compensation / Janata Policy as per requirements. The policy shall be kept valid till issue of virtual completion certificate/ handing over of the project..
- d) Necessary PF & ESI contribution of contractor's labourers will have to be paid by contractor as per statutory authority's regulations and EMPLOYER shall be absolved of all the risk.

##### **In Respect of Damage to Person and Property :-**

From Commencement to Completion, the Contractor shall be responsible for all injury to persons, animal or things and for all structural and decorative damage to property which may arise from operation or neglect of himself or any subcontractor or of any of his or a subcontractor's employee whether such injury or damage may arise from carelessness, accident or any other cause whether in any way connected with the carrying out of this contract. This clause shall be held to include interalia any damage to building, whether immediately adjacent or otherwise, any damages to roads, streets, footpaths, bridges, or ways as well as all damage to the buildings and works forming the subject of this contract by first or other inclemency weather. The contractor shall indemnify the Employer and hold him harmless in respect of all and

Any expenses arising from any such injury or damage to persons or property as aforesaid and also in respect of any claim made in respect of any award of compensation or damages consequent upon such claim.

The Contractor shall reinstate all damage of every spot mentioned in this clause so as to

deliver up the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

**Against third party risks :-**

On commencement of the work, the contractor shall take out and submit to the Employers a suitable insurance policy against third party risks. The limits of liability of this insurance shall be as follows:

Rs. 25 Lakhs in respect of any one accident or series of accidents arising out of one event. Contractor shall take out third party insurance for 3 no. of such accidents and repetition of the same after three occurrence including visitors like Local Authority, Vendors etc.

**CONTRACTOR'S LIABILITY AND INSURANCE SUMMARY**

Sr. No	Nature and Scope of Risk	Value of Insurance	Validity Period of Insurance	Name of the Insurer	Insurance Policy No. and
1.	Loss of damage to works or any part thereof and all materials at site from any cause whatsoever. <b>CAR Policy</b>	100 % of Contract Amount	The policy shall be valid till issue of virtual completion certificate.	The policy shall be in the joint names of the Employer / Bank	
2.	Damage, Loss or Injury to any Property of the Employer or Consultant to any person including the Employer or Consultant for his Agents and Servants.	Rs. 35.00 Lakhs per claim upto 3 claims	- DO -	- DO -	
3.	Claims under the Workmen's Compensation Act, 1923	As per Govt. Rules	- DO -	- DO -	
4.	Third party insurance	Rs. 25 Lakhs in respect of any one accident or	- DO -	- DO -	

		series of accidents arising out of one event. Contractor shall take out third party insurance for 3 no. of such accidents and repetition of the same after three occurrence including visitors like Local Authority, Vendors etc.			
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**42. (i) Rate of Progress**

The whole of the materials, plant and labour to be provided by the Contractor and the mode, manner and speed of execution and maintenance of the Works are to be of a kind and conducted in a manner to the satisfaction of the Engineer. Should the rate of progress of the Works or any part thereof be at any time be in the opinion of the Engineer too slow to ensure the completion of the whole of the Works by the prescribed time or extended time for completion, the Engineer shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as considered necessary by the Engineer to expedite progress so as to complete the works by the prescribed time or extended time for completion. Such communication from the Engineer neither shall relieve the contractor from fulfilling obligations under the contract nor he will be entitled to raise claims arising out of such directions.

**(ii) Work during Night or on Holidays**

Subject to any provision to the contrary contained in the Contract none of the permanent work shall save as herein provided be carried on during the night or on Holidays without the permission in writing of the Engineer, save when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works in which case the Contractor shall immediately advise the Engineer. Provided always that the provisions of this clause shall not be applicable in the case of any work, which becomes essential to carry out by rotary or double shifts in order to achieve the progress & quality of the part of the works being technically required / continued with the prior approval of the Engineer.

All work at night shall be carried out without unreasonable noise and disturbance and with the approval of the Engineer and in addition that of the local authority, if so applicable. The Contractor shall indemnify the Employer from and against any liability for damages on account of noise or other disturbance created while or in carrying out



the work and from and against all claims, demands, proceedings, costs, charges and expenses whatsoever in regard or in relation to such liability.

43. **Suspension of Work**

The Contractor shall on the written order of the Engineer in Consultation with EIC suspend the progress of the Works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall during such suspension properly protect and secure the work so far as is necessary in the opinion of the Engineer. The extra cost including all running wages to be paid on the Site, salaries, depreciation and maintenance of plant, Site on costs & overhead costs of the Contract relating to the works done or incurred by the

Contractor in giving effect to the Engineer's instructions under this Clause shall, be borne and paid by the Employer. However, the same will not be payable if the such suspension is :

- (a) otherwise provided for in the Contract

OR

- (b) necessary by reason of inclement weather conditions affecting adversely the safety or quality of the Works.

OR

- (c) necessary by reason of some default on the part of the contractor

Provided that the Contractor shall not be entitled to recover any such extra cost unless he gives notice in writing of his intention to claim to the Engineer within 28 days of the Engineer's order. The Engineer shall settle and determine such extra payment and / or extension of time under relevant Clause hereof to be made to the Contractor in respect of such claim as shall in the opinion of the Engineer be fair and reasonable and the Engineer's decision shall be final and binding.

#### 44. Settlement of Disputes and Differences

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, manner or thing whatsoever in any way arising out for relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the work or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, Termination, completion or abandonment thereof shall be dealt with as mentioned herein after.

- i) If the contractor considers that he is entitled to any extra payment or compensation in respect of the works over and above the amounts admitted as payable by the Interior Designer or in case the contractor wants to dispute the validity of
- ii) any deductions or recoveries made or proposed to be made from the contract or raise any dispute, the contractor shall forthwith give notice in writing of his claim, or dispute to the **Chief Manager / Asst. General Manager, Bank Of Baroda** and endorse a copy of the same to the Interior Designer, within 30 days from the date Of disallowance thereof or the date of deduction or recovery. the said notice shall give full particulars of the claim, grounds on which it is based and detailed calculations of the amount claimed and the contractor shall not be entitled to raise any claim nor shall the Bank be in any way liable in respect of any claim by the contractor unless

notice of such claim shall have been given by the contractor to the **Chief Manager / Asst. General Manager, Bank of Baroda** in the manner and within the time as aforesaid. The contractor shall be deemed to have waived and extinguished all his rights in respect of any claim not notified to the **Chief Manager / Asst. General Manager, Bank of Baroda** in writing in the manner and within the time as aforesaid.

- iii) **Chief Manager / Asst. General Manager, Bank of Baroda** shall give his decision in writing on the claims notified by the contractor. The contractor may within 30 days of the receipt of the decision of **Chief Manager / Asst. General Manager, Bank of Baroda** submit his claims to the conciliating authority namely the **Dy. General Manager, Bank of Baroda** for conciliation along with all details and copies of correspondence exchanged between him and the **Chief Manager / Asst. General Manager, Bank Of Baroda**.

#### 45. **Arbitration**

If the conciliation proceedings are terminated without settlement of the disputes, the contractor shall, within a period of 30 days of termination thereof shall give a notice to the concerned **Dy. General Manager, Bank Of Baroda, Baroda Corporate Centre, BKCMumbai** of the Bank for appointment of an Arbitrator to adjudicate the notified claims failing which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.

v) Except where the decision has become final, binding and conclusive in terms of the contract, all disputes or differences arising out of the notified claims of the contractor as aforesaid and all claims of the Bank shall be referred for adjudication through arbitration by the sole Arbitrator appointed by the **General Manager, Bank of Baroda, Corporate Centre, BKC Mumbai**. It will also be no objection to any such appointment that the Arbitrator so appointed is a Bank officer and that he had to deal with matter to which the contract relates in the course of his duties as Bank officer. If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole Arbitrator shall be appointed in the manner aforesaid by the said **General Manager, Bank of Baroda**. Such person shall be entitled to proceed with the reference from the stage he is entitled to proceed with the reference from the stage at which it was left by his Predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each dispute along with the notice for appointment of arbitrator. It is also a term of this contract that no person other than a person appointed by such **General Manager, Bank of Baroda, Corporate Centre, BKC Mumbai** as aforesaid

should act as Arbitrator. The conciliation and arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or re-enactment thereof and the rules made there under. It is also a term of the contract that if any fees are payable to the arbitrator these shall be paid equally by both the parties. However, no fees will be payable to the arbitrator if he is a Bank officer. It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner, such costs or any part thereof, shall be paid and fix or settle the amount of costs to be so paid.

46. **Boreholes & Exploratory Excavation**

Deleted

47. **Fossils, Etc.**

Deleted

48. **Contractor to Search**

Deleted

49. **Interference with Traffic and Adjoining Properties**

All operations necessary for the execution of the Works and for the construction of any Temporary Works shall so far as in compliance with the requirements of the Contract permits be carried on so as not to interfere unnecessarily or improperly with the public convenience or the access to use and occupation of public or private roads and footpaths or to or of properties whether in the possession of the Employer or of any other person and the Contractor shall save harmless and indemnify the Employer in respect of all claims, demands, proceedings, damages, costs, charges and expense whatsoever arising out of or in relation to any such matters in so far as the Contractor is responsible.

50. (i) **Extraordinary Traffic**

Deleted

(ii) **Special Loads**



Should it be found necessary for the Contractor to move one or more loads of Constructional Plant Machinery or pre-constructed units or parts of units of work over part of a highway or bridge the moving whereof is likely to damage any highway or bridge unless special protection or strengthening is carried out then the Contractor shall adopt proper & adequate measures and shall be responsible for all the costs and consequences thereof.

(iii) **Settlement of Extra Ordinary Traffic Claims**

Deleted

51. (i) **Contractor to Keep Site Clear**

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

(ii) **Clearance of Site on Completion**

On the completion of the Works the Contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish and temporary works of every kind and leave the whole of the site and works clean and in a workmanlike condition to the full satisfaction of the Engineer / local authorities not later than 30 days from the virtual completion of the works or by such other later date as fixed by the Engineer.

52. **Construction Plant**

(i) **Definition**

For the Purpose of this Clause

- (a) The expression "Constructional Plant" shall be deemed to exclude vehicles engaged in transporting any plant, equipment or materials & staff to or from the site.
- (b) The expression "Hired Plant" shall mean any Construction equipments, Temporary Works & materials for Temporary Works held by the Contractor under any agreement for hire thereof.
- (c) The expression "Hire Purchase Plant" shall mean any Constructional Plant Temporary Works & materials for Temporary Works held by the Contractor under any agreement for hire purchase thereof.



(ii) **Hire Purchase of Plant Exclusively for Works**

Deleted

(iii) **Conditions of Hire of Certain Plant**

Deleted

(iv) **Cost of Hiring Plants for purposes of Clause no. 39**

Deleted

(v) **Contractor's Certificate as to Hiring Provisions**

Deleted

(vi) **Hire Purchase Payments by Employer**

**DELETED.**

(vii) **Plants Etc. not to be Removed**

Deleted

(viii) **Revesting & Removal of Plant**

Upon removal of any such Constructional plant Temporary Works or materials as have been deemed to have become the property of the Employer under sub-clause (ii) of this Clause with consent of the Employer the property therein shall be deemed to revest in the Contractor and upon completion of the Works the property in the remainder of such Constructional Plant, Temporary Works and Materials as aforesaid shall subject to the provisions of **Clause 39** hereof be deemed to revest in the Contractor who shall remove the same together with Hire Purchase Plant.

(ix) **Disposal of Plant**

Deleted

(x) **Liability for Loss or Injury to Plant**

Deleted

(xi) **Incorporation of Clause in Sub-Contracts**

Sub-contracting or back to back contracting not allowed. The Contractor shall when entering into any sub-contract for the execution of any specialized work incorporate in such sub-contract by reference or otherwise the provisions of this Clause in relation to Constructional Plant, Temporary Works and Materials, Essential Hired Plant and Hire Purchase Plant brought on to the site by the Specialist Agency.

### **53. Labour Laws**

53.1 The Contractor shall at all times during the continuance of the Contract, comply fully with all existing Acts, regulations and bylaws including all statutory amendments and re-enactment of State or Central Government and other local authorities and any other enactments, notifications and acts that may be passed in future either by the State or the Central Government or local authority, including Indian Workmen's Compensation Act, Contract Labour (Regulation and Abolition) Act 1970 and Equal Remuneration Act 1976, Factories Act, Minimum Wages Act, Provident Fund Regulations, Employees Provident Fund Act, schemes made under the same Act and also Labour Regulations as revised Health and Sanitary Arrangement for Workmen, Insurance and other benefits and shall keep Employer indemnified in case any action is commenced by competent authorities for contravention by the Contractor. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated henceforth on the part of the Contractor, the Interior Designer / Employer shall have the right to deduct from any money due to the Contractor, his amount of Performance Security or recover from the Contractor personally any sum required or estimated to be required for making good the loss or damage suffered by the Employer, responsibility in connection with the employees of the contractor, who shall, in no case, be treated as the employees of the Employer at any point of time.

### **53.2 Fair Wages:**

The Contractor shall pay the labourers engaged by him on the work not less than fair wage which expression shall mean, whether for time or piecework, the respective rates of wages fixed by the local authorities as fair wages for the area payable to the different categories of labourers or those notified under the Minimum Wages Act for corresponding employees of the Employer, whichever may be higher.

53.3 The Contractor shall, notwithstanding the provisions of a contract to the contrary, cause to be paid a fair wage to labourers indirectly engaged on the Works, including any labour engaged by sub/contractors in connection with the said works as if the labourers had been directly employed by him.

### **53.4 Notices:**

The Contractor shall before he commences the work, display, and correctly maintain in a clean and legible condition at a conspicuous place on the Site, notices in English and in a language spoken by the majority of the workers, stating therein the rate of wages which have been fixed as fair wages and the hours of work for which such wages are earned and send a copy of such notices to the Interior Designer.

### **53.5 Record of wages etc.**

The contractor shall maintain records of wages and other remuneration paid to his employees in such form as may be convenient and as per the requirements of the ARCHITECT/Employer/ Interior Designer and the Conciliation Officer (central), Ministry of Labour Government of India, or such other authorized person appointed by the central or State Government and the same shall include the following particulars of each worker :

- a. Name, worker's number and grade;
- b. Rate of daily or monthly wage;
- c. Nature of work on which employed;
- d. Total number of days worked during each wage period;
- e. Total, amount payable for the work during each wage period; All deductions made from the wage with details in each case of the ground for which the deduction is made;
- f. Wage actually paid for each wage period.
- g. The Contractor shall provide a Wage Slip for each worker, employed on the Works.
- h. The Wage records and Wage Slips shall be preserved for at least 12 months after the last entry for Inspection of Wage Records.
- i. The Contractor shall allow inspection of the aforesaid Wage Records and Wage Slips to the ARCHITECT and to any of his workers or to his agent at a convenient time and place after due notice is received, or to the Employer or any other person authorized by him on his behalf.
- j. The Employer / Interior Designer or any other person authorized by them on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the Fair Wages Clause. He shall also have the Power to investigate into any complaint regarding any default made by the Contractor or subcontractor in regard to such provision.
- k. No party shall be represented by a legal practitioner in any investigation or inquiry

under this Clause, unless Interior Designer / Employer agree otherwise.

#### **54. Safety Code**

The Contractor shall comply with all the precautions as required for the safety of the workmen by the I.L.O. Convention No. 62 as far as they are applicable to the Contract. The Contractor shall provide all necessary safety appliances, gears like goggles, helmets, masks, etc. to the workmen and the staff.

#### **SCAFFOLDS**

- i. Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality of wood or steel. The steps shall have a minimum width of 450 mm and a maximum rise of 300 mm. Suitable hand holds of good quality wood or steel shall be provided and the
- ii. Scaffolding or staging more than 4m. above the ground floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly bolted, braced or otherwise secured, at least 1 m. above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- iii. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4 m. above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in (ii) above.
- iv. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 m. Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.
- v. Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. in length while the width between side rails in rung ladder shall in no case, be less than 290mm. for ladder up to and including 3m. in length. For longer ladders this width shall be increased at least 20mm for each additional meter of length.

- vi. A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to construction.
- vii. All personnel of the contractor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
- viii. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

### **EXCAVATION & TRENCHING**

- i. All trenches, 1.25 m. or more in depth shall at all times be supplied with at least one ladder for each 30 m. in length or fraction thereof. The ladder shall be extended from bottoms of the trench to at least 1 m. above the surface of the ground. Sides of trenches which are 1.5 m or more in depth shall be stepped back to give suitable slope or securely held by timber bracing so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
- ii. The contractor shall take all measures on the site of the work to protect the public from accidents and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any such persons or which may with the consent of the contractor, be paid to compromise any claim by any such person.

### **DEMOLITION**

- a. Before any demolition work is commenced and also during the process of the work:
- b. All open areas adjacent to the work site shall either be closed or suitably protected.
- c. No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
- d. All practical steps shall be taken to prevent danger to persons employed from the risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

## PERSONAL SAFETY EQUIPMENTS

- i. All necessary personal safety equipment as considered adequate by the site Engineer / ARCHITECT should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned.
  - a) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
  - b) Those engaged in white washing and mixing or stacking of cement bags or any material which is injuries to the eyes shall be provided with protective goggles.
  - c) Those engaged in welding works shall be provided with welder's protective eye sight lids.
  - d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
  - e) When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into manholes and the manholes so. Opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.
  - f) The contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead or any toxic material in any form. Wherever men above the age of 18 are employed on the work of such painting the following precautions should be taken:
    - g) No paint containing lead or lead products shall be used except in the form of paste or readymade paint. Paints like vinyl and epoxies having toxic fumes should be applied after following all precautions laid down by manufacturers.
    - h) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
- ii. Overalls shall be supplied by the contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

- iii. When the work is done near any public place where there is risk of drowning all necessary equipments should be provided and kept 'ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- iv. Use of hoisting machines and tackle including their attachments anchorage and supports shall conform to the following standards or conditions:
  - a) These shall be of good mechanical constructions sound material and adequate strength and free from patent defect and shall be kept in good repair and in good working order.
  - b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.
- v. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffolding which or give signals to operator.
- vi. In case of every hoisting machine and of every chain ring hook, shackle shovel and pulley block used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the. Conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
- vii. In case of departmental machines, the safe working load shall be notified by the site Engineer / ARCHITECT. As regards contractor's machines, the contractor shall notify the safe working load of the machine to the ARCHITECT whenever he brings any machinery to site of work and get it verified by the ARCHITECT concerned.
- viii. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum of the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulated mats, wearing apparel,



such as gloves, sleeves and boots as may be necessary, should be provided. The workers should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

- ix. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.
- x. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.
- xi. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer, Engineers of the Department or their representatives.
- xii. Notwithstanding the above clause from (i) to (xviii), there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

#### **First Aid:**

At every workplace, there shall be maintained in a readily accessible place first aid appliances including an adequate supply of sterilized dressings and sterilized cotton wool as prescribed in the Factory Rules of the State in which the work is carried on. The appliances shall be kept in good order and, in large workplaces; they shall be placed under the charge of a responsible person who shall be readily available during working hours.

At large workplace, where hospital facilities are not available within easy distance of the works, First Aid Posts shall be established and be run by a trained compounder. Where large workplaces are remotely situated and far away from regular hospitals, an indoor ward shall be provided with one bed for every 250 employees. Where large work place are situated in cities, towns or in their suburbs and no beds are considered necessary owing to proximity of city or town hospitals, suitable transport shall be provided to facilitate removal of urgent cases to these hospitals. At other workplaces, some conveyance facilities shall be kept readily available to take injured person or persons suddenly taken seriously ill, to the nearest hospital. At large workplace, there shall be provided and maintained an ambulance room containing the prescribed equipment and in the charge of such medical and nursing staff as may be prescribed. For this purpose, the relevant provisions of the Factory Rules of the State





Government of the area, where the work is carried on, may be taken as the prescribed standard.

### **Accommodation for Labour:**

The Contractor shall during the progress of the Work provide, erect and maintain necessary temporary living accommodation and ancillary for labour at his own expenses to the standards and scales as approved by the ARCHITECT

### **Drinking Water:**

In every workplace, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of water fit for drinking. Where drinking water is obtained from an intermittent public water supply, each workplace shall be provided with storage where drinking water shall be stored. Every water supply storage shall be at a distance of not less than 15 meters from any latrine, drain or other source of pollution. Where water has to be drawn from an existing well, which is within such proximity of latrine, drain or any other source of pollution, well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust-proof and water-proof. A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

**Labour rooms/staying facilities**-Contractor have to make their own arrangement outside of the premises for staying labour.

### **Washing and Bathing Places:**

Deleted

### **Latrines and Urinals:**

Deleted

### **Payment of Wages**

- a. Wages due to every worker shall be paid to him direct. All wages should be paid in current coins or currency or in both.
- b. Wages of every worker employed on the Contract shall be paid where the wage period is one week, within THREE days from the end of the Wage period, and in any

other case before the expiry of the 7<sup>th</sup> day or 10<sup>th</sup> day from the end of the wage period according as the number of workers does not exceed 1,000 or exceeds 1,000.

- c. Minimum wages to be paid to all the workers as per the statutory Govt. norms. The minimum wages of state/central whichever is highest to be paid to all the workers/labour.

**NOTE:** The term "Working Day" means a day on which the work on which the labour is employed is in progress.

**Register of Workmen:**

A register of workmen shall be maintained in the Form appended to the regulations and kept at the work site or as near to it as possible and relevant particulars of every workman shall be entered therein within THREE days of his employment.

**Employment Card:**

The Contractor shall issue an employment card in the Form appended to these regulations to each worker on the day of work or entry into his employment. If a worker already has any such card with him issued by the previous employer, the Contractor shall merely endorse that Employment Card with relevant entries. On termination of employment, the Employment Card shall again be endorsed by the Contractor and returned to the worker.

**Register of Wages, etc.:**

- i) A Register of Wages cum Muster Roll in the Form appended to these regulations shall be maintained and kept at the Work Site or as near to it as possible.
- ii) A wage slip in the form appended to these regulations shall be issued to every worker employed by the Contractor at least a day prior to disbursement of wages.

**55. Force Majeure**

**Conditions of Force Majeure**

The terms "Force Majeure" as employed herein shall mean act of God, war, revolt, riot, fire, flood and Acts & Regulations of respective Governments of the two parties namely the Employer and the Contractor.

**Note : 'Typhoon', 'Cyclones', 'Hurricanes', 'Tornado' are covered under act of God.**

In the event of either party being rendered unable by force majeure to perform any of obligations required to be performed by them under the Contract, the relative obligation of the party affected by such Force Majeure shall upon notification to the other party be suspended for the period of delay, which is directly caused by such Force Majeure event.

Upon the occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid thereby, shall notify the other party in writing within (72) seventy two hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of its claim.

Time for performance of the relative obligation suspended by the Force Majeure shall then stand extended by the period of delay, which is directly caused by Force Majeure event. The party who has given such notice shall be excused from timely performance of its obligations under the Contract, for so long as the relevant event of Force Majeure continues and to the extent that such parties performance is prevented, hindered or delayed, provided the party or parties affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect thereof upon its performance of the Contract and so to fulfill its obligations under the Contract.

If works to be executed by the Contractor are suspended by Force Majeure conditions lasting for more than (2) two months, the Employer shall have the option of cancelling or terminating this Contract in whole or part thereof at Employer's discretion. Upon such termination provisions of Clause 39 shall apply.

Delay or non-performance by a party hereto caused by the occurrence of any of Force Majeure shall not:

- a) Constitute a default or breach of the Contract,
- b) Give rise to any claim for damages or additional cost or expense occasioned thereby : if such delay or non-performance is caused by the occurrence of any event of Force Majeure. Force Majeure conditions shall not be payable under any circumstances.

**Guidelines issued by Govt. for COVID-19-** Contractor has to strictly follow all the guidelines issued by the local/state/ central or any concern department for COVID-19.

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## **Section H**

### **SPECIAL CONDITION OF CONTRACT**

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## SPECIAL CONDITIONS OF CONTRACT

### 1. Scope of Work

The scope of the work is to carry out Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV & allied work as detailed in the Drawings, Specifications and Bill of Quantities on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat.

### 2. Location of Site

The site is located at 5<sup>th</sup> floor, Manjalpur, Vadodara, Gujarat., Gujarat.

### 3. Area for the Contractor's Site Facilities

The area to the extent available, at the discretion of the EIC, from the said plot will be allocated to the contractor for his stores, offices, erection of plants, workshops etc. Any additional area including area for labour camp etc. shall be arranged by the contractor at his own cost. The Employer neither undertakes any responsibility for providing the area more than the above nor will entertain any claim / reimbursement etc. towards arrangement of additional area / land etc. by the contractor.

### 4. Dimensions and Levels

All dimensions and levels shown on the Drawings shall be verified by the Contractor on the Site and he will be held responsible for the accuracy and maintenance of all the dimensions and the levels.

Figured dimensions are in all cases to be accepted and no dimension shall be scaled. Large-scale details shall take precedence over small-scale drawings. In case of discrepancy the Contractor shall ask for clarification from the Engineer before proceeding with the work.

### 5. Notice of Operation

The Contractor shall not carry out any important operation without the consent in writing of the Engineer / EIC.

### 6. Construction Records

The Contractor shall keep and provide to the Engineer full and accurate records of the dimensions & locations of all new work and any other information necessary for the Engineer for records of the works as constructed.

## **7. Safety of adjacent Structures**

The Contractor shall provide and erect to the approval of the Engineer such supports as may be required to protect efficiently all structures and protective guards to trees which may be endangered by the execution of the works or otherwise take such permanent measures as may be required by the Engineer to protect the structures and trees.

## **8. Temporary Works**

Before any Temporary Works are commenced the Contractor shall submit at least 7 days in advance to the Engineer for approval, complete drawings of all Temporary Works he may require for the execution of the works. The Contractor shall also submit his calculations relating to strength, if required by the Engineer and shall carry out the modifications that the Engineer may require in accordance with the Conditions of Contract at his own cost. The Contractor shall be solely responsible for the stability and safety of all Temporary Works and unfinished works and for the quality of the permanent works resulting from the arrangement eventually adopted for their execution.

## **9. Temporary Roads**

The Contractor shall be responsible for proper maintenance of this access road and would take all care to see that existing services if any are maintained in working order.

The construction and maintenance of Temporary Roads within the site area shall be the Contractor's responsibility and the Contractor shall take such measure as are necessary and as directed by the Engineer / EIC.

## **10. Power, Water & Other Facilities**

- (a) The rate quoted by the Contractor shall include expenditure for providing all the water required for the work and the Contractor shall make his own arrangements for the supply of good quality potable water, including obtaining Municipal connection for his labour as well as for construction purpose, and all charges for water shall be borne by him. If water is not available and should it become necessary for Contractor to bring water from outside by tankers, the Employer shall not be liable to pay any charges in connection therewith.
- (b) The rate quoted in the tender shall also include electric consumption charges for power. If no power is available at the site, the Contractor shall have to make his own arrangements to obtain power connections and maintain at his own expenses an efficient service of electric light and power and shall pay for the electricity consumed. If electricity and water provided by bank, recovery @ 2.0% amount of the actual work done at site shall be done.

- (c) For water and electricity, the Contractors for other trades directly appointed by the Employer shall be entitled to take connections from the temporary water and electric supply connection obtained by the Contractor at their cost. Such contractors (directly appointed by Employer) shall install a sub-meter for measuring electric / water consumption at their own cost and maintain the wiring / installation in good condition as per the local rules and reimburse the actual consumption charges directly to the Contractor at mutually agreed rates between them. In case of any disagreement, the reimbursement charges shall be decided by the Engineer, whose decision shall be final and with out appeal.

All charges for drainage, water connection and electricity charges for construction purposes shall be borne by the Contractor and charges payable for permanent connections, if any, shall be initially paid by the Contractor and the Employer will reimburse the amount on production of receipts.

- (d) The contractor shall make suitable arrangement for a stable and uninterrupted supply of water, power and other facilities for the work and Engineer's and Employer's office. The cost of these facilities towards installation and maintenance shall be borne by the contractor and are deemed to be included in the quoted rates / prices.
- (e) The Employer, as well as the Engineer, shall give all possible assistance to the Contractor to obtain the requisite permission from the various Authorities, but the responsibility for obtaining the same in time shall be that of the Contractor.
- (f) In case water and electricity are provided by the Employer from their existing source, the charges as decided by the Employer will be deducted from the payment due to contractor.

## 11. Temporary Services

The Contractor shall provide and maintain all temporary services on or about the site, for the execution of the works and shall remove them on completion at his own cost.

## 12. (i) Office Accommodation for Contractor, Architect / Employer's Representatives and Visiting Officials

**DELETED.**

## (ii) Telephone & Fax

**DELETED**

### **13. Facilities for Contractor's Employees**

The Contractor shall make his own arrangement for the housing and welfare of his staff and workmen including adequate drinking water and sanitary facilities. The Contractor shall also make his own arrangements at his own cost for transport where necessary for his staff and workmen to and from the Sites of the works. The necessary drinking water and sanitary facilities for Employer's representative, architect, contractor's staff & labour & visitors at site shall be provided and maintained by the contractor at no extra cost.

### **14. Lighting for Works**

The Contractor shall at all times provide adequate and approved lighting as required for the proper execution, supervision & inspection of the works.

### **15. Fire Fighting Arrangement**

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

(ii) The Contractor may be subject to periodic fire prevention inspections and any deficiency or unsafe condition shall be corrected by the Contractor at his own cost and to approval of the Engineer and the relevant authorities.

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

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





g) General housekeeping

**16 (i) Site Instruction Book**

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

Any communication, relating to the works may be conveyed through Site Instruction Books. Such a communication from one party to the other shall be deemed to have been adequately served in terms of the Contract. Each site book shall have machine-numbered pages in triplicate and shall be carefully maintained and preserved by the Contractor and shall be made available to the Engineer / EIC as and when demanded. Any instruction which the Engineer / EIC may like to issue to the Contractor may be recorded by him in the Site Book and two copies thereof taken by the Engineer / EIC for his record. The Contractor or his Agency or Representative may similarly record in the Site Book any communication he may like to send to the Engineer / EIC. Two copies thereof when sent to the Engineer / EIC and receipt obtained thereof, will constitute adequate services of the communication to the Engineer / EIC.

**(ii) Site Records**

Contractor shall maintain various site records like inventories of materials, challan, approval of material, testing, hindrance etc as per standard practice or as advised by Engineer / EIC.

**17. Temporary Fencing, Barricades etc.**

The Contractor shall provide and maintain a suitable approved temporary fencing / barricades and gates to adequately enclose all boundaries of the site for the protection of the public and for the proper execution of the Works including all costs incurred for the security of the Works and in accordance with the requirements of the Engineer / Employer and regulations of local authorities / pollution board. These shall be altered, relocated and adapted from time to time as necessary and removed on completion.

**18. Site Meetings**

Progress and quality evaluation meetings will be held at the site every week or fortnightly. The Contractors senior representative in charge of the project along with his site-in-charge and other staff including staff of approved subcontractors and suppliers as required shall participate in these progress review meetings and ensure all follow up actions. Any additional

review meetings shall be held if required, as decided by the Engineer / EIC which also shall be attended by the above referred representatives.

## 19. Programme of Works

### (i) Detailed Programme to be furnished

Within 15 days of receiving letter of Acceptance / Award the Contractor shall prepare and submit a detailed programme of works in the form of a Bar Chart / Mile stone network showing all activities & the order of procedure in which he proposes to carry out the works including labour histogram, cash flow and deployment of equipments. Within 15 days from the date of submission, the Engineer / EIC shall convey to the Contractor his comment / approval on the programme.

The contractor shall be required to submit the PERT / CPM chart for the various activities involved in this work including dependencies etc., and regularly monitor the progress of construction accordingly.

### (ii) Programme to be Modified

Subject to the provisions of **Clause no. 19** hereof, if at any time it should appear to the Engineer that the actual progress of the works does not conform to the approved programme referred to in sub-clause (i) of this Clause, the Contractor shall produce a revised & detailed programme showing the modifications to the original programme necessary to ensure the completion of the works within the time for completion as defined in **Clause no. 32 of GCC** hereof.

### (iii) Cash Flow

The detailed programmes shall also show the estimated Cash flow required for each month to complete the works.

### (iv) Progress Report / Photograph

Two copies of weekly progress reports containing the following shall be submitted by the Contractor to the Employer through the Engineer on or before the 3<sup>rd</sup> day of the next week.

- (a) Weekly detailed progress report showing the progress of individual activities of programme as achieved at site till such period & being suitably marked on the approved network diagram, or as directed by the Engineer, shall be provided by the Contractor indicating the actual state of progress during the course of the contract, together with other details of procurement & delivery schedules of materials / equipments, as required by the Engineer.

- (b) Three copies of coloured photographs in showing day to day important progress of work.
- (c) Labour report in the form prescribed by the Engineer.
- (d) Equipment & machinery report in the form pre scribed by the Engineer.
- (e) Supervisory staff report in the form prescribed by the Engineer.
- (f) Remedial Measures for covering up delay, if any.
- (g) Bottlenecks and hindrances,

Apart from the above the Contractor shall submit daily report indicating regular deployment of his staff and works, equipments, important stages of progress, procurement of construction materials etc. as approved by the Engineer.

**20. Procedure for Measurement, Record and Billing:**

- i. All measurements shall be taken jointly by the Contractor/Architect/Engineer. During measurement, Contractor shall provide all assistance with measuring appliances, labour and other necessary for measurement.
- ii. Interim Bills shall be submitted by the Contractors based on the measurement taken for Scrutiny and Certification for payment by Architect/Engineer/EIC.
- iii. Engineer to Scrutinize, Check and record the measurements on the Measurement Sheets / Books (duly approved by Employer and issued to Engineer) and to Certify the bills for payment.
- iv. Measurement shall be taken as per methods of measurement spelt out in the Specification / Contract document. In case of any dispute as to the mode of measurement not covered by the Contract to be adopted for any item of work, mode of measurement as per latest Indian Standard Specification / CPWD / Standard Engineering Practices as decided by Engineer shall be followed in order of preference.
- v. While preparing the final bills overall cumulative measurement may be taken again. However, detailed checking of previous Interim Bills shall be made and in case there are any missing items or measurements, the same shall be recorded. Contractor have to submit a copy of purchased material bills as and when required by bank. In case of not submission of bill, the payment for the same shall not be processed.
- vi. Incase, the Contractor does not submit the Final Bill within the stipulated period as specified in **Clause no. 31** of General Condition of Contract, the Engineer may take

the measurements of his own and certify the Bill which will be binding on the Contractor.

- vii. The schedule of payment of Bill shall be as specified in **Clause no. 31** of General Condition of Contract.

## 21. Disposal of Refuse etc.

- i) The Contractor shall cart away from site and POP/debris/deposit where directed by the Engineer all refuse, etc. arising from the Works both as it accumulates, at completion of the Works or at the direction of the Engineer. No extra payment shall be done for the same.
- ii) It is the responsibility of the Contractor to obtain a certificate from the local authorities concerned to the effect that all rubbish arising out of Contractor's activities at the construction site or any other offsite activities borrow pits and / or disposal area(s) has been properly disposed off.

This certificate from the authority shall be dated not later than the (last) Certificate of Completion of Works and is to be enclosed with the Payment Certificate in which the Contractor requests for payment of any Retention money due to him.

## 22. Contractor to verify site Measurements

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

## 23. Hoarding

Deleted

## 24. Bar-bending Schedule for reinforcement Work

Deleted

## 25. Approved Makes / Agencies

The Contractor shall provide all materials from the list of approved makes and also appoint the specialist agency from the approved list as provided in the Tender. The Architect / Employer / Engineer will approve make / agency as selected by the contractors within the

approved list after inspection of their samples / mock-ups and their compliance to Technical Specifications / BOQ items and after ascertaining their spare capacities and recent past performances. In case the materials are not in conformity with BOQ & Technical Specification though it is in approved list or for Aesthetic reason, Employer / Architect may select the other approved makes. Contractor have to ensure the availability of the material before commencement of the work. After commencement of the work, non-availability of material shall not be the reason for the delay.

## **26. As Built Drawings / Documents / Shop Drawing**

### **(a) Drawings Issued to the Contractor by the Engineer:**

The Engineer will issue three sets of the drawings / soft copies to the Contractor for the items for which some changes have been made from the approved drawings as instructed by the Engineer. The contractor will mark the changes which have been made from the approved drawings and submit the copies of drawings / soft copies to the Engineer for his approval. In case any revision is required or the corrections are not properly marked, the Engineer will point out the discrepancies to the Contractor. The Contractor will have to incorporate these corrections and / or attend to discrepancies either on the copies as above or fresh copies as directed by the Engineer and resubmit to the Engineer for approval along with soft copies. The Engineer will return one copy to the contractor duly approved for his records.

### **(b) Shop drawings prepared by the Contractor:**

The contractor shall prepare the shop-drawings as & when required or as directed by EIC. The Contractor will modify the drawing prepared by him wherever any changes are made consequent to site decisions etc. as approved by the Engineer. Three copies along with soft copies shall be submitted of these corrected drawings to the Engineer for his approval.

The Engineer shall return one copy of the same, duly approved, if found satisfactory or advise contractor the changes required or discrepancies, if any. The Contractor shall resubmit the three copies after incorporating all the corrections / changes etc. with soft copies. The Engineer / Architect will return one copy to the contractor duly approved for his records.

### **(c) Documents:**

Contractor shall submit documents like Maintenance and Operation Manuals, Literatures of various equipment, GST Bill of materials(if required), guarantee etc. in bounded form in triplicate to Engineer on completion of work, which will be construed as a condition for certify Final Bill.

**27. Procurement of Materials.**

The contractor shall make his own arrangement to procure all materials required for the work. All wastages including shall be the contractors account.

**28. (i) Excise & Sales Taxes for Works**

The Contractor shall pay and be responsible for payment of all taxes, duties, levies, royalties, fees or charges in respect of the works including but not limited to sales taxes, Excise duties payable in respect of materials, equipment, plant and other things required for the Contract. All of the aforesaid taxes, duties, levies fees and charges shall be to the Contractor's account and Employer shall not be required to pay any additional or extra amount on this account. Variation of taxes, duties, levies, fees etc., if any, till completion of work shall be deemed to be included in the accepted rates and no extra claim on this account will in any case be entertained by the Employer. Only GST will be paid in extra, as applicable.

**(ii) New Taxes, Duties & Levies, etc.**

If a new Tax or Duty or Levy is imposed under as statute or law during the currency of the contract, the same may be reimbursed by the Employer if so deemed fit on documentary evidence.

**29. General Price Variation Adjustment (PVA) for Materials and Labour**

Deleted.

**30. Non-Assignability**

This Contract & Benefits and Obligations thereof shall be strictly personal to the bidder bidding the bid and shall not on any account be assignable or transferable by the Bidder. Also, the Bidder will not be allowed to get the work executed on back to back basis through any other agency except for specialized works.

**31. Appointment of Specialist Agencies**

The contractor shall appoint specialist Agencies for the following works with due approval from Engineer / Engineer-in-charge apart from that mentioned in elsewhere of the tender document for specialized works.

- i. Skilled Carpenters/ Polishers,
- ii. Electrical work (agency having valid license)



- iii. BMS and CCTV work
- iv. Fire Fighting Work
- v. HVAC work

The specialist agencies so appointed by the contractor should have adequate Technical and Financial capability and have proven record for the relevant works.

The contractor shall submit the relevant documents to the Engineer / Engineer-in-charge for appointing specialist agencies and shall get approval from the Engineer / Engineer-in-charge.

The appointment of specialist agencies shall not relieve contractor from any of their performance obligation as per the contract. The contractor should be fully and solely responsible for the quality and completion of works to be carried out by the specialist agencies.

However, contract can deploy their own In-house facilities only if it is approved by Employer / Engineer after verifying their credential and past performance.

### **32. Priority of Contract Documents**

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the documents forming the Contract shall be as follows in order of precedence.

1. BOQ & its nomenclature
2. Tender drawings
3. GFC drawings issued by Architect on award of the work.
4. Technical specifications
5. Special conditions of contract
6. Latest IS Codes / CPWD specifications
7. Decision of Architect/Bank

### **33. Statutory Approvals**

Contractor shall obtain all statutory approvals at his own cost before commencement and on completion of work, if required from the GIFT/Local authorities. However, Employer shall pay or reimbursed the all official fees on demand/producing original receipts.

The contractor shall obtain the Occupation Certificate and NOC from local authorities on virtual completion of the work so as to obtain the power, water and sewerage connections





from the respective authorities in order to hand over the building before stipulated completion date.

**34. Contractor to co-ordinate with other Contractors:**

Contractor has to co-ordinate with other Contractors employed by Employer for other works and for any dispute the same to be brought to the notice of Employer / Engineer.

**35. Delegation**

The BOB may delegate any of the duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

**36. Basic Rates for Materials**

Basic rates of Material while bidding the Tender, the bidders shall quote the rates based on the basic rates mentioned in BOQ:

Basic price means the landed cost of materials at site including transportation, excise duty, sales tax and all other duties levied by Govt. or any public bodies.

1. Materials for which a basic price has been stipulated in the tender, the variation in the actual cost of purchase including transportation, excise duty, sales tax and all other duties levied by Govt. or any public bodies (Excluding GST) from the basic price stipulated above will be considered for adjustment (recoverable or payable as the case) due to incorporation of required quantity of such material in the works over different periods of time as per construction schedule. **No claim against wastage component will be consider for the same.** Rates should be however fair and competitive and verified by market enquiry by the Employer calling quotations from the approved material distributors/manufactures on regular interval and the quantity purchased in every period should be reasonable and advantageous, in case of huge fluctuation in rate for basic rated items, upon receiving instructions from Employer, contractor to initiate bulk procurement for those items to have benefit of rate etc. Contractor is required to submit delivery challan, invoice and payment details in respect of the basic rated material purchased for verification of Employer.
2. The Contractor shall not in any way be entitled to any sums by way of overhead costs, profits or otherwise whatsoever in respect of such variation. The corresponding adjustment shall be made in the Contractor's bill on production of all necessary documents duly certified by the Interior Designer. Wastage in cement, steel and other materials shall be on the Contractor's account. It is clarified that no adjustment shall be made in respect of items such as steel grills window/ventilator bars, doors, hoop iron or



M.S. rods for partitions wall plates for water tanks, & other manufactured items whatsoever.

3. The employer has the right to instruct the successful bidder to purchase the required materials for which the “Basic Price” has been stipulated from the dealer or supplier as per list of approved makes / Agencies or any other agencies selected by the Employer and at the rate approved by the Employer on verification of market rate from time to time.
4. Contractor has to take prior written approval from bank for make and rate approval before placing order. If fail, than bank will not pay any amount for the respective item.

The Contractor shall make his own arrangements for procurement of cement. As the cement of tested quality is freely available in the market in abundant quantity at competitive prices, the contractor shall take prior approval from Employer with regard to brand of cement other than approved make or brand and the price at which the same shall be procured.

**37. Typographic or Clerical Errors:**

The Architect's clarifications regarding partially omitted particulars or typographical or clerical errors in the Tender documents shall be final and binding on the Contractor.

**38. Rate Analysis of Major Items:**

Rate Analysis of major items to be submitted by the Bidder before award of work if so required by Employer.

**39. Notices:**

Notices of the Employer to the Interior Designer or the contractor may be served personally or by being left at or sent by registered post to the known place of abode or business of the party to whom the same is given or in the case of the Contractor by being left on the works. In the case of company or corporation, Notices may be served at or sent by registered post to the registered office of the Company or Corporation. Any notice sent by registered post shall be deemed to be served at the time when, in the ordinary course of post, it would be delivered

**40. Soil Test Report:**

Deleted

**41. Technical Audit**

The whole of the work may be technically audited by the Chief Technical Examiner (CTE) of the Central Vigilance Commission, Government of India from time to time. Any defects, improvement or testing etc. conveyed by the Examiner shall be carried out by the contractor at no extra cost, to the satisfaction of the CTE. Any deduction suggested by the CTE either due



to faulty workmanship or not adhering to the specification will be effected.

The Employer shall have a right to cause a technical examination and audit of work and running and final bills of the contractor including all supporting vouchers. Abstract, etc. to be made at the time of the bill. If as a result of this examination or otherwise any sum is found to have been overpaid in respect of any work done by the contractor under the contract the contractor shall be liable to return the amount of over payment and it will be lawful for the employer to recover the same from any sum or sums due to him and in any other manner legally permissible and if it is found that the Contractor was paid less than what was due to him under the contract in respect of any work, executed by him under the contract, the amount of such under payment shall be duly considered / paid by the employer.

Any sum of money due and payable to the contractor (including security deposit returnable to him) under this contract may be appropriated by the Employer and set off against any claim of the Employer for the payment of a sum of money arising out of or under any other contract made by the Contractor with the Employer.

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## SECTION - I

### PROFORMA & ANNEXURE

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**PROFORMA & ANNEXURES**

**PROFORMAS & ANNEXURES**

**ANNEXURE – A NOTICE OF COMMENCEMENT / COMPLETION OF CONTRACT WORK**

**ANNEXURE – B MONTHLY PROGRESS REPORT**

**ANNEXURE – C RECEIPT & CONSUMPTION OF MATERIALS AT SITE**

**ANNEXURE – D MEASUREMENT BOOK (Interior Decoration WORK)**

**ANNEXURE – E RUNNING A/C BILL**

**ANNEXURE – F R. A. BILL CERTIFICATE**

**ANNEXURE – G PROFORMA OF UNDERTAKING IN CONNECTION WITH PAYMENTS OF ADVANCE ON MATERIALS BROUGHT BY THE CONTRACTORS TO THE SITE**

**ANNEXURE – H CERTIFICATE OF PAYMENT BY PMC**

**ANNEXURE – I HINDRANCE REGISTER**

**ANNEXURE – J EXTENSION OF TIME LIMIT**

**BANK OF BARODA**



**PROFORMA & ANNEXURES**

**ANNEXURE – A**

**PROFORMA OF NOTICE OF COMMENCEMENT / COMPLETION OF CONTRACT WORK**

1. Name and principle employer & address
2. No. and date of certificate of registration
3. I / we hereby intimate that the contract work\_\_\_\_\_ (Name of work) given to \_\_\_\_\_ (Name and address of the Contractor) having License No. \_\_\_\_\_ dated\_\_\_\_\_ has commenced / has been completed with effect from \_\_\_\_\_ (date ) / on \_\_\_\_\_(date).

Signature of the Principle

Employer

The Inspector,

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PROFORMA & ANNEXURES**

**ANNEXURE – B**

**PROFORMA OF MONTHLY PROGRESS REPORT**

Name of work

Progress report for the month

Report No.

Sr. No.	Description	Details of location where works is done	Approximate quantity executed

**A. GENERAL BUILDING WORK**

1. Overall progress
2. Carpentry work, Partitions (half & full), Storage floorwise
3. Carpentry work for Conference Tables, Storages
4. False ceiling, Coordination with other agencies
5. Work station, Loose furniture, Tables at cabins etc.

Sr. No.	Description of work	Date of Commencement	Due date of Completion	Percentage Progress Achieved



**PROFORMA & ANNEXURES**

**ANNEXURE - C**

**RECEIPT & CONSUMPTION OF MATERIALS AT SITE**

<b>Sr. No.</b>	<b>Description</b>	<b>Opening Balance</b>	<b>Receipt during month</b>	<b>Consumption during month</b>	<b>Closing balance</b>	<b>Total quantity received till date</b>

1. Plywood
2. Laminations
3. False ceiling material
4. Teakwood and other material for door, door frames.
5. Door shutters





**PROFORMA & ANNEXURES**

**ANNEXURE – D**

**MEASUREMENT BOOK (Interior Decoration Work)**

Item. No.	Description	Measurements No.			Quantity
		L	B	D/H	

**PROFORMA & ANNEXURES**

**ANNEXURE – E**

**I - RUNNING A/C BILL MEASUREMENTS**

1. Name of Contractor / Agency
2. Name of work
3. Sr. No. of this bill
4. No. and date of previous bill
5. Reference to Agreement No.
6. Date of written order to commence
7. Date of completion as per agreement

Sr. No.	Item Description	Unit	Rate (Rs.)	As per Tender
1	2	3	4	5

Upto previous R/A. Bill		Upto date (Cumulative)		Present Bill		Remarks
Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	
6.	7.	8.	9.	10.	11.	12.

- Note:** 1) if part rate is allowed for any item, it should be indicated with reasons for allowing such a rate
- 2) if advance payment is made, it should be mentioned specifically

\_\_\_\_\_  
Net values since  
Previous bill



**PROFORMA & ANNEXURES**

**PROFORMA & ANNEXURES**

**ANNEXURE – F**

**R.A. BILL CERTIFICATE**

The measurements on the basis of which the above entries for the running bill no. : \_\_\_\_\_ were made have been taken jointly on \_\_\_\_\_ and are recorded at pages \_\_\_\_\_ to \_\_\_\_\_ of Measurement Book No. \_\_\_\_\_

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Signature and date of  
Contractor

Signature and date of PMC's  
Representative (seat)

The work recorded in the above mentioned measurements has been done at the site satisfactory as per tender drawings, conditions and specification.

Architect

P.M.C.  
Bank's Engineer

**PROFORMA OF UNDERTAKING IN CONNECTION WITH PAYMENTS OF  
ADVANCE ON MATERIALS BROUGHT BY THE CONTRACTORS TO THE SITE**

The undertaking made this \_\_\_\_\_ day of \_\_\_\_\_ 20 16 \_\_\_\_\_ between the Bank of Baroda \_\_\_\_\_ and having its \_\_\_\_\_ office at (hereinafter called the Employer) of the one part and \_\_\_\_\_ (hereinafter called the Contractors of the other part).

The Employer and the Contractors have entered into an Agreement dated \_\_\_ hereinafter called as the said agreement and in terms of clause no. \_\_\_\_\_ of the conditions in the agreement, the Employer has agreed that the Contractors will be paid an advance of 75 % of the cost of non-perishable building materials brought by the Contractor to the site for consumption in the works at the discretion of the Employer.

The Contractors have applied to the Employer that they be allowed advances on the security of materials absolutely belonging to them and brought by them to the site of work. The Employer has agreed to do so on the terms and hereinafter set out.

Not this Letter of Undertaking witnesses that in consideration of the said agreement and in consideration of the amount paid / payable to the Contractors by the Employer and / or any further advances as may be made to the Contractors as aforesaid, the Contractors hereby agree with the Employer and undertake as under:

- i) The amount advanced by the Employer to the Contractors as aforesaid and all or any further sum or sums advanced as aforesaid shall be employed by the Contractors in or towards expediting the execution of the said works and for no other purpose whatsoever.
- ii) That the materials which have been offered to and accepted by the Employer as security are absolutely the Contractors own property and free from encumbrances of any kind and the Contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the Contractors indemnify the Employer against all claims to any materials in respect of which an advance has been made to them as aforesaid.

- iii) That the materials on the security of which any further advance or advances may hereafter be made as aforesaid (hereinafter called the said materials) shall be used by the Contractors solely in the execution of the said works in accordance with the directions of \_\_\_\_\_ of the Employer and accordance with the terms of the said agreement.
- iv) That the contractors shall take their own cost all the necessary and adequate arrangement for the proper watch, safe custody and protection against all risks of the site of the said works in the contractors custody and on their own responsibility and shall at all times be open to inspection to the Employer's Engineers or any Officer authorized by the Employer. In the event of the materials or any part thereof being stolen, destroyed or damaged, the Contractors will further replace the same with other materials of like quality or repair and make good the same as required by the Employer.
- v) That the said materials shall not on any account be removed from the site of the said works except with the written permission of the \_\_\_\_\_ of Bank of Baroda.
- vi) That the advances shall be repayable in full when or before the Contractors receive payment from the Employer of the price payable to them for the said works under the terms and the provisions of the said agreement provided that if any intermediate payments are made to the Contractors on account of work done, then on occasion of each such payment, the Employer will be at liberty to make a recovery from the Contractors bill for such payment by deducting there from the value of the said materials then actually used in the construction and in respect of which recovery has not been made previously, the value for this purpose being determined in respect of each description of materials at the rates at which the amount of the advances made under these presents were calculated.
- vii) That if the Contractors shall at any time make any default in the performances or observance in any respect of any of the terms and provisions of the said agreement or of these presents, the total amount of advance or advances that may still be owing to the Employer, shall immediately on the happening of such default be repayable by the Contractors to the Employer together with interest thereon at 12% per annum from the date or respective dates of such advance or advances to the date of repayment and with all costs, charges, damages and expenses incurred by the Employer in or for the recovery thereof or the enforcement of this security or otherwise by reason of the default of the Contractors and the Contractors hereby covenant and agree with the Employer to repay and pay the same respectively to him accordingly.

- viii) That the Contractors hereby charge all the said materials with the repayment to the Employer of the sum or sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the powers contained therein if and whenever the covenant for payment and repayment hereinabove contained shall become enforceable and the money owing shall not be paid in accordance therewith, the Employer may at any time thereafter adopt all or any of the following courses as he may deem best:
- ix) Seize and utilize the said materials or any part thereof in the completion of the said works on behalf of the Contractors in accordance with the provisions in that behalf contained in the said agreement debiting the Contractors with the actual cost of effecting such completion and the amount due in respect of advances under these presents and crediting the Contractors with the value of work done as if he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the Contractors, they are bound to pay the same to the Employer on demand.
- x) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale, retain all the sums aforesaid repayable or payable to the Employer under these presents and pay over the surplus (if any) to the Contractor.
- xi) Deduct all or any part of the money owing out of the Security Deposits or any sum due to the Contractor under the said agreement.
- xii) That except in the event of such default on the part of the Contractors as aforesaid, no interest shall be payable on the said advance.
- xiii) That in the event on any conflict between the provisions of these presents and the said agreement, the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been herein before expressly provided for the same shall be referred to the Officer in charge, Premises Department , whose decision shall be final and no appeal shall lie against his decision before any court, arbitrator or authority.
- xiv) The provision of this Undertaking shall be deemed to be supplemental to the said agreement.



IN WITNESS WHEREOF the Contractors have set their hands to these presents the day and year first hereinabove written.

Signed, sealed and delivered by the said Contractors in the presence of Witness:

Signature

Name

Address





**PROFORMA & ANNEXURES**

**ANNEXURE – H**

**PROFORMA OF CERTIFICATE OF PAYMENT BY PMC**

<b>Certificate No. Interim</b>	<b>Dated</b>	
Client:	Project No.	Building Work / Interior Work
	Particulars:	
Contractor:	Contract / Letter No.	Dated:
	Contract's Bill No.	Dated:

This is to certify that the amount given below (\*) is due to your contractors for the work done by them and / or against materials delivered at site and/or for advance towards contract on the above referred project.

Advance against contract:

Less: Advance adjusted to date

Balance Advance

Advance against material delivered at site

Amount of work done to date

Total

Less: Retention on work done

Less: Previously certified upto

Present Certificate (\*)

Rupees \_\_\_\_\_



The cost of cement or any other material supplied by you or payments made by you directly if any, and not covered herein above, should be adjusted before making the payment of the certified amount (\*).

Necessary Deduction U/S 194C of the Income Tax 1961 and sales tax may be made before paying the above certified amount.

By a copy of this letter, we are intimating the contractors to call on you for the necessary payment.

Remarks, if any

the details of insurance policy are enclosed .

Enclosures: Bill

Signature of P.M.C.



**PROFORMA & ANNEXURES**

**ANNEXURE – I**

**PROFORMA OF HINDRANCE REGISTER**

Name of the work :

Date of state of work:

Name of Contractor :

Period of Completion:

Agreement No. :

Date of completion:

Sr. No.	Nature of Hindrance	Date of Occurrence of Hindrance	Date of which Hindrance was removed	Period of Hindrance	Signature of PMC	Remarks
1	2	3	4	5	6	7

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PMC – Project Management Consultant

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## PROFORMA & ANNEXURES

## ANNEXURE – J

### APPLICATION OF PROFORMA FOR EXTENSION OF TIME LIMIT

1. Name of Contractor
2. Name of the work as given in the Agreement
3. Agreement No.
4. Estimated Tender Amount.
5. Date of Commencement of work as per Agreement.
6. Period allowed for Completion of work as per Agreement.
7. Date of Completion Stipulated in Agreement.
8. Period for which Extension of Time has been given previously:
  - a) 1<sup>st</sup> Extension vide Architects / Bank letter no. dtd, month, days
  - b) 2<sup>nd</sup> Extension vide Architects / Bank letter no. dtd, month, days
  - c) 3<sup>rd</sup> Extension vide Architects / Bank letter no. dtd, month, days
  - d) 4<sup>th</sup> Extension vide Architects / Bank letter no. dtd, month, days
9. Total Extension previously given.
  - a) Reasons for which extensions have been given (copies of the previous application should be attached)
10. Period for which extension is applied for :



11. Hindrances on account of which extension is applied for with dates on Hindrances occurred and the period for which these are likely to last :

- a) Serial No.
- b) Nature Of Hindrance:
- c) Date of Occurrence:
- d) Period for which is likely to last :
- e) Period for which Extension required for this particulars Hindrance:
- f) Overlapping period if any , with to item (e) above
- g) Net extension applied for :
- h) Remarks if any

12. Extension of time required for extra work

13. Details of extra work and amount involved :

- a) Total value of extra work :
- b) Proportionate period of extension time on estimated amount put tender

14. Total extension time required for 11 & 12 :

Submitted to the Architects / Bank

-----  
Signature of contractor

Date:

## **GENERAL TECHNICAL SPECIFICATION**

**Tender for Civil, Interior Furnishing, Electrical, HVAC, Firefighting, CCTV& allied work on 5<sup>th</sup> floor, Bank of Baroda, Manjalpur, Vadodara, Gujarat..”**

INTERIOR & CIVIL ITEM SPECIFICATIONS SUMMARY PAGE

**I. INTERIOR & CIVIL WORK**

**A. Item Specifications**

Section – 1	AAC Block Masonry Work
Section – 2	Plaster Work
Section – 3	Gypsum Plaster
Section – 4	Color Work
Section – 5	White PU (Polyurethane)
Section – 6	Texture Work
Section – 7	Kitchen & Toilet Platform
Section – 8	Vitrified Tiles
Section – 9	Skirting Work
Section – 10	Composite Marble Flooring
Section – 11	Composite Marble Skirting
Section – 12	Vitrified Tiles (600X600)
Section – 13	Wood Flooring
Section – 13.1	Beeding
Section – 14	Wooden Skirting
Section – 15	Carpet Tile
Section – 16	Door Work
Section - 17	Gypsum Board Ceiling
Section – 18	Armstrong Channeled Woodworks



Ceiling

Section – 19	Ultima (BEVELLED TEGULAR)
Section – 20	DUNE (Beveled regular)
Section – 21	ARMSTRONG  SOUNDSCAPES SHAPES
Section - 22	ARMSTRONG  METALWORKS    BAFFLE  CEILING
Section – 23	ARMSTRONG CELLIO OPEN CELL
Section – 24	Full Height Solid Partition
Section – 25	MDF Frame Work 100mm x 8mm
Section – 26	MDF Frame Work 75mm x 8mm
Section – 27	10mm thick Fix Glass with Profile Fitting -ALEXA MR 28 (DORMA)
Section – 28	Glass Door With Patch Fitting - ALEXA (DORMA)
Section – 29	Frost Decorative Film/Translucent Film on Glass
Section – 30	Reception Table
Section – 31	RM Executive Table Suites
Section – 32	DRM, RLF & SME Executive Table
SuiteSection – 33	Conference Table
Section – 34	Discussion table

Section – 35	Cafe table
Section – 36	1 Seater workstation table
Section –37	2 Seater workstation table With Front side low height Partition
Section – 38	2 Seater workstation table With center Partition
Section – 39	4 Seater workstation table
Section - 40	Chair for RM's cabin
Section – 41	Visitor Chair For RM's Cabin, Reception table & Conference room
Section – 42	Desk let Chair for Conference Room
Section – 43	Chair for Workstation & Discussion room
Section – 44	Chair for Cafe table
Section - 45	Podiums
Section – 46	Full Height Storage (up to 2400mm height)
Section – 47	Low Height Storage (up to 1200mm height)
Section – 48	Low Height Storage (for cabin area) (up to 750mm height)
Section – 49	Storage Units for Passage
Section – 50	Sofa (3 Seater)

Section – 51	Sofa (2 Seater)
Section – 52	Center Table
Section – 53	Sofa Side Table
Section – 54	Wooden Paneling
Section – 55	Roller Curtain
Section – 56	Water Dispensers
Section – 57	Printed Glass
Section – 58	Glass Shelves
Section – 59	Dry Planters Boxes
Section – 60	SS Dustbins
Section – 61	Murals in Display Area
Section – 62	Artificial Small Plants
Section – 63	Signages
Section – 64	Aaronic - KMR3A Recess Panel (3 in 1):
Section – 65	C.P. towel ring
Section – 66	C.P. Toilet paper holder
Section – 67	Mirrors in Toilet
Section – 68	Pantry (Shutters under platform)
Section – 69	Pantry (Overhead unit)
Section – 70	Toilet Cubical partition
Section – 71	Urinal partition
Section – 72	Vertical Garden
Section – 73	Assembly conference table

Section – 74                      Conference table (18 seater)

Section – 75                      Workstation with overhead storage

Section – 76                      Workstation

Section – 77                      Rotafile Storage

## **INTERIOR & CIVIL ITEM SPECIFICATIONS**

### **1.0 AAC Block Masonry Work**

Providing and constructing AAC Block masonry work with minimum compressive strength of 50 Kg per Sq.cm. in cement mortar 1:5 (1cement : 5 coarse sand) for superstructure at all levels including racking out of joints, scaffolding, making provision for opening in walls for switches, water lines, watering, curing etc. complete as directed by the Architect/Engineer in charge. Item to also include, all accessories, men material for a lift up to 20th floor in the building for materials, pre- application preparation cleaning after the finish etc. complete.

#### **1) Material**

Autoclaved aerated concrete is a lightweight, load-bearing, high-insulating, durable building product which is produced in a wide range of sizes and strengths. AAC offers incredible opportunities to increase building Quality and at the same time reduce cost at the construction side. AAC is produced out of a mix of Quartz sand /or pulverized fly ash (PFA), lime, cement, gypsum, water and aluminum and is hardened by steam -curing in autoclaves. As a result of its excellent properties, AAC is used in many building construction, for example in residential homes, commercial and industrial buildings, schools, hospital, hotels and many other applications. The construction material AAC contains 60% to 85% air by volume.

#### **2) Workmanship:**

Scaffolding:

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

Preparation of back ground:

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be toughened by wire brushing if it is not hard and by hacking if it is hard. In case of concrete surface, if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarder is left on the surface. Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.

Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistened again.

For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

Application of plaster:

The plaster about 15x15 cms. Shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required. Excessive troweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

Cement plaster shall be used within half an hour after addition of water and mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.

The plastering work shall be in single coat on rough side of block wall for interior plastering up to floor two level, finished even and smooth in C.M. 1:4.

### 3) Mode of measurement:

The rate shall be for a unit of one cubic meter. No extra will be payable towards wastage due to material pattern.

## 2.0

### Plaster Work

Providing 15mm thick Cement Plaster in single coat on brick/concrete wall for

interior plastering at various floor level as below, finished even and smooth including application of rough backing coat of cement mortar 1:4 with trowel finish as directed etc. complete.

**1) Material**

The cement mortar of proportion 1:4 (1 cement: 4 sand)

**2) Workmanship :**

Scaffolding:

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

Preparation of back ground :

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be toughened by wire brushing if it is not hard and by hacking if it is hard. In case of concrete surface, if a chemical retarded has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the readers if left on the surface. Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.

Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistened again.

For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

Application of plaster :

The plaster about 15x15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive troweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

Cement plaster shall be used within half an hour after addition of water and mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.

The plastering work shall be in single coat on rough side of block wall for interior plastering up to floor two level, finished even and smooth in C.M. 1:4.

### **3) Mode of measurement**

The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship.

All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 15 mm at any point on this surface.

The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.

Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.

For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq.mt each in area and for openings exceeding 0.5. sq.mt and not exceeding 3.00 sq.mt. in each area deductions and additions shall be made in the following manners.

(a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. MT each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, for finish to plaster around ends of joints, beams



posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravel, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all is equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.

In case of openings of area above 3 sq. mt. each, deduction shall be made for openings but jambs, soffits and sills shall be measured.

The rate shall be for a unit of One sq. meter.

### **3.0**

Providing Avg. 12 mm thk. gypro expert (Saint gobain) Gypsum Plaster, of approved make, to be applied in 2 varying coats to achieve desired total thickness, with all necessary nominal curing and drying complete, to correct line, level and plumb, finished smooth. Item to be inclusive of all accessories, fixing implements, tools and tackle, men material and lift up to 27 floor, cleaned complete with all necessary edge masking with approved min. 8mm wide masking tape. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

#### **1) Material**

Gypsum Plaster (1): It shall be formed by enclosing and bonding together a core of set gypsum plaster by two sheets of heavy paper. It shall offer high standard of safety, thermal efficiency and aesthetics. It shall be light in weight, shall offer good fire resistance and shall render faster construction. It shall be suitably used in areas subjected to continuously damp or wet conditions, except bathrooms, where gypboard partitions shall be properly protected by tiles or other impervious materials. It shall be a non-resonant material, rendering sound insulation. It shall be strong, durable and dimensionally stable. It shall offer a smooth surface which can be painted, tiled or wall papered. It shall block the passage of heat and shall retard the spread of fire. It shall hide up to 60 dB of sound, when erected in the proper manner.

#### **2) Workmanship**

It shall be suitably used in areas subjected to continuously damp or wet conditions, except bathrooms, where Gypboard partitions shall be properly protected by tiles or other impervious materials. It shall be a non-resonant Material, rendering sound insulation. It shall be strong, durable and dimensionally stable. It shall offer a smooth surface which can be painted, tiled or wall papered.

### 3) Mode of measurement

Gypsum plaster be measure in sqm. Dimensions is computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern.

## 3.0 Colour Work

### Royale Emulsion paint

Providing & applying three finish coats of 100% water-proof Royale Emulsion paint of Asian Paints or equivalent brand (low VOC) approved by Architect/EIC of require shade including two coats of acrylic wall Putty making surfaces even on walls and ceilings, applied evenly to give uniform finish in color patterns and even shade, including curing, preparation of surface and a coat of matching primingcoat of white cement to give an even shade after thoroughly brushing the surface to remove all dirt and dust and remains of loose powdered, complete. Incase of areas having excessive dampness using Damp Block to limit further dampness. When the underlying surface exhibits chalkiness, in spite of thorough surface cleaning, use Asian Paints Exterior Sealer.

#### 1) Material

100% water-proof Royale Emulsion paint of Asian Paints or equivalent brand approved by Architect.

In case of areas having excessive dampness using Asian Paints Damp Block to limit further dampness. When the underlying surface exhibits chalkiness, in spite of thorough surface cleaning, use Asian Paints Exterior Sealer.

#### 2) Workmanship

Three finish coats of 100% water-proof Royale Emulsion paint of Asian Paints or equivalent brand approved by Architect of require shade including two coats of acrylic wall Putty making surfaces even on walls and ceilings,

Applied evenly to give uniform finish in color patterns and even shade, including curing, preparation of surface and a Coat of matching priming coat of white cement to give an even shade after thoroughly brushing the surface to Remove all dirt and dust and remains of loose powdered, complete

#### 3) Mode of measurement

Item will be measure in sqm. Dimensions is computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern.

## 5.0 WHITE PU

Providing & applying Polyurethane Paint (PU) n approved shade selected by architect on wooden, Plywood, and MDF surfaces. It is a single pack clear wood

finishing system comprising of basecoat and topcoat that can be applied and a clear, flexible coating that has unique non-yellowing property. PU can be thinned with potable water and can be applied by spraying or roller and can be used for all kind of wood, veneer, plywood and medium density fiber board (MDF). Apply coating as follow: first coat spraying or brushing and sand with emery paper 320 or 400 and wipe clean. Second coat spraying or brushing and sand with emery paper 320 or 400 and wipe clean. After first & second coat PU matt/glossy spraying and emery paper 320 or 400 and wipe clean.

### 1) **Material**

Polyurethane Paint (PU) in approved shade selected by architect on wooden, Plywood, and MDF surfaces. It is a single pack clear wood finishing system comprising of basecoat and topcoat that can be applied and a clear, flexible coating that has unique non-yellowing property.

### 2) **Workmanship**

First coat spraying or brushing and sand with emery paper 320 or 400 and wipe clean. Second coat spraying or brushing and sand with emery paper 320 or 400 and wipe clean. After first & second coat PU matt/glossy spraying and emery paper 320 or 400 and wipe clean.

### 3) **Mode of measurement**

Item will be measure in sqm. Dimensions is computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern.

## **6.0 Texture Work**

Providing & applying Interior Texture of Asian Paints - Royal Play Archi (Or as Approved) Concrete including cost of emulsion paint in approved shade ( two coats ) laid on 2 mm. th. texture material pattern, quality and manufacturer by architect incl. priming coat ( One coats) of white cement to give an even shade after thoroughly brushing the surface to remove all dirt and dust and remains of loose powdered materials etc. compete & as per detail & directed by Architect & Engineer in-charge. The work should be carried out by authorized applicator of Asian Paints.

### 1) **Material**

Interior Texture of Asian Paints - Roayle Play Archi+ (OR as approved) Concrete including cost of emulsion paint in approved shade

### 2) **Workmanship**

(Two coats ) laid on 2 mm. th. texture material pattern, quality and manufacturer by architect incl. priming coat ( One coats) of white cement to give an even shade after thoroughly brushing the surface to remove all dirt and dust and remains of loose powdered materials etc. compete & as per detail & directed by Architect & Engineer in-charge

### 3) Mode of measurement

Item will be measure in sqm. Dimensions is computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern

## 7.0 Kitchen & Toilet Platform

Providing & laying avg 20 mm thick (+/-2mm) pre-polished artificial engineered quartzite marble sandwich platform for counter top basins 600 & Kitchen sink of avg 700 mm wide, with quartzite supports of avg 20 mm thick for vertical support and kadappa/Kota of avg 25 mm thick below Quartzite marble with necessary approved sealant as required as per the detail drawing etc., including avg. 32mm fascia patties of Engineered Quartzite marble and rounding or polishing the exposed edges as per drawing, cutting for basin & kitchen sink opening, sealing all crevices with silicon sealant, etc. complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

### 1) Material

20 mm thick (+/-2mm) pre-polished artificial engineered quartzite marble sandwich platform for counter top basins 600 & Kitchen sink of age 700 mm wide, with quartzite supports of age 20 mm thick for vertical support and kadappa/Kota of avg 25 mm thick below Quartzite marble with necessary approved sealant as required as per the detail drawing etc.

32 mm fascia pattis of Engineered Quartzite marble and rounding or polishing the exposed edges as per drawing.

### 2) Workmanship

The Kitchen & toilet platform of size as directed shall be constructed on 70 Cm width and 80cm height. The vertical support shall be of polished kota stone sandwich type upto full depth in cement mortar (1:3). 20 mm thick (+/-2mm) pre-polished artificial engineered quartzite stone shall be provided in a single piece upto 1.5 mt. in length & specified light. The same shall be sandwich with bottom PKS slab. The horizontal & vertical sandwich partition shall be provided with quartz stone single piece facia. All exposed edges of stones shall be machine cut and rounded of smoothly.

### 3) Mode of measurement

The work of cooking platform shall be measured for finished work. The rate includes cost of all labour and materials etc. required for satisfactory completion of this item as described above.

The rate shall be for a unit of per Sq. meter. (Only plan area shall be considered)

## 8.0 Vitrified Tile

Providing & laying Vitrified tile (Glossy/Mat) flooring as per approved shade/patterns with tiles of sizes 1200 mm x 600 mm/800 mm x 800 mm/other

approved size with avg.13 mm (+/- 1mm) thk. Tiles as per approved brand of 1st quality set in with approved tile adhesives as per the detailed instructions of the tile adhesive manufactures. Joints shall be properly grouted with grouts of reputed brand .The rate shall be inclusive of cutting of raceways junction box conduits etc. Complete as per standard specification. The item shall also include cleaning, making mock-up for approval of Architect/Engineer in charge, all accessories, tools, labour, and protecting finished installation with POP layer till handover, with all cleaning complete etc. No extra will be payable towards wastage due to material pattern. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect. Make: Somany /johnson/Kajaria/AGL. Basic Price of Vitrified tiles Rs 1300 per sq.mt.

**1) Material**

Vitrified tile (Glossy/Mat) flooring as per approved shade/patterns with tiles of sizes 1200 mm x 600 mm/800 mm x 800 mm/other approved size with avg.13 mm (+/- 1mm) thk. tile flooring over 20mm (average) base of cement mortar 1:6 (1 Cement : 6 Coarse sand)

**2) Workmanship**

tile flooring over 20mm (average) base of cement mortar 1:6 (1 Cement : 6 Coarse sand) on new surface or fixing on existing flooring by adhesive material including of flooring and jointed with color cement slurry including finished with flush pointing and cleaning the surface etc.

**3) Mode of measurement**

Dimensions are computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern.

**9.0 Skirting**

P & L Skirting of size 1200 MM X 75 MM on wall / column in complete line & level. The job includes joint finishing with the help of white cement, cement color, with joint filler of approved make, cleaning etc. complete. The skirtings are to be fixed to match the joints of the flooring, joined with suggested color cement slurry in joints. Proper fixing level should be maintained. Full pieces have to be fixed except where small pieces are unavoidable. Actual on site laid quantity will be considered for the measurement purpose. The item includes cutting / hacking in wall / plaster, surface preparation, fixing the skirting with rich cement mortar, putting 1/2"x1/2" groove between skirting & plaster, finishing etc. comp. & removal of debris

**1) Material**

Vitrified tile (Glossy/Mat) as per approved shade/patterns with tiles of Skirting of size 600 mm x 75 mm /1200 MM X 75 MM on wall / column in complete line & level.

**2) Workmanship**

The job includes joint finishing with the help of white cement, cement color, with joint filler of approved make, cleaning etc. complete. The skirtings are to be fixed to match the joints of the flooring, joined with suggested color cement slurry in joints. Proper fixing level should be maintained. Full pieces have to be fixed except where small pieces are unavoidable. Actual on site laid quantity will be considered for the measurement purpose. The item includes cutting / hacking in wall / plaster, surface preparation, fixing the skirting with rich cement mortar, putting 1/2"x1/2" groove between skirting & plaster, finishing etc. comp. & removal of debris.

### **3) Mode of measurement**

Item will be measure in SQ.MT. (L x H). It will not be measured in RMT. No extra will be payable towards wastage due to material pattern.

### **10.0 Composite Marble**

Providing and fixing avg. 20 mm (+/- 2mm) thk. Pre-polished Composite Marble flooring (silica) in reception & waiting area installed size 3025x1225/approved equivalent size of Approved Make, shade & code laid as per Design Drawing, blemish less and clear without any spots or marks, laid on CM Bed Mortar 1:3 with thickness of 20 mm as approved with mortar overlay of White cement, levelled, aligned as per flooring layout drawing, fixed complete. Item to include getting dry mock-up approved from the Architects. Item to include all Tools & Tackle, lift for all men, materials & implements to masking neighbouring installations, cleaning complete with protective tarpaulin cover on finished installation till handover. No extra will be payable towards wastage due to material pattern. Please note payment will be in SQM of finished floor/dado area only.

#### **1) Material**

20 mm (+/- 2mm) thk. Pre-polished Composite Marble flooring (silica) in reception & waiting area installed size 3023x1225/approved equivalent size of Approved Make, shade & code laid as per Design Drawing, blemish less and clear without any spots or marks, laid on CM Bed Mortar 1:3 with thickness of 20 mm as approved with mortar overlay of White cement, levelled, aligned as per flooring layout drawing, fixed complete

#### **2) Workmanship**

Pre-polished Composite Marble flooring (silica) laid on CM Bed Mortar 1:3 with thickness of 20 mm as approved with mortar overlay of White cement, leveled, aligned as per flooring layout drawing, fixed complete. Item to include getting dry mock-up approved from the Architects. Item to include all Tools & Tackle, lift for all men, materials & implements to masking neighboring installations, cleaning complete with protective tarpaulin cover on finished installation till handover.

#### **3) Mode of measurement**



Dimensions are computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern.

**11.0** Providing and fixing avg. 20 mm (+/- 2mm) thk. Pre-polished Composite Marble Skirting including installed size avg. 3025X1225/approved equivalent size of Approved Make, shade & code laid as per Design Drawing, blemish less and clear without any spots or marks, laid on CM Bed Mortar 1:3 with thickness of 20 mm as approved with mortar overlay of White cement, leveled, aligned as per flooring layout drawing, fixed complete. Item to include getting dry mock-up approved from the Architects/Engineer in charge. Item to include all Tools & Tackle, lift for all men, materials & implements to 19th floor, masking neighboring installations, cleaning complete, with protective tarpaulin cover over finished installation till handover. No extra will be payable towards wastage due to material pattern. Please note payment will be in Running Meter of finished skirting area only. Item to be completed in all respects as per drawings & instructions from Project-in-charge/Architect.

**1) Material**

20 mm (+/- 2mm) thk. Pre-polished Composite Marble Skirting including installed size avg. 1500 x 1500/approved equivalent size of Approved Make, shade & code laid as per Design Drawing,

**2) Workmanship**

Pre-polished Composite Marble Skirting laid on CM Bed Mortar 1:3 with thickness of 20 mm as approved with mortar overlay of White cement, leveled, aligned as per flooring layout drawing, fixed complete. Item to include getting dry mock-up approved from the Architects/Engineer in charge. Item to include all Tools & Tackle, lift for all men, materials & implements to 19th floor, masking neighboring installations, cleaning complete, with protective tarpaulin cover over finished installation till handover.

**3) Mode of measurement**

Item will be measure in SQ.MT. (L x H). It will not be measured in RMT. No extra will be payable towards wastage due to material pattern.

Providing & laying Vitrified tile (Glossy/Mat) flooring as per approved shade/patterns with tiles of sizes 600 x 600 mm/other approved size with avg.10 mm (+/- 1mm) thk. Tiles as per approved brand of 1st quality double charged set in with approved tile adhesives/cement pest with mortar as per the detailed instructions of the tile adhesive manufactures. Joints shall be properly grouted with grouts of reputed brand .The rate shall be inclusive of cutting of raceways junction box conduits etc. Complete as per standard specification. The item shall also include cleaning, making mock-up for approval of Architect/Engineer in charge, all accessories, tools, labour, and protecting finished installation with POP layer till handover, with all cleaning complete etc. No extra will be payable towardswastage due to material pattern. Item to be completed in all respects as per drawings &

instructions from Project- in-charge/Architect. Make: Somany / Johnson/ kajaria/AGL. Basic Price of Vitrified tiles = Rs 550 per smt. Inclusive of all taxes & freight

### 1) **Material**

Vitrified tile (Glossy/Mat) flooring as per approved shade/patterns with tiles of sizes 600 mm x 600 mm/other approved size with avg.10 mm (+/- 1mm) thk. Tile flooring over 20mm (average) base of cement mortar 1:6 (1 Cement: 6 coarse sand).

### 2) **Workmanship**

tile flooring over 20mm (average) base of cement mortar 1:6 (1 Cement : 6 Coarse sand) on new surface or fixing on existing flooring by adhesive material including of flooring and jointed with color cement slurry including finished with flush pointing and cleaning the surface etc.

### 3) **Mode of measurement**

Dimensions are computed in square meter, rounded to two places of decimal. No extra will be payable towards wastage due to material pattern.

## **13.0 Wooden Flooring**

Providing and Fixing Armstrong, Douglas Hunter (or As approved) premium Commercial laminated Wooden flooring of selected by architect Wenge/ Savannah oak fixing in proper shape and true line level, including fixing with primary base 3-4mm thick armer including 0.9 micron polythene to protect the seepage. Wooden Flooring planks of size 1214mm x 141.50mm x 10mm thick fixing on exacting floor. Remove & preliminary clear all dirt and dust, necessary apply adhesive tools etc. complete as per guideline of Architect/Consultant.

### **Material**

Armstrong, Hunter Douglas ( or as approved) premium Commercial laminated Wooden flooring of selected by architect Wenge/ Savannah oak fixing in proper shape.1214mm X 141.50mm x 10mm th. Fixing on exacting floor. Remove & preliminary clear all dirt and dust, necessary apply adhesive tools etc.

### 2) **Workmanship**

Providing, supplying & fixing of approved quality, brand and shade premium Commercial laminated Wooden flooring 10mm. thk at stage or directed or mentioned in drawing which shall be free from any stains or dust & with even pile level, wooden flooring shall be including fixing with primary base 3-4 mm thick Arm or including 0.9 micron polythene to protect the seepage .which is fixed above concrete floor with SR - fevicol - rubber adhesive of approved quality in proper manner etc. panel product with perfect & Air tight tounge-groove joint method. The surface of wooden tile is sawn in one piece, knots & less variation in colour. wooden tile should be placed as per directed by Architect / Engineer in charge. All wall end should be with 2 mm. groove at side in flooring which will be covered with wall base



shaped match wooden skirting. Risers & steps end should be covered with stair nose molding. end of flooring in same or above flooring should be covered with hard surface reducer. all end stop, molding, flooring should be with match hard wood in true line level & perfect in shape.

### **3) Mode of measurement**

Item will be measure in SQ.MT. (L x W). It will not be measured in rmt.

### **13.1 Bedding:**

The sub-grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it. The laminated wooden tiles shall be laid on 8mm. th. 60 density armor of approved quality if found un level flooring leveled it by white cement or cement mortar bedding of 12 mm. thick in C.M. 1 : 3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted.

#### **1) Material**

Armstrong, hunter Douglas (or as approved) premium Commercial laminated wooden bedding. The laminated wooden bedding shall be laid on 8mm. th. 60 density armor of approved quality

#### **2) Workmanship**

The laminated wooden bedding shall be laid on 8mm. th. 60 density armor of approved quality if found un level flooring leveled it by white cement or cement mortar bedding of 12 mm. thick in C.M. 1 : 3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding.

#### **3) Mode of measurement**

Item will be measure in SQ.MT. (L x W). It will not be measured in rmt. No extra will be payable towards wastage due to material pattern.

### **14.0 Providing and fixing wooden 75mm X 20mm thick skirting of Armstrong make including one side moulding finish same as per flooring patterns etc.**

#### **1) Material**

Wooden 75mm X 20mm thick skirting of Armstrong make including one side molding finish. 75mm X 20mm thk. "T"- molding, End molding, stair nose molding etc. 8 mm th. armor and fevicol, SR - Rubber Adhesive. fixing on exacting floor. Remove & preliminary clear all dirt and dust, necessary apply adhesive tools etc.

#### **2) Workmanship**

Fixing wooden 75mm X 20mm thick skirting of Armstrong make including one side moulding fixing on wall. Remove & preliminary clear all dirt and dust, necessary applies adhesive tools etc.

### **3) Mode of measurement**

Item will be measure in rmt. No extra will be payable towards wastage due to material pattern.

**15.0** Providing and Laying 100 % Nylon Multilevel loop pile Carpet Tiles as per Brand and shade approved by architect from approved make in 18oz Quality having 100 % solution dyed, of 1/12th gauge having pile thickness of 3mm total thickness 6.5mm. PIt should be antimicrobial and with soil/stain protection. Tile size 50cm x 50cm and tile backing should be of glass back having minimum 32 % recycled content including minimum 30 % post-consumer content. Product should comply with CRI Green label plus standards. Floor carpet for inside Conference Hall flooring which shall be free from dust completed as per Architect/EIC instruction and design/approval. Basic Price of Carpet Tiles = Rs 1750 per smt. Inclusive of all taxes & freight.

#### **1) Material**

100 % Nylon Multilevel loop pile Carpet Tiles of Interface/Tandus (Or As approved) Brand shade approved by architect in 18oz Quality having 100 % solution dyed, of 1/12<sup>th</sup> gauge having pile thickness of 3mm total thickness 6.5mm. PIt should be antimicrobial and with soil/stain protection.

#### **2) Workmanship**

100 % Nylon Multilevel loop pile Carpet Tiles of Interface/Tandus Brand shade approved by architect in 18oz Quality having 100 % solution dyed, of 1/12th gauge having pile thickness of 3mm total thickness 6.5mm. PIt should be antimicrobial and with soil/stain protection. Tile size 50cm x 50cm and tile backing should be of glass bac having minimum 32 % recycled content including minimum 30 % post consumer content. Product should comply with CRI Green label plus standards. Floor carpet for inside Conference Hall flooring which shall be free from dust completed as per Architect instruction and design.

#### **3) Mode of measurement**

The rate shall include the cost of all materials and labours involved in all the operation as described above. The rate shall be for a unit of One Sq. MT. No extra ill be payable towards wastage due to material pattern.

### **16.0 Door Work**

Providing and fixing 35mm thick flush door shutters in single/Double leaf with teakwood leaping of factory made solid core in continuous gapless section with butt joints tightly factory bonded with phenol formaldehyde adhesive of brand as approved with anti-termite treated FIRESAFE IS: 5509 Century Plywood finished with 4 mm thick veneer of approved colour/shade on both sides. The door frame of 75 x 100 TW type to be fixed and integrated into Gyp-partition/Al. partition/local partition support frame by approved screws min. 90 mm long (TW Frame-Al. Box stud joint). The TW frame top rail (at lintel level) to have avg. 100 mm horn projection on either side to anchor firmly on the local partition as per the drawing inclusive of all walling holdfasts & horns, fixing implements, accessories and installation.

finished etc. complete. Item to be completed in all respects as per drawings & instructions from Project- in- charge/Architect. Hardware to include Double bearing 3 Nos (Nos. means Number in BOQ) of butt hinges of stainless steel having 4" x 3" x 3mm size, Mortize lock/dead lock, 20mm square forend prepared for euro profile cylinder including strike plate. and EPC 60mm Length both side key operation & Escutcheons in SS Finish-1 No, Pull Handle back to back with adjustable fixing for glass, wood and metal doors in satin stainless steel. The pull handles should have supporting washer with raised beveling on the outer surface. Length =300mm, 22mm dia, - 1 No, Concealed cam action door closer slide channel arm with standard spindle, including cushioned limit stay lever finish. Non-handed version- 1 No, Floor stop half dome with 45mm dia with fixing accessories, in satin stainless steel (Basic Rate of 4mm thk Veneer will be Rs.1200/smt. and all the hardware should be of approved brand by architect and Bank).

### **1) Material**

42mm thick flush door shutters in single/Double leaf with teakwood leaping of factory made solid core in continuous gapless section with butt joints tightly factory bonded with phenol formaldehyde adhesive of brand as approved with anti- termite treated FIRESAFE IS: 5509 Century Plywood finished with 4 mm thick veneer of approved colour /shade on both sides . The door frame of 75 x 100 TW type to be fixed and integrated into Gyp-partition/Al. partition/local partition support frame by approved screws min. 90 mm long (TW Frame-Al. Box stud joint). Hardware to include Double bearing 3 Nos of butt hinges of stainless steel having 4" x 3" x 3mm size, Mortize lock/dead lock, 20mm square for end prepared for euro profile cylinder including strike plate. and EPC 60mm Length both side key operation & Escutcheons in SS Finish-1 No, Pull Handle back to back with adjustable fixing for glass, wood and metal doors in satin stainless steel. The pull handles should have supporting washer with raised beveling on the outer surface. Length =300mm, 22mm dia, - 1 No, Concealed cam action door closer slide channel arm with standard spindle, including cushioned limit stay lever finish. Non-handed version -1- No, Floor stop half dome with 45mm dia with fixing accessories, in satin stainless steel.

### **2) Workmanship**

42mm thick flush door shutters in single/Double leaf with teakwood leaping of factory made solid core in continuous gapless section with butt joints tightly factory bonded with phenol formaldehyde adhesive of brand as approved with anti- termite treated FIRESAFE IS: 5509 Century Plywood finished with 4 mm thick veneer of approved colour /shade on both sides . The door frame of 75 x 100 TW type to be fixed and integrated into Gyp-partition/Al. partition/local partition support frame by approved screws min. 90 mm long (TW Frame-Al. Box stud joint). The TW frame top rail (at lintel level) to have avg. 100 mm horn projection on either side to anchor firmly on the local partition as per the drawing inclusive of all walling holdfasts & horns, fixing implements, accessories installed finished etc. complete. Item to be completed in all respects as per drawings & instructions from Project- in- charge/Architect. Hardware to include Double bearing 3 Nos of butt hinges of stainless steel having 4" x 3" x 3mm size, Mortize lock/dead lock, 20mm square for

end prepared for euro profile cylinder including strike plate. and EPC 60mm Length both side key operation & Escutcheons in SS Finish-1 No,Pull Handle back to back with adjustable fixing for glass, wood and metal doors in satin stainless steel. The pull handles should have supporting washer with raised beveling on the outer surface. Length =300mm, 22mm dia, - 1 No, Concealed cam action door closer slide channel arm with standard spindle, including cushioned limit stay lever finish.Non-handed version-1 No,Floor stop half dome with 45mm dia with fixing accessories, in satin stainless steel. All members of the frames shall be exactly at right angles. The right angle shall be checked from inside surface of the respective members.

1 All members of frames shall straight without any warp or bow and shall have smooth surface well planed on the three exposed at right angles to each other. The surface touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall size within the tolerances specified.

2 Frame shall have dovetail joints. When clerestory windows are included, it shall be provided by having full length one piece post for door or windows and clerestory

window extending the frame on top at the head to the required extent. Horns shall not be provided in the head of the frame. When no sills are provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10cm. on upper floors, the vertical posts shall be fixed in the floor or masonry by forming notches 10mm.deep. Slight adjustment of spacing as necessary shall be done to have the hold fasts in the joints of masonry curd. The frame shall be erected in position and held plumb with strong support from both sides and built in masonry as it is being built. The transom shall be through tenoned into the mortises of the jamb post to the full width of the jamb post and the thickness of the tenon shall be not less than 15mm.

3 The tenons shall be closely fitting into the mortise and suitably pinned with wood dowels not less than 10mm.diameter. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.

4 The contact surface of tenon and mortice shall be treated before putting together with an adhesive of approved make.

### 3) **Mode of measurement**

The doors shall be measured in sqmt. Rate shall include providing and fixing of door frame complete with melamine polish etc. Rate shall be inclusive of all major/minor civil & repair work required to be carried out in order to execute the aforesaid item to the satisfaction of the consultant/ EIC. Rate includes all material and labour to complete the item as per instruction of Engineer in-charge.

### 17.0 **Gypsum Board Ceiling**

Providing & fixing seamless ceiling with gypboard of avg 12.5mm thk.fixed to the underside of the suspended grid formed of GI perimeter channel of avg. size 20x27x30mm fixed along the wall by TW Rawl plugs and Metal (Galvanized steel expansion) anchor bolts. The GI intermediate channel of avg. size 45x15x0.90 mm

shall be fixed to the suspended strap hanger /GI ceiling angle at intervals not more than 1220mm. The suspended GI ceiling angle / strap hanger is to be connected with GI soffit cleat of size Avg 37x27x25x1.6mm and it should be fixed on the roof slab/beam by using metal expansion fasteners (Wt.Type) of 12.5mm dia to a length of 35mm with

6mm dia.bolt / screw at top ends .The GI ceiling section of avg. size 80x26x0.5mm is to be provided across the intermediate channel at intervals notmore than 600mm centres at bottom and the same shall be fixed by GI connectionclips 2.64mm dia at the intersection points. The ends of ceiling section channel byadopting an overlap length of minimum 150mm connected with intermediatechannel shall be fixed to perimeter channel in insertion. Work to include makingand finishing of recesses for lighting fixture, preparing the board to take paint finish , providing cutting for trap door of required size for service access, Al. powder coated HVAC grills as per approval by Architect Consultant, necessary coves, recesses as per design drawing, including cutting for access doors, sealing the joints with Air Drying Joining Compound or equivalent sealing materials, with flushbonded/ screwed securing of the hatch using a clip-lock mechanism that isintegrated in the frame and concealed. correct installation procedure, trap door cutting and necessary cutting in False ceiling strictly with unit template andfinishing, necessary scaffolding, cleaning etc. complete. The work has to be completed as per drgs and instructions by EIC/Architect. Only plan area shall be measured for payment.

### 1) Material

12.5mm thk.fixed to the underside of the suspended grid formed of GI perimeter channel of avg. size 20x27x30mm fixed along the wall by TW Rawl plugs and Metal (Galvanised steel expansion) anchor bolts. The GI intermediate channel of avg. size 45x15x0.90 mm shall be fixed to the suspended strap hanger /GI ceiling angle at intervals not more than 1220mm. The suspended GI ceiling angle / strap hanger is to be connected with GI soffit cleat of size Avg. 37x27x25x1.6mm and it should be fixed on the roof slab/beam by using metal expansion fasteners (Wt.Type) of 12.5mm dia to a length of 35mm with 6mm dia.bolt / screw at top ends.

### 2) Workmanship

Fixing seamless ceiling with gypboard of avg 12.5mm thk.fixed to the underside of the suspended grid formed of GI perimeter channel of avg. size 20x27x30mm fixed along the wall by TW Rawl plugs and Metal (Galvanized steel expansion) anchor bolts. The GI intermediate channel of avg. size 45x15x0.90 mm shall be fixed to the suspended strap hanger /GI ceiling angle at intervals not more than 1220mm. The suspended GI ceiling angle / strap hanger is to be connected with GI soffit cleat of size Avg. 37x27x25x1.6mm and it should be fixed on the roof slab/beam by using metal expansion fasteners (Wt. Type) of 12.5mm dia to a length of 35mm with 6mm dia.bolt / screw at top ends .The GI ceiling section of avg. size 80x26x0.5mm is to be provided across the intermediate channel at intervals not more than 600mm centres at bottom and the same shall be fixed by GI connection clips 2.64mm dia at the intersection points. The ends of ceiling section channel by adopting an overlap length of minimum 150mm connected with intermediate



channel shall be fixed to perimeter channel in insertion. Work to include making and finishing of recesses for lighting fixture, preparing the board to take paint finish, providing cutting for trap door of required size for service access, Al. powder coated HVAC grills as per approval by Architect Consultant, necessary coves, recesses as per design drawing, including cutting for access doors, sealing the joints with Air Drying Joining Compound or equivalent sealing materials, with flush bonded/ screwed securing of the hatch using a clip-lock mechanism that is integrated in the frame and concealed. correct installation procedure, trap door cutting and necessary cutting in False ceiling strictly with unit template and finishing, necessary scaffolding, cleaning etc. complete.

### **3) Mode of measurement**

Item will be measure in Smt. No extra will be payable towards wastage due to material pattern.

### **18.0 Armstrong Channeled Woodworks Ceiling**

Providing and Fixing Armstrong Woodworks panels of width 600 x 600 x 12 mm thickness of, made of a 830 Kg/M<sup>3</sup> high density fiber board substrate with alamate (US Maple, Royal Cherry, Maple, Dark Walnut, Pure White, Papyrus Grey, Aluminum Grey) finish and a melamine balancing layer on the reverse side. The panels shall provide a minimum sag resistance of RH90 and a fire rating classof 1 as per Part 7 of BS 476. The edges of the panels shall be “tongue-and- grooved” to receive special clips for installation. The back of the perforated panel shall have sound absorbing non-woven acoustical fleece having NRC of 0.55. Thepanels shall be mounted on as per Armstrong installation instructions and approved by the Architect/ Engineer-in-Charge. The panel shall be laid on Armstrong 24 MM IMPERIAL grid with 38mm web height and 24mm wide T - section flanges color white having rotary stitching on all T sections with and a load carrying capacity of minimum 15.5 Kgs/M. Main Runners with C3 coupling & Cross Tees to have Hardened XL2 clip. The TSections have a Galvanizing of 90 grams per M<sup>2</sup> with pullout strength of 100kg. Suspension system for Armstrong grid to be of Armstrong makes. Theinstallation method is as mentioned below:

#### **1) Material**

Armstrong Channeled Woodworks perforated panels of width 128mm, thickness of 15mm and length 2440 mm, made of a 820 Kg/M<sup>3</sup> high density fibre board substrate with a laminate (US Maple, Royal Cherry, Maple, Dark Walnut, Pure White, Papyrus Grey, Aluminum Grey) finish and a melamine balancing layer on the reverse side. The boards shall have a special G14 perforation pattern where the visible surface has a “Helmholtz” fluted perforation of 2mm width and 14mm of visible panel each.

#### **2) Workmanship**

To comprise main runner (3698 x 141mm) spaced at 600mm centers securely fixed to the structural soffit using Armstrong suspension system (specifications below) at



rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 32mm and a load carrying capacity of 7.57 Kgs/M<sup>2</sup> & pull out strength of minimum 100 kgs..The T Sections have a Galvanizing of 90 grams per M<sup>2</sup> and need to be installed with Suspension system of Armstrong make.

### **3) Mode of measurement**

Item will be measure in Smt. (L x W). No extra will be payable towards wastage due to material pattern.

## **20.0 DUNE (Beveled Tegular)**

Providing and fixing Panel Dune Suspended Ceiling (Beveled Tegular) of size 600x600x16mm having RH 99 with NRC 0.5 shall be used as per the layout designed. Installation and Suspension system details are as below:

### **1) Material**

Panel Dune Suspended Ceiling (Beveled Tegular) of size 1200x150x16mm having RH 99 with NRC 0.5 shall be used as per the layout designed.

### **2) Workmanship**

To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit using Armstrong suspension system (specifications below) at 1200mm maximum centre. The First/Last Armstrong suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners

at 600mm centre to form 1200 x 600 mm module. Cross Tee of 1200mm shall be connected to Main Runners for form Technical Zone of 1200x150mm as per the Layout. Perimeter trim to be Armstrong wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

at 600mm centre to form 1200 x 600 mm module. Cross Tee of 1200mm shall be connected to Main Runners for form Technical Zone of 1200x150mm as per the Layout. Perimeter trim to be Armstrong wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

ARMSTRONG SUSPENSION SYSTEM accessories manufactured and supplied by Armstrong World Industries consisting of M5 Anchor Fasteners with hole for suspending Hanger Wire. A pre Straightened Hanger wire of dia – 2.5 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanized spring steel for 2.68 mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

### **3) Mode of measurement**

Item will be measure in Smt. (L x W). No extra will be payable towards wastage due to material pattern.

## **21.0 ARMSTRONG SOUNDSCAPES SHAPES – 4 Panels Linear Group Layout**

**(For Conference room)**



Providing and Fixing Armstrong SoundScapes - Acoustical clouds which are 30 mm thick, flat glass fiber panels with Humidity Resistance RH 90% & Recycled Content of minimum 30%, come in various shape options like Square / Convex 1041x1168x30mm / Concave) and in standard Traffic White color with LR 90% or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown).The size and sound absorption details are as below:

### 1) Material

Armstrong SoundScapes - Acoustical clouds which are 30 mm thick, flat glass fiber panels with Humidity Resistance RH 90% & Recycled Content of minimum 30%, come in various shape options like Square / Convex 1041x1168x30mm / Concave) and in standard Traffic White color with LR 90% or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown).

### 2) Workmanship

4 Panel Linear Group Lay out

The panels to be suspended in a 4 panel linear group layout using the Armstrong SoundScapes Deck hanging kit consisting of (gripper structure anchors with an outer diameter of 16mm and height 23mm, aircraft cables of 1.5mm dia 2.44 LM in length and bottom end cable adjusters of 8.9mm outer diameter) 3.66m Aluminum group carrier frames, frame alignment spacers and panel hooks of sizes 115mm & 90mm. 2 Aluminum group frames to be used which are cut to size of 1931mm. Also 4 pieces of size 712mm of Aluminum group frames would also be required. Two Aluminum carrier frames to be placed parallel to each other and at a distance of 406 mm with their open face down and would form the 'lower' frame. The 712mm pieces of carrier bar to be placed parallel to each other at every 1219mm with their open face up and should be placed on top and perpendicular to the 'lower' frame thus forming the 'upper' frame using the frame alignment spacers with the first and the last 'upper' frame pieces to be placed at 356mm from the ends and the assembly is secured with nut and bolts passing through the 'upper', 'lower' and the frame alignment spacers at every intersection. The assembly to be suspended to the soffit using the deck hanging kit and the levels to be adjusted using the bottom end cable adjuster. 4 panel hooks to be screwed on the embedded square frame bracket at the back of each panel such that the two 115mm 'High' hooks are opposite to each other and are at the 203mm off centre mark of the embedded square frame bracket and the two 90mm 'Low' hooks are opposite to each other at the centre mark of the embedded square frame bracket. SoundScapes Panels to be suspended on the Aluminum group frames by engaging the High hooks to the 'upper' frame and the Low hooks to the 'lower' frame.

### 3) Mode of measurement

Item will be measure in Smt. (L x W). No extra will be payable towards wastage due to material pattern.

## **22.0 ARMSTRONG METAL WORKS BAFFLE CEILING (For Workstation Area and Pantry )**

Providing & fixing Armstrong Vertical Linear Baffle Ceiling made out of Aluminum Extrusion in Aluminum alloy grade 6063. The baffle blade shall be in size of 100x 25 x 3600mm in Wood grain finish – Pradoo & Cabrueava. The baffle blade shall be suspended using Slotted U-profile at on-center spacing in multiples of 25mm. Longer lengths of Baffle to be connected by Baffle Joiner and the ends to be fixed with End caps.

### **1) Material**

Armstrong Vertical Linear Baffle Ceiling made out of Aluminum Extrusion in Aluminum alloy grade 6063. The baffle blade shall be in size of 100x 25 x 3600mm in Wood grain finish – Pradoo & Cabrueava. The baffle blade shall be suspended using Slotted U-profile at on-center spacing in multiples of 25mm. Longer lengths of Baffle to be connected by Baffle Joiner and the ends to be fixed with End caps.

### **2) Workmanship**

Installation of Armstrong Baffles:

Locate the slot for Baffle Hangers in slot of Baffle section at 1200mm centres. Hangers are inserted into the slot, then rotated 90° and fixed into position by tightening the grub screw. Baffle to be lifted into position and hangers engage over lip of U-Grid Channel. Each Hanger to be secured into position by inserting the Locking Clip. Baffles blades to be connected at ends with Baffle Joiner, which are inserted into the top and bottom slots of the Baffle closed profile for alignment only. The bottom Joiner to be located first and fastened on one side only. The top Joiner to be fitted then and secured with grub screws on one side. Then the two Baffle sections shall be joined and the top Joiner is screw fastened on the 2nd Baffle profile. End Caps to be located by pushing the End Cap tongues into Baffle slots. Installation shall be according to the instructions provided by manufacturer.

### **3) Mode of measurement**

Item will be measure in Smt. (L x W). No extra will be payable towards wastage due to material pattern.

## **23.0 ARMSTRONG CELLIO OPEN CELL**

Providing and fixing in true horizontal level Armstrong Cellio Open cell Aluminum lay-in ceiling tiles with border panels forming flush-tegular edge of size 600mmx600mmx38mm having Fire Performance CLASS 0/Class 1 (BS 476). The tile of ‘Global white’ color with cell size 150mm X 150mm shall be laid on white painted Armstrong Suprafine XL15mm profile grid system comprising Main runners (3000mm), 1200mm and 600mm cross tees with 15mm white flanges and 38mm web height. The grid should be of “Armstrong” make with 15mm wide T - section flanges color white having rotary stitching on all

T sections i.e. the Main Runner with C3 coupling, 1200 mm & 600 mm Cross Tees with Hardened XL2 Clip having a web height of 38 mm and a load carrying capacity of 14 Kgs/M. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of 100 Kgs. Suspension system for Armstrong grid to be of Armstrong make.

### 1) Material

Armstrong Cellio Open cell Aluminum lay-in ceiling tiles with border panels forming flush-regular edge of size 600mmx600mmx38mm having Fire Performance CLASS 0/Class 1 (BS 476). The tile of 'Global white' color with cell size 150mm X 150mm shall be laid on white painted Armstrong Suprafine XL15mm profile grid system comprising Main runners (3000mm), 1200mm and 600mm cross tees with 15mm white flanges and 38mm web height. The grid should be of "Armstrong" make with 15mm wide T - section flanges color white having rotary stitching on all T sections i.e. the Main Runner with C3 coupling, 1200 mm & 600 mm Cross Tees with Hardened XL2 Clip having a web height of 38 mm and a load carrying capacity of 14 Kgs/M. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of 100 Kgs. Suspension system for Armstrong grid to be of Armstrong make.

### 2) Workmanship

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit by approved hangers at 1200mm maximum centre & not more than 150mm from spliced joints. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long cross tees centrally between the 1200 mm cross tees. Perimeter trim to be Armstrong wall angles, secured to walls at 450 mm maximum centers.

ARMSTRONG SUSPENSION SYSTEM accessories manufactured and supplied by Armstrong World Industries consisting of M5 Anchor Fasteners with hole for suspending Hanger Wire. A pre Straightened Hanger wire of dia – 2.65 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanized spring steel for 2.68 mm. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

### 3) Mode of measurement

Item will be measure in Smt. (L x W). No extra will be payable towards wastage due to material pattern.

## 24.0 Full Height Solid Partition

Providing and Fixing of full height wooden partition with glass wool insulation made

of 2 MM thick x 50 mm x 50 mm Aluminium tube frame The sections are placed @ 600 x 600 MM C/C both ways and additionally at openings or ends as required. Sections are joined by Aluminium angle cleats and the frame is fixed to wall, floor & ceiling with suitable aluminium angles and fastened with steel screws. Frame size 50x 50 MM with 9 MM thick BWR Ply with 1mm thk. High Gloss Laminate/ Laminate in approved colour, design, shape and size, including all exposed surface with teak lipping 6mm thk as required and instructed by Architect including Anti Termite Treatment. in all respect and satisfaction of Architect/Engg.

### 1) Material

Wooden Partition 100mm thick including base frame of 50mm x 50 mm x 2mm thick Aluminium tube wood provided at average 600 mm x 600 mm c/c both ways. with both side covered with 9 mm thick FIRESAFE IS: 5509 Century/Archid/Green Plywood sheet up to RCC ceiling Slab, followed by 1 mm thick Laminate till false ceiling approved by architect

### 2) Workmanship

100mm thick including base frame of 50mm x 50 mm x 2mm thick Aluminium d provided at average 600 mm x 600 mm c/c both ways fixed to wall and ceiling slab to Floor with dash fasteners. 50mmthk. with both side covered with 9 mm thick FIRESAFE IS: 5509 Century/Archid/Green Plywood sheet upto RCC ceiling Slab, followed by 1 mm thick Laminate till false ceiling approved by architect duly Spirit polished with melamine matt coating with desired finishing. Grooves of approved size to be provided at joints. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

### 3) Mode of measurement

Only veneer face one side below false ceiling will be measured for payment. Cut for fixed glass / door will be deducted in the measurement. Item will be measure in Smt. (W x H) . No extra will be payable towards wastage due to material pattern.

**25.0** Providing and fixing in position MDF frame work of size 100mm x 8mm for partitions, paneling, boxing, soffits complete including necessary additional supports, bracing runner etc. complete as per drawing and directions. Item to be completed in all respects as per drawings & instructions from project-in- charge. The MDF patta should be finished with milky white PU color and grooves of approved size to be provided at joints. Rate to include applying fire retardent paint of approved make on the finished frame work. The moisture content in case of material to be between 12.5 to 18%. The frame work should be applied with fire retardant paint before fixing the same. (This will include Polyurethane Paint (PU) of approved shade selected by architect)

### 1) Material

MDF frame work of size 100mm x 8mm for partitions, paneling, boxing, and soffits complete including necessary additional supports, bracing runner etc. complete as per drawing and directions. The MDF patta should be finished with milky white PU

color and grooves of approved size to be provided at joints.

## **2) Workmanship**

MDF frame work of size 100mm x 8mm for partitions, paneling, boxing, and soffits complete including necessary additional supports, bracing runner etc. complete as per drawing and directions. Item to be completed in all respects as per drawings & instructions from project-in-charge. The MDF patta should be finished with milky white PU color and grooves of approved size to be provided at joints. Rate to include applying fire retardant paint of approved make on the finished frame work. The moisture content in case of material to be between 12.5 to 18%. The frame work should be applied with fire retardant paint before fixing the same.

## **3) Mode of measurement**

Item will be measure in rmt. No extra will be payable towards wastage due to material pattern. (This will include Polyurethane Paint (PU) of approved shade selected by architect).

**26.0** Providing and fixing in position MDF frame work of size 75mm x 8mm for partitions, paneling, boxing, soffits complete including necessary additional supports, bracing runner etc. complete as per drawing and directions. Item to be completed in all respects as per drawings & instructions from project-in- charge. The MDF patta should be finished with milky white PU color and grooves of approved size to be provided at joints. Rate to include applying fire retardant paint of approved make on the finished frame work. The moisture content in case of material to be between 12.5 to 18%. The frame work should be applied with fire retardant paint before fixing the same. (This will include Polyurethane Paint (PU) of approved shade selected by architect).

### **1) Material**

MDF frame work of size 75mm x 8mm for partitions, paneling, boxing,soffits complete including necessary additional supports, bracing runner etc. complete as per drawing and directions. Item to be completed in all respects as per drawings & instructions from project-in-charge. The MDF patta should be finished with milky white PU color and grooves of approved size to be provided at joints.

### **2) Workmanship**

MDF frame work of size 75mm x 8mm for partitions, panelling, boxing, soffits complete including necessary additional supports, bracing runner etc. complete as per drawing and directions. Item to be completed in all respects as per drawings & instructions from project-in-charge. The MDF patta should be finished with milky white PU color and grooves of approved size to be provided at joints.Rate to include applying fire retardant paint of approved make on the finished frame work. The moisture content in case of material to be between 12.5 to 18%. The frame work should be applied with fire retardant paint before fixing the same.

### **3) Mode of measurement**

Item will be measure in rmt. No extra will be payable towards wastage due to material pattern. (This will include Polyurethane Paint (PU) of approved shade selected by architect).



architect).

## **27.0 12mm thick Fix Glass**

**Supplying and fixing of 12 mm plain toughened fixed Glass partition with wall connecting will be fixed along floor, wall and ceiling joints extending across the sidelights with hardware and fittings. The above work complete in all respect as per approved drawings and to the satisfaction of engineer in charge / Architect Consultants. The rates are including 12mm thick toughened glass with all hardware**

### **1) Material**

12m thick Fix Glass with All necessary hardware

### **2) Workmanship**

12 mm plain toughened fixed Glass partition with wall connecting will be fixed along floor, wall and ceiling joints extending across the sidelights. The above work complete in all respect as per approved drawings and to the satisfaction of engineer in charge / Architect Consultants. The rates are including 12mm thick toughened glass and necessary hardware .

### **3) Mode of measurement**

Item will be measure in Smt. No extra will be payable towards wastage due to material pattern.

## **28.0 Glass Door With Patch Fitting - ALEXA (DORMA)**

Providing and fixing Frameless 12 mm Glass Door with S/S Patch fitting consisting of 10mm thick etched toughened glass with (PT Standard)/ECKELT/AUSTVISION. Patch fittings such as PT24 - Top Pivot, PT-

35-Top patch,PT-35-Bottom Patch, US 10 Corner Lock with EPC, Lock keeper plate, 'H' Pull Handle TGDI-H-450 (ctc 350mm\* dia 25mm) and Floor spring (Dorma Model No. BTS 75V) with standard spindle conforming to DIN EN 1154 and CE marked, non-handed unit suitable for doors up to 120 kg leaf weight, with adjustable spring strength (size EN 1 – 4) and closing speed, with closing action operational from approx. 175°, fixed hold open at 90° and SS cover plate. Featuring hydraulically fully controlled closing cycle, mechanical back check and including cement box. Dimension of the floor spring body - Length - 285 mm, width

- 82 mm and Height - 50 mm & Weight - 3 Kg. Finish : Satin Stainless Steel. (NOTE: Opening size 900mm x 2100 mm Single Leaf, each Leaf weight up to 120kg). The above work complete in all respect as per approved drawings and to the satisfaction of Engineer-in-Charge/ Architect Consultant. The rate shall include the cost of providing & fixing 1 nos of

50mmX100mmX1150mm partial wood member for fixing the S/S patch fitting at lintel level The list of the items s/s fittings & accessories shall be as below: Pivot PT 24 with fixing plate, material thickness 3 mm, to let into the ceiling PT Standard Bottom Patch Fitting - PT 10 - SS Finish.

### 1) Material

Frameless 12 mm Glass Door with S/S Patch fitting consisting of 10mm thick etched toughened glass with (PT Standard)/ECKELT/AUSTVISION. Patch fittings such as PT24 - Top Pivot, PT-35-Top patch,PT-35-Bottom Patch, US 10 Corner Lock with EPC, Lock keeper plate, 'H' Pull Handle TGDI-H-450 (ctc 350mm\* dia 25mm) and Floor spring (Dorma Model No. BTS 75V) with standard spindle conforming to DIN EN 1154 and CE marked, non-handed unit suitable for doors up to 120 kg leaf weight, with adjustable spring strength (size EN 1 – 4) and closing speed, with closing action operational from approx. 175°, fixed hold open at 90° and SS cover plate. Featuring hydraulically fully controlled closing cycle, mechanical back check and including cement box. Dimension of the floor spring body - Length - 285 mm, width - 82 mm and Height - 50 mm & Weight - 3 Kg. Finish : Satin Stainless Steel.

(NOTE: Opening size 900mm x 2100 mm Single Leaf, each Leaf weight up to 120kg).

### 2) Workmanship

The above work complete in all respect as per approved drawings and to the satisfaction of Engineer-in-Charge/ Architect Consultant. The rate shall include the cost of providing & fixing 1 nos of 50mmX100mmX1150mm partal wood member forfixing the S/S patch fitting at lintel level The list of the items s/s fittings & accessoriesshall be as below: Pivot PT 24 with fixing plate, material thickness 3 mm, to let into the ceiling PT Standard Bottom Patch Fitting - PT 10 - SS Finish.

### 3) Mode of measurement

Item will be measure in Smt. No extra will be payable towards wastage due to material pattern.

## 29.0 Frost Decorative Film/Translucent Film on Glass

Providing and fixing frosted/translucent decorative film avg. 15 micron thick of approved make pasted on one side of Glass surface only with standard installation practice as provided by the manufacturer, as per detailed design drawing. Item to include all cutting, to form design pattern, all accessories, and material, cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

### 1) Material

Frosted/translucent decorative film avg. 15 micron thick of approved make pasted on one side of Glass surface only with standard installation practice as provided by the manufacturer.

### 2) Workmanship

Frosted/translucent decorative film avg. 15 micron thick of approved make pasted on one side of Glass surface only with standard installation practice as provided by the manufacturer , as per detailed design drawing. Item to include all cutting, to form

design pattern, all accessories, and material, cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

### 3) Mode of measurement

Item will be measure in Smt. (W x H). No extra will be payable towards wastage due to material pattern.

## 30.0 Reception Table

**Providing and fixing May I help YOU Table in with 19mm BWR Ply /Board and 1.0 mm laminate in two or more shades. The Customer top, which is at 230 mm higher than working top, customer top & front to be finished in 12mm thk acrylic solid surface thermoformed and fixed over 12 mm BWR Ply with provision for LED strip in cove as per design & Details. The table size to be as per size mentioned in BOQ including drawers godrej multipurpose locks, CPU Trolley etc Teak lipping to be provided at channels for key board and drawers to be provided on L.H.S/R.H.S..every exposed section of board and ply, Sliding channels for key board, and drawers to be provided. complete in all respect.(As per Architectural drawing).**

### 1) Material

Reception table of size 1800mm x 750mm x 750mm as per Design Drawings & Dimensions made of FIRESAFE IS: 5509 century/Archid /green Plywood sheets covered with 12 mm thick Acrylic Solid Surface approved by architect and finished with PU polished.

## 2) Workmanship

Reception table of size 1800mm x 750mm x 750mm as per Design Drawings & Dimensions made of FIRESAFE IS: 5509 century/Archid/green Plywood sheets covered with

12mm thick Acrylic Solid surface approved by architect and finished and front frame panel covered with 18 mm thick Ply patta finish color as approved by architect. Item to be inclusive of all accessories, drawers, storage shelves, any operable shutters, niches, design grooves, moulded edges, aluminum profile, ss studs, soft close drawer channels etc. as per detailed design drawing and to be completed in all aspects as per detailed drawings & instructions from Project- in- charge/Architect.

### 3) Mode of measurement

The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

## 31.0 Cabin Table Suite- Deleted



Procuring, supplying and installation of executive desking suites for cabin of approved brand as per drgs and instructions by Architect with following specification: The main desk shall be of dimension 1500 x 900 x 750 mm with additional joining table of 1200/1000 x 750mm. The table top to be made out of 18mm + 18mm thk FIRESAFE IS: 5509 century Plywood sheet with 12mm the. MDF sheet finished white PU color. The back unit shall be of 1400 x 460 mm x 760 mm made of 18 mm the. FIRESAFE IS: 5509 Plywood sheet covered with 4mm thick natural veneer sheet finish with PU polish as approved by architect. The side unit shall of size 1200 mm x 450 mm x 620 mm a made of 18 mm the. FIRESAFE IS: 5509 century Plywood sheet covered with 4mm thick natural veneer sheet finish with PU polish. Internal part of Side Unit and Back unit should be finished with 0.8 mm the white laminate sheet and edges of drawer & shutter should be covered with teakwood beading patti finish with matching colored PU polish. Item to be inclusive of all accessories, drawers, storage shelves, any openable shutters, niches, design grooves, moulded edges, aluminum profile, ss studs, soft close drawer channels etc. as per detailed design drawing and to be completed in all aspects as per detailed drawings & instructions from Project- in-charge/Architect.

### **1) Material**

Executive desking suites for cabin of approved brand as per drgs and instructions by Architect with following specification: The main desk shall be of dimension 2700 x 900 x 750 mm with additional joining table of 1200 x 1050 x 750mm. The table top to be made out of 18mm + 18mm the FIRESAFE IS: 5509 century Plywood sheet with 12mm the. MDF sheet finished white PU color. The back unit shall be of 1400 x 460 mm x 760 mm made of 18 mm the. FIRESAFE IS: 5509 Plywood sheet covered with 4mm thick natural veneer sheet finish with PU polish as approved by architect. The side unit shall of size 1200 mm x 450 mm x 620 mm a made of 18 mm the. FIRESAFE IS: 5509 century Plywood sheet covered with 4mm thick natural veneer sheet finish with PU polish. Internal part of Side Unit and Back unit should be finished with 0.8 mm the white laminate sheet.

### **2) Workmanship**

Installation of executive desking suites for cabin of approved brand as per drgs and instructions by Architect with following specification: The main desk shall be of dimension 2700 x 900 x 750 mm with additional joining table of 1200 x 1050 x 750mm. The table top to be made out of 18mm + 18mm the FIRESAFE IS: 5509 century Plywood sheet with 12mm the. MDF sheet finished white PU color. The back unit shall be of 1400 x 460 mm x 760mm made of 18 mm the. FIRESAFE IS: 5509 Plywood sheet covered with 4mm thick natural veneer sheet finish with PU polish as approved by architect. The side unit shall of size 1200 mm x 450 mm x 620 mm a made of 18 mm the. FIRESAFE IS: 5509 century Plywood sheet covered with 4mm thick natural veneer sheet finish with PU polish. Internal part of Side Unit and Back unit should be finished with 0.8 mm the white laminate sheet and edges of drawer & shutter should be covered with teakwood beading patti finish with matching colored PU polish. Item to be inclusive of all accessories, drawers, storage shelves, any operable shutters, niches, design

grooves, moulded edges, aluminum profile, ss studs, soft close drawer channels etc. as per detailed design drawing and to be completed in all aspects as per detailed drawings & instructions from Project- in-charge/Architect.

### 3) Mode of measurement

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

## 32.0 OFFICER TABLE-Deleted

Supply and installation of Table (1000 X 575mm X 750mm) + Side Return Unit 900X 380 X 675 + Pedestal Drawer Unit + Metal Keyboard Tray 19" with Mouse Pad and Metal CPU Trolley completely made up of particle board conforming to IS : 12823 Interior Grade with post formed finish. Table Top are with 25mm thk boards with post formation on 2 sides and 2mm PVC edge banding with enhanced scratch resistance supported on 25mm thk. Gable ends and 18mm thk Modesty panels. exposed edges are in 2mm thk PVC edge banding & sealed edges are in 0.8mm thk PVC edge banding. Separate provision for mounting switches below the table adjoining the tables shall be made by customer as the tables do not come with switch mounting facility. Wire routing / wire management gromets (Patented Squeeze) shall be provided on main or side table as specified by customer. Key board Tray Metal 19" with mouse pad + Metal CPU Trolley

SIDE RETURN UNIT:- 900(w) x 380(D) x 675(H) : completely made up of particle board conforming to IS : 12823 Interior Grade with PVC edge banding. Top is in 25mmthk board with 2mm post formation on 2 sides and 2mm PVC edge banding supported on 25mm thk. Gable ends and 18mm thk. Modesty panel. Having sliding shutter for storage. Exposed edges are in 2mm thk PVC edge banding & sealed edges are in 0.8mm thk PVC edge banding. Separate provision for mounting switches on the wall adjoining the tables shall be made by customer as the tables do not come with switch mounting facility.

PEDESTAL DRAWER UNIT:- The Pedestal Unit of Dimensions 400W x 470D x 675mmH is made of 18mm thick pre laminated particle Board conforming to IS : 12823 Interior Grade. All the exposed edges are sealed with 2mm thick PVC Imported edge banding on sides and bottom. The top and drawer facia are sealed with 2mm thick PVC edge. The drawer unit consists of 2 box drawer and 1 file drawer. The sides of Inside drawer box are of prelam particle board. The drawer box is fitted with roller Slide for free movement. The drawer unit is provided with separate locking system, where in the three drawer are locked with one key. PVC recessed handles are provided for easy opening and closing of drawer. The drawer unit is fitted on castors (optional) for easy mobility. PVC edge banding are imported from Rehau or Dolken of Germany. The complete furniture unit is factory assembled with knock down fittings. The pedestal is fitted with additional (5th) castor to avoid toppling of pedestal in case of opening of any / all of the 3 drawers.

### 1) Materials

As Above

### 3) Mode of measurement

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

#### 33.0 Conference Table-Deleted

Providing & placing in position Conference room table(size 4800x1200x750) made from 25mm BWR Ply top finished with 4 mm veneer (Base price 200-250 /Sft-without tax) in two or more colours. All internal surface of table to be finished with white paint. Base and modesty to be made from 18-19mm BWR Ply with 1mm leminate. Top is supported on teak wood frame with 75x50mm teak wood members placed as per detail Drawings, The Table top to have 65x50 mm teak wood moulding on edges. Table top & moulding to be polished with MF P.U Matt finish after preparing base as per manufacturer's specifications. Table to have all RGB & AV connectivity with pneumatic POP-UP plate (Legrand, Crab tree or equivalent), complete to the satisfaction of Engineer / Architect. 6 mm Acrylic SoildSurface thermoformed is inserted in top ply as per design (To be paid separatelyin Acrylic Soild Surface item) (Only Table top is considered for area calculations) as/ approved design. complete in all respect and instructed by Architect/ Engg.

#### 1) Materials

Conference table of size as per Design Drawings. The table top to be made out of 18mm + 18mm + 8mm the FIRESAFE IS: 5509 century Plywood sheet covered with 4mm thick natural veneer finished PU polish. Edge of the table top should be finished same veneer. The centre part of the table top should be finish with PU color on 8mm MDF sheet. Understructure made from 50mm thick plywood housing covered with 4mm thick natural veneer finished PU polish and should be fixed as per detailed drawings.

#### 2) Workmanship

Conference table of size as per Design Drawings. The table top to be made out of 18mm + 18mm + 8mm the FIRESAFE IS: 5509 century Plywood sheet covered with 4mm thick natural veneer finished PU polish. Edge of the table top should be finished same veneer. The centre part of the table top should be finish with PU color on 8mm MDF sheet. Understructure Made from 50mm thick plywood housing covered with 4mm thick natural veneer finished PU polish and should be fixed as per detailed drawings. Item to be inclusive of all accessories, cable managers, provision of electric wire cabling, design grooves, moulded edges, ss studs, ss patti fixed on bottom of the table legs etc. as per detailed design drawing and to be completed in all aspects as per detailed drawings & instructions from Project- in-charge/Architect.

### 3) Mode of measurement

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be



rounded edge complete. complete in all respect.( As per Architectural drawing) All bottom surface of table to be finished with white Paint.(Table size 900x750).

### 1) **Materials**

Providing and fixing cafeteria 900 mm Dia Round tables with base structure made from 50mm SS round pipes and 6m SS strips. The top frame to be of 35x35mm Square SS pipes

### 2) **Workmanship**

. The table top to have 18mm BWR ply finished with 12mm thick synthetic acrylic surface (Corian/ Formica or equivalent) thermoformed to give rounded edge complete. complete in all respect.( As per Architectural drawing) All bottom surface of table to be finished with white Paint.(Table size 900x750).

### 3) **Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of one number. No extra will be payable towards wastage due to material pattern.

**36- 45 DELETED**

### **46.0 Full Height Storage (up to 2400mm height)**

Providing and fixing Storage cabinet 380mm deep and 2100mm/up to false ceiling high length as/design as shown in details with all sides, shelves to be 18-19 mm thk. BWR ply with 6mm BWR ply to be fixed at the back. The shutters to be 18-19mm BWR ply, with 1.0 mm laminate. All internal surfaces to have 0.8m laminate. All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. completeto the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area calculation.

### 1) **Materials**

Storages of avg. 380 mm wide, made of AT treated FIRESAFE IS: 5509 century /Archid/green Plywood sheet with select laminate skin on both faces- pedestal box frame of 19 thick ply board with 12 thick FIRESAFE IS: 5509 Plywood backer sheet, horizontal shelving of 19 thick ply board & drawer sideboard of FIRESAFE IS: 5509 century Plywood sheet, all as per Design drawing.

### 2) **Workmanship**

450 mm wide, made of AT treated FIRESAFE IS: 5509 century Plywood sheet with select laminate skin on both faces- pedestal box frame of 19 thick ply board with 12 thick FIRESAFE IS: 5509 Plywood backer sheet, horizontal shelving of 19 thick ply



board & drawer sideboard of FIRESAFE IS: 5509 century Plywood sheet.

all edge lipping of water based PU polished & stained good grade TW, all GI & Al. joining cleats, fixing accessories, phenol formaldehyde based adhesives, SS 304 Grade 'Butler' finished hardware of handles, hinges, mortise locks, clip-locks, GI drawer slides, key-hole roses etc. as approved by Architect/Engineer-in-charge; and inclusive of all installation, all accessories, fitments, tools and tackle, finished, laid complete. Item to be completed in all respects as per drawings & instructions from Project-in-charge/Architect.

### 3) Mode of measurement

Item will be measure in Smt.(W x H). No extra will be payable towards wastage due to material pattern.

## 47.0 DELETED

## 48.0 Low Height Storage (for cabin area) (up to 750mm height)

Providing and fixing Storage cabinet 380mm deep and 750 mm high length as/deign as shown in details with all sides, shelves to be 18-19 mm thk. BWR ply with 12mm BWR ply to be fixed at the back finished with 0.8mm laminate. The shutters to be 18-19mm BWR ply, with 1mm laminate. All internal surfaces to have 0.8m laminate but the top surface finished with 12mm Acrylic Solid Surface thermoformed at edges in front side 25mm thk. All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. (Only front elevation to be considered for area calculation

### 1) Materials

Low height Storage of size as per BOQ made of treated FIRESAFE IS: 5509 century/Archid/green Ply covered with 4mm thick natural veneer sheet on front side of unit finish with PU polish as approved by architect.

All internal face the storage should be finished with laminate sheet.All

edge lipping of water based PU polished.

### 2) Workmanship

All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. completeto the satisfaction of Architect /Bank's Engg. (Only front elevation to be considered for area calculation

### 3) Mode of measurement

Item will be measure in Smt.(W x H). No extra will be payable towards wastage due to material pattern.

## 49.0 Storage Unit for Passage (1200 mm Ht)

Providing and fixing Storage cabinet 380mm deep and 1200 mm high as shown in details with all sides, shelves to be 18-19 mm thk. BWR ply with 12mm BWR ply to be fixed at the back with 1 mm laminate. The shutters to be 18-19mm BWR ply, finished with 1.0 mm laminate. All internal surfaces to have 0.8m laminate and sides to be finished with 1mm laminate. All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. Only front elevation to be considered for area calculation.

### **1) Materials**

Modular storage unit for passage of 380 mm deep with details as per tech specs. The cupboard shall be made out of prelaminate particle wood having 4 nos of full adjustable shelves. The wood shall be approved by Architect or EIC.

### **2) Workmanship**

Modular storage unit for passage of 380 mm deep with details as per tech specs. shall be approved by Architect or EIC. The top to be made out of 25mm the FIRESAFE IS: 5509 century Plywood sheet and verticals to be made out of 18mm the FIRESAFE IS: 5509 century Plywood sheet. The cupboard shutters shall be made of MDF and honeycomb covered with decorative and backing laminate. 2mm the lipping shall be provided in all edges matching with the laminate of table top. The exposed and internal surfaces to be provided with 1 mm the laminate of approved pattern. The shutters shall be provided with self-closing hinges and 3 way locking (min. 0.20m long). The handles shall be made out of aluminum and to be ergonomically sound.

### **3) Mode of measurement**

Item will be measure in Smt. (W x H). No extra will be payable towards wastage due to material pattern.

## **50.0 Sofa (3 Seater)**

As per Specification and make of Godrej

### **3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

## **51.0 Sofa (2 Seater)**

As per Specification and make of Godrej

### **3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

## **52.0 Center Table-Deleted**



Providing and fixing in position centre table 1000x1000x450 mm, as per selection with 12 Solid Acrylic Surface as per design drawing. The vertical support should be of 18 mm BWR Ply and sides to be finished with 6 mm Acrylic Surface . Item to be inclusive of all accessories, fixing implements, tools and tackle, men material, finished installed cleaned complete

**1) Materials**

Centre table 1000x 100x450 mm, as per selection with 12 mm thick 12 Solid Acrylic Surface as per design drawing.

**2) Workmanship**

Providing and fixing in position centre table 1000x1000x450 mm, as per selection with 12 Solid Acrylic Surface as per design drawing. The vertical support should be of 18 mm BWR Ply and sides to be finished with 6 mm Acrylic Surface . Item to be inclusive of all accessories, fixing implements, tools and tackle, men material, finished installed cleaned complete

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

**53.0 Sofa Side Table**

Providing and fixing Corner table made of 18-19mm BWR ply top to be finished with 12mm Acrylic Soild Surface thermoformed including all edges and the sides to be finished with 6mm Acrylic Soild Surface thermoformed as/ approved design ; complete in all respect and instructed by Architect/Engg. Table size

**1) Materials**

18-19mm BWR ply top to be finished with 12mm Acrylic Soild Surface thermoformed including all edges and the sides to be finished with 6mm Acrylic Soild Surface thermoformed

**2) Workmanship**

Table size : 500x500x450, Elements Specifications Top Worktop 25 mm Thick FIRESAFE IS: 5509 century Plywood sheet

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

**54.0 Wooden Paneling**

Providing and Fixing of wooden Paneling of wall on hall and column made of 2 MM thick Aluminium tube frame The sections are placed @ 600 x 600 MM C/C both ways and additionally at openings or ends as required. Sections are joined by Aluminium angle cleats and the frame is fixed to wall, floor & ceiling with suitable

aluminium angles and fastened with steel screws. Frame size 25 x 50 MM with 9 MM thick BWR Ply with 1mm thk.High gloss Laminate/ Laminate in approved colour,design, shape and size, including Anti Termite Treatment. Complete in all respect and satisfaction of Architect/Engg.

### 1) Materials

Full height paneling as per design drawing, comprising of 2 MM thick Aluminium tube frame The sections are placed @ 600 x 600 MM C/C both ways and additionally at openings or ends as required. Sections are joined by Aluminium angle cleats and the frame is fixed to wall, floor & ceiling with suitable aluminium angles and fastened with steel screws.Frame size 25 x 50 MM with 9 MM thick BWR Ply with 1mm thk.High gloss Laminate/ Laminate

### 2) Workmanship

Full height paneling as per design drawing, comprising of 2 MM thick Aluminium tube frame The sections are placed @ 600 x 600 MM C/C both ways and additionally at openings or ends as required. Sections are joined by Aluminium angle cleats and the frame is fixed to wall, floor & ceiling with suitable aluminium angles and fastened with steel screws.Frame size 25 x 50 MM with 9 MM thick BWR Ply with 1mm thk.High gloss Laminate/ Laminate

### 3) Mode of measurement

Only veneer face one side below false ceiling will be measured for payment. Item will be measure in Smt. (W x H). No extra will be payable towards wastage due to material pattern.

## 55.0 Roller Curtain

Supply & Fixing of Roller Blinds of brand from Hunter Douglas or Equivalent brand approved by architect having the DRIVE UNIT shall be of moulded plastic with steel spring support and inserted into the tube end. It shall be driven by a ball chain pulley with ball chain and can be positioned at right side or left hand side of the Shade. The Shade when lowering or raising, shall be automatically locked in position upon release of the ball chain by means of a built in friction lock. The END PLUG shall be moulded of plastic with a steel location pin. The plug shall be inserted into the tube end. (Opposite to the Drive Unit).The SUPPORT BRACKETS shall be of coated steel & provided with covers and used in right hand or left hand positions differentiated by the acceptance of the of the rectangulardrive unit support or the round idler plug pin.The ROLLER TUBE shall be of extruded aluminum with 38mm internal diameter & skin thickness of 1mm and shallincorporate a keyway integral with the tube to accommodate the spline. The outsidediameter of the roller tube shall be 40mm.The BOTTOM RAIL shall be a stiffening element inserted into a bottom rod pocket. The material may be timber, PVC covered steel tube or VB Bottomrail.The BALLCHAIN shall be 2mm diameter cord with 4.5mm diameter acetal balls moulded co-axially to it on 6mm pitch to form an endless ballchain. It is used for raising or lowering action of the shades. The FABRIC will be 100% PVC free with no Volatile Organic Compounds recommended , having no bacterial / fungal emission and satisfying NFPA fire safety standard , shall be as per selection from the

Hunter Douglas range and shall be sized according to site requirement (subject to maximum width limitation of individual fabric types). A bottom pocket shall be created in the fabric to incorporate the bottom rail. Basic Rate of roller blind is Rs 1500/- sqmt incl. all excluding GST.

### **1) Materials**

Roller Blinds of from Hunter Douglas or Equivelent brand approved by architect having the DRIVE UNIT shall be of moulded plastic with steel spring support and inserted into the tube end. It shall be driven by a ball chain pulley with ball chain and can be positioned at right side or left hand side of the Shade. The Shade when lowering or raising, shall be automatically locked in position upon release of the ball chain by means of a built in friction lock. The END PLUG shall be moulded of plastic with a steel location pin. The plug shall be inserted into the tube end. (Opposite to the Drive Unit).

### **2) Workmanship**

Roller Blinds of Luxaflex brand from Hunter Douglas or Equivalent brand approved by architect having the DRIVE UNIT shall be of moulded plastic with steel spring support and inserted into the tube end. It shall be driven by a ball chain pulley with ball chain and can be positioned at right side or left hand side of the Shade. The Shade when lowering or raising, shall be automatically locked in position upon release of the ball chain by means of a built in friction lock. The END PLUG shall be moulded of plastic with a steel location pin. The plug shall be inserted into the tube end. (Opposite to the Drive Unit). The SUPPORT BRACKETS shall be of coated steel & provided with covers and used in right hand or left hand positions differentiated by the acceptance of the of the rectangular drive unit support or the round idler plug pin. The ROLLER TUBE shall be of extruded aluminum with 38mm internal diameter & skin thickness of 1mm and shall incorporate a keyway integral with the tube to accommodate the spline. The outside diameter of the roller tube shall be 40mm. The BOTTOM RAIL shall be a stiffening element inserted into a bottom rod pocket. The material may be timber, PVC covered steel tube or VB Bottom rail. The BALLCHAIN shall be 2mm diameter cord with 4.5mm diameter acetal balls moulded co-axially to it on 6mm pitch to form an endless ballchain. It is used for raising or lowering action of the shades. The FABRIC will be 100% PVC free with no Volatile Organic Compounds recommended, having no bacterial / fungal emission and satisfying NFPA fire safety standard, shall be as per selection from the Hunter Douglas range and shall be sized according to site requirement (subject to maximum width limitation of individual fabric types). A bottom pocket shall be created in the fabric to incorporate the bottom rail.

### **3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. Item will be measured in Smt. (W x L). No extra will be payable towards wastage due to material pattern.

## **56.0 Water Dispenser-Deleted**

Providing & Supplying of SS Body Water-Cooler with 40 Ltrs. Storage capacity & 20 Ltrs. Cooling capacity per hour. (100 Glasses cold Water Per Hour). Make-

**1) Materials**

SS Body Water-Cooler with 40 Ltrs.

**2) Workmanship**

SS Body Water-Cooler with 40 Ltrs. Storage capacity & 20 Ltrs. Cooling capacity per hour. (100 Glasses cold Water Per Hour).

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. No extra will be payable towards wastage due to material pattern.

Providing and fixing 5mm. the. Designer/ Printed Glass, frosting Incl. fixing in Aluminum / Wooden door, window, ventilator shutter and partitions etc. with PVC neoprene gasket etc. complete as per the architectural drawings and concept, with necessary adhesive, nails, screw, scaffolding, tools tolerance etc. complete as per directed by engineer-in-charge (cost of aluminum snap beading shall be paid in basic item).

**1) Materials**

5mm. the. Designer/ Printed Glass, frosting Incl. fixing in Aluminum / Wooden door, window, ventilator shutter and partitions etc with PVC neoprene gasket etc.

**2) Workmanship**

5mm. the. Designer/ Printed Glass, frosting Incl. fixing in Aluminum / Wooden door, window, ventilator shutter and partitions etc. with PVC neoprene gasket etc. complete as per the architectural drawings and concept, with necessary adhesive, nails, screw, scaffolding, tools tolerance etc. complete as per directed by engineer- in-charge.

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. Item will be measure in Smt. (W x H). No extra will be payable towards wastage due to material pattern.

**58.0 Glass Shelves**

Providing and fixing 12 mm thick toughened glass shelves with all edges machine polished to diamond finish with pre-drilled fixing holes, mounted to wall/partition through SS 316 grade D-Clips/brackets avg. 50 mm wide along wall support of approved make and shape/fabrication. D-clip fixed to wall by avg. 50 mm threaded screws driven through wooden/PVC rawl plugs as approved. Item to be inclusive of all accessories, fixing implements, tools and tackle, finished installed cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in- charge/Architect.

**1) Materials**

12 mm thick toughened glass shelves with all edges machine polished to diamond finish with pre-drilled fixing holes, mounted to wall/partition through SS 316 grade D-Clips/brackets avg. 50 mm wide along wall support of approved make and signature of Bidder

shape/fabrication.

## 2) Workmanship

12 mm thick toughened glass shelves with all edges machine polished to diamond finish with pre-drilled fixing holes, mounted to wall/partition through SS 316 grade D-Clips/brackets avg. 50 mm wide along wall support of approved make and shape/fabrication. D-clip fixed to wall by avg. 50 mm threaded screws driven through wooden/PVC rawl plugs as approved. Item to be inclusive of all accessories, fixing implements, tools and tackle, finished installed cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

## 3) Mode of measurement

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. Item will be measure in Smt. (L x W) No extra will be payable towards wastage due to material pattern.

## 59.0 Dry Planters Boxes

Providing and fixing dry Planters Boxes 12mm thk corian Flower pot size 12"x12"..All Acrylic Soild Surface thermoformed surfaces to be buffered.as/design and

### 1) Materials

Providing and fixing dry Planters Boxes 12mm thk corian Flower pot size 12"x12"..All Acrylic Soild Surface thermoformed surfaces to be buffered.as/design and

### 2) Workmanship

Providing and fixing dry Planters Boxes 12mm thk corian Flower pot size 12"x12"..All Acrylic Soild Surface thermoformed surfaces to be buffered.as/design and

### 3) Mode of measurement

The rate includes cost of all labour, materials, tool and plant etc. required for

satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

**60.0 SS Dustbins**

Worktable Dustbins- Providing and placing SS type dustbins, avg. 1 mm thick & avg. 200 mm dia. Mouth tapering bucket type of avg. height 310 mm; as per approved shade and pattern, with all turned, well-formed and moulded edges at the bucket rim. Item to include sample approval from Architect/Engineer-in- Charge, item provisioned, laid complete. Item to be inclusive of all accessories, fixing implements, finished installed cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in- charge/Architect.

**1) Materials**

SS type dustbins, avg. 1 mm thick & avg. 200 mm dia. Mouth tapering bucket type of avg. height 310 mm; as per approved shade and pattern, with all turned, well-formed and moulded edges at the bucket rim.

**2) Workmanship**

SS type dustbins, avg. 1 mm thick & avg. 200 mm dia. Mouth tapering bucket type of avg. height 310 mm; as per approved shade and pattern, with all turned, well-formed and moulded edges at the bucket rim. Item to include sample approval from Architect/Engineer-in-Charge, item provisioned, laid complete. Item to be inclusive of all accessories, fixing implements, finished installed cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

**61.0 Deleted**

**62.0 Artificial Small Plants**

Providing and fixing in wire-mesh substrate, artificial plants of size up to 1100 mm height out of composite Polythene/polyurethane as approved of first quality. Item inclusive of all accessories, approved from Architect, protecting installation by avg. 20 micron polythene sheet till handover of facility, etc. cleaned complete. The type and height will be decided after evaluating the various mock up plants provided by the vendor from various professional sources in Vadodara.

**1) Materials**

Wire-mesh substrate, artificial plants of size up to 1100 mm height out of composite Polythene/polyurethane as approved of first quality.

**2) Workmanship**



Wire-mesh substrate, artificial plants of size up to 1100 mm height out of composite Polythene/polyurethane as approved of first quality. Item inclusive of all accessories, approved from Architect, protecting installation by avg. 20 micron polythene sheet till

handover of facility, etc. cleaned complete. The type and height will be decided after evaluating the various mock up plants provided by the vendor from various professional sources in Vadodara.

### **3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

## **63.0 Signages**

Providing and fixing Signage made from Matt finished Stainless Steel plate of various sizes having 1mm thickness with radium sticker cutting letters as per design inclusive of fixing with ss stud & screw in place using all necessary hardware / brackets as Instructions given by the Architect/EIC.

### **1) Materials**

Signage made from Matt finished Stainless Steel plate of various sizes having 1mm thickness with radium sticker cutting letters as per design.

### **2) Workmanship**

Signage made from Matt finished Stainless Steel plate of various sizes having 1mm thickness with radium sticker cutting letters as per design inclusive of fixing with ss stud & screw in place using all necessary hardware / brackets as Instructions given by the Architect/EIC.

### **3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. Item will be measure in Smt. (W x H). No extra will be payable towards wastage due to material pattern.

## **64.0 Provide and Installation of Automatic Roll Towel Dispenser, Hand Dryer, and Waste Receptacle panel of Euronic - KMR3A Recess Panel (3 in 1 ):**

Provide and Installation of Automatic Roll Towel Dispenser, Hand Dryer, and Waste Receptacle panel of Euronic - KMR3A Recess Panel (3 in 1 )

Door - 18-8, type-304, 1.2mm (18-gauge) stainless steel. 14mm (9/16") 90 degree return for maximum rigidity. Secured to cabinet with a concealed, full-length stainless steel piano-hinge. Equipped with a stainless steel cable door-swing



limiter and three tumbler locks keyed (1key for 3 locks)

Cabinet- 18-8, type-304, 22gauge (0.8mm) stainless steel with satin finish, which is durable and steady. All-welded construction.

Auto Roll Towel Dispenser - 18-8, type-304 (22-gauge) stainless steel. Infrared Sensor, Adjustable dispense length. Battery Operated 4 x D Size Alkaline Batteries. Paper Roll Size: Width 195mm - 200mm, Dia  $\leq$  200mm

Waste Container:- 18-8, type-304, 0.8mm (22-gauge) stainless steel. Removable for servicing. Capacity: 23 liters.

## 1) Materials

Automatic Roll Towel Dispenser, Hand Dryer, and Waste Receptacle panel of Euronic - KMR3A Recess Panel (3 in 1)

Door - 18-8, type-304, 1.2mm (18-gauge) stainless steel. 14mm (9/16") 90 degree return for maximum rigidity. Secured to cabinet with a concealed, full-length stainless steel piano-hinge. Equipped with a stainless steel cable door-swing limiter and three tumbler locks keyed (1key for 3 locks)

Cabinet- 18-8, type-304, 22gauge (0.8mm) stainless steel with satin finish, which is durable and steady. All-welded construction.

Auto Roll Towel Dispenser - 18-8, type-304 (22-gauge) stainless steel. Infrared Sensor, Adjustable dispense length. Battery Operated 4 x D Size Alkaline Batteries.

Paper Roll Size: Width 195mm - 200mm, Dia  $\leq$  200mm

Waste Container:- 18-8, type-304, 0.8mm (22-gauge) stainless steel. Removable for servicing. Capacity: 23 liters

## 2) Workmanship

Provide framed rough wall opening 335mm wide x 1615mm high. Minimum recessed depth required from finish face of wall is 165 mm. Allow clearances for construction features that may protrude into rough wall opening from opposite wall. Co-ordinate with mechanical engineer to avoid pipes, vents, and conduits. If unit projects above top of waincot, provide aluminum channel or other filler to eliminate gap between flanges and finish face of wall. Open battery cover of the dispenser and install 4, "D" size alkaline batteries. Select sheet length, Load paper towel using the instructions on the dispenser. Dryer Wiring Instructions: Connect the 220-volt / 50 Hz. Wattage: 1600 W

OPERATIONS:

Electronics sensor automatically dispenses towel when hands are placed under the towel opening. Roll towel dispenser is adjustable to dispense 200mm, 250mm, 300mm length roll towel without use of additional adapters or towel trays. To service waste receptacle, unlock door with key provided and remove waste container. Cable door-swing limiter prevents damage to washroom accessories and walls. Hand Dryer has no-touch operation. Electronic sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Remove hands from path of sensor and dryer stops. Dryer will not stop by itself before user is satisfied hands are dry. Dryer operates only when actually drying hands, which saves energy and operating costs. Electronic sensor will automatically shut dryer off one minute after dryer turns on if inanimate object is placed across sensor lens. After inanimate object is removed, electronic sensor automatically resets itself and dryer operates normally.

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of one number. No extra will be payable towards wastage due to material pattern.

**65.0 C.P. towel ring**

Providing & fixing 15 mm dia C.P. towel ring for wash hand basin of approved make etc. complete as approved by Architect/Engineer-in-charge, Item to include screw, roll plug and all fixing accessories, installed complete. Item to be completed in all respects as per drawings & instructions from Project-in-charge/Architect.

**1) Materials**

15 mm dia C.P. towel ring for wash hand basin of approved make etc. complete as approved by Architect/Engineer-in-charge.

**2) Workmanship**

15 mm dia C.P. towel ring for wash hand basin of approved make etc. complete as approved by Architect/Engineer-in-charge, Item to include all fixing accessories, installed complete. Item to be completed in all respects as per drawings & instructions from Project-in-charge/Architect.

**3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

### **66.0 C.P.Toilet paper holder**

Providing & fixing C.P.Toilet paper holder of approved make continental range as per instructions of engineer in charge etc. complete as approved by Architect/Engineer-in- charge. Item to include screws, roll plug and all fixing accessories, installed complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

#### **1) Material**

C.P.Toilet paper holder of approved make continental range as per instructions of engineer in charge etc. complete as approved by Architect/Engineer-in- charge.

#### **2) Workmanship**

C.P.Toilet paper holder of approved make continental range as per instructions of engineer in charge etc. complete as approved by Architect/Engineer-in- charge. Item to include all fixing accessories, installed complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.

### **3) Mode of measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

### **67.0 Mirrors in Toilet**

Providing and Fixing Mirrors in toilet, homogenous piece 5 mm thick faultless Float glass mirrors of approved source glass. Mounted with approved 316 grd. SS Studs on 12mm thick FIRESAFE IS: 5509 century Plywood sheet backing of Ply or equip., entire assembly mounted over specified Dado to locations as per drawing and approval. Ply board edges to be sealed with min.

4 mm thick TW lipping AT treated and clear matt PU finished; and glass edges to be avg. 2.5 mm beveled & grinded finished smooth. Exposed SS mounting studs on face of glass to be of brushed steel/Butler finish. Item to include all fixing hardware & accessories as approved, and a single unit mock-up for approval of the Architects. Item to be mounted on cleaned finished complete to correct line, finished item suitably protected till handover. Item to be completed in all respects as per drawings & instructions from Project- in- charge/Architect.

#### **1) Materials**

Mirrors in toilet, homogenous piece 5 mm thick faultless Float glass mirrors of approved source glass. Mounted with approved 316 grd. SS Studs on 12mm thick FIRESAFE IS: 5509 century Plywood sheet backing of Ply or equip., entire

assembly mounted over specified Dado to locations as per drawing and approval. Ply board edges to be sealed with min. 4 mm thick TW lipping AT treated and clearmatt PU finished.

## 2) Workmanship

Mirrors in toilet, homogenous piece 5 mm thick faultless Float glass mirrors of approved source glass. Mounted with approved 316 grd. SS Studs on 12mm thick FIRESAFE IS: 5509 century Plywood sheet backing of Ply or equip., entire assembly mounted over specified Dado to locations as per drawing and approval. Ply board edges to be sealed with min. 4 mm thick TW lipping AT treated and clearmatt PU finished; and glass edges to be avg. 2.5 mm beveled & grinded finished smooth. Exposed SS mounting studs on face of glass to be of brushed steel/Butler finish. Item to include all fixing hardware & accessories as approved, and a single unit mock-up for approval of the Architects. Item to be mounted on cleaned finished complete to correct line, finished item suitably protected till handover.

1. All members of the plywood/ horizontal surfaces, frames shall be exactly at right angles. The right angle shall be checked from inside surface of the respective members.
2. All members/ plywood surfaces of frames/ shutters shall be straight line without any warp or bow and shall have smooth surface well planned/ or cut in right direction with right angles.
3. 5mm thick Mirror of first quality and approved make shall be fixed on 2mm thick FIRESAFE IS: 5509 century Plywood sheet backing of Ply or equip with first quality hardware.
4. All open edges of plywood to cladded with first quality sycamore wooden beading of required sizes.

damaging adjoining surfaces/ members and without having any stains, spots or dirt.

Mirrors in toilet, homogenous piece 5 mm thick faultless Float glass mirrors of approved source glass. Mounted with approved 316 grd. SS Studs on 12mm thick FIRESAFE IS: 5509 century Plywood sheet backing of Ply or equip., entire assembly mounted over specified Dado to locations as per drawing and approval. Ply board edges to be sealed with min. 4 mm thick TW lipping AT treated and clearmatt PU finished; and glass edges to be avg. 2.5 mm beveled & grinded finished smooth. Exposed SS mounting studs on face of glass to be of brushed steel/Butler finish. Item to include all fixing hardware & accessories as approved, and a single unit mock-up for approval of the Architects. Item to be mounted on cleaned finished complete to correct line, finished item suitably protected till handover.

## 3) Mode of measurement

Item will be measure in Smt. (W x H). No extra will be payable towards wastage due to material pattern. all finished work including all required hardware. Rate includes all material and labour to complete the item as per instruction of Engineer in-charge.

### **68.0 Pantry (Shutters under platform)**

Providing and fixing storage cabinet (below platform) in pantry The Front frame and shutters including partition to be 18-19mm BWR ply, with 1.0 mm laminate. All edges of shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area calculation

#### **1) Materials**

. Providing and fixing storage cabinet (below platform) in pantry The Front frame and shutters including partition to be 18-19mm BWR ply, with 1.0 mm laminate. All edges of shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area calculation

#### **2) Workmanship**

Providing and fixing storage cabinet (below platform) in pantry The Front frame and shutters including partition to be 18-19mm BWR ply, with 1.0 mm laminate. All edges of shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area calculation

#### **3) Mode of measurement**

Item will be measure in Smt. (W x H) . No extra will be payable towards wastage due to material pattern. all finished work including all required hardware. Rate includes all material and labour to complete the item as per instruction of Engineer in-charge. (Measurement will be counted from front shutter's height & width, no extra will be given for ss basket & shelves).

### **69.0 Pantry (Over head unit)**

Providing and fixing over head storage cabinet 380mm deep and 750/900mm high length as/design as shown in details with all sides, shelves to be 18-19 mm thk. BWR ply with 12mm BWR ply to be fixed at the back with 0.8mm laminate. The shutters to be 18-19mm BWR ply, with 1.0 mm thk laminate/High gloss laminate. All internal surfaces to be finished with white Paint. All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area calculation.

### 1) Materials

Providing and fixing over head storage cabinet 380mm deep and 750/900mm high length as/deign as shown in details with all sides, shelves to be 18-19 mm thk. BWR ply with 12mm BWR ply to be fixed at the back with 0.8mm laminate. The shutters to be 18-19mm BWR ply, with 1.0 mm thk laminate/High gloss laminate. All internal surfaces to be finished with white Paint. All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area

### 2) Workmanship

Providing and fixing over head storage cabinet 380mm deep and 750/900mm high length as/deign as shown in details with all sides, shelves to be 18-19 mm thk. BWR ply with 12mm BWR ply to be fixed at the back with 0.8mm laminate. The shutters to be 18-19mm BWR ply, with 1.0 mm thk laminate/High gloss laminate. All internal surfaces to be finished with white Paint. All edges of sides, shelves and shutters to have 2mm PVC Edge binding tape as per details, complete including S.S. long handles, self closing hinges, locks, etc. complete to the satisfaction of Architect /Bank's Engg. Only front elevation to be considered for area

### 3) Mode of measurement

Item will be measure in Smt. (W x H) (frontface). No extra will be payable towards wastage due to material pattern. all finished work including all required hardware. Rate includes all material and labour to complete the item as per instruction of Engineer in-charge.

70.0 Deleted

71.0 Deleted

72.0 Deleted

73.0 deleted

75.0 Workstation

Manufacture, supply and Installation in position 'Linear' shape unit as directed Modular workstation comprising of partitions, work surface, gable end.Linear work station will be module of 3/4/5/6/8 sittings both side/one side. the end of the linear work station to have partition as specified above. also the liner work station to have partition as per BOQ divider in frame.

SIZE :- (1000 (L) x 575/600 (W) x 750mm

Panel based Partitions :-Vertical partition members made of aluminium extrusion alloy of minimum 60x60 mm size having thickness of min 1.2mm for vertical members and that of 1.00mm thick for horizontal members duly finished with powder coating in desired shade/colour. Both the faces of vertical partition to be finished with laminate/fabric panels. Top caps of partition shall be slightly curved/flushed.



aluminium alloy duly finished with powder coating in desired shade/colour. The partition should have the raceways for carrying voice and data wire and power cable, which should be separate from each other in the panel. (power switch should be above table necessary provision to be made in workstation). The panel above the work surface should be on tackable board with fabric panels. The height of partition shall be of min. 1200mm. All partition should have the provision of level adjuster to adjust the height of + 10mm. All metal components will be finished with powder coated undesired shade/colour. 150mm high metal skirting.

1200mm min. high partition thick panel based systems 1200mm(HT). Base shall be formed as approved powder coating on aluminium & fabric panel. Workstation along corridor / Passage.

1200mm min. high partition thick panel based systems 1200mm(HT). Base shall be formed as approved powder coating on aluminium & fabric panel. Workstation along corridor / Passage.

1200mm min. high partition with laminate finish below the worktop, fabric above work top towards Inside and Outside of Workstation in return partition / handshake Only end to end of workstation.

Work Top:- Worktop shall be of 25mm thick prelaminated particle board with 2mm thick PVC edge banding finish with as per approved laminate color.

Work top shall have 2mm PVC edging of approved make quality shade and colour on exposed area and 1mm on covered area.

Powder coating will be in Epoxy powder coating will be minimum 50 micron.

Gable Ends shall be of 25mm thick prelaminated particle board with 2mm thick PVC edge banding finish with as per approved laminate color.

Gable end Bracket will be of minimum 2.0mm thick CRCA steel Grade D as per IS 513 with metal insert

Round Wire manager for wire management od dia 60-70mm shall be finished same as per table top.

## 2 Drawer pedestal with levellers :- Deleted

Prelaminated 3Drawer Pedestal (2D+1F) 400Lx450Dx685Ht. Carcass & Facia made up of 18mm thick Pre-laminated particle board. Back Panel from 9mm PPB. All exposed edges are sealed with 2mm thick PVC edgeband & Non-exposed edges with 0.8mm thick PVC edge- band

### 1) Materials

Vertical partition members made of aluminium extrusion alloy of minimum 60x60 mm size having thickness of min 1.2mm for vertical members and that of 1.00mm thick for horizontal members duly finished with powder coating in desired shade/colour. Both the faces of vertical partition to be finished with laminate/fabric panels. Top caps of partition shall be slightly curved/flat shape of aluminium alloy duly finished with powdercoating in desired shade/colour.

Modular workstation with details as per tech specs

### 2) Workmanship



Modular Workstation with details as per tech specs. The material shall be factory finish and should be supplied in knockdown condition which can be installed at site. The workmanship shall be under supervision of the contractor and the installation shall be approved by Architect or EIC. For approval of sample factory visit shall be arranged by the Contractor for consultant & representative of Bank. All the expenses for the said visit will be borne by the contractor.

### 3) Mode of measurement

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

76. Deleted

### 77.0 Rotafile Storage -Deleted

Providing and Supplying “Rotafile” a large multifunctional square column for FILING storage. Column should be fully rotatable. It should have facilities for additional levels and it can be added to increase the height. It should be sturdy 4-armed star base. The sides of the levels should be bolted to provide additional stability and fitted with 2mm abutting edges for long term use. Dimension of each level should be 93 x 93 cm (diagonal 93 cm)

- (A) 3 levels unit of a 120 cm height
- (B) 4 level unit of a 155cm height

### Material & Workmanship

1 – **Castors** – For mobile use of rotating column can be retrofitted , raise the column by 7 cm. 1 set consists of 4 castors lockable.

or

- 1- **Base cover** – Act as cover panel for the star base. 9.5 cm height , powder coated steel sheet.
- 2- **Additional Level** – The additional level increases the height of the column by a further level and provides more space for binders and working materials
- 3- **Seat Pad** – High quality upholstered seat pad, black fabric 100% microfiber with antistatic finish. Lightfast and abrasion resistant, strain and dirt repellent.
- 4- **Compartments** – Use to divide the compartment into 6 equally sized compartments (each approx.. 4.5 cm) can be retrofitted at any time simply by slotting in. no tools require and no need to dismantle the column.
- 5- **Shelf** – Used to divide the compartments into two equally sized compartments (each approx.. 16 cm.) can be retrofitted at any time simply by slotting in. no tools require and no need to dismantle the column.

- 6- **Slatwall** –Panel made of anodized galvanized sheet steel to take up. Slatwall accessories such as hooks, broacher’s tray. It should be attached simply by slotting into the chosen side panel.
- 7- **Set of brochure flaps** – Flaps made of anodized galvanized sheet steel turn the rotating column into a broacher or catalogue unit. no tools require and no need to dismantle the column.
- 8- **Set Magnetic boards** – Magnetic boards in powder coated steel sheet to go on the sides of the levels (4 magnets incl.)

**Mode of Measurement**

The rate includes cost of all labour, materials, tool and plant etc. required for satisfactory completion of this item as specified in workmanship. The rate shall be for a unit of One number. No extra will be payable towards wastage due to material pattern.

## SPECIFICATION FOR PLUMBING WORK

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<b>2.00</b>	<b>Plumbing Approved Make list</b>

## **SECTION 1: GENERAL SPECIFICATIONS**

### **1.0 SCOPE OF WORK**

- 1.1 Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely furnish all the plumbing and other specialized services as described hereinafter and as specified in the schedule of quantities and/or shown on the plumbing drawings.
- 1.2 Scope of Work generally shall include the area shown in the drawings attached.
- 1.3 Over & above Clause 1.1, the plumbing installation may include but not limited to the following:
- a) Sanitary & CP Fixtures with all accessories.
  - b) Water Treatment plant
  - c) Internal & External Water supply & Distribution
  - d) Internal & External Sewerage Collection & Disposal system
  - e) Sewage Treatment plant
  - f) Electro-mechanical equipment/accessories required for Plumbing Installation
  - g) All hardware, supports, hangers required for complete installation
  - h) Civil work related to Plumbing Installation
  - i) Instruments, meters, gauges, required for the installation
  - j) The scope of 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.

### **2.0 SPECIFICATIONS**

The detailed specifications given hereinafter 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.

- 2.1 Work under this contract shall be carried out strictly in accordance with specifications attached with the tender.
- 2.2 Item not covered under these specifications due to any ambiguity or misprints, or additional works, the work shall be carried out as per specifications of the latest applicable standards with latest amendments as applicable in the contract or as directed by Engineer in Charge.
- 2.3 Works not covered under Para 2.1 and 2.2 shall be carried out as per relevant Indian standards specifications or codes of practice.
- 2.4 Unless specifically otherwise mentioned, all the applicable codes and standards published by the Indian Standard Institution 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

- 2.5 Wherever any reference to any Indian Standard Specification occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued there to or revisions thereof, if any, up to the date of receipt of tenders. In case there is no I.S.I. specification for the particular work, such work shall be carried out in accordance with the instructions in all respects and requirements of the Engineer-in-Charge.
- 2.6 For the items not covered under any of the specifications stated above, the work shall be executed as per manufacturers specifications/ General good engineering practice/ or as per direction of Engineer in charge and shall be carried out in a manner complying in all respects with the requirement of relevant byelaws of municipal corporation/ Development Authority etc. under the jurisdiction of which the work is to be carried out.
- 2.7 In case of any difference or discrepancy between specifications & the description of Schedule of Quantities, Schedule of Quantities shall take precedence. In case of any difference or discrepancy between specification and drawings, the drawings shall take precedence. In case any difference or discrepancy between the specifications for civil works and specification for Public Health Engineering works, specifications for civil works shall take precedence.
- 2.8 In case of any dispute arising out of the interpretation of any tender condition, the decision of Engineer-In-Charge shall be final and binding on the contractor.
- 2.9 Detail specification for Sanitary & CP fittings like model/ makes shall be selected by Architect/ Owner and the same shall be binding for execution.
- 2.10 All electrical installation shall comply with the requirements of relevant Indian Standards, Indian Electricity rules & Indian Electricity Act amended up to date & local bye laws.

### **3.0 CONTRACTOR'S RATES**

- 3.1 Rates quoted in this tender shall be inclusive of cost of materials, labour, supervision, erection, tools, plant, scaffolding, service connections, transport to site, taxes, octroi and levies, breakage, wastage, excavation, refilling, bedding, encasing, transportation of lifts/leads and all such expenses as may be necessary and required to completely do all the items of work and put them in a working condition.
- 3.2 Rates quoted are for all heights and depths required for this work.
- 3.3 All rates quoted must be for complete items inclusive of all such accessories, fixtures and fixing arrangements, nuts, bolts, hangers as are a standard part of the particular item except where specially mentioned otherwise.
- 3.4 All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar/ concrete of appropriate mix and strength as directed by Architect/ Engineer in Charge.

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- 3.5 Rates quoted shall be inclusive of cost incurred in testing, commissioning of works and materials.
- 3.6 Rates quoted shall be inclusive of any rework to be carried in the system installation due to the instructions given by Statutory/ Approval authority.
- 3.7 For all the items/ equipments supplied free of cost by the Owner, the contractor's rate shall take care of transportation to the site, storage at site, installation, testing & commissioning of those items/equipments.
- 3.8 All rates quoted by the contractor under this contract shall including bailing or pumping out of all the water which may accumulate during the progress of work either through seepage, springs, rain or any other cause.
- 3.9 All rates quoted by the contractor shall include all miscellaneous civil work related to Plumbing work like excavation, refilling, timbering, bedding, encasing, etc. required as per actual site condition.
- 3.10 All water and electricity charges for testing and commissioning of the system shall be borne by the contractor.
- 3.11 In case of discrepancy/ calculation error between rate & amount quoted by the contractor, the quoted rate shall be considered as final to derive the amount.

## 4.0 DRAWINGS

- 4.1 Plumbing drawings are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the Architectural and other services drawings.
- 4.2 Architectural drawings shall take precedence over plumbing or other services drawings as to all dimensions.
- 4.3 Contractor shall verify all dimensions at site and bring to the notice of the Architect/ Engineer in Charges all discrepancies or deviations noticed. Architect/ Engineer in Charges decision shall be final.
- 4.4 Civil related details like tanks, basement channel, and plant room, sump, etc. to be read in conjunction with structure drawings. In case of any discrepancies, Contractor shall co-ordinate with other agencies & execute as per the best practices.
- 4.5 Large size details and manufacturers dimensions for materials to be incorporated shall take precedence over small-scale drawings.
- 4.6 Any drawings supplied with the tender shall be returned in good conditions along with the tender.
- 4.7 Any drawings issued by the Architect/ Engineer In Charges for the works are the property of the Architect/ Engineer In Charges and shall not be lent, reproduced or used on any works other than intended without the written permission of the

## **5.0 EXECUTION OF WORK**

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- 5.1 The contractor must get acquainted with the proposed site for the works and study specifications and conditions carefully before execution.
- 5.2 The work shall be carried out in conformity with the plumbing drawings and within the requirements of Architectural, HVAC, Electrical, Structural and otherspecialized services drawings.
- 5.3 On award of the work, contractor shall submit a program of construction in the form of a pert chart or bar chart for approval of the Architect/ Engineer in Charge. All dates and time schedule agreed upon shall be strictly adhered to, within the stipulated time of completion/ commissioning along with the specified phasing, if any.
- 5.4 The work shall be executed as per program approved by the Architect/ Engineer in Charge. If part of site is not available for any reason or there is some unavoidable delay in supply of materials stipulated by the owner/ or due to any other issue not pertaining to the contractor, the contractor shall draw attention to the owner & as per the mutual agreement, the programme of construction shall be modified accordingly and the contractor shall have no claim for any extras or compensation on this account. Here Owner means the authorized person/ agency representing Owner/Client.
- 5.5 The contractor shall cooperate with all trades and agencies working on the site. The contractor shall ensure that all inserts, pipe lines embedded in structural members, sleeves, cutouts, etc. are placed in position in coordination with civil work as and when required. All holes, sleeves, cutouts shall be filled with best quality sealant to make leak proof joint. Location & size of core cutting of the floor slabs in case of suspended plumbing shall be co-ordinate with civil contractor. However, core cutting work is to be carried out by Civil Contractor or any other agency.
- 5.6 The contractor shall take instructions from the Engineer In charge regarding collection and stacking of material in any place with lockable arrangement. For damage/ theft of any material, Contractor shall be hold responsible. No Excavated earth or Building material shall be stacked on areas where otherbuildings, roads, services, compound walls, etc. are to be constructed.
- 5.7 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.
- 5.8 The installation of the sanitary fixtures and fittings shall be as per the shop drawings approved by the Architect/ Engineer in Charge/ Consultant. The fixtures in the trial assembly can be re-used for final installation without any additional payments for fixing or dismantling of the fixtures.
- 5.9 All gaps between wall/ floor and sanitary vessels shall be filled with sanitary



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grade sealant. CP Brass or SS screws shall be used for fixing sanitary fixtures and accessories in toilet, bath, and pantry and kitchen area.

5.10 While carrying out pipeline work, in case the contractor encounters any Interference with other services, such as cable, conduits, etc. he shall take sufficient precautions in order to prevent any damage to them. If any damage

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occurs it shall be rectified to its original condition at his own cost to the satisfaction of Engineer-In-Charge.

5.11 The contractor carrying out the construction work shall take effective measures to carefully open out all existing channels, culverts, bridges, pipelines, conduits, water courses, sewer, drains, electrical cables, transmission lines and their supports and all works buried or otherwise where such services have to be interfered with the purpose of the construction of the works. He shall provide and arrange all necessary temporary supports and diversions if necessary across/ under/ even through along sides of the trenches and all other parts of construction work for all such channels, culverts, bridges, pipe lines, conduit

5.12 The contractor shall arrange to carry out all works with least interference practicable with public footpath and vehicular traffic and with existing waste water or storm water drainage arrangements and provide all necessary road barriers, fences, notices, lights, gangways, access crossings, diversions for traffic, temporary drains, dewatering channels, chutes pumping or water lifting arrangements and all other facilities for the proper execution of the works to the approval and satisfaction in all respects of the Engineer-in-Charge. Any work carried out by the contractor in this connection shall be deemed as temporary works incidental to the construction work.

5.13 For any free issue items by Owner, the contractor shall maintain the same properly & install as per good engineering practice.

5.14 No structural member shall be chased or cut without the written permission of the Architect/ Engineer in Charge/ Engineer in charge.

5.15 The work shall be executed in a manner complying in all respects with requirements of relevant bye-laws of the municipal corporation/ Development Authority/ Applicable Statutory Authority the jurisdiction of which the work is to be executed or as directed by the Engineer-In-Charge.

5.16 All plumbing services shall be handed over to Engineer-In-Charge complete in all respects. Incomplete work will not be taken over. Any loss or damage to these services due to any reasons by anybody whatsoever before handing over will be contractor's risk and cost, Any damage to any structural, finishing work done during the testing or rectification shall be made good by the contractor at his own cost and risk.

## **6.0 MATERIALS & WORKMANSHIP**

6.1 All materials used in the works shall conform to the list of approved vendor in tender specifications. The approved samples shall be maintained at site till the completion of work.

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- 6.2 As far as possible materials bearing I.S. certification marks shall be used with the approval of the Architect/ Engineer in Charge/ Engineer in charge.
- 6.3 Unless otherwise specified and expressly approved in writing by the Architect/ Engineer in Charge, materials of makes and specifications mentioned with tender shall be used. In case of any items, list of approved vendor is not given; the contractor shall submit his recommendation to Engineer in charge with proper technical back up justifying the selection.
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- 6.4 Workmanship and general finish shall be of first class quality and in accordance with best workshop practice. All similar items of the Plant and their component parts shall be completely interchangeable.
- 6.5 Spare parts shall be manufactured from the same materials as the originals and shall fit all similar items.
- 6.6 Machining fits on renewable parts shall be accurate and to specified tolerances so that replacements made to may be readily installed.
- 6.7 All equipment shall operate without excessive vibration and with minimum noise.
- 6.8 All revolving parts shall be truly balanced both statically and dynamically so that when running at normal speeds at any load up to the maximum there shall be no vibration due to lack of balance.
- 6.9 All parts which can be worn or damaged by dust shall be totally enclosed in dust proof housings
- 6.10 All materials selected in the work shall be most suitable for duty concerned, free from imperfections, selected for long life and minimum maintenance.
- 6.11 All necessary accessories required for satisfactory and safe operation of the Plant shall be supplied by the Contractor unless it is specifically excluded from his scope.
- 6.12 All valves shall be closing on clockwise rotation of the hand wheel. The effort required to close/ open under all operating conditions shall be limited to 7 kg. The direction of opening/ closing shall be cast on the hand wheel.
- 6.13 All flanges shall be drilled in accordance with requirements of IS: 1538. All flanges shall be full or spot faces on the back side. The flange thickness shall be uniform throughout. Flange outside periphery shall be concentric with the bore. Flanges shall be finished smooth on periphery also Castings and fabricated materials shall be finished smooth all over.

## **7.0 INSPECTION AND TESTING OF MATERIALS**

- 7.1 Contractor shall be required, if requested, to produce manufacturers test certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Indian standards.

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- 7.2 Testing charges including incidental charge and cost of sample for testing shall be borne by the contractors for all mandatory tests.
- 7.3 Testing charges for optional tests shall be paid by the Dept. However, the incidental charges and cost of sample for testing shall be borne by the contractor.
- 7.4 In case of non-I.S. materials, it shall be the responsibility of the contractor to establish the conformity of material with relevant I.S. specification by carrying out necessary tests. Testing charges including incidental charge and cost of sample for testing shall be borne by the contractors for such tests.
- 7.5 The materials should pass all tests and tolerance in dimensional, chemical, physical properties should be within the limit as stipulated in relevant I.S. for acceptance. Such materials will be accepted as standard.
- 7.6 Payments shall be restricted to standard unit mass, or as specified in the schedule, without making any cost adjustment towards mass or any other properties provided the material pass all the tests and tolerance are within the specified limit.
- 7.7 For examination and testing of materials and works at the site contractor shall provide all testing and gauging equipment necessary but not limited to the followings:
- 7.8 a) Theodolite b) Dumpy level c) Steel tapes d) Weighing machine e) Plumb bobs, spirit levels, Hammers f) Micrometers g) Thermometers, Stoves h) Hydraulic test machine i) Smoke test machine.
- 7.9 All such equipment shall be tested for calibration at any approved laboratory, if required by the Architect/ Engineer in Charge.
- 7.10 All testing equipment shall be preferably located in special room meant for the purpose.
- 8.0 MOCK UP**
- 8.1 The contractor shall install all pipes, fixtures, clamps and accessories and fixing devices in mock-up shaft and room so constructed as directed by Architect/Engineer in Charge without any cost. The materials used in the mock-up may be reused in the works if found undamaged.
- 8.2 The contractor shall have to assemble at least one set of each type of sanitary fixtures and CP fittings in order to determine precisely the required supply and disposal connections. Relevant instructions from manufacturers shall be followed as applicable. This trial assembly shall be developed to determine the location of puncture holes, holding devices etc. which will be required for final installation of all sanitary fixtures and fittings. The above assembly shall be subject to final approval by the Architect/ Engineer in Charge/ Engineer In charge.
- 8.3 Any tiles or finished surfaces or floors damaged by the contractor while doing his work shall be made good with new tiles or other finishing material. No payment shall be admissible for such repairs. The Architect / Engineer in Charge may, at his discretion get the damaged work repairs to the contractor.

**9.0 MATERIALS SUPPLYING BY OWNER**

9.1 The contractor shall verify that all materials supplied by the Owner conform to the specifications of the relevant item in the tender. Any discrepancy found shall be brought to the notice of the Architect /Engineer in charge.

9.2 If any materials issued to the contractor, free of cost, are damaged or pilfered, the cost of the same shall be recovered from the contractor on the basis of actual cost to owner which shall include all freight and transportation, excise duty, sales tax, octroi, import duty etc.

**10.0 REFERENCE POINTS**

10.1 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of the work.

10.2 All such reference points shall be in relation to the levels and locations given in the Architect/ Engineer in Charge and plumbing drawings.

**11.0 REFERENCE DRAWINGS**

11.1 The contractor shall maintain one set of all construction drawings issued to him as reference drawings. These shall not be used on site.

11.2 All corrections, deviations and changes made on the site shall be shown on these reference drawings for final incorporation in the completion (as built) drawings. All changes to be made shall be initialed by the Engineer in charge.

11.3 One complete set of construction drawings shall be made available to the execution engineer & shall be maintained in good condition throughout the execution activities.

**12.0 SHOP DRAWINGS**

12.1 The contractor shall submit to the Architect/ Engineer In Charge four copies of the shop drawings.

12.2 Shop drawings shall be submitted under following conditions:

- a) Showing any changes in layout in the plumbing drawings.
- b) Foundation details, Nozzle Orientation, Equipment layout and piping, wiring diagram.
- c) Manufacturer's or contractor's fabrication drawings for any materials or equipment supplied by him.

12.3 The contractor shall submit four copies catalogues, manufacturers drawings, technical data sheet, equipment characteristic data or performance charts as required by the Architect/ Engineer In Charge.

**13.0 SITE CLEARANCE AND CLEANUP**

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- 13.1 The contractor shall, from time to time clear away all debris and excess materials accumulated at the site.
- 13.2 After the fixtures, equipment and appliances have been installed and commissioned, contractor shall clean-up the same and remove all plaster, paints stains, stickers and other foreign matter of discoloration leaving the same in a ready to use condition.
- 13.3 On completion of all works, contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done at contractors risk and cost.

### **14.0 TESTING**

- 14.1 Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.
- 14.2 Tests shall be performed in the presence of the Engineer In Charge. The engineer in charge shall issue a certificate for approved testing of all systems duly signed & stamped.
- 14.3 All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.
- 14.4 Contractor shall perform all such tests as may be necessary and required by the local authorities to meet Municipal or other bye-laws in force.
- 14.5 Contractor shall provide all labour, equipment and materials for the performance of the test.
- 14.6 After completion of work and during the maintenance liability period of contract, the work shall be subjected to "Post construction and testing". In case, if the materials incorporated in the work are found to be inferior, though the sample collected from the materials might have been passed at the time of execution, it shall be the responsibility of the contractor to replace the same without any cost to the Owner failing which the Owner may rectify the same at the risk and cost of the contractor or the Owner may accept the same as substandard, and cost be adjusted from the outstanding security deposit as per the terms and condition of the contract for the work.

### **15.0 LICENSE AND PERMITS**

- 15.1 Contractor must hold a valid plumbing license issued by the Municipal authority or other competent authority under whose jurisdiction the work falls.
- 15.2 Contractor must keep constant liaison with the Municipal authority and obtain approval of all drainage and water supply works carried out by him.
- 15.3 Contractor shall obtain, from the municipal authority, completion certificate with respect to his work as required for occupation of the building.
- 15.4 All inspection fees or submission fees paid by the contractor shall be reimbursed by

## **16.0 HANDING OVER DOCUMENTS**

- 16.1 On completion of work, contractor shall submit one complete set of as built drawings in editable soft copy and two hard prints of 'as built' drawings to the Engineer in Charge. These drawings shall have the following information:
- a) Run of all piping & diameters on all floors, terrace and vertical stacks.
  - b) Ground and invert levels of all drainage pipes together with location of all manhole and connections up to outfall.
  - c) Run of all water supply lines with diameters, locations, of control valves, access panels inside the utilities.
  - d) Location of all mechanical equipment with layout and piping connections & location of electrical panel for the same.
  - e) Location & capacity of Underground / Overhead tanks
  - f) Location of water & sewage treatment plant with layout
  - g) Location of rain water harvesting structures with detail drawings
- 16.2 Contractor shall provide four sets of catalogues, performance data and list of spare parts together with the name and address of the manufacturer for allelectrical and mechanical equipment provided by him.
- 16.3 All 'warranty cards' given by the manufacturers shall be handed over to the Architect/ Engineer in Charge.
- 16.4 Contractor shall provide Operation and Maintenance manual of all major Electro-mechanical equipment.
- 16.5 All test certificates of materials & testing at manufacturer works shall be submitted in one set of hard copy.
- 16.6 All site performance test certificates approved by Engineer in charge shall be submitted in one set of hard copy.

## **17.0 APPLICABLE CODES AND STANDARDS:**

- 17.1 Plumbing system design shall conform to plumbing design codes like National Building code– 2005, Part 9, Section 1, CPHEEO Manual, Handbook on Water supply & Drainage- SP 35, Public Health Engineering Handbook, Uniform Plumbing Code for India.
- 17.2 All equipment, supply, erection, testing and commissioning shall comply with the requirements of Indian Standards and code of practice given below as amended up to the date of submission of Tender. All equipment and material being supplied shall meet the requirements of BIS and other relevant standard and codes.

**18.0 LIST OF INDIAN STANDARDS FOR PLUMBING**

18.1 The following IS codes shall be referred in execution of PH Engineering works.

<b>IS CODE</b>	<b>SUBJECT</b>
27 - 1992	Specifications for Pig Lead
269- 1989	Specifications for 33 grade Ordinary Portland Cement
407- 1981	Brass tubes for General purposes
456- 2000	Code of practice for Plain & Reinforced concrete.
458- 2003	Specifications for Concrete Pipes.
554- 1999	Dimensions for pipe thread where pressure tight joints are required.
636- 1988	Firefighting hose ,rubber lined or fabric reinforced rubber lined woven –jacketed
638- 1979	Sheet rubber jointing & rubber insertion jointing
651- 1992	Specifications for Salt glazed stoneware pipes & fittings.
771 (Pt. I &VII)	Glazed Fire Clay Sanitary Appliances.
771- 1979 (Pt. I)	General requirements
771- 1985 (Pt. II)	Specific requirements of kitchen & laboratory sinks
771- 1979 (Pt. III/ Sec 1)	Specific requirements of urinals ( section 1- Slab urinals)
771- 1985 (Pt. III/ Sec2)	Specific requirements of urinals ( section 2- Stall urinals)
771- 1979 (Pt. IV)	Specific requirements of postmortem slabs.
771- 1979 (Pt. V)	Specific requirements of shower trays
771- 1979 (Pt. VI)	Specific requirements of bed pan sinks
771- 1981 (Pt. VII)	Specific requirements of slop sinks
774- 1984	Flushing cistern for water closet and urinals.
775- 1970	Cast iron brackets and supports for wash basin and sink.
778- 1984	Specifications for copper alloy gate & Globe check valves for water works
779- 1994	Water meters (domestic type)
781- 1984	Specifications for cast copper alloy screw down bib taps & stop cocks for water services
782- 1978	Specification for Caulking lead.
783- 1985	Code of practice for laying concrete pipes.
784- 2001	Pre-stressed concrete pipes.
884- 1985	Fire aid hose reel for firefighting (for fixed installation)
901 - 1988	Specification for couplings, double males & double female, instantaneous pattern for Fire Fighting
902 - 1992	Specification for suction hose couplings for Fire Fighting purposes.
903 - 1993	Couplings for fire hose delivery, branch pipe, nozzles specification
904 - 1983	Specification for 2 way and 3 way suction collecting headsfor Fire Fighting purposes.
905 - 1980	Specification for delivery breechings, dividing and collecting instant tenuous pattern for Fire Fighting
<b>IS CODE</b>	<b>SUBJECT</b>



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906 - 1988	Specification for revolving branch pipe for Fire Fighting
907 - 1984	Specification for suction strainer, cylindrical type for Fire Fighting purposes.
908- 1975	Fire Hydrants, Stand post type
909- 1992	Specifications for underground fire hydrants, sluice valve type
940 - 1989	Portable Fire Extinguisher, water Type (Gas Cartridge) - Specification
941- 1985	Specification for Blower and Exhauster for Fire Fighting.
1172- 1993	Code of basic requirements for water supply, drainage and sanitation
1200-1979 (Pt. 16)	Method of measurements for Laying of water and sewer lines including appurtenant items.
1200-1981 (Pt. 19)	Method of measurements for Water supply, plumbing and drains.
1230	Specifications for CI Rain Water pipes
1239- 2004 (Pt. I)	Specifications for Mild steel tubes
1239- 1992 ( Pt. II)	Specifications for Mild steel Tubular & other wrought steel pipe fittings
1300- 1994	Phenol molding material specification
1536- 2001	Specifications for Centrifugally cast iron (spun) pressure pipes for water, gas and sewage
1537- 1976	Specifications for Vertically cast iron pressure pipes for water, gas and sewage
1538- 1993	Cast iron fittings for pressure pipes for water, gas and sewage
1700- 1973	Drinking fountains
1701- 1960	Combination valve , mixing valves
1703- 2000	Ball valve (horizontal plunger type) including floats for water supply.
1711- 1984	Self-closing taps.
1726- 1991	Cast iron manhole covers and Frames.
1729- 2002	Cast /ductile iron drainage pipes & fittings for over ground NP pipeline S/S series.
1742- 1983	Code of practice for building drainage
1795- 1982	Pillar taps for water supply purposes
1879	Malleable Cast Iron Pipe Fittings
1978- 1982	Specification for line pipe (M S Seamless )
1979- 1985	Specification for high test line pipe
2065- 1983	Code of practice for water supply in buildings.
2097 - 1983	Specification for foam making branch pipe.
2104- 1981	Water meter boxes (domestic type)
2171 – 1999	Specification for portable fire extinguisher, dry powder (Cartridge Type)
2190- 1992	Code of practice for selection ,installation & maintenance of portable first-aid fire extinguishers

2267- 1995	Polystyrene molding and extension materials – specification
2326- 1987	Automatic flushing cistern for urinals
<b>IS CODE</b>	<b>SUBJECT</b>
2373	Specification for Water Meter (Bulk type)
2379- 1990	Color code for identification of pipe lines.
2401- 1973	Code of practice for selection, installation & maintenance of domestic water meters
2470 (Pt. I to II)	Code of practice for installation of septic tanks
2470- 1985 (Pt. I)	Design criteria & construction
2470- 1985 (Pt. II)	Secondary Treatment & disposal of septic tank effluent
2527- 1984	Code of practice for fixing rain water gutters and down pipes for roof drainage.
2546 - 1974	Specification for galvanized Mild Steel Fire bucket.
2548- 1996(Pt. I)	Plastic water closet seats and covers.
2548- 1996(Pt. II)	Plastic water closet seats and covers.
2556 (Pt. 1 to XV)	Specification for Vitreous (Vitreous China) sanitary appliances.
2556- 1994 (Pt.1)	General requirements
2556- 1994 (Pt.2)	Specific requirements of wash down water-closets
2556- 2004 (Pt.3)	Specific requirements of squatting pans
2556- 2004 (Pt. 4)	Specific requirements of wash basins
2556- 1994 (Pt.5)	Specific requirements of laboratory sinks
2556- 1995(Pt.6)	Specific requirements of urinals & partition plate
2556- 1995 (Pt.7)	Specific requirements of accessories for sanitary appliances
2556- 1995 (Pt.8)	Specific requirements of pedestal close coupled & wash down and siphon water closets
2556- 2004 (Pt.9)	Specific requirements of pedestal type bidets
2643- 1999	Type Threads where pressure tight joints are not mase on the threads dimension, tolerances and designation
2692- 1989	Specification for Ferrules for water services.
2800- 1991 (Pt. I)	Construction of tube well
2800- 1979 (Pt. II)	Testing of tube well
2878 - 2004	Fire Extinguisher, Carbon Dioxide Type (Portable and Trolley Mounted) – Specification.
2951 (Pt. I to II)	Recommendation for estimate of flow of liquids in closed conduits.
2951- 1965 (Pt. I)	Head loss in straight pipes due to frictional resistance
2951- 1965 (Pt. II)	Head loss in valves & fittings.
3006- 1979	Specification for Chemically resistant glazed S.W. pipes and Fitting
3076- 1985	Low density polyethylene pipes for potable water supply
3114- 1994	Code of practice for laying of Cast Iron pipes.
3311- 1979	Waste plug & its accessories for sinks & wash basins.
3328- 1993	Quality tolerances for water for swimming pools

3389- 1994	Urea formaldehyde molding materials
3486- 1966	Specification for Cast iron spigot and socket drain pipes
3489- 1985	Specifications for enameled steel bath tubs
3589- 2001	Specifications for steel pipes for water & sewage (168.3 to 2540 mm outside dia.)
3597- 1998	Method of test for concrete pipes.
<b>IS CODE</b>	<b>SUBJECT</b>
3844- 1989	Code of practice for installation and maintenance of internal fire hydrants Hose reels in premises.
3950- 1979	Specification for Surface boxes for sluice valve.
3989- 1984	Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings & accessories.
4038- 1986	Foot valves for water works purposes.
4111 (Pt. I to V)	Code of practice for ancillary structures in sewage system.
4111- 1986 (Pt. I)	Manholes
4111- 1985 (Pt. II)	Flushing tanks
4111- 1985 (Pt. III)	Inverted siphon
4111- 1968 (Pt. IV)	Pumping stations & pumping mains (rising mains)
4111- 1993 (Pt. V)	Tidal out-falls
4120- 1967	Tubs and baths.
4127- 1983	Code of practice of laying of glazed stone ware pipes.
4308 - 2003	Dry Chemical Powder for Fighting B & C class Fires– Specification.
4350- 1967	Specification for concrete porous pipes for under drainage.
4733- 1972	Methods of sampling & test for sewage effluents
4736- 1986	Specification for hot –dip zinc coating on mild steel tubes.
4854 (Pt. I to III)	Glossary terms for valves and their parts
4854- 1969 (Pt. I)	Screw down stop, check & gate valves & their parts
4854- 1968 (Pt. II)	Plug valves & cocks & their parts
4854- 1974 (Pt. III)	Butterfly valves
4927- 1992	Unlined flax canvass hose for fire fighting
4947 - 1985	Specification for gas cartridge for use in Fire extinguishers.
4984- 1995	Specifications for HDPE pipes for water supply
4985- 2000	Specifications for un plasticized PVC pipes for potable water supplies
5290- 1993	Specifications for Landing valves.
5312 (Pt. I)	Swing check type reflux (non return ) valves
5312- 1984 (Pt. I)	Reflux (non return ) valves – single door pattern
5329- 1983	Code of Practice for sanitary pipe work above ground for building
5330- 1984	Criteria for design for anchor blocks for pen-stocks with expansions joints.
5382- 1985	Specifications for rubber sealing rings for water, gas & sewer mains
5455- 1969	Cast iron steps for manholes
5600- 2002	Specifications for Sewage and drainage pumps

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5611- 1987	Code of Practice for waste stabilization ponds (Facultative type)
5714- 1981	Specifications for Hydrant stand-pipe for fire fighting
5822- 1994	Code of Practice for laying of welded steel pipes for water supply
5961- 1970	Specifications for CI grating for drainage purposes
<b>IS CODE</b>	<b>SUBJECT</b>
6234 - 2003	Portable fire Extinguisher water Type (Stored Pressure) – Specification.
6279- 1971	Equipment for grit removal
6280- 1971	Sewage screens
6295- 1986	COP for water supply & drainage in high altitude & / or sub-zero region
6392- 1971	Steel pipe flanges
6411- 1985	Specifications for gel coated glass fiber reinforced polyester resin bath tubs
6418- 1971	Cast Iron & malleable flanges for general engineering Purpose
6494- 1988	COP for water proofing of underground water tanks & swimming pools
6587- 1987	Specifications for Spun hemp yarn
7181- 1986	Horizontally Cast Iron Double Flanged pipe for water, gas & sewage.
7231- 1994	Specifications for Plastic Flushing Cisterns for water closet & urinals
7558- 1974	Code of Practice for domestic hot water installations
7634 (Pt. I to III)	Code of Practice for Plastic pipe work for potable water supplies
7634- 1975 (Pt. I)	Choice of materials & general recommendations
7634- 1975 (Pt. II)	Laying & jointing polyethylene (PE) pipes
7634- 2003 (Pt. III)	Laying & jointing un plasticized PVC pipes
7740- 1985	Code of Practice for road gullies
7834 (Pt. I to VIII)	Injection molded PVC socket fittings with solvent cement joints for water supplies
7834 - 1987(Pt. I)	General requirements
7834- 1987 (Pt. II)	Specific requirements for 45 0 elbows
7834- 1987 (Pt. III)	Specific requirements for 90 0 elbows
7834- 1987 (Pt. IV)	Specific requirements for 90 0 tees
7834- 1987(Pt. V)	Specific requirements for 45 0 tees
7834- 1987 (Pt. VI)	Specific requirements for sockets
7834- 1987(Pt. VII)	Specific requirements for unions
7834- 1987 (Pt. VIII)	Specific requirements for caps
8008 (Pt. I to VII)	Injection molded HDPE fittings for potable water supplies
8008- 2003 (Pt. I)	General requirements for fittings
8008- 1976 (Pt. II)	Specific requirements for 90 0 bends
8008- 2003 (Pt. III)	Specific requirements for 90 0 tees

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8008- 2003 (Pt. IV)	Specific requirements for reducers
8008- 2003 (Pt. V)	Specific requirements for ferrule reducers
8008- 2003 (Pt. VI)	Specific requirements for pipe ends
8008- 2003 (Pt. VII)	Specific requirements for sandwich flanges
8090- 1976	Coupling, branch pipe, nozzle used in hose reel tubing for fire fighting
8329- 2000	Centrifugally cast (spun) ductile iron pressure pipes & fittings for water, gas & sewage
8413 (Pt. I)	Requirements for biological treatment equipment
<b>IS CODE</b>	<b>SUBJECT</b>
8718- 1978	Specifications for vitreous enameled steel kitchen sinks
8727- 1978	Specifications for vitreous enameled steel wash basin
8835- 1978	Guideline for planning and design of surface drains.
8931- 1993	Specifications for copper alloys Fancy single taps, combination tap assembly & stop valves for water services
9140- 1996	Method of sampling of vitreous & fire clay sanitary appliances
9338- 1984	Specifications for Cast Iron screw down stop valves and stop & check valves for water works purposes
9739- 1981	Specifications for Pressure reducing valves for Domestic water supply system.
9758- 1981	Flush valves and Fittings for water closets and urinals
9762- 1994	Specifications for polyethylene floats for float valves
9763- 2000	Specifications for Plastic Bib taps, pillar taps, angle valves and stop valves for hot & cold water service.
10221- 1982	Code of practice for coating and wrapping of underground M.S. steel pipeline,
10500- 1991	Specification of Drinking water
11189- 1985	Method of tube well development
11606 - 1986	Method for sampling of cast iron pipes and fittings.
11632 - 1986	Rehabilitation of Tube well
12183- 1987 (Pt. I)	Code of practice for Plumbing in multi-storied buildings (for water supply)
12231 - 1987	UPVC pipes for section & delivery lines of agricultural pumps–Specification.
12235 - 1986	Method of test for UPVC pipe for potable water supply
12288 - 1987	Code of practice for use and laying of Ductile Iron pipes.
12469 - 1988	Specifications for pumps
12592- 2002	Precast concrete frame & cover ( SFRC frame & cover )
12701-1996	Specifications for rotational molded polyethylene water storage tanks
12709 - 1994	Glass fiber reinforce plastic(GRP) pipes, joints & fittings for use for potable water supply – Specification.
12818 - 1992	Spn. for UPVC ribbed screen casing & plain casing pipes for bore / tube well
12820 - 1989	Dimensional Req. of Rubber Gaskets for Mechanical Joints

	& push in joints for use with Cast Iron Pipes & fittings for carrying water, Gas & sewage.
13095 - 1991	Butterfly valves for general purposes
13114 - 1991	Spn. for forged brass gate, globe & check valves for water works purposes
13382-2004	Cast Iron specials for mechanical & push-on flexible joints for pressure pipelines for water, gas & sewage
13592- 1992	Specifications for PVC soil, waste & rain water (SWR) including ventilation pipes
13593 - 1992	UPVC pipes fittings for use with section and delivery lines for Agricultural pumps – Specification.
<b>IS CODE</b>	<b>SUBJECT</b>
13916 – 1994	Code of practice for installation of GRP piping system.
13983-1994	Specifications for stainless steel kitchen sinks & drain boards for domestic purpose
14333-1996	Specification for HDPE pipes for sewerage system.
14402-1996	GRP pipes, joints & fittings – Specification.
14735-1999	UPVC injection molded fittings for UPVC – SWR pipes – Specifications.
IS CODE	SUBJECT
14845- 2000	Resilient seated cast iron air relief valves for water works purposes – Spn
14846- 2000	Specifications for sluice valve for water works purposes (50 to 1200 mm size )
15265 – 2003	Specifications for flexible PVC pipes or polymer reinforcement thermo plastic hoses for suction and delivery lines for Agricultural pumps.
15328 – 2003	UPVC non pressure pipes for use in underground drainage and sewerage system – Specifications.
15450- 2004	Polyethylene/Aluminum/Polyethylene composite pressure pipes for hot and cold water supplies – Specifications.

## **SECTION 2: TECHNICAL SPECIFICATIONS**

### **1.0 SANITARY & CP FIXTURES**

#### **1.1 GENERAL REQUIREMENTS**

1. Sanitary fixtures shall be of the best quality confirming to specification and subject to the approval of the Architect/Consultants. Wherever particular makes are mentioned, the choice of selection shall remain with the Owner/Architect.
2. All Appliances, fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Quantities, specifications, and drawings. Accessories shall include proper fixing arrangement, brackets, nuts, bolts, screws and required connection pieces.
3. Fixing screws shall be half round head chromium plated brass screws with C.P. washers where necessary.
4. Porcelain sanitary ware shall be glazed vitreous china of first quality free from warps, cracks and glazing defects confirming to I.S. 2556.
5. Chromium plated fittings shall be cast brass chromium plated of the best quality approved by the Owner/ Architects. Fixture Finishes like mirror/ mat/ or any other shall be as directed by Architect.
6. All materials shall be rust proof; materials in direct/ indirect contact shall be compatible to prevent electrolytic or chemical (bimetallic) corrosion.
7. Sanitary appliances, subject to the type of appliance and specific requirements, shall be fixed in accordance with the relevant standards/ best practices by skilled labours.
8. All Appliances, fittings and fixtures shall be fixed in a neat workmanlike manner true to level and heights shown on the drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, Filing Plaster, Paint, insulation or terrace shall be made good by the Contractor at his own cost.
9. CP Wall flanges shall be provided on walls, floors, etc. wherever supply/



discharge pipes pierce through them. These flanges/ fittings shall be large enough to cover punctures properly.

10. In case of free supply of sanitary wares & CP fittings by Client, the contractor shall be responsible for transportation of those items to the site, storage & proper handling till execution ends, installation/ fixing of these materials with required hardware, testing & commissioning.
11. Contractor shall, during the entire period of installation and afterwards protect the appliances by providing suitable cover or any other protection so as to absolutely prevent any damage to the appliances until handing over. (The original protective wrapping shall be left in position for as long as possible).
12. The appliance shall be fixed in a manner such that it will facilitate subsequent removal if necessary.
13. All appliances shall be securely fixed. Manufacturers' brackets and fixing methods shall be used wherever possible. Compatible rust- proofed fixings shall be used. Fixing shall be done in a manner that minimizes noise transmission.
14. Pipe connections shall be made with demountable unions. Pipe work shall not be fixed in a manner that it supports or partially supports an appliance.
15. Appliances shall be fixed so that water falls to the outlet.
16. Appliances shall be fixed true to level firmly fixed to anchor or supports provided by the manufacturer and additional anchors or supports where necessary.
17. Fixtures shall be generally installed at following heights or as directed by Architect/ Engineer in charge.

Water Closet	:	390 mm to top of bowl rim
Bidet	:	390 mm to top of bowl rim
Urinal	:	650 mm to top of bowl rim
Wash basin/ Sink	:	750-800 mm to top of bowl rim

18. Joints/ gaps between all sanitary appliances/fixtures & the floor/wall shall be caulked with an approved quality sealant, having antifungal properties, colour & shade to match that of the appliances/fixture & floor/wall to the extent possible.
19. Care shall be taken in fixing all approved CP fixtures & accessories so as not to leave any tool marks or damage on the finish. All fixtures shall be tightened with fixed spanner.
20. All fixtures shall be thoroughly tested after connecting the drainage & water supply system. All fixtures shall be thoroughly finished & any leakage in piping/

valves/ waste fittings shall be corrected to the complete satisfaction of Engineer in charge.

21. Upon completion of work, all labels, stickers, plaster, etc. shall be removed from the fixtures & all fixtures shall be cleaned with soap & water so as to present a neat & clean toilet.

## **1.2 EUROPEAN W.C.**

### **1.2.1 SCOPE**

1.2.1.1 The item pertains for providing white or color glazed vitreous chinaware European water closet with seat and cover of size and color as specified in the schedule or as directed by Architect including all accessories & fixing, testing & commissioning.

### **1.2.2 MATERIAL**

1.2.2.1 European W.C. shall be wash down type single or double siphonic type, floor or wall mounted set with integral 'P' or 'S' Trap set & shall conform to IS 2556 (Part I & II). The trap shall have minimum water seal of 50 mm.

1.2.2.2 The closet shall be of one piece construction and shall have minimum two hole of 6.5 mm diameter for fixing closet to floor. Closet shall have integral flushing rims of self draining type.

1.2.2.3 Each WC shall be provided with 110 mm (OD) Pan Connector connecting ceramic outlet of WC to soil pipe.

1.2.2.4 Each European W.C. set shall be provided with a solid plastic seat with cover in conformity to IS: 2548 Part I & II & of colour given in the schedule of quantities. They shall be made of molded from PP heavy duty material which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects & shall have rubber buffers and chromium plated hinges.

1.2.2.5 Each Anglo Indian W.C. shall be flushed with concealed/ exposed flushing cistern or an exposed or concealed type manual flush valve or sensor faucet as specified in bill of quantities. Material of cistern shall be Porcelain/ HDPE or as specified in schedule of quantities. Valves shall be of chromium plated brass. The flushing system shall be provided with all inlet/ outlet & overflow connections.

1.2.2.6 Optionally, European W.C. shall be with coupled cistern directly mounted on WC with single or dual flow discharge as mentioned in schedule of quantities

### **1.2.3 FIXING**

1.2.3.1 The water closet pan shall be placed in position as shown in the drawing. If the pan trap is damaged during handling or fixing, it shall be replaced by the contractor at his own cost.

- 1.2.3.2 WC shall be fixed to floor using SS or non ferrous screws. Wall hung W.C. shall be supported by C.I. floor mounted chair with 75 mm. long 6.5 mm. diameter counter sunk bolts and nuts embedded in the wall concrete using rubber or fiber washers so as not to allow any lateral displacement. The pan, soil pipe shall be jointed in 1:1 Cement Mortar with hemp yarn caulked.
- 1.2.3.3 Joints between W.C. and flush pipe shall be made with a putty or white lead and linseed oil and caulked well or with an approved rubber joint.
- 1.2.3.4 The gap between W.C. and floor shall be finished with white/matching cement and sand as directed.
- 1.2.3.5 Seat and cover shall be fixed to the Pan by two corrosion resistance hinge with 65 mm shank and threaded to within 25 mm from of flange. Seat shall be fixed in level by providing the washers of rubber with non ferrous or stainless steel washer to bolt. Plastic seat shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C.
- 1.2.3.6 Each WC shall be fixed with concealed/ exposed/ coupled flushing cistern/ manual flush valve/ sensor faucet with required brackets, hardware & accessories.

#### **1.2.4 RATES**

- 1.2.4.1 European type water closet with an integral `P` or `S` trap & plastic seat cover, etc.
- 1.2.4.2 Flushing Cistern/ Flush Valve with fixing brackets (only if called in BOQ).
- 1.2.4.3 Cast Iron Chair/ Bracket, Screws, Hardware.
- 1.2.4.4 Jointing & fixing material.
- 1.2.4.5 Cutting slab/ beam etc. wherever required. And making all damages good to original condition after completion of work.
- 1.2.4.6 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 1.2.4.7 Testing the entire system and rectification of defect if any.
- 1.2.4.8 All necessary labor, material and use of tools.

#### **1.2.5 MODE OF MEASUREMENT**

- 1.2.5.1 The measurement shall be for each unit of W.C. fixed.

#### **1.2.6 MODE OF PAYMENT**

- 1.2.6.1 The contract rate shall be for each unit of W.C. fixed.

### **1.3 URINAL**

#### **1.3.1 SCOPE**

- 1.3.1.1 The item pertains for providing white or color glazed vitreous chinaware Urinals of

type, size and color as specified in the schedule or as directed by Architect including all accessories & fixing, testing & commissioning.

## **BOWL TYPE**

### **1.3.2 MATERIAL**

- 1.3.2.1 Urinal basin shall be flat back or angle wall type lipped in front. The vitreous china conforming to IS 2556 (Part VI). Urinal shall have an integral flushing rim and inlet or supply horn for connecting flush pipe. Flushing rim and inlet shall be of the self draining type. At bottom of basin and outlet horn for connecting outlet shall be provided. The inside surface of the urinal shall be uniform and smooth throughout to ensure efficient flushing.
- 1.3.2.2 They shall be of vitreous china conforming to IS:2556 (Part-VI) constructed in one piece with providing slot or alternative fixing arrangement at flat back and where the integral flushing rim is not provided, they shall be provided with ridges inside the bowl to divert towards the front line of the urinal.
- 1.3.2.3 The flushing arrangement to urinals for single or in range shall be of CP brass with CP brass spreader of 15 mm diameter conforming to IS: 407.
- 1.3.2.4 Urinals shall be flushed by means of flushing cistern, exposed or concealed type as specified in schedule of quantities. Flushing cistern for urinals shall be automatic valve less type. Each flushing cistern shall have a copper siphon and inlet noose cock to control the flow and shall conform to IS 774 with necessary union & couplings for connection with inlet, outlet & overflow pipes.
- 1.3.2.5 Recommended capacity of flushing cistern & size of flush pipe shall be as below:

Nos. of urinals in range	Capacity of flush tank	Size of C.P. brass Flush pipe	
		Main	Distribution
One	5 liters		15 mm
Two	10 liters	20 mm	15 mm
Three	10 liters	25 mm	15 mm
Four	15 liters	25 mm	15 mm

- 1.3.2.6 Alternatively, urinals shall be flushed with flush valves, exposed or concealed manual type or by infrared sensor operated faucet with complete kit of plumbing, infra-red photo cells, solenoid valve and flush plate. The automatic flush sensor plate shall be flush and press fitted and shall be of high quality mirror polish finish. Each urinal shall be provided with one flush valve unit.
- 1.3.2.7 Urinals shall be provided with 32 mm P trap or bottle trap further connected to

waste pipe.

- 1.3.2.8 Each Urinal outlet shall be provided with Brass dome shaped removable grating.
- 1.3.2.9 Where a floor channel is provided, tread plates shall be fitted to drain into channel. Channel shall be of fire clay, white inside & top edges, 100 mm diameter to dispose waste from urinals to the trap.
- 1.3.2.10 Urinal Flush pipes shall be GI/ rigid PVC pipes.
- 1.3.2.11 Urinal partitions shall be white glazed vitreous china or 25mm thick marble of size specified in the schedule of quantities or directed by Architect.

### **1.3.3 FIXING**

- 1.3.3.1 Bowl type Urinal shall be fixed to wall in position by using rawl plug, wooden plug, C.P screws etc. It shall be fixed at height of 65 cm from the standing level to the top of the lip of urinal or as recommended by manufacturer or directed by the Engineer-in-charge.
- 1.3.3.2 Flushing cistern shall be fixed to wall with R.S. or C.I. brackets. The brackets shall be painted with two coats of white enamel paint. Cistern may be concealed in pipe shafts or false ceilings if required as directed by Architect.
- 1.3.3.3 The cistern shall be connected with Urinal by means of standard GI/ rigid PVC flush pipe with CP brass wall clips & unions in concealed/ exposed manner. The joint between Urinal, flush & waste pipe shall be made of putty or white lead mixed with chopped hemp. Flush pipe can also be concealed as directed by Architect/ Engineer in charge.
- 1.3.3.4 The urinal shall be connected to waste pipe through P trap/ bottle trap which shall discharge Urinal waste to the floor channel or floor trap.
- 1.3.3.5 Urinal partitions shall be fixed at proper heights with CP brass bolts, anchor fasteners and MS clips as recommended by the manufacturer and directed by the Architect/ Consultants.

### **SQUATTING PLATE URINALS**

#### **1.3.4 MATERIAL**

- 1.3.4.1 The urinals shall have squatting plates – single or in range, glazed fire clay channel, automatic flushing cistern, flush pipe with fittings, spreader & Trap.
- 1.3.4.2 Dimensions are generally 60 cm x 16.5 cm or 45 cm x 12.5 cm or as specified in schedule of quantities.

1.3.4.3 Urinals shall be flushed by means of flushing cistern, exposed or concealed type as specified in schedule of quantities. Flushing cistern for urinals shall be automatic valve less type. Each flushing cistern shall have a copper siphon and inlet noose cock to control the flow and shall conform to IS 774 with necessary union & couplings for connection with inlet, outlet & overflow pipes.

1.3.4.4 Recommended capacity of flushing cistern & size of flush pipe shall be as below:

Nos. of urinals in range	Capacity of flush tank	Size of C.P. brass Flush pipe	
		Main	Distribution
One	5 liters		20 mm
Two	10 liters	25 mm	20 mm
Three	15 liters	32 mm	15 mm
Four	15 liters	32 mm	15 mm

1.3.4.5 There shall be 100 mm diameter white glazed fire clay channel with stop & outlet pieces which shall discharge Urinal waste into 65 mm dia. CI standard trap having 65 mm CP brass outlet grating.

1.3.4.6 Squatting plate shall have 1200 mm high & 100 mm thick partition walls in front & either side of plate.

### 1.3.5 FIXING

1.3.5.1 The floor shall be suitable sunk to provide squatting Urinals, if it is not sunk, the squatting urinals shall be provided over a platform.

1.3.5.2 Top edge of the squatting plate shall be flushed with finished floor. It shall be embedded in layer of 25 mm thick cement mortar 1:6 laid over a bed of 1:5:10 cement concrete.

1.3.5.3 Flushing cistern shall be fixed to wall with R.S. or C.I. brackets. The brackets shall be painted with two coats of white enamel paint. Cistern may be concealed in pipe shafts or false ceilings if required as directed by Architect.

1.3.5.4 The cistern shall be connected with Urinal by means of standard GI/ rigid PVC flush pipe with CP brass wall clips & unions. The joint between Urinal, flush & waste pipe shall be made of putty or white lead mixed with chopped hemp. Flush pipe can also be concealed as directed by Architect/ Engineer in charge.

1.3.5.5 100 mm diameter, white glazed fire clay channel with stop & outlet pieces shall be fixed in floor in cement mortar 1:3 & joint flushed with white cement.

1.3.5.6 Exposed surface of Squatting plate partitions shall be lined with white glazed tiles with proper corners & angles set in neat cement mortar & finished with white cement.

## STALL URINALS

### 1.3.6 MATERIAL

1.3.6.1 The stall urinal and its screen shall be glazed fire clay conforming IS: 771 (Part- III, Sec-2). The inside surface of stall and screen shall be regular and smooth throughout to ensure efficient flushing.

1.3.6.2 The flushing arrangement to urinals for single or in range shall be of CP brass with CP brass spreader of 15 mm diameter conforming to IS: 407.

1.3.6.3 Urinals shall be flushed by means of flushing cistern, exposed or concealed type as specified in schedule of quantities. Flushing cistern for urinals shall be automatic valve less type. Each flushing cistern shall have a copper siphon and inlet noose cock to control the flow and shall conform to IS 774 with necessary union & couplings for connection with inlet, outlet & overflow pipes.

1.3.6.4 Recommended capacity of flushing cistern & size of flush pipe shall be as below:

Nos. of urinals in range	Capacity of flush tank	Size of C.P. brass Flush pipe	
		Main	Distribution
One	5 liters		15 mm
Two	10 liters	20 mm	15 mm
Three	15 liters	25 mm	15 mm
Four	15 liters	25 mm	15 mm

1.3.6.5 Alternatively, urinals may be flush with flush valves, exposed or concealed manual type or by infrared sensor operated flush valve with complete kit of plumbing, infrared photo cells, solenoid valve. The automatic flush sensor plate shall be flush and press fitted and is of high quality mirror polish finish. Each urinal shall be provided with one flush valve unit.

1.3.6.6 Urinals shall be provided with 32 mm P trap or bottle trap.

1.3.6.7 Each Urinal outlet shall be provided with Brass dome shaped removable grating.

1.3.6.8 Where a floor channel is provided, tread plates shall be fitted to drain into channel. Channel shall be of fire clay, white inside & top edges, 100 mm dia. To dispose waste from urinals to the trap.

1.3.6.9 Urinal Flush pipes shall be GI/ rigid PVC pipes concealed in wall or exposed as directed by Engineer in charge.

1.3.6.10 Urinal partitions shall be white glazed vitreous china or 25mm thick marble of size specified in the schedule of quantities.

### 1.3.7 FIXING



- 1.3.7.1 The lip of the stall urinal shall be flush with the finished floor level. The stall urinal shall be laid over a fine sand cushion on average 25 mm thickness. The gap between wall surface, finished floor level and urinals shall not be more than 3mm and filled with water proofing plastic compound.
- 1.3.7.2 Flushing cistern shall be fixed to wall with R.S. or C.I. brackets. The brackets shall be painted with two coats of white enamel paint. Cistern may be concealed in pipe shafts or false ceilings if required as directed by Architect.
- 1.3.7.3 The cistern shall be connected with Urinal by means of standard GI/ rigid PVC flush pipe with CP brass wall clips & unions in concealed/ exposed manner. The joint between Urinal, flush & waste pipe shall be made of putty or white lead mixed with chopped hemp. Flush pipe can also be concealed as directed by Architect/ Engineer in charge.
- 1.3.7.4 The urinal shall be connected to waste pipe through P trap/ bottle trap which shall discharge Urinal waste to the floor channel or floor trap.
- 1.3.7.5 Urinal partitions shall be fixed at proper heights with CP brass bolts, anchor fasteners and MS clips as recommended by the manufacturer and directed by the Architect/ Consultants.

### **1.3.8 RATES**

- 1.3.8.1 Glazed Urinals (single or in range) and CP brass pipe flushing pipe, spreader.
- 1.3.8.2 Flushing Cistern/ Manual or Sensor operated Flush Valves with brackets & hardware (if called in BOQ).
- 1.3.8.3 Waste coupling & P/Bottle trap.
- 1.3.8.4 Jointing & fixing materials.
- 1.3.8.5 CI brackets, Screws, Hardware.
- 1.3.8.6 Urinal Partitions with fixing accessories.
- 1.3.8.7 Cutting hole wherever required and making all damage good to original condition after completion of work.
- 1.3.8.8 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 1.3.8.9 Testing the entire system and rectification of defects if any.
- 1.3.8.10 All necessary materials, labor and use of tools.

### **1.3.9 MODE OF MEASUREMENT**

- 1.3.9.1 The measurement shall be for each unit of urinal set (single or range) fixed.

### **1.3.10 MODE OF PAYMENT**

- 1.3.10.1 The contract rate shall be for each unit of urinal set (single or range) fixed.



## 1.4 FLUSHING CISTERN

### 1.4.1 SCOPE

1.4.1.1 The item pertains for providing Plastic/ Porcelain/ CI flushing cistern of size, flow and color as specified in the schedule or as directed by Architect including all accessories & fixing, testing & commissioning for water closets & urinals.

1.4.1.2 The flushing cisterns shall be automatic or manually operated high level or low level, single/ twin flush flow, exposed/ concealed as specified in schedule of quantities.

### 1.4.2 MATERIAL & FIXING

1.4.2.1 The materials for manufacturing various components of the flushing cisterns shall conform to the requirements given below:

Sr.	Component	Material	Conforming to
1	Cisterns	High Density Polyethylene (HDPE) OR Polystyrene, high impact OR Polypropylene 1 OR Acrylonitrile butadiene styrene (ABS) OR Glass Fiber reinforced plastic (GRP)	IS: 7328  IS: 2267
2	Flush Pipe	Steel tube, seamless or welded, medium or light, completely protected inside and outside by hot-dip galvanizing, electroplating or vitreous enameling OR Lead pipe OR Copper alloy tube OR High density polyethylene pipe OR Unplasticized PVC plumbing pipe	IS: 1239 (Part 1) IS: 404 (Part 1) IS: 407 IS: 2501
3	Cover	Same material as that of the body	-
4	Chain	Hot-dip galvanized steel wires Or Inter-locked non-ferrous metal Or Any other-corrosion resistant material	
5	Overflow Pipe	High density polyethylene Or Unplasticized PVC Or Any other corrosion-resistant material	IS 4984; IS 4985

6	Siphon/Valve	High density polyethylene Or Polystyrene, high impact Or Polypropylene Or Acrylonitrile-butadiene-styrene Or Glass fiber reinforced plastic (GRP)	IS 7328; IS 2267
7	Operating Mechanism/L	Non-ferrous metal or any other corrosion-resistant material	-

	ever		
8	Float Valve	As specified in IS: 1703 Or IS: 12234 Or IS: 13049	-
9	Polyethylene float for float valve	As specified in IS: 9762	-
10	Coupling nut and lock-nut	Non-ferrous metal, Or Hot-dip galvanized steel Or Hot-dip galvanized malleable iron Or Any other non-corrosive metal Or Injection-molded HDPE/Polyacetal	-

Note: Where the requirements for the material are not specified, it shall be as directed by the Engineer in Charge.

- 1.4.2.2 When there is no clearance anywhere in it which would permit a 1.6 mm diameter wire to pass through. The outlet of each siphon or stand pipe or flush valve shall be securely connected to the cistern by means of a lock nut. In the case of plastic siphon, it shall be provided with suitable means of ensuring and maintaining watertight and airtight joint to the cistern.
- 1.4.2.3 The cistern shall be provided with a removable cover which shall fit closely and shall be secured against displacement. In designs, where the operating mechanism is attached to the cover, the cover may be made in two sections, the section supporting the mechanism being securely fixed or booked to the body.
- 1.4.2.4 Concealed cistern shall be in HDPE construction with front & top access panel. The installation shall have integral isolation valve & internal overflow warning. It shall have push fit inlet & flush pipe. Cistern shall be provided with fixing bracket & all accessories.
- 1.4.2.5 The flush pipe (except plastic flush pipe) shall have an internal diameter of 32 + 1 mm for high level cistern and 38 + 1 mm for low level cistern. The steel flush pipe shall be not less than 1 mm thick whereas the lead flush pipe shall have a minimum thickness of 3.5 mm. For high density polyethylene pipes, the outside diameter of the pipes shall be 40 mm. For unplasticized PVC plumbing pipes the outside

diameter of the pipe shall be 40 mm for high level cisterns, and 50 mm for low level cisterns. In the case of high level flushing cisterns, a pipe clip fitted with a rubber buffer shall be fixed to the flush pipe to prevent damage either to the pipe or to the seat when the seat is raised. No flush pipe is required for coupled cisterns.

1.4.2.6 A high level cistern is intended to operate with minimum height of 125 cm and a low level cistern with a maximum height of 30 cm between the top of the pan and the underside of the cistern.

1.4.2.7 The thickness of the body including cover at any point shall not be less than 2 mm for GRP, and not less than 3 mm for other plastic materials. The cistern shall be free from manufacturing faults and other defects affecting its utility. All working parts shall be designed so as to operate smoothly and efficiently.

1.4.2.8 The cistern shall be mosquito-proof. It shall be deemed to be mosquito proof only  
Note: The minimum thickness specified is for normal conditions of service. Where highly corrosive atmospheres are expected, greater thicknesses are required to be provided as per nomenclature of the item.

1.4.2.9 Flush Pipe Connection to Cistern:

a) The flush pipe shall be securely connected to cistern outlet and made airtight by means of a coupling nut. The nuts made of injection-molded HDPE/ Polyacetal may be used only if the end pipe is also made of plastic. The nominal internal diameter of the cistern outlet shall be not less than 32 mm and 38 mm for high-level and low-level cisterns respectively.

b) The screw thread for connection to the flush pipe shall not be less than size 1½ of IS 2643 (Part 3). In the case of polyethylene and unplasticized PVC flush pipes, the upper end of the flush pipe shall be provided with suitable means of ensuring and maintaining a watertight and airtight joint to the flushing cistern. When ordered for use with a flush pipe, the outlet connection may be supplied with coupling nut made of copper based alloy or other non-corrodible material and a plain tail piece having a minimum length of 60 mm. The centre of the outlet hole shall be generally central to the length of the cistern. The length of the outlet shall be 37±2 mm in case of interchangeable siphon; however, where integral siphon is provided, the outlet length shall be 20±2 mm.

Note: The length of the cistern outlet shall be the dimension from the bottom surface of the cistern to the end of the outlet after the cistern with siphon/ stand pipe has been duly fitted with all washers, lock-nuts, etc.

1.4.2.10 Inlet and Overflow Holes

a) The cistern shall be provided with inlet and overflow holes, situated one at each end, which shall be capable of accommodating overflow pipe of not less than 20 mm nominal bore and a 15 mm size float valve. The holes shall be cleanly molded or drilled and the adjacent surfaces shall be smooth.

1.4.2.11 Float Valve

- a) The float valve shall be 15 mm nominal size and shall conform to IS 1703 or IS 12234 or IS 13049.

1.4.2.12 Operating Mechanism Lever

- a) The operating mechanism/lever shall not project beyond the side of the cistern for a distance greater than 350 mm measured from the centre of the cistern to the end of the lever arm. The lever arm shall be provided with a suitable hole near the end through which a split rings or S-hook can be inserted. A string (chain) shall be attached to the ring or hook. When S-hook is employed, it shall be effectively closed after assembly to prevent accidental disconnection.

- b) In the case of low-level cisterns, where the mechanism is handle operated, the handle, whether situated on the front (Face Plate) or at the end of the cistern, shall be within the projection limit. Particular attention shall be given to the case of operation of the handle.

c) String (Chain)

The string (chain) shall be of such strength as to sustain a dead load of 500 N without any apparent or permanent deformation.

The string (chain) shall terminate in a suitable handle or pull made of a molding in any heat resisting and non-absorbent plastic or any other equally suitable material. The finish shall be smooth and all burrs which are liable to cause injury to the hand when gripped shall be removed.

- d) Optionally, pneumatically operated flush push buttons/ plates/ Electronic sensors are to be provided for operation of cistern

1.4.2.13 Overflow Pipe

- a) The overflow pipe shall be of not less than 20 mm nominal bore and shall incorporate a non-corrodible mosquito-proof device secured in a manner which will permit it to be readily cleaned or renewed when necessary. No provision shall be made whereby the overflow from the cistern shall discharge directly into the water-closet or soil pipe without being detected.

- b) The invert of the overflow pipe in the case of high-level and low level cisterns and the top edge of the overflow pipe in the case of coupled cistern shall be 19 mm (Min) above the working water level. In case of overflow due to any reason, water should drain out through the overflow pipe and not through the siphon pipe.

1.4.2.14 Finish

The surface of the cistern including cover shall be free from blisters and delamination and reasonably free from flow lines, streaking or colour variations. The cistern and cover shall be opaque to light.

### **1.4.3 Operational and Performance Requirements**

#### **1.4.3.1 Flushing Arrangement**

The cistern under working conditions and with the float valve in closed position shall operate on a single operation of the operating mechanism/lever without calling for a sudden jerk in pulling. If a valve is used instead of siphon for flushing purposes, the valve shall be completely leak proof.

#### **1.4.3.2 Working Water Level**

The working water-level shall be a minimum of 6.5 cm. below the effective top edge of the cistern and shall be legibly and permanently marked on the inside of the cistern. Effective top edge shall be taken on edge after top of the body without considering bead.

#### **1.4.3.3 Freedom from Self Siphonage**

The siphon system shall be capable of being rapidly brought into action when the water is at the working water level, but shall not self siphon or leak into the flush pipe when the water is up to 1 cm above the invert of the overflow pipe.

#### **1.4.3.4 Reduced Water Level**

The discharge shall operate satisfactorily when the cistern is filled to a level up to 1 cm. below the working water level.

#### **1.4.3.5 Discharge Capacity**

When tested in accordance with IS 7231, cistern of 5 liters and 10 liters capacities, when required to give a full flush, shall respectively discharge 5 liters and 10 liters with variation of  $\pm 0.5$  liters. Dual-flush cistern of 10 liters capacity shall discharge alternatively a short flush of  $5 \pm 0.5$  liters. Dual flush cistern of 6/3 or 4/2.6 liters capacity shall discharge  $6 \pm 0.5$  liters or  $4 \pm 0.5$  liters and alternatively a half flush of  $3 \pm 0.5$  or  $2.6 \pm 0.5$  liters.

#### **1.4.3.6 Discharge Rate**

When tested in accordance with IS 7231, the discharge rate shall be  $10 \pm 0.5$  liters within 6 seconds and  $5 \pm 0.5$  liters within 3 seconds for cistern of capacities 10 liters and 5 liters and  $6 \pm 0.5$  liters within 6 second and  $3 \pm 0.5$  liters within 3 second for cistern of 6/3 liters capacity respectively. The cistern shall be so designed that there is no appreciable variation in the force of the flush during the discharge of the required quantity of water. For coupled cisterns, this test shall not be applicable.

### **1.4.4 Special Requirements**

#### **1.4.4.1 Distortion Resistance Test**

The cisterns, complete with its fittings, shall be installed and filled with water to the marked water line and observed for any distortion. The cistern shall not budge more than 6 mm and the cover shall not be dislodged.

#### 1.4.4.2 Dead Load Test

When the flushing mechanism incorporates chain pull or hand operated lever, the cistern, complete with its fittings, when installed and filled with water to the marked water line and tested by the application of a dead load of 230 N applied 6 mm from the end of the operating lever arm for 30 seconds, shall not distort to such an extent that any part becomes detached. In the case of other operating mechanism, the dead load applied shall be a mass equivalent to the operating force required to overcome the normal hydrostatic head; Thirty seconds after the load is removed, the function and appearance of the cistern shall not be impaired.

#### 1.4.4.3 Front Thrust Test

The front thrust test shall be applied only to cisterns intended for low level use. The cistern complete with its fittings, when installed and filled with water to the marked water line and tested by the method described in IS 7231, shall not distort to such an extent as to be inoperable or unsightly when the load is removed.

#### 1.4.4.4 Impact Test

The cistern, complete with its fittings, when installed and filled as described in IS 7231 shall show no defect after one impact. Repeat the test but with the cistern empty. The cistern shall show no defect after the further impact.

### 1.4.5 RATES

1.4.5.1 Concealed/ Exposed high/ low level cistern with flush pipe.

1.4.5.2 Operating mechanism like lever/ chain/ pneumatic push buttons/ push plates/ electronic sensor.

1.4.5.3 Fixing Brackets, Accessories & Hardware.

1.4.5.4 Jointing & fixing material.

1.4.5.5 Cutting hole/ cutout in wall wherever required and making all damage good to original condition after completion of work.

1.4.5.6 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.

1.4.5.7 Testing the entire system and rectification of defects if any.

1.4.5.8 All necessary materials, labor and use of tools.

### 1.4.6 MODE OF MEASUREMENT

1.4.6.1 The measurement shall be for each unit of Flushing Cistern fixed.

### 1.4.7 MODE OF PAYMENT

1.4.7.1 The contract rate shall be for each unit of Flushing Cistern fixed.

## 1.5 LAVATORY BASIN

### 1.5.1 SCOPE

1.5.1.1 The item pertains to for providing flat back/ angle back/ over or under counter



type, with or without pedestal colored or white glazed vitreous china/ glass of best quality, size, shape and type specified in the Schedule of Quantities or as directed by Architect including all accessories & fixing, testing & commissioning.

## **1.5.2 MATERIAL**

- 1.5.2.1 Wash basin shall conform to IS 2556 (Part IV) and I.S. 771-1979 & shall be of one piece construction.
- 1.5.2.2 Wash basin shall be provided with single tap/ double tap holes of size 28 mm square or 30 mm rounded.
- 1.5.2.3 Half/ full Pedestal shall be of same glazing as that of wash basin.
- 1.5.2.4 Each basin shall be provided with 32mm diameter C.P. waste coupling with overflow, pop-up waste or rubber plug and chain as given in the schedule of quantities, 32mm diameter C.P. Brass bottle trap with C.P. pipe to wall, flexible to angle cock and flange.
- 1.5.2.5 Waste Coupling shall conform to IS 3311, and as specified in the item and of approved make. Waste fittings shall be of with thickness of coating not less than service Grade No.2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect to IS 2963 and shall sound, free from laps below, holes and fittings and other manufacturing defect. External and internal surface shall be clean and smooth. They shall be neatly dressed. The waste fitting for wash basin shall be of nominal size of 32 mm.
- 1.5.2.6 The bottle trap shall be as specified in the item and of approved make. The bottle-trap shall be provided with a CP brass extension piece to the wall flange on one hand and on the other with a rubber adopter for waste connection.
- 1.5.2.7 Bottle trap shall be of thickness of coating not less than service grade No. 2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect of IS 2963 and shall be sound, free from laps below, holes and fittings and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed and be truly machined so that nut smoothly moves on the body. The Bottle trap for wash basin shall be of nominal size of 32 mm.
- 1.5.2.8 PVC water inlet connection shall conform to IS specifications and shall be of standard pattern with flexible hose of minimum 450 mm long with CP brass check nut at both the end and shall be able to withstand the testing pressure of 1 Mpa (10 kg/sq. cm.)
- 1.5.2.9 Each basin shall be provided with manual taps/ mixing (mono or thermostatic type) fitting/ sensor tap as specified in the schedule of quantities.



### **1.5.3 FIXING**

- 1.5.3.1 Wash basin shall be wall bracket mounted or half/ full pedestal mounted or over/ under counter mounted as specified in schedule of quantities or as directed by Architect.
- 1.5.3.2 Wash basin shall be securely fixed to wall with R.S. or C.I. brackets and clips embedded in cement concrete (1:2:4) block of 100 x 75 x 150 mm.
- 1.5.3.3 The MS angle shall be provided with two coats of red oxide primer and two coats of synthetic enamel paint of make, brand and colour as approved by the Architect/ Consultants.
- 1.5.3.4 In case of Counter mounted, Oval/ Round shape wash basins are required to be installed in RCC platform/ counter with stone topping either fully sunk in stone top or flush on stone topping.
- 1.5.3.5 The wall plaster on seat shall be cut to rest over the top edge of basin so as not to leave any gap for water seepage through between wall plaster and skirting of basin. The gap between wall & basin shall be finished with matching white cement.

### **1.5.4 RATES**

- 1.5.4.1 Wash basin with/ without pedestal.
- 1.5.4.2 Brackets, Accessories & Hardware.
- 1.5.4.3 CP Waste Coupling, Bottle trap, flexible pipe.
- 1.5.4.4 Angle cock, Taps/ Sensor faucet, Mixer (if called in BOQ).
- 1.5.4.5 Jointing & fixing material.
- 1.5.4.6 Cutting hole/ wall wherever required and making all damage good to original condition after completion of work.
- 1.5.4.7 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 1.5.4.8 Testing the entire system and rectification of defects if any.
- 1.5.4.9 All necessary materials, labor and use of tools.

### **1.5.5 MODE OF MEASUREMENT**

- 1.5.5.1 The measurement shall be for each unit of Wash basin fixed.

### **1.5.6 MODE OF PAYMENT**

- 1.5.6.1 The contract rate shall be for each unit of Wash basin fixed.

## **1.6 FLUSH VALVE**

### **1.6.1 SCOPE**

- 1.6.1.1 The item pertains to provide chromium plated brass flush valve or brass exposed/ concealed type flush valve with lever/ push button or plate/ sensor operated with

necessary accessories including fixing, testing & Commissioning for Urinals & Water Closets.

## **1.6.2 MATERIAL**

1.6.2.1 The Flush valve shall be nominal diameter as specified in the schedule of quantities.

1.6.2.2 It shall be of C.P. brass approved and heavy quality, and shall conform to I.S. 9758.

1.6.2.3 The flush valve shall have working pressure of 0.15 to 0.5 Mpa. The valve shall be tested to a Hydraulic pressure of 2 Mpa for 2 minutes.

1.6.2.4 Flush valve shall have either single flow discharge or twin flow discharge per flush as specified in schedule of quantities

## **1.6.3 FIXING**

1.6.3.1 Flush valve shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer in charge.

1.6.3.2 Jointing shall be done with white zinc, spun yarn/ Teflon tape etc.

1.6.3.3 A few turns of fine hemp yarn dipped in linseed oil/ Teflon tape shall be taken over the threaded ends to obtain complete water tightness. Leaky joint shall be remade to make it leak proof.

1.6.3.4 Flush valve shall be fixed either exposed or concealed in shaft/ wall with manual lever/ push button/ plate operation or with infrared sensor.

## **1.6.4 RATE**

1.6.4.1 Flush Valve of size, type & operation as mentioned in schedule of quantities.

1.6.4.2 Accessories & Hardware, wall flanges.

1.6.4.3 Jointing & fixing material.

1.6.4.4 Cutting hole– cutout in floor/ wall wherever required and making all damage good to original condition after completion of work.

1.6.4.5 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.

1.6.4.6 Testing the entire system and rectification of defects if any.

1.6.4.7 All necessary materials, labor and use of tools.

## **1.6.5 MODE OF MEASUREMENT**

1.6.5.1 The measurement shall be for each unit of flush valve fixed.

## **1.6.6 MODE OF PAYMENT**

1.6.6.1 The contract rate shall be for each unit of flush valve fixed.

## **1.7 HEALTH FAUCET**

### **1.7.1 SCOPE**

1.7.1.1 The item pertains for providing chromium plated Health Faucet as specified in the schedule or as directed by Architect including all accessories & fixing, testing & commissioning.

### **1.7.2 MATERIAL**

1.7.2.1 The health faucet shall be brass chromium plated or plastic or as specified in schedule of quantities. The chromium plating shall be of grade 'B' type conforming to I.S. 1068-2958.

1.7.2.2 Health faucet shall be provided with 1 mtr long flexible PVC tube and CP brass wall hook etc.

### **1.7.3 FIXING**

1.7.3.1 The health faucet Hook & health faucet shall be fixed in position as per drawings or as directed by Architect/ EIC.

1.7.3.2 The height shall be approx 45cm from floor level if not mentioned in the drawing.

1.7.3.3 The one end of 1.0 meter long pipe shall be connected to faucet & other end to the angle cock.

### **1.7.4 RATE**

1.7.4.1 Health Faucet & flexible PVC hose/ tube.

1.7.4.2 Accessories, Hardware, mounting hook.

1.7.4.3 Jointing & fixing material.

1.7.4.4 Cutting/ drilling hole– cutout in wall wherever required and making all damage good to original condition after completion of work.

1.7.4.5 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.

1.7.4.6 Testing the entire system and rectification of defects if any.

1.7.4.7 All necessary materials, labor and use of tools.

### **1.7.5 MODE OF MEASUREMENT**

1.7.5.1 The measurement shall be for each unit of Health Faucet fixed.

### **1.7.6 MODE OF PAYMENT**

1.7.6.1 The contract rate shall be for each unit of Health Faucet fixed.

## **1.8 PILLAR TAP**

### **1.8.1 SCOPE**

1.8.1.1 The item pertains to provide chromium plated brass pillar tap of type, lever(spatula) operated or Pressmatic type as specified including fixing, testing & commissioning.

### **1.8.2 MATERIAL**

1.8.2.1 The pillar tap shall be 15 mm nominal size or as specified in the schedule.

1.8.2.2 Fancy type pillar tap shall be of C.P. brass approved quality and shall conform to I.S. 8931. Non fancy pillar tap shall be chromium plated-brass and shall conform to IS 1795.

1.8.2.3 Casting of Pillar tap shall be sound and free from laps, blow hole and pitting.

1.8.2.4 External and internal surface shall be clean, smooth and free from sand and be neatly dressed.

1.8.2.5 All the parts fitted to pillar tap shall be axial, parallel and cylindrical with surfaces smoothly finished.

1.8.2.6 The minimum of finish weight of Pillar tap shall not be less than 650 grams (body weight 250 Gms, washer plate loose valve 150 Gms and back nut 40 Gms).

1.8.2.7 Thickness of C.P coating shall not be less than service grade no.2 of IS 4827 and plating should be capable of taking high polish which shall not easily tarnish or scale.

### **1.8.3 FIXING**

1.8.3.1 Pillar tap shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer-in-charge.

1.8.3.2 Jointing shall be done with white zinc, spun yarn/Teflon tape etc. A few turns of fine hemp yarn dipped in linseed oil/ Teflon tape shall be taken over the threaded ends to obtain complete water tightness.

1.8.3.3 Pillar tap shall withstand and internally applied hydraulic pressure of 2 Mpa (20 kg/sq.cm) for period of 2 minutes during which period, it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof without any extra cost

from the contractor.

#### **1.8.4 RATE**

- 1.8.4.1 Pillar Tap.
- 1.8.4.2 Wall flanges, Hardware & Accessories.
- 1.8.4.3 Jointing & Fixing material.
- 1.8.4.4 Cutting/ drilling hole– cutout in floor/ wall wherever required and making all damage good to original condition after completion of work.
- 1.8.4.5 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 1.8.4.6 Testing the system and rectification of defects if any.
- 1.8.4.7 All necessary materials, labor and use of tools.

#### **1.8.5 MODE OF MEASUREMENT**

- 1.8.5.1 The measurement shall be for each unit of pillar tap fixed.

#### **1.8.6 MODE OF PAYMENT**

- 1.8.6.1 The contract rate shall be for each unit of pillar tap fixed.

### **1.9 BIB TAP/ STOP COCK/ ANGLE COCK**

#### **1.9.1 SCOPE**

- 1.9.1.1 The item pertains for providing chromium plated Bib Tap/ Stop cock/ Angular Stop cock/ Angle Valve type (i.e. Pressmatic or threaded)& size as specified in the schedule or as directed by Architect including all accessories & fixing, testing & commissioning.

#### **1.9.2 MATERIAL**

- 1.9.2.1 It shall be 15 mm. dia. brass screw down type with chromium plating, and shall conform to I.S. 781-1977. The taps shall be quarter or full threaded. The bib cock shall be best Indian make and quality as specified in item and approved by Architect/ Engineer In Charge.
- 1.9.2.2 A bib cock (stop tab) is a draw off tap with a horizontal inlet and free outlet and stop cock (stop tap) is a valve with a suitable means of connections for insertion in a pipeline for controlling or stopping the flow. They shall be of specified size and shall be of screw down type. The closing device should work by means of shuts against water pressure on a non-metallic washer, which shuts against water pressure on a seating at right angles to the exit of the threaded spindle, which operates it. The handle shall be either crutch or butterfly type securely seated pattern. The cocks (taps) shall open in anti-clockwise direction.
- 1.9.2.3 Brass bib taps and stop cocks and angle stop cocks shall conform to IS 781, they

shall be polished bright. The minimum finished weight of different sizes

1.9.2.4 of bib tap weight of 15 mm size bib tap and stop cock shall be as per table given below. They shall be sound and free from taps, blow hole and fitting. Internal & External surface shall be clean, smooth and free from sand and neatly dressed. Taps shall be nickel chromium plated and thickness of coating shall not be less than service grade No.2 of IS 4827 and plating shall be capable of taking high polish which shall not be easily tarnished.

1.9.2.5 Minimum finished mass of Bib Taps and Stop Valves as per IS: 781:1984 (Reaffirmed 2001).

Size	MINIMUM FINISHED MASS			
	Bib Taps	Stop valves		
		Internally threaded	Externally threaded	Mixed threaded
MM	KG	KG	KG	KG
8.0	0.250	0.220	0.250	0.235
10.0	0.330	0.330	0.350	0.325
15.0	0.400	0.330	0.400	0.365
20.0	0.750	0.675	0.750	0.710
25.0	1.250	1.180	1.300	1.250
32.0	-	1.680	1.800	1.750
40.0	-	2.090	2.250	2.170
50.0	-	3.700	3.850	3.750

### 1.9.3 FIXING

1.9.3.1 The body of stop cock of 15mm diameter with adjustable flange shall be as specified above shall be fixed on water supply line keeping the arrow in the direction of flow as per drawing or as directed.

1.9.3.2 Transition male/ female adapter with shall be used on either side for PVC pipes.

1.9.3.3 The threaded portion shall be smeared with white or red lead and around with a few turns of fine spun yarn/ Teflon tape round the screwed end of the cock.

1.9.3.4 On completion the of tiling work ,the outer part of stop cock shall be fixed to the brass body

1.9.3.5 Every tap complete with its component shall with stand an internally applied hydraulic pressure of 2 Mpa (20 kg/sq.cm) maintained for a period of 2 minutes during the period it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof without any extra cost from contractor.

### 1.9.4 RATES

- 1.9.4.1 Bib Tap/ Angle Valve/ Stop cock as specified in Schedule of Quantities.
- 1.9.4.2 Wall flanges & Hardware.
- 1.9.4.3 Jointing & fixing material.
- 1.9.4.4 Cutting/ drilling hole– cutout in floor/ wall wherever required and making all damage good to original condition after completion of work.
- 1.9.4.5 Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 1.9.4.6 Testing the entire system and rectification of defects if any.
- 1.9.4.7 All necessary materials, labor and use of tools.

### **1.9.5 MODE OF MEASUREMENT**

- 1.9.5.1 The measurement shall be for each unit of Bib tap/Stop Cock/Angle Valve fixed.

### **1.9.6 MODE OF PAYMENT**

- 1.9.6.1 The contract rate shall be for each unit of Bib tap/Stop Cock/Angle Valve fixed.

### **1.10 WASTE COUPLING**

#### **1.10.1 SCOPE**

- 1.10.1.1 The item pertains to provide chromium plated brass waste coupling including fixing, testing & commissioning.

#### **1.10.2 MATERIAL**

- 1.10.2.1 Waste Coupling shall confirm to IS 3311.
- 1.10.2.2 Waste fittings shall be of CP with thickness of CP coating not less than service Grade No.2 of IS 4827 which is capable of receiving polish and will not easily scale off.
- 1.10.2.3 The fitting shall conform in all respect to IS 2963 and shall sound, free from laps below, holes and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed.
- 1.10.2.4 The waste fitting for wash basin shall be of nominal size of 32 mm and for sink shall be nominal size 40/50 mm unless otherwise specified.

#### **1.10.3 FIXING**

- 1.10.3.1 Waste coupling shall be fixed to wash basin, sink or urinal as ordered with necessary specials. Jointing shall be done with white zinc, yarn etc. A few turns of fine hemp yarn dipped in the linseed oil shall be taken over the threaded endsto obtain complete water tightness. Leaky joint shall be remade to make it leak



proof.

#### **1.10.4 RATE**

- 1.10.4.1 Waste coupling with necessary specials.
- 1.10.4.2 Jointing & fixing material.
- 1.10.4.3 Necessary civil work and making good to original condition after completion of work.
- 1.10.4.4 Testing the system and rectification of defects if any.
- 1.10.4.5 All necessary labor, material and the use of tools.

#### **1.10.5 MODE OF MEASUREMENT**

- 1.10.5.1 The measurement shall be for each unit of waste coupling fixed.

#### **1.10.6 MODE OF PAYMENT**

- 1.10.6.1 The contract rate shall be for each unit of waste coupling fixed.

#### **1.11 BOTTLE TRAP**

##### **1.11.1 SCOPE**

- 1.11.1.1 The item pertains to provide chromium plated brass bottle trap including fixing.

##### **1.11.2 MATERIAL**

- 1.11.2.1 Bottle trap shall be of C.P brass with thickness of CP coating not less than service grade No. 2 of IS 4827 which is capable of receiving polish and will not easily scale off.
- 1.11.2.2 The fitting shall conform in all respect of IS 2963 and shall be sound, free from laps below, holes and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed and be truly machined so that nut smoothly moves on the body.
- 1.11.2.3 The Bottle trap for wash basin & urinal shall be of nominal size of 32 mm and for sink shall be nominal size 40/50 mm. unless otherwise specified.

##### **1.11.3 FIXING**

- 1.11.3.1 Bottle trap shall be fixed to wash basin, sink or urinal as indicated in the drawing with necessary specials or as ordered by the Engineer-in-charge.
- 1.11.3.2 Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil/ Teflon tape shall be taken over the threaded ends to

obtain complete water tightness. Leaky joint shall remake to make it leak proof.

#### **1.11.4 RATE**

- 1.11.4.1 Bottle trap with necessary specials.
- 1.11.4.2 Jointing & fixing material.
- 1.11.4.3 Necessary civil work and making good to original condition after completion of work.
- 1.11.4.4 Testing the system and rectification of defects if any.
- 1.11.4.5 All necessary labor, material and the use of tools.

#### **1.11.5 MODE OF MEASUREMENT**

- 1.11.5.1 The measurement shall be for each unit of bottle trap fixed.

#### **1.11.6 MODE OF PAYMENT**

- 1.11.6.1 The contract rate shall be for each unit of bottle trap fixed.

### **1.12 TOWEL ROD/ TOWEL RING**

#### **1.12.1 SCOPE**

- 1.12.1.1 The item includes providing Towel rod/ towel ring of size as mentioned in the schedule including fixing.

#### **1.12.2 MATERIAL**

- 1.12.2.1 Towel rail shall be of SS or C.P brass with two CP brass bracket coated with chromium plating of thickness not less than grade No.2 of IS 4827.
- 1.12.2.2 The size of rail shall be 600 mm x 20 mm diameter unless otherwise specified in the schedule.
- 1.12.2.3 Towel ring of SS/ CP brass with one CP brass bracket with thickness not less than Grade No.2 of IS 4827.
- 1.12.2.4 The diameter of the ring shall be 175 mm unless otherwise specified in the schedule. The diameter of ring rod shall not be less than 8 mm.

#### **1.12.3 FIXING**

- 1.12.3.1 The towel rod/ ring shall be fixed to proper line and level as indicated in drawing with CP brass screws, wooden raw plug, drilling hole etc. and making good the wall to original condition after fixing the towel rod.

#### **1.12.4 RATE**

- 1.12.4.1 Towel rod rail/ ring CP brackets & screws etc.
- 1.12.4.2 Fixing material.
- 1.12.4.3 All necessary labor, material and the use tools.

#### **1.12.5 MODE OF MEASUREMENT**

- 1.12.5.1 The measurement shall be for each unit of towel rod fixed.

#### **1.12.6 MODE OF PAYMENT**

- 1.12.6.1 The contract rate shall be for each unit of towel rod fixed

#### **1.13 SOAP DISH**

##### **1.13.1 SCOPE**

- 1.13.1.1 The item includes providing white or color glazed chinaware type or CP brass or Glass soap dish of size as mentioned in the schedule including fixing.

##### **1.13.2 MATERIAL**

- 1.13.2.1 Soap Dish shall be of SS/ CP brass or vitreous China on specified and of size, design an approved by the Engineer in charge. Soap Dish shall conform to relevant IS standard and should have ISI certification mark.

##### **1.13.3 FIXING**

- 1.13.3.1 Soap Dish shall be fixed in position by means of C.P brass covers and rawl plug embedded in the wall.
- 1.13.3.2 Vitreous china Soap Dish shall fixed in recessed manner into the wall with 1:2 cement mortar. The pocket shall be cut in wall, if not left, finishing the gap with white/ matching cement.
- 1.13.3.3 Chrome plated Brass soap dish can be surface mounted by means of CP/ SS screws.

##### **1.13.4 RATE**

- 1.13.4.1 Soap dish.
- 1.13.4.2 Accessories & Hardware.
- 1.13.4.3 Cutting the pocket if they are not left in case of recessed fixing & drilling hole in wall in case of surface mounting.
- 1.13.4.4 Jointing & fixing material.
- 1.13.4.5 All necessary labor, material and the use of tools.

**1.13.5 MODE OF MEASUREMENT**

1.13.5.1 The measurement shall be for each unit of soap dish fixed.

**1.13.6 MODE OF PAYMENT**

1.13.6.1 Contract rate shall be for each unit of soap dish fixed.

**1.14 MIRROR**

**1.14.1 SCOPE**

The item pertains to provide Mirrors of size as specified including fixing.

**1.14.2 MATERIAL & FIXING**

1.14.2.1 Size of the mirror shall be as specified in schedule of quantities or as directed by Architect. It shall be generally of make as specified in the approved make list or as directed by Architect.

1.14.2.2 Mirror shall be with or without beveled edges.

1.14.2.3 Mirrors shall be free from all defects & shall give clear undisturbed image at any distance or angle.

1.14.2.4 Mirror shall be mounted on asbestos sheet or 6 mm plywood with brass countersunk screws & washers & detachable G.P. caps

**1.14.3 RATES**

1.14.3.1 Mirrors

1.14.3.2 Brackets, Accessories & Hardware.

1.14.3.3 Jointing & fixing material.

1.14.3.4 Making all damage good to original condition after completion of installation work.

1.14.3.5 Testing the entire system and rectification of defects if any.

1.14.3.6 All necessary materials, labor and use of tools.

**1.14.4 MODE OF MEASUREMENT**

1.14.4.1 The measurement shall be for each unit of Mirror fixed.

**1.14.5 MODE OF PAYMENT**

1.14.5.1 The contract rate shall be for each unit of Mirror fixed.

## **1.15 MULTIFLOOR TRAP**

### **1.15.1 SCOPE**

1.15.1.1 The item pertains to provide multi floor traps with grating including fixing, testing & commissioning.

### **1.15.2 MATERIAL & FIXING**

1.15.2.1 The trap shall be of cast iron or PVC or SS as specified in schedule of quantities.

1.15.2.2 The trap shall be provided with SS/ CP brass/ PVC grating of size 100/ 150 mm size as specified in schedule of quantities.

1.15.2.3 The trap shall have generally water seal not less than 50 mm.

1.15.2.4 The trap shall have 150/ 100 mm inlet & 40/ 50/ 75/ 100 mm multiple outlets.

1.15.2.5 The trap & waste pipe shall be fixed in PCC 1:2:4, 100 mm around up to finished floor with water tight finishing & shall be firmly supported on structural floor.

### **1.15.3 RATES**

1.15.3.1 Multi floor trap with grating cover.

1.15.3.2 Jointing & fixing material.

1.15.3.3 Making all damage good to original condition after completion of installation work.

1.15.3.4 Testing the entire system and rectification of defects if any.

1.15.3.5 All necessary materials, labor and use of tools.

### **1.15.4 MODE OF MEASUREMENT**

1.15.4.1 The measurement shall be for each unit of Multi floor trap with grating fixed.

### **1.15.5 MODE OF PAYMENT**

1.15.5.1 The contract rate shall be for each unit of Multi floor trap with grating fixed.

## **1.16 uPVC PIPE & FITTINGS**

### **1.16.1 SCOPE**

1.16.1.1 The item includes supplying of PVC pipes with fittings of specified diameter including laying, fixing, cutting, joining, painting etc.

### **1.16.2 MATERIAL**

1.16.2.1 The uPVC pipe size & pressure class shall be as specified in schedule of quantities.

- 1.16.2.2 The pipes shall conform to IS: 4985 with its latest edition. Fittings shall conform to IS: 7834 with its latest edition.
- 1.16.2.3 Fittings shall be of the same make as that of pipes. It shall be injection molded type.
- 1.16.2.4 PVC pipes and fittings shall be visually inspected before laying & shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule of quantities. Cracked & damaged pipe shall be removed from the site by the contractor at his own cost. All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and outside surfaces.
- 1.16.2.5 The pipe shall be provided with bends, junctions, inspection doors, offsets, cowl, access pieces/ plugs etc. jointing with Solvent cement (lubricant) including cutting holes in walls and making good the same. The Access door shall be secured air and water tight with 3mm thick insertion rubber washer and white lead. The bolts shall be lubricated with grease or white lead for easy removal.
- 1.16.2.6 Lubricant/ solvent cement: It is available in 100 Gms, 250 Gms & 500 Gms packing. It is specially formulated for compatibility with rubber seal as well as PVC. It does not support the growth of bacteria or fungi. Solvent joints shall be used as per manufacturer's recommendations.

### **1.16.3 JOINTING & FIXING**

- 1.16.3.1 The jointing of the pipes to the fittings shall be done as per the manufacturer's instructions/ recommendation.

The rubber ring socket fittings and pipes shall be jointed as follows:

The pipes and sockets shall be accurately cut. Care shall be taken that that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife. Clean the outside of the pipes spigot end and the inside of the ceiling groove of the fitting. Apply the lubricant/ solvent cement uniformly to the spigot end, sealing ring and pass the spigot end into the socket containing sealing ring until fully home.

Since solvent cement is aggressive to P.V.C., care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Mark the position of the socket edge with pencil or felt open on the pipe, then withdraw the pipe from the socket by approximately 10 mm to make the pipe fully fitted to the fitting.

- 1.16.3.2 Detachable joints shall be made where pipes of different materials have to be jointed or as specified in the schedule. The flanges are first pushed over the pipe

ends and jointing shall be made by cement solvent.

If manufacture recommends its own methods of jointing, the same shall be adopted after necessary approval from the Engineer in charge.

#### **1.16.4 UNDERGROUND INSTALLATION**

1.16.4.1 Pipe shall be laid in trenches of appropriate size. The trench bottom shall be carefully examined for the presence of hard objects such as flints, rock projection or tree roots etc. Pipe shall be embedded in sand or soft soil, free from rock & gravel, back fill 150mm above the pipe shall also be of fine sand or soft soil. Pipe shall not be painted. The width of trench shall not be less than outside diameter of pipe plus 300 mm in case of gravel soils. Pipe shall be laid at least 900 mm below the ground level (measured from the surface of the ground to the top of pipe).

1.16.4.2 The entire length of pipe shall be evenly supported on bed of the trench throughout. Care shall be taken to prevent any sand, earth or other materials from entering into the pipes during laying. At the end of day's work the open end shall be suitably plugged.

1.16.4.3 The pipe shall also be encased if required as per site condition.

1.16.4.4 The work shall include bailing or pumping out all the water till completion or work if accumulated during the progress of work either from seepage, springs, rain or any other cause.

#### **1.16.5 OVER GROUND INSTALLATION**

1.16.5.1 For over ground exposed installation, to take care of thermal expansion, due allowance shall be made for any change in length of pipe line.

1.16.5.2 The pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. The pipe shall be fixed with G.I. clamps not less than 2 mm thick or with suitable PVC clamps.

1.16.5.3 The clamps shall be fixed into the wall with G.I. nails not less than 40 mm long and wooden gummy. Spacing between clamps for fixing internal piping shall be as given below:

<b>Pipe diameter</b>	<b>For Horizontal Runs</b>	<b>For Vertical Runs</b>
20 mm	700 mm	1050 mm
25 mm	750 mm	1125 mm
32 mm	825 mm	1240 mm
40 mm	975 mm	1460 mm
50 mm	975 mm	1460 mm



- 1.16.5.4 The underground/ over ground pipes shall be carefully laid straight to the correct alignment or in gradients as indicated in the drawing. The entire pipe shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length.
- 1.16.5.5 Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level and supported on structural with clamps.
- 1.16.5.6 In case of fixing of pipes and fittings on the slab & below flooring (sunk slab), these shall run on the surface of the slab under the floors, the pipe shall be laid in layer of sand filling & then apply PCC cover of 1:4:8 on the pipe.

#### **1.16.6 PAINTING**

- 1.16.6.1 If mentioned in schedule of work, the exposed pipe line shall be painted with two coats of approved oil paint of matching color over a coat of primer. Underground pipe line shall not be painted.

#### **1.16.7 TESTING**

- 1.16.7.1 Solvent welded pipe shall not be pressure tested until at least 24 hours after the last solvent cemented joint has been done. The openings of the pipes shall be sealed for the section to be tested. All control valves shall be positioned open for the duration of the test and open end closed with water tight fittings. The testing pressure on completion of the work shall not be less than 1.5 times the working pressure of the pipes.
- 1.16.7.2 Pressure shall be applied either by hand pump or power driven pump. Pressure gauges shall be calibrated, correctly positioned and closely observed to ensure that at no time are the test pressure exceeded. The systems shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.
- 1.16.7.3 When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supports under load. Pressure is reached. Without any additional requirement of make-up-water the test pressure should not fall more than 0.02 Mpa (0.2 kg./sq.cm) at the end of one hour test duration.
- 1.16.7.4 The water pressure shall be maintained for minimum of two hour with accurate pressure gauge. The engineer shall examine carefully all the joints for leakage. Any joint found leaking shall be redone, and all leaking pipes removed and replaced without extra cost.

### 1.16.8 RATES

- 1.16.8.1 PVC pipes and fittings of specified diameter & pressure class.
- 1.16.8.2 Laying and cutting the pipe wherever necessary and wastage.
- 1.16.8.3 Underground installation with all necessary civil work if specified in bill of quantities like excavation, dewatering, backfilling, bedding, encasing, etc. Or over ground installation with supports/ clamps, accessories required.
- 1.16.8.4 Making the solution joint, painting the pipe line if mentioned in schedule of quantities.
- 1.16.8.5 Making all damage good to original condition after completion of installation work.
- 1.16.8.6 Testing the entire system and rectification of defects if any.
- 1.16.8.7 All necessary materials, labor and use of tools.

### 1.16.9 MODE OF MEASUREMENT

- 1.16.9.1 The measurement shall be for unit running meter length of pipe line laid of fixed. The measurement shall be taken along the center line of pipe. No measurement shall be recorded separately for fittings, making joint, supports, clamps, civil work, painting if mentioned in schedule of quantities.

### 1.16.10 MODE OF PAYMENT

- 1.16.10.1 Mode of payment shall be Unit length of pipe line laid or fixed. No extra payment shall be made for fittings, making joint, supports, clamps, civil work, painting if mentioned in schedule of quantities.

### 1.17 GUN METAL/ BRASS COPPER ALLOY GATE/ GLOBE/ CHECK VALVE

#### 1.17.1 SCOPE

- 1.17.1.1 The item includes provision valves of type, size & pressure class as mentioned in the schedule of quantities including fixing, testing & commissioning.

#### 1.17.2 MATERIAL

- 1.17.2.1 Full way valve shall be of either Brass fitted with a cast iron hand wheel or Gun metal fitted with a C.I. hand wheel or copper alloy as the case may be. The weight of the full way gate valve shall be as per the table given below with a tolerance of 5 percent.

Dia-meter in mm	Flanged arch(Kg)	Screwed arch(Kg)
15	1.021	0.567
20	1.503	0.680
25	2.495	1.077
32	3.232	1.559
40	4.082	2.268

50	6.691	3.232
65	10.149	6.804
80	13.381	8.845

- 1.17.2.2 Check/NRV shall be either brass or Gun metal body with single door design  
1.17.2.3 The valves shall have either screwed ends or flanged ends

## **ALL VALVES**

- 1.17.2.3.1 All ball valves shall be heavy duty of approved make. Valves shall have suitable for pressure of PN 1.0/1.6.  
1.17.2.3.2 Ball valves up to 80 mm shall have forged brass body, SS spindle & Teflon seat rings.  
1.17.2.3.3 Ball valve shall conform to IS: 9890 or BS: 1868

### **1.17.2.4 SLUICE VALVES**

- 1.17.2.4.1 Sluice valves shall conform to IS 14846 with PN 1.0/1.6 rating as specified. Valve body shall be cast iron & spindle, valve seat & wedge nut shall be of gun metal. The valve shall be generally non rising spindle design. The valve shall be provided with C.I. hand wheel for exposed installation & cap top for underground installation.  
1.17.2.4.2 Valve shall be generally flanged ends & fitted by means of non corrosive bolt,nuts & asbestos fiber gaskets.

### **1.17.2.5 BUTTERFLY VALVE**

- 1.17.2.5.1 All butterfly valves shall be heavy duty cast iron of approved make. The valves shall be suitable for PN 1 or PN 1.6 rating as specified & shall conform to IS: 13095 or BS: 5155. Valve shall be either wafer type design or flanged ends. Valve body shall be of cast iron & disc shall be of C.I. / C.S with EPDM disc seal & SS spindle. Valve shall have manual handle/ lever operation.

### **1.17.2.6 NON-RETURN VALVES**

- 1.17.2.6.1 Non return valve shall be either lift single/ multi door type or spring operated check valves.  
1.17.2.6.2 For sizing more than 50 mm, generally NRV shall be of Cast Iron body, CI / CS door.  
1.17.2.6.3 Single door Non return valve shall conform to IS 5312 up to 600 mm. Size above 600 mm shall have multi door design. Spring operated shall conform to API 594/598 standard having spring for non slam action.

1.17.2.7 Material of Valves for hot water application shall withstand the temperature up to 80 deg. C.

1.17.2.8 Generally all internal valves (within the building) shall be of Gun Metal unless otherwise specified. All external installation on pipe line, plant rooms, etc. shall be of cast iron unless otherwise specified.

1.17.2.9 All valves up to 50 mm shall have screwed ends while all valves beyond 50 mm size shall have flanged ends. Flange dimensions shall conform to IS: 1538 Table IV & VI or IS: 6392 PN 1.0/1.6

### **1.17.3 FIXING**

1.17.3.1 The valves shall be fixed in position in the pipeline as shown in the drawing or as directed with necessary socket or union, nuts, flanges, hardware, gaskets, tail piece, etc. During installation, flow direction on the valve shall be checked.

1.17.3.2 Valves shall be preferably installed in horizontal position, except butterfly valves which can be fixed in the vertical position.

1.17.3.3 Screwed valves after few turns shall be applied with Teflon tape over the threaded ends to obtain complete water tightness. Flanged joint shall be fixed with non corrosive bolts & nuts with suitable thickness asbestos fiber gasket conforming to IS 638 for water tightness.

### **1.17.4 TESTING**

1.17.4.1 The valves shall be body & seat tested at manufacturer's works as per therelevant standard & duly stamped. Test certificate shall be submitted for material & hydraulic testing.

1.17.4.2 After fixing in the pipelines, the system shall be hydraulically tested for 1.5 times working pressure or 10 kg/cm<sup>2</sup> whichever is higher for minimum 4 hrs without any pressure drop. In case of leakage, contractor shall rectify/replace valves at his own cost

1.17.4.3 Valves shall also be tested for its hand wheel/ lever function by frequent on-off operation.

### **1.17.5 RATES**

1.17.5.1 Valve of required type, size & pressure rating.

1.17.5.2 Fixing & jointing material.

1.17.5.3 Painting.

1.17.5.4 Making all damage good to original condition after completion of installation work.

1.17.5.5 Testing.

1.17.5.6 All necessary materials, labor and use of tools.

### **1.17.6 MODE OF MEASUREMENT**

1.17.6.1 The measurement shall be for each unit valve of specified diameter fixed.

### **1.17.7 MODE OF PAYMENT**

1.17.7.1 The contract rate shall be for each unit of valve of specified diameter fixed. No extra payment shall be made for G.I. fittings used in fixing of the valve.

### **1.18 UPVC- SWR PIPING WORK**

#### **1.18.1 SCOPE**

1.18.1.1 The item includes supplying of UPVC soil, waste and rain water (SWR) and ventilation pipes with fittings of specified diameter including laying, fixing, cutting, joining, painting if required etc.

#### **1.18.2 MATERIAL**

1.18.2.1 The pipes shall conforming to IS 13592, UPVC - SWR (Type 'A' or 'B' as specified) and fittings conforming to IS 13591 shall be free from cracks, flaws and defects and shall be U.V. stabilized and able to withstand a pressure as mentioned in the schedule of work. Rubber sealing rings conforming to IS: 5382 with lubricant for sliding socket joints as mentioned in the schedule of work.

#### **1.18.2.2 EXAMINING**

Before laying the pipe line, it shall be first examined for damages and cracks, No cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost and charge.

#### **1.18.2.3 CLEANING**

All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and outside surfaces.

#### **1.18.3 LAYING, FIXING & JOINTING**

1.18.3.1 The pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. The entire pipe shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length. The entire length of pipe shall be evenly supported on bed of the trench throughout. Care shall be taken to prevent any sand, earth or other materials from entering into the pipes during laying. At the end of day's work the open end shall be suitably plugged.

1.18.3.2 The pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in-charge. The pipe shall be fixed with G.I. clamps not less than 2.0 mm thick of with suitable UPVC clamps/ clips, The clamps/ clips shall be

fixed into the wall with G.I. nails not less than 40 mm long and wooden gutties keeping the pipe about 15 mm clear of the wall.

- 1.18.3.3 The jointing of pipes and fittings generally shall be done with approved make cement solvent including making surface rough or rubber sealing rings with lubricant for sliding socket joints . The pipe shall be cut to desired length. Care shall be taken that that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

#### **1.18.4 DETACHABLE JOINT**

- 1.18.4.1 Detachable joints shall be made where pipes of different materials have to be jointed or as specified in the schedule. The flanges are first pushed over the pipe ends and jointing shall be made by cement solvent.

#### **1.18.5 PAINTING**

- 1.18.5.1 In case of underground piping, the pipe line shall be painted with two coats of approved oil paint of matching color over a coat of primer.

#### **1.18.6 DEWATERING & CIVIL WORK**

- 1.18.6.1 In case of underground pipes, the contract rate shall include bailing or pumping out all the water till completion or work if accumulated during the progress of work either from seepage, springs, rain or any other cause. The rate shall also include for excavation, refilling, etc. civil work required if specified in schedule of quantities. Pipe shall be laid with suitable bedding, encasing as per actual site condition. For concealed piping, chasing, drilling holes in wall, etc. shall be covered under the rate.

#### **1.18.7 TESTING**

- 1.18.7.1 The joints shall be tested by either smoke test for vertical stacks or 2.5 m head of water at the highest point of the section under test for horizontal drainage pipes. Smoke shall be pumped into the pipes at the lowest end from a smoke machine which consists of a below and burner .The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detectable by sight as well as by smell, if there is leak at any point of the drain. The water head test shall be carried out by suitably plugging the lower end of the drain and the ends of the connection if any and filling the system with water. A knuckle bend shall be temporarily jointed to it so as to provide required test head , or the top may be plugged with a connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained and fixed suitable for observation. The leaky joints shall be remade and section re-tested at no extra cost.

#### **1.18.8 RATES**

- 1.18.8.1 Supplying of UPVC-SWR pipes and fittings of specified diameter.
- 1.18.8.2 Laying and cutting the pipe wherever necessary and wastage.
- 1.18.8.3 Fixing the pipe line with G.I. clamps not less than 2mm thick and G.I. / M.S. nails length not less than 40mm or with UPVC clamps, screws, wooden gutties etc.
- 1.18.8.4 Making the solution joint and painting if mentioned in schedule of work the pipe line.
- 1.18.8.5 All civil work required for concealed piping.
- 1.18.8.6 In case of underground pipes, dewatering if necessary till completion of work, excavation, refilling, etc civil work if specified in schedule of quantities.
- 1.18.8.7 Testing of pipes.
- 1.18.8.8 Making all damage good to original condition after completion of installation work.
- 1.18.8.9 All necessary materials, labor and use of tools.

#### **1.18.9 MODE OF MEASUREMENT**

- 1.18.9.1 The measurement shall be for unit running meter length of pipe line laid of fixed. The measurement shall be taken along the center line of pipe. No measurement shall be recorded separately for fittings, making joint, painting, civil work if mentioned in schedule of work and testing.

#### **1.18.10 MODE OF PAYMENT**

- 1.18.10.1 The contract rate shall be for unit running meter length of pipe line laid or fixed.

### **2.0 PLUMBING MAKE LIST**

<b>SR</b>	<b>ITEM DESCRIPTION</b>	<b>MAK E</b>
01	Sanitary ware	As per Architect selection
02	C P Fittings & Bathroom Accessories	As per Architect selection
03	C P Grating	Chilly/ Futura
04	Ball Valve	Sent/ Zoloft/ Leader/ Honeywell
05	Gun Metal Wheel Valve	Sent/ Zoloft/ Leader/ Honeywell
06	UPVC Pipes/ Fittings	Astral/ Supreme/ Finolex
07	CPVC Pipes/ Fittings	Astral/ Supreme/ Finolex
08	SWR Pipes/Fittings	Astral/ Supreme/ Finolex



## HVAC TECHNICAL SPECIFICATION

### A) SYSTEM DESIGN DATA:

#### 1.0 GENERAL:

1.1 The System design, the basis of design, estimated requirements and the proposed HVAC system for the above mentioned project are outlined in this section.

The detailed specifications & specific requirements are outlined in subsequent sections.

#### 2.0 STANDARDS & CODES:

The applicable Standards/Codes are:

- 2.1 American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE).
- 2.2 Indian Society of Heating, Refrigeration and Air-conditioning Engineers (ISHRAE).
- 2.3 National Building Codes - Building Services.
- 2.4 IS:Codes.:

S. No.	Material/item of Work	Standard/Code
a.	Ducting Fabrication	IS : 655 (Latest Rev.)/ SMACNA
b.	Galvanized Sheets/Wires	IS : 277-1977
c.	Aluminum Sheets/Wires	IS : 737
d.	Horizontal Centrifugal Pumps	IS : 1620
e.	Mild Steel, ERW Pipes	IS : 1239, IS : 3589
f.	Pipe Fittings	IS : 1239
g.	Steel Pipe Flanges	IS : 6392
h.	Colour Code for Identifications of pipes	IS : 2379-1963
i.	3 Phase induction motors	IS : 325
j.	Burden type pressure gauges	IS : 3624
k.	PVC insulated electric cables	IS : 1554
l.	Starters sheets/wires	IS : 8555
m.	Inspection and testing of Installation	IS : 732 (Part III)

n	Oil storage tanks	IS : 10987-1984
o	Calorifier Tanks	IS : 2825-1969
P	Glossary of terms used in refrigeration and air-conditioning	IS : 3615
q	Glossary of terms, symbols and units relating to thermal insulation materials	IS : 3069-1994
r.	Hot die zinc coated steel pipes	IS : 4736-1968
s	Expanded polystyrene	IS : 4671-1984

## 2.6 Safety codes:

The following safety codes as laid down by ISI shall be followed:

a.	Safety code for mechanical refrigeration	IS : 660
b.	Safety code for air-conditioning	IS : 659
c.	Safety code for scaffolding and ladders	IS : 3696
d.	Code of practice for fire precautions in Welding and cutting operations	IS : 3016-1965

## 3.0 BASIS OF DESIGN:

a.	Site Location:	, Gujrat
b.	Geographic Location:	23.02° N
c.	Altitude:	55 Mts above mean sea level

## 3.1 Outdoor Design Conditions:

Summer	Monsoon	Winter
110°F DB (43.3°C)	90°F DB (32.2°C)	60°F DB (15.6°C)
78°F WB (25.6°C)	83°F WB (28.3°C)	51°F WB (10.6°C)

## 3.2 Inside Conditions:

Space	Summer	Monsoon
Corridors,	23±1°C DB	23±1°C DB
Office areas	RH < 55%	RH < 60%

RH < 60%

RH < 60%

**3.3 Fresh Air:**

Office : 2 ACPH,  
e

**3.4 Lighting Load:**

Corridor : 1.0  
W/SFT

Office : 1.5  
W/SFT

**3.5 Noise Criteria:**

Office: <40 DB

**4.0 HVAC Ducting:**

- a. Maximum flow velocity in Ducts: 1500fpm (7.5 meters per second)  
for Air conditioning
- b. Maximum flow velocity in Ducts : 1500 – 2500 fpm ( 7.5 – 12.5 m/s)  
for Ventilation in pump room, boilerroom, Generator room, toilet exhaust & Kitchen Exhaust
- c. Maximum friction : 0.1 inch WG / 100FT
- d. Maximum velocity supply air outlet : <500 fpm (2.5 m/s) ,  
based on noise criteria level and required throw.

**\*Contractor have to Ensure and verify the drawings /designing and get it done approved from Architect before commencement.**

**5.0 Ventilation Fans:**

- a. Maximum fan outlet velocity for fans upto 450 mm : 550 M / Min  
dia

**B) AIR COOLED SPLIT TYPE CONDITIONER UNIT:**

**1.0 SCOPE:**

The scope of this section comprises supply, erection, testing and commissioning of self- contained air cooled split air- conditioning units and auxiliaries conforming to these speci- fications and in accordance with the drawings.

**2.0 SPLIT UNITS:**

Air cooled split unit shall be as per approved make, energy efficient scroll hermitically or semi-hermitically compressor complete with vibration isolation & Signature of Bidder

factory installed controls (like HP & LP cutouts, inter locking Fan & Compressor, Thermostat with selector switch etc) & accessories including wiring. Efficient cooling coil shall be selected for low velocity with 3/8"/1/2" OD copper tubing having extended aluminium fins. Hydraulic expansion of tubes assures tight bonding between tubes & fins for high heat transfer. Tubes shall be arranged in a staggered design for best air contact thus giving low bypass. The cooling coil circuits are fed with liquid refrigerant through the thermostatic expansion valve and a distributor. Blower of an evaporating unit shall be statically and dynamically balanced and shall be selected to give required airflow as identified in the drawings. Filters shall be minimum 25mm thick synthetic type or equivalent wire aluminium frame. Drain pan shall be of 18 gauge insulated with expanded polyethylene sheet. Casing shall be heavy gauge factory painted to provide better protection against rusting.

Remote air cooled condensing unit shall have to be most efficient condenser coils made out of copper tubing with extended aluminium fins. Tubes shall be arranged in a staggered design for better efficiency. Condenser fans shall be selected to operate quietly for required CFM to keep condensing temperature low. The compressor may be in the indoor unit or with the outdoor unit, but, it should be capable of operating continuously even at high ambient of 46 deg C (115 deg F). The condensing unit shall be installed with steel base frame, alongwith cushy foot mounting vibration isolation pads.

Interconnected refrigerant piping between outdoor unit & indoor unit shall be of heavy gauge copper complete with thermostatic expansion valve, liquid line strainer, drier, shut off valves, high & low pressure gauges including insulated suction line. 25mm thick neoprene rubber pads shall be supplied for each indoor/outdoor units. The units shall be tested in accordance with IS:1391.

### **3.0 INSTALLATION:**

The units shall be mounted on ribbed rubber pads for vibration isolation. The contractor shall supply the required charge of refrigerant, lubricant and other consumables, for commissioning and testing of the equipment.

All the equipment shall be thoroughly tested and checked for leaks. All safety controls shall be suitably set and a record of all setting shall be furnished to the project supervisor.

### **4.0 TESTING:**

Unit capacity in tons Refrigeration, shall be computed from the temperature readings and air-flow measurements. Flow measurements shall be preferably by a hot-wire anemometer or a velometer. Computed results shall conform to the specified capacities and the power consumption shall conform to the figures furnished by the manufacturer.

### **5.0 PAINTING:**

Shop coats of paint that have become marred during transportation or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the finish over the adjoining shop-painted surfaces.

**6.0 CONDENSER DRAIN PIPING :**

All pipes to be used for cold water (makeup), drain, and condensate drain shall be PVC pipe conforming to IS: 4985 - Class I & all joints should be Gluing or solvent cementing as per manufacturer recommendation.

**7.0 REFRIGERANT PIPING:**

- a. All refrigerant pipes and fittings shall be type 'L' hard drawn copper tubes and wrought copper fitting suitable for connection with silver solder phos copper.
- b. All joints in copper piping shall be sweat joints using low temperature brazing and/or silver solder. Before jointing any copper pipe or fittings, its interior shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while construction the joints. Subsequently, it shall be thoroughly blown out using carbondiox- ide/nitrogen.
- c. Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg per Sq.cm.
- d. Removable type combination drier and filter shall be installed in liquid line of the refrigeration system incorporating a three way valve bypass. After ninety days of operation, liquid line drier and filter cartridges must be replaced.
- e. After the refrigerant piping installation has been completed the refrigerant piping system shall be pressure tested using, Freon mixed with nitrogen/carbondioxide at a pressure of 20 Kg per Sq. cm. (High side) and 10 Kg per Sq. cm (Low side) pressure shall be maintained on the system for a minimum of 12 hours. The system shall then be evacuated to a minimum vacuum of 70 cm. of mercury and held for 24 hours, during which time, change in vacuum shall not exceed 12 cm of mercury. Vacuum shall be checked with vacuum gage.
- f. All refrigerant piping shall be installed strictly as per the instructions and recommendations of air conditioning equipment manufacturers.

**8.0 TESTING & BALANCING:**

- a. All piping shall be tested to hydrostatic test pressure of atleast two and half times the maximum operating pressure, but not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified and gotten approved at site.
- b. Piping repaired subsequent to the above pressure test shall be retested in the same manner.
- c. System may be tested in sections and such sections shall be securely capped, then retested for entire system.

- d. The contractor shall give sufficient notice to all other agencies at site, of his intention to test a section or sections of piping and all testing shall be witnessed and recorded by Consultant/Project Manager.
- e. The contractor shall make sure that proper noiseless circulation of fluid is achieved through all coils and other heat exchange equipment in the system concerned. If proper circulation is not achieved the contractor shall rectify the defective connection. He shall bear all expenses for carrying out the above rectifications, including the tearing up and refinishing of floors and walls as required.
- f. The contractor shall provide all materials, tools, equipment, instruments, services and labour required to perform the test.
- g. Complete certified report shall be submitted to consultant/Project Manager for evaluation and approval. Upon approval, four copies of the balancing report shall be submitted with complete drawings and documents.

## C) AIR DISTRIBUTION

### 1.0 SCOPE

The scope of this section comprises supply fabrication, installation and testing of all sheet metal aluminum ducts, supply, and installation, testing and balancing of all grilles, registers and diffusers. All to be in accordance with these specifications and the general arrangement shown on the Drawings.

### 2.0 DUCT MATERIALS

#### 2.1 RAW MATERIALS

Galvanizing shall be Class VIII – light coating of zinc, nominal 120gm/sq.m as per IS: 277 surface area and Lock Forming Quality prime material along with mill test certificates. In addition, if deemed necessary, samples of raw material, selected at random by owner's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense.

#### 2.2 GAUGES, BRACING BY SIZE OF DUCTS (FACTORY FABRICATED)

All ducts shall be fabricated from galvanized steel / aluminum of the following thickness, as indicated as below :

##### 2.2.1 For Ducts with external SP upto 250 Pa (25mmWg)

Rectangular	Pressure 250 Pa		
Ducts G. S.	Duct Section Length 1.2 m (4 ft)		
Maximum Duct Size	Gauge	Joint Type	Bracing Spacing
1-750 mm	26	C & SS	Nil

751 – 1000 mm	26	4 Bolt Transverse Duct Connector-E (TDC) with built in sealant	Nil
1001 – 1200 mm	24	4 Bolt TDC –E	Nil
1201 – 1500 mm	24	4 Bolt TDC-H	Nil
1501 – 1800 mm	22	4 Bolt TDC-H	Nil
1801 – 2100 mm	20	4 Bolt TDC-J	Zeebar stiffener 1-S
2101 – 2700 mm	18	4 Bolt TDC-J	Zeebar stiffener 1-S

OR

**2.2.2 For Ducts with External SP upto 500 Pa (50mmWg)**

Rectangular Ducts G.S.	External Pressure 500 Pa	
	Duct Section Length 1.2 m (4 ft)	
Maximum Duct Size	Joint Type	Bracing Spacing
1–600 mm	C & SS	Nil
601-750 mm	4 Bolt Transverse Duct Connector-E (TDC) with built in sealant	Nil
751-1000 mm	4 Bolt TDC-E	Nil
1001-1200 mm	4 Bolt TDC-H	Nil
1201-1300 mm	4 Bolt TDC-J	Nil
1301-1500	4 Bolt TDC-J	Zeebar stiffener 1-S
1501-1800 mm	4 Bolt TDC-J	Zeebar stiffener 1-S
1801-2100 mm	4 Bolt TDC-J	Zeebar stiffener 1-S
2101-2250 mm	4 Bolt TDC-J	Zeebar stiffener 1-S
2251-2400 mm	4 Bolt TDC-J	Zeebar stiffener 1-S
2401-2700 mm	4 Bolt TDC-J	600

'C'-cleat; 'S'-S cleat; 'SS'-Standing S cleat; 'AI' -Angle Iron in mm

\*Distance of reinforcement/bracing from each joint. Bracing material to be same as  
Seal & Signature of Bidder



of material used for joining of duct sections.

### 2.2.3 For Round Ducts

Duct diameter mm	Upto 50 mm Wg static pressure (+ve)		51 – 250 mm Wg static pressure (+ve)		Upto 50 mm Wg static pressure (-ve)	
	Spiral seam gauge	Longitudinal seam gauge	Spiral seam gauge	Longitudinal seam gauge	Spiral seam gauge	Longitudinal seam gauge
Upto 650	26	24	24	22	24	22
651-900	24	22	22	20	22	20
901 – 1250	22	20	20	20	20	18
1251 – 1500	20	18	18	18	18	16
1501 – 2100	18	16	18	16	16	14

### 3.0 FABRICATION STANDARDS & EQUIPMENT

All duct construction and installation shall be in accordance with SMACNA standards. In addition ducts shall be factory fabricated utilizing the following machines to provide the requisite quality of ducts.

1. Coil (Sheet metal in Roll Form) lines to facilitate location of longitudinal seams at corners/folded edges only, for required duct rigidity and leakage free characteristics. No longitudinal seams permitted along any face side of the duct.
2. All ducts, transformation pieces and fittings to be made on CNC profile cutter for requisite accuracy of dimensions, location and dimensions of notches at the folding lines.
3. All edges to be machine treated using lock formers, flaggers and rollers for turning up edges.
4. **Kitchen exhaust ducting shall be with 16 G MS.** Suitable access doors shall

be provided at every 3m. Provision shall be made for firefighting agency to install duct mounted sprinklers at every 3m. Generally exhaust ducts shall have slope towards kitchen hood.

#### 4.0 DUCT CONSTRUCTION

All ducts shall be fabricated and installed in workmanlike manner, conforming to relevant SMACNA codes.

Ducts so identified on the Drawings shall be acoustically lined and insulated from outside as described in the section “Insulation” and as indicated in schedule of Quantities. Duct dimensions shown on drawings, are overall sheet metal dimensions inclusive of the acoustic lining where required and indicated in Schedule of quantities. The fabricated duct dimensions should be as per approved drawings and care should be taken to ensure that all connecting sections are dimensionally matched to avoid any gaps.

Ducts shall be straight and smooth on the inside with longitudinal seams shall be airtight and at corners only which shall be either Pittsburgh or snap button as per SMACNA practice, to ensure air tightness.

All ducts up to 75cms width within conditioned spaces shall have slip and drive (C & S/SS) joints. The internal ends of slip joints shall be in the direction of airflow. Care should be taken to ensure that S/SS Cleats are mounted on the longer side of the duct and Cleats on the shorter side. Ducts and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint.

Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7). Air- turns (vanes) shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

Ducts shall be fabricated as per details shown on Drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees, or angles, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

All sheet metal connection, partitions and plenums, required to confine the flow of air to and through the filters and fans, shall be constructed of 18 gauge GSS / 16gauge aluminum, thoroughly stiffened with 25mm x 25mm x 3mm galvanized steel angle braces and fitted with all necessary inspection doors as required, to give access to all parts of the apparatus. Access doors shall be not less than 45cm x 45cm in size.

Plenums shall be shop/factory fabricated panel type and assembled at site. Fixing of galvanized angle flanges on duct pieces shall be with rivets heads inside i.e. towards GS sheet and riveting shall be done from outside.

Self adhesive Neoprene rubber / UV resistant PVC foam lining 5mm nominal thickness instead of felt, shall be used between duct flanges and between duct

supports in all ducting installation.

## 5.0 INSULATED FLEXIBLE DUCTS

All duct work shall conform to quality standards and shall be carried out as per specifications and details given hereunder:-

- 5.1 Wherever specified, flexible duct shall be made of double lamination of metalized polyester film permanently bonded to a coated spring steel wire helix. Duct shall be tear and puncture resistant construction.

Wherever insulated flexible duct are specified inner core for the same should be made of double lamination of metalized polyester film permanently bonded to a coated spring steel wire helix. Fiberglass insulated of minimum 14kg/cuM density, having R-value 4.20F-Ft<sup>2</sup>-hr/Btu and 1 inch thickness shall be wrapped over the inner core and covered with strong outer jacket cum vapour barrier made of fiberglass reinforced metalized polyester film laminate.

Care must be taken to install all the flexible duct in fully extended position and bends made with adequate radius as per manufacturer recommended practices.

- 5.2 Installation

The flexible duct must be installed fully extended to produce optimum results.

The maximum allowable sag, between any two adjacent suspension points, should not exceed 50mm per meter.

The distance between any two adjacent suspension points may vary from 1.50 to 3.0 meter depending upon the type of flexible duct in use.

- 5.3 Bending Radius

All bends should be made as large as possible and should have a radius of not less than the diameter of the duct in use. This reduces unfavorable pressure losses and is particularly important for metal based products which are more susceptible to stress rupturing. Double bends should be avoided, however if unavoidable, ensure that each radius is not less than  $R = 2xD$ .

- 5.4 Longer Length Installation

In the event where extreme length of flexible duct is to be installed, round duct connectors made of galvanized sheet of at least 30cm long should be used to connect the duct at every distance of 10 mtrs. Use metal or galvanized hangers as recommended to support the point where connections are made. Light railings are a good alternative hanging support when using long length of flexible duct.

## 6.0 INSTALLATION PRACTICE

- a) All ducts shall be installed generally as per tender drawings, and in strict

accordance with approved shop drawings to be prepared by the Contractor:

The Contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent of these Specifications and Drawings. The work shall meet with the approval of Owner's site representative in all its parts and details.

- b) All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and conduits, the ducts shall be transformed, divided or curved to one side (the required area being maintained) all as per the site requirements.

If a duct cannot be run as shown on the drawings, the contractor shall install the duct between the required points by any path available in accordance with other services and as per approval of owner's site representative.

All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with trapeze hangers formed of galvanized steel rods and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel rod under ducts. The spacing between supports should be not greater than 2.0 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the hanger rods shall be welded to the plates. Trapeze hanger formed of galvanized steel rods shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Hanger rods shall then hang through the cleats or fully threaded galvanized rods can be screwed into the anchor fasteners.

Ducting over furred ceiling shall be supported from the slab above, or from beams after obtaining approval of Owner's site representative. In no case shall any duct be supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractor's work in the building.

Where ducts pass through brick or masonry openings, it shall be provided with 25mm thick TF quality expanded polystyrene around the duct and totally covered with fire barrier mortar for complete sealing.

All ducts shall be totally free from vibration under all conditions of operation. Whenever ductwork is connected to fans, air handling units or blower coil units that may cause vibration in the ducts, ducts shall be provided with a flexible connection, located at the unit discharge.

Flexible connections shall be constructed of fire retarding flexible heavy canvas sleeve at least 10cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both sides of the flexible connection. The flexible connection shall

be suitable for pressure at the point of installation.

Duct shall not rest on false ceiling and shall be in level from bottom. Taper pieces shall taper from top.

## **7.0 DAMPERS**

- a. Dampers: All duct dampers shall be opposed blade louver dampers of robust 16 G GSS construction and tight fitting. The design, method of handling and control shall be suitable for the location and service required.
- b. Dampers shall be provided with suitable links levers and quadrants as required for their proper operation. Control or setting device shall be made robust, easily operable and accessible through suitable access door in the duct. Every damper shall have an indicating device clearly showing the damper position at all times.
- c. Dampers shall be placed in ducts at every branch supply or return air duct connection, whether or not indicated on the Drawings, for the proper volume control and balancing of the air distribution system.

## **8.0 FIRE & SMOKE DAMPERS**

- a. All supply and return air ducts at AHU room crossings and at all floor crossings shall be provided with Motor operated Fire & smoke damper of at least 90 minutes rating as per UL555/1995 tested by CBRI. These shall be of multi-leaf type and provided with Spring Return electrical actuator having its own thermal trip for ambient air temperature outside the duct and air temperature inside the duct. Actuator shall have Form fit type of mounting, metal enclosure and guaranteed long life span.
- b. Fire damper blades and outer frames shall be of 16G galvanised steel construction fitted with 18 gauge extended sleeves on both sides. The damper blade shall be pivoted on both ends using chrome plated spindles in self lubricated bronze bushes. Stop seals shall be provided on top and bottom of the damper housing made of 16G galvanised sheet steel. For preventing smoke leakage metallic compression seals will be provided.
- c. The electric actuator shall be energized either upon receiving a signal from smoke detector installed in AHU room supply air duct / return air duct or temperature sensor. The fire damper shall also close upon sensing temperature rise in supply air ducts thru the electronic temperature sensor.
- d. Each damper shall be provided with its own control panel, mounted on the wall and suitable for 240 VAC supply. This control panel shall be suitable for spring return actuator and shall have at least the following features:
  - Potential free contacts for AHU fan ON/ Off and remote alarm indication.

- Accept signal from external smoke / fire detection system for tripping the electrical actuator.
  - Test and reset facility.
  - Indicating lights / contacts to indicate the following status:
    - Power Supply On
    - Alarm
    - Damper open and close position.
- e. Actuators shall be mounted on the sleeve by the damper supplier in his shop and shall furnish test certificate for satisfactory operation of each Motor Operated Damper in conjunction with it's control panel. Control panel shall be wall mounted type.
- f. It shall be HVAC Contractor's responsibility to co-ordinate with the Fire Alarm System Contractor for correctly hooking up the Motor Operated Damper to Fire Detection / Fire Management System. All necessary materials for hooking up shall be supplied and installed by HVAC Contractor under close co-ordination with the fire protection system contractor.
- g. HVAC Contractor shall demonstrate the testing of all Dampers and its control panel after necessary hook up with the fire protection / fire management system is carried out by energizing all the smoke detectors with the help of smoke.
- h. HVAC Contractor shall provide Fire retardant cables wherever required for satisfactory operation and control of the Damper.
- j. HVAC Contractor shall strictly follow the instructions of the Damper Supplier or avail his services at site before carrying out testing at site.
- k. Fire/smoke damper shall be provided with factory fitted sleeves; however, access doors shall be provided in the ducts within AHU room in accordance with the manufacturer's recommendations.

## 9.0 FIRE DAMPERS

- a. Whenever a supply/return duct crosses from one fire zone to another, it shall be provided with approved fire damper of at least 1½ hour fire rating as per UL555/1995 tested by CBRI. This shall be curtain type fire damper.
- b. Fire damper blades shall be one piece folded high strength 16 gage galvanised steel construction. In normal position, these blades shall be gathered and stacked at the frame head providing maximum air passage and preventing passing air currents from creating noise or chatter. The blades shall be held in position through fusible link of temp 70 C.
- c. In case of fire, the intrinsic energy of the folded blades shall be utilized to



close the opening. The thrust of the suddenly released tension shall instantly drive the blades down and keep it down without the use of springs, weights or other devices subject to failure.

- d. Fire damper sleeves and access doors shall be provided within the duct in accordance with the manufacturer's recommendation.

## 10.0 SUPPLY AND RETURN AIR REGISTERS

Supply & return air registers shall be of either steel or aluminium sections as specified in schedule of quantities. Steel construction registers shall have primer Coat finish whereas extruded aluminium registers shall be either Anodised or Powder Coated as specified in Schedule of Quantities. These registers shall have individually adjustable louvers both horizontal and vertical. Supply air registers shall be provided with key operated opposed blade extruded aluminium volume control damper anodised in matt black shade.

The registers shall be suitable for fixing arrangement having concealed screws as approved by Architect. Linear continuous supply cum return air register shall be extruded aluminium construction with fixed horizontal bars at 15 Deg. inclination & flange on both sides only (none on top & bottom). The thickness of the fixed bar louvers shall be minimum 5.5 mm in front and 3.8 mm in rear with rounded edges. Flanges on the two sides shall be 20 mm/30 mm wide as approved by Architect. The grilles shall be suitable for concealed fixing. Volume control dampers of extruded aluminium anodised in black colour shall be provided in supply air duct collars. For fan coil units horizontal fixed bar grilles as described above shall be provided with flanges on four sides, and the core shall be & suitable for clip fixing, permitting its removal without disturbing the flanges.

- a. All registers shall be selected in consultation with the Architect. Different spaces shall require horizontal or vertical face bars, and different width of margin frames. These shall be procured only after obtaining written approval from Architect for each type of register.
- b. All registers shall have a soft continuous rubber/foam gasket between the periphery of the register and the surface on which it has to be mounted. The effective area of the registers for air flow shall not be less than 66 percent of gross face area.
- c. Registers specified with individually adjustable bars shall have adjustable pattern as each grille bar shall be pivot able to provide pattern with 0 to +45 degree horizontal arc and upto 30 degree deflection downwards. Bars shall hold deflection settings under all conditions of velocity and pressure.
- d. Bar longer than 45 cm shall be reinforced by set-back vertical members of



approved thickness.

- e. All volume control dampers shall be anodized aluminium in mat black shade.

#### **11.0 SUPPLY AND RETURN AIR DIFFUSERS**

Supply and return air diffusers shall be as shown on the Drawings and indicated in Schedule of Quantities. Mild steel diffusers/dampers shall be factory coated with rust-resistant primer. Aluminium diffusers shall be powder coated & made from extruded aluminium section as specified in schedule of quantities.

- a. Rectangular Diffusers shall be steel / extruded aluminium construction, square & rectangular diffusers with flush fixed pattern for different spaces as per schedule of quantities These shall be selected in consultation with the Architect. These shall be procured only after obtaining written approval from Architect for each type of diffuser.
- b. Supply air diffusers shall be equipped with fixed air distribution grids, removable key-operated volume control dampers, and anti-smudge rings as required in specific applications, and as per requirements of schedule of quantities. All extruded aluminium diffusers shall be provided with removable central core and concealed key operation for volume control damper.
- c. Linear Diffuser shall be extruded aluminium construction with removable core, one or two way blow type. Supply air diffusers shall be provided with volume control/ balancing dampers within the supply air collar. Diffusers for different spaces shall be selected in consultation with the Architect, and provided as per requirements of schedule of quantities. All diffusers shall have volume control dampers of extruded aluminium construction anodized in mat black shade.
- d. Slot Diffuser shall be extruded aluminium construction multislot type with air pattern controller provided in each slot. Supply air diffusers shall be provided with Hit & Miss volume control dampers in each slot of the supply air diffusers. Diffusers for different spaces shall be selected in consultation with the Architect and provided as per requirement of Schedule of Quantities.

#### **12.0 DOCUMENTATION & MEASUREMENTS FOR DUCTING**

All ducts fabricated and installed should be accompanied and supported by proper documentation viz:

- a) Bill of material/Packing list for every duct section supplied.

Measurement sheet covering each fabricated duct piece showing dimensions and external surface area along with summary of external surface area of duct

gauge- wise. Each and every duct piece to have a tag number, which should correspond to the serial number, assigned to it in the measurement sheet. The above system will ensure speedy and proper site measurement and verification.

Unless otherwise specified, measurements for ducting for the project shall be on the basis of centerline measurements described herewith

Ductwork shall be measured on the basis of external surface area of ducts. Duct measurements shall be taken before application of the insulation. The external surface area shall be calculated by measuring the perimeter comprising overall width and depth, including the corner joints, in the center of each duct section, multiplying with the overall length from flange face to flange face of each duct section and adding up areas of all duct sections. Plenums shall also be measured in a similar manner.

For tapered rectangular ducts, the average width and depth shall be considered for perimeter, whereas for tapered circular ducts, the diameter of the section midway between large and small diameter shall be adopted, the length of tapered duct section shall be the centerline distance between the flanges of the duct section.

For special pieces like bends, tees, reducers, branches and collars, mode of measurement shall be identical to that described above using the length along the centerline.

- b. Special Items for Air Distribution shall be measured by the cross-section area perpendicular to air flow, as identified herewith:
  - i. Grilles and registers - width multiplied by height, excluding flanges. Volume control dampers shall form part of the unit rate for registers and shall not be separately accounted.
  - ii. Diffusers - cross section area for air flow at discharge area, excluding flanges. Volume control dampers shall form part of unit rate for supply air diffusers and shall not be separately accounted.
  - iii. Linear diffusers - shall be measured by cross-sectional areas and shall exclude flanges for mounting of linear diffusers. The supply air plenum for linear diffusers shall be measured with ducting as described earlier.
  - iv. Fire dampers - shall be measured by their cross sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary collars and flanges for mounting, inspection pieces with access door, electrical actuators and panel. No special allowance shall be payable for extension of cross section outside the air stream.

- v. Flexible connection - shall be measured by their cross sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary mounting arrangement, flanges, nuts and bolts and treated-for-fire requisite length of canvas cloth.

### **13.0 TESTING AND BALANCING**

After the installation of the entire air distribution system is completed in all respects, all ducts shall be tested for air leaks by visual inspection.

The entire air distribution system shall be balanced using an anemometer. Measured air quantities at fan discharge and at various outlets shall be identical to or less/excess than 5 percent in excess of those specified and quoted. Branch duct adjustments shall be permanently marked after air balancing is completed so that these can be restored to their correct position if disturbed at any time. Complete air balance report shall be submitted for scrutiny and approval, and four copies of the approved balance report shall be provided with completion documents.

#### **D) INSULATION:**

This section deals with supply and fixing of **Thermal/Acoustic** insulation of ducts, pipes etc. as per the specification given in this section.

#### **1.0 INSULATION ON SHEET METAL DUCTING**

##### **1.1 Material of Insulation**

The insulation material of the following kind shall be used for duct insulation.

##### **a) Closed Cell Electrometric Nitrile Rubber**

Insulation material shall be Closed Cell Elastomeric Nitrile Rubber. Thermal conductivity of electrometric nitrile rubber shall not exceed 0.036 W/m<sup>2</sup>K at an average temperature of 0<sup>o</sup> C. The insulation shall have fire performance such that it passes minimum CLASS 1 as per BS476 Part 7 for surface spread of flame. Water vapour permeability shall not exceed 0.04 Perm inch (2x 10<sup>-10</sup> Kgs/m.hr.Pa). The Nitrile Rubber Insulation should have approval from CBRI, Roorkee.

Thickness of the insulation shall be as specified for the individual application

- b) The air-handling ducts shall be insulated with Elastomeric Nitrile rubber density 40-60kg./m<sup>3</sup>.

- c) Duct insulation thickness shall be as follows:
- ii) Supply Duct in conditioned space - 13mm thick
  - ii) Return air duct - 9 mm thick
  - iii) Acoustic lining - 15 mm thick

## 2.2 ACOUSTIC LINING:

2.2.1 The acoustic lining shall consist of 25 mm resin bonded glass wool of density 32 kg/m<sup>3</sup> (min) then it shall be covered by 0.5 mm perforated aluminium sheets having 3 mm perforation at 6 mm centres.

### 2.2.2 Installation:

- a) The duct surface shall first be cleaned from inside.
- b) The insulation boards shall be wrapped in RP Tissue paper with the end stitched.
- c) Then the boards shall be fixed inside the duct.
- d) The insulation shall then be covered with 0.5 mm perforated aluminium sheets.
- e) The sheet and the insulation shall be secured to the duct by means of cadmiumplated bolts, nuts and washers. The ends should be completely sealed off, so that no insulation material is exposed.

## E) VENTILATION FANS:

### 1.0 IN-LINE FANS;

In-line fans shall be Centrifugal type direct/belt driven complete with motor, belt guard, motor mount and vibration isolation type suspension arrangement mounted within/end of duct.

#### 1.1 Rectangular Inline Fan:

Inline fan shall incorporate SISW direct drive Centrifugal fan With TEFC(IP-44) motor. The fan assembly shall be encased in a sheet metal housing of gss & with necessary inspection cover & proper gasket assembly. The fan material shall be galvanised sheet. Flanged shall be provided on both sides of the inline fan to facilitate easy connection. Flexible anti- vibration joints shall be provided to arrest vibration being communicated to other equipments connected to inline fan. Motor shall be single/three phase as per duty conditions.

All single phase fans shall be provided with speed regulator while all three phase fans shall be provided with opposed blade damper in Gss construction at fan outlet for air balancing

The fan assembly shall be reliable for continuous operation

Fan shall be factory assembled and shipped with all accessories factory-mounted.

**F) VARIABLE REFRIGERANT VOLUME AIR CONDITIONERS:**

**1.0 SCOPE:**

The scope of this section comprises the supply, erection, testing and commissioning of Variable Refrigerant Flow System conforming to these specifications and in accordance with the requirements of Drawings and Schedule of quantities.

**2.0 TYPE:**

Unit shall be air cooled, variable refrigerant flow air conditioner consisting of one outdoor unit and multiple indoor units. Each indoor unit having capability to cool independently for the requirement of the rooms.

It shall be possible to connect multiple indoor units on one refrigerant circuit as shown in the drawings or as indicated in schedule of quantities. The indoor units on any circuit can be of different type and also controlled individually. Following type of indoor units shall be connected to the system:

- Ceiling mounted cassette type.
- Ceiling mounted duct able type.
- Wall mounted Hi-Wall type.
- Floor mounted type.

Compressor installed in outdoor unit shall be equipped with inverter controller, and capable of changing the rotating speed to follow variations in cooling. Outdoor unit shall be suitable for mix-match connection of all type of indoor units.

The refrigerant piping between indoor units and outdoor units shall be extended up to 150m with maximum 50 m level difference. Oil recovery system shall be managed without disturbance to normal operation cycle of the system / compressor.

Both indoor unit and outdoor unit shall be factory assembled, tested and filled with first charge of refrigerant before delivery at site.

**3.0 OUT DOOR UNIT:**

The outdoor unit shall be factory assembled, weather proof casing constructed from heavy gauge mild steel panels with powder coated finish.

All outdoor units above 5 HP rating shall have minimum two number scroll compressors.

In case of outdoor units with multiple compressors, the operation shall not be disrupted with failure of any compressor.

The noise level shall not be more than 40 dB (A) at normal operation measured horizontally 1m away and 1.5 m above ground level.

The unit shall be provided with microprocessor control panel.

**The unit shall be provided with Factory Pre-Coated Fines to protect the outdoor unit fins with chemical reaction.**

#### **4.0 LOW NOISE MODE AT NIGHT:**

The outdoor unit of variable refrigerant flow system has a peculiar function of night shift setting, which reduces the noise level by 5 Db at night when operating at full capacity compared with the normal operation in daytime.

#### **5.0 COMPRESSOR:**

The compressor shall be high efficiency scroll type and capable for capacity controlling. It shall change the speed / refrigerant mass flow rate in accordance to the variation in cooling load requirement.

All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated. Forced lubrication may also be employed.

Oil heater shall be provided in the compressor casing.

#### **6.0 HEAT EXCHANGER:**

The Heat Exchanger shall be constructed with copper tubes mechanically bonded to aluminum fins to form a cross fan coil and larger surface area.

The fins shall have anticorrosion treatment for Heat Exchanger Coil. The treatment shall be suitable for areas of high pollution, moisture and salt laden air.

The casings, fans, motors etc. shall also be with anticorrosion treatment as a standard features.

The unit shall be provided with necessary number of direct driven low noise level propeller type fans arranged for vertical / horizontal discharge and shall be capable of handling minimum 6 mm external pressure drop. Each fan shall have a safety guard.

#### **7.0 REFRIGERANT CIRCUIT:**

The Refrigerant Circuit shall include a liquid receiver /accumulator, liquid & gas shut off valves and a solenoid valve. All necessary safety devices shall be provided to ensure the safety operation of the system.

## 8.0 SAFETY DEVICES:

All necessary safety devices shall be provided to ensure safe operation of the system.

Following safety devices shall be part of the outdoor unit: high pressure switch, low pressure switch, fuse, crankcase heater, fusible plug, over current protection for inverter, and short recycling guard timer.

## 9.0 PIPING:

All connections of Refrigerant piping shall be in high grade Copper of Refrigeration quality and material test Certificates.

All connections, tees, reducers etc. shall be standard make fittings.

Insulation of cold lines shall be carried out with Paramount/Supreme/Armacell/ equiv. insulation sheets and tubes of appropriate thickness so that condensation does not occur.

For individual Piping 50 / 100 mm wide Aluminum Tape shall be used at joints of Piping with Bands for identification.

**All interconnecting piping, joints and U bends within the condensing unit shall be painted with two coats of clear transparent polymer coating for protection against corrosion from ambient air pollution.**

**Each coat shall have dry film thickness of 25 micron or more. The coating shall be strong, flexible and durable. It shall have good adhesive and abrasion resistance.**

**It shall be resistant to moisture, UV, acid alkali and other chemicals and capable of functioning between -25 C up to 150 C**

**The polymer shall be obtained by the mixing of base / monomer with a hardener / Polymerisor. It may be brush applied or with the use of a suitable gun.**

## 10.0 OIL RECOVERY SYSTEM:

Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigerant piping. System shall be designed for proper oil return to compressor along with the distribution of oil to individual compressor. The refrigerant piping shall be extended up to 150 M with 50-M level difference.

## 11.0 MOUNTING:

All indoor units shall be mounted with Brackets, Hangers etc. With proper size anchor Fasteners.

### a) Test Instruments:

- i) All instruments for testing shall be provided by the air-conditioning contractor.



- ii) Electronic thermometers used for measurement of temperature of water/ refrigerant shall have graduations of 0.1oC and shall be calibrated from N.P.L. or any recognized test house before hand.
- iii) Thermometers used in the psychrometers shall have graduations of 0.2 OC and shall be calibrated as at (2) above.
- iv) Pressure gauges shall also be calibrated before hand from a recognized test house.

**b) Capacity Computations:**

- i) The air quantity computation and temperatures difference on air side shall be used to compute the air side capacity.

**ii) Tolerance**

The test data shall be within  $\pm 5\%$  of the specified data, to fulfill the tender requirements.

**12) INDOOR UNIT**

This section deals with supply, installation, testing, commissioning of various type of indoor units conforming to general specification and suitable for the duty selected. The type, capacity and size of indoor units shall be as specified in detailed Bill Of Quantities

**GENERAL**

Indoor units shall be either ceiling mounted cassette type, or ceiling mounted duct able type or floor standing type or wall mounted type or other as specified in BOQ. These units shall have electronic control valve to control refrigerant flow rate respond to load variations of the room.

- a) The address of the indoor unit shall be set automatically in case of individual and group control
- b) In case of centralized control, it shall be set by liquid crystal remote controller

The fan shall be dual suction, aerodynamically designed turbo, multi blade type, statically & dynamically balanced to ensure low noise and vibration free operation of the system. The fan shall be direct driven type, mounted directly on motor shaft having supported from housing.

The cooling coil shall be made out of seamless copper tubes and have continuous aluminum fins. The fins shall be spaced by collars forming an integral part. The tubes shall be staggered in the direction of airflow. The tubes shall be hydraulically/ mechanically expanded for minimum thermal contact resistance with fins. Each coil shall be factory tested at 21kg/sqm air pressure under water.

Unit shall have cleanable type filter fixed to an integrally molded plastic frame. The filter shall be slide away type and neatly inserted.

Each indoor unit shall have computerized PID control for maintaining design room temperature. Each unit shall be provided with microprocessor thermostat for cooling and heating.

Each unit shall be with cordless type remote control. The remote controller shall memorize the latest malfunction code for easy maintenance. The controller shall have self-diagnostic features for easy and quick maintenance and service. The controller shall be able to change fan speed and angle of swing flat individually as per requirement.

#### **1.0 CEILING MOUNTED CASSETTE TYPE UNIT (MULTI FLOW TYPE)**

The unit shall be ceiling mounted type. The unit shall include pre-filter, fan section and DX-coil section. The housing of the unit shall be powder coated galvanized steel. The body shall be light in weight and shall be able to suspend from four corners.

Unit shall have an external attractive panel for supply and return air. Unit shall have fourway supply air grilles on sides and return air grille in center.

Each unit shall have high lift drain pump, fresh air intake provision (if specified) Low gas detection system and very low operating sound.

All the indoor units regardless of their difference in capacity should have same decorative panel size for harmonious aesthetic point of view. It should have provision of connecting branch ducts.

#### **1.1 CEILING MOUNTED DUCTABLE/SLIM DUCTABLE TYPE UNIT**

Unit shall be suitable for ceiling mounted type. The unit shall include pre filter, fan section & DX coil section. The housing of unit shall be light weight powder coated galvanized steel. The unit shall have high static fan for Duct able arrangement.

#### **1.2 CEILING SUSPENDED TYPE**

Unit shall be suitable for ceiling suspended arrangement below false ceiling.

The unit includes pre filter, fan section & DX coil section. The housing of unit shall be light weight powder coated galvanized steel.

#### **1.3 HIGH WALL MOUNTED UNITS**

The units shall be wall-mounted type. The unit includes pre filter, fan section & DX coil section. The housing of unit shall be light weight powder coated galvanized steel.

Unit shall have an attractive external casing for supply and return air.

## 2.0 REFRIGERANT PIPING

All refrigerant piping for the air conditioning system shall be constructed from soft seamless up to 19.1mm and hard drawn copper refrigerant pipes for above 19.1mm with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and are to include charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits.

All joints in copper piping shall be sweat joints using low temperature brazing and or silver solder. Before jointing any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The pipings shall be continuously kept clean of dirt etc. while constructing the joints. Subsequently, it shall be thoroughly blown out using nitrogen. After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at pressure of 38Kg per sq.cm. Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to minimum vacuum of 700mm Hg and held for 24 hours.

The air-conditioning system supplier shall design sizes and erect proper interconnections of the complete refrigerant circuit.

The thickness of copper piping shall not be less than mentioned below:

<b>Pipe Size in mm (OD)</b>	<b>Wall Thickness in mm</b>
41.3	1.4
38.1	1.3
34.9	1.2
31.8	1.1
28.6	1.0
25.4	1.0
22.2	1.0
19.1	1.0
15.9	1.0
12.7	0.8
9.5	0.8
6.4	0.8

The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturers specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors,

brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

To protect nitrile rubber insulation of exposed copper piping from degrading due to ultra violet rays & atmospheric condition, it should be covered with poly coating and at least two coats of woven glass reinforced plastic mat with resin and hardener (Make- poly Bond Company) above nitrile rubber insulation. Fiberglass tape shall be helically wound & coated with painted two coats of resin with hardener to give smooth & plain finish.

### **3.0 DRAIN PIPING**

uPVC pipes & fittings shall be used from condensate from Evaporator Unit to drain point. The joints shall be properly sealed so that there is no water leakage. U-trap as required shall be provided at the end. Additional insulation drain tray shall be provided below the Evaporator Unit, if required

### **4.0 TECHNICAL DATA**

#### **TO BE FURNISHED BY THE BIDDER IN METRIC SYSTEM ONLY**

#### **TECHNICAL DATA FOR OUT DOOR UNITS**

<b>S.No.</b>	<b>DESCRIPTION</b>	<b>UNI T</b>	<b>CONDITION SERVICE</b>	<b>OF</b>
<b><u>OUTDOOR UNITS</u></b>				
1	Make			
2.	Origin of Outdoor Units			
3.	Model			
4.	Cooling Capacity HP			
5.	Nominal	TR		
	At 35 deg C ambient & standard rating conditions			
6.	Actual capacity at operating condition	TR		
	AT 43 deg C ambient & standard rating conditions			
7.	Heating Capacity			

8. Nominal KW

9. Actual capacity at operating condition KW

**S.No. DESCRIPTION UNIT CONDITION OF SERVICE**

10. Compressor Motor KW

11. Sound Level at distance of 3m DB (A)

12. No. of Compressor

13. Fixed Speed Type Nos.

14. Variable Speed Type Nos.

15. Total No. of Compressor Nos.

16. Power Supply requirement 3Ph/ 1Ph

17. Power consumption at rated capacity KW  
At 43 deg C ambient & standard rating conditions

18. Type of Refrigerant

19. COP AT 100%

20. COP AT 50%

21. Machine Weight Kg

**TECHNICAL DATA FOR INDOOR UNITS**

**INDOOR UNITS**

1. TR
2. Type of indoor Unit
3. Origin
4. Make of Air Handler
5. Capacity CMH
6. Qty.
7. Drain Pump Considered Yes / No
8. Make of drain Pump
9. Overall Size L x B x H (mt.) of units
10. Overall Weight in Kg.

11. No. of blowers
12. Ceiling Panel for Cassette considered, Yes / No

### **COOLING COIL**

13. Make
14. Face area
15. No of Rows/ Fins per cm
16. Tube thickness

### **G) ELECTRICAL WORK:**

#### **1.0 SCOPE:**

The scope of this section comprises of fabrication, supply, erection, testing and commissioning of electric control panels, wiring and earthing of all air-conditioning equipment components and accessories, including supply, installation and wiring of remote control with indicating lamps.

The following exclusions from this contract may be provided by Owner, through other agencies, as per special conditions of contract.

- i. Wiring and earthing of incoming breakers in the air-conditioning plant room control panel.
- ii. Supply, installation, wiring and earthing of 15 amps three pin socket in vicinity of each fan coil unit if any and each single phase ventilation fan.

#### **2.0 GENERAL:**

Work shall be carried out in accordance with the specifications of local rules, Indian Electricity Act 1910 as amended upto date, and rules issued there under, regulations of the Fire Insurance Company and Indian Standard Code of practice No. IS: 732-1963 (latest upto date). Wiring for items of work not covered by any of the above regulations. Wiring rules in the 13th edition of the Institution of Electrical Engineers (London) shall apply.



Definition of terms shall be as per the rules of the Institution of Electrical Engineers (London).

### **3.0 WIRING SYSTEM:**

All power wiring shall be carried out with 1100 volt grade XLPE/PVC insulated, armoured, overall, PVC sheathed aluminum conductor cables. Cables shall be sized for starting current and by applying proper derating factor. All control wiring shall be carried out by using 1100 volts PVC insulated copper conductor wires in wire ways or in conduit. Minimum size of control wiring shall be 1.5 sq.mm.

### **4.0 CONSTRUCTION FEATURES:**

The control panel shall be metal enclosed sheet steel cubical indoor type, dead front, floor mounting/wall mounting type. The control panel shall be totally enclosed, completely dust and vermin proof, Gaskets between all adjacent units and beneath, all covers shall be provided to render the joints dust proof. Control panels shall be arranged in multitier formations. All doors and covers shall be lockable. All mild steel sheets used in the construction of control panels shall be 2mm. thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all slag grounded off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of control panels. Base channel of 75mm x 75mm x 5mm thick shall be provided at the bottom. Minimum clear space of 200mm between the floor of control panel and bottom most unit shall be provided.

The control panels shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear. Knockput holes of appropriate size and number shall be provided in the control panels in conformity with the location of incoming and outgoing conduits/cables. All equipment such as meters and indicating lamps, etc shall be located adjacent to the unit with which it is associated and care shall be taken to achieve a neat and symmetrical arrangement. Facility shall be provided for termination of cables from both above and below the control panel. Where cables enter below, cables boxes shall be fitted at the rear and arranged in tiers to facilitate making connections to the upper and lower units. Clamps shall be provided to support the weight of the cables. All incoming and outgoing feeders shall be brought out to a terminal block of adequate size at suitable location inside the control panel. All wiring inside the control panel shall be colour coded and labeled with approved plastic beads for identification. Circuit diagrams showing the arrangement of circuits shall be pasted on the inside of the

panel door and covered with transparent plastic sheet and all labeling shall be provided on the front face of the panel board.

## **5.0 CIRCUIT COMPARTMENTS:**

Each circuit breaker, contactor and relay shall be housed in a separate compartment and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with the breaker in the 'ON' position. Safety interlocks shall be provided to prevent the breaker or Contactor from being drawn out when the breaker is in the draw out portion of the panel. Instruments and indicating lamps shall not be mounted on the panel compartment door. Sheet steel barriers shall be provided between the tiers in a vertical section.

## **6.0 BUS BARS AND BUS BAR CONNECTION:**

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminium. The bus bars shall have uniform cross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate busbar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral busbars shall be provided). The interval between the two insulators will be designed after considering the following:

- a) Strength and safe load rating of the insulator,
- b) The vibrating force generated during a fault,
- c) A Factor of safety of 1.25
- d) A set of insulators at both ends of the bus.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanised high tensile steel nuts, bolts, plain or spring washers of suitable size will be used in connecting the various section of the bus bars.

## **7.0 TERMINALS:**

The outgoing terminals and neutral links shall be brought out to a terminal block suitably located in the control panels. The current transformer for instruments, metering and for protection shall be mounted on the terminal blocks. Separate cable compartment shall be provided for incoming and outgoing cables.

## 8.0 WIRE WAYS:

A horizontal wire way screwed covers shall be provided at the top to take in the connecting control wiring in different vertical sections.

## 9.0 CABLE COMPARTMENTS:

Cable compartments of adequate size shall be provided in the control panels for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate and proper supports shall be provided in cable compartments to support cables. All incoming and outgoing terminals shall be brought out to terminal blocks in the cable compartment.

## 10.0 MATERIALS:

All materials shall be of the best quality complying with the appropriate Indian Institutions and British Standard specifications, Materials used shall be subject to the approval of the Architect/Consultant and sample of the same shall be furnished where required.

### a. Air Circuit Breaker:

The air circuit breakers shall be sheet metal enclosed flush front, draw out type, and shall be provided with a trip free manual operating mechanical "ON" - "OFF" indications. The circuit breaker shall be suitable for continuous rating and of capacity as called for. It shall be possible to switch "ON & "OFF" the circuit breaker without opening the circuit breaker compartment door. The operating handle and the mechanical trip push button shall be at the front of the breaker and integral with the breaker.

### Cradle:

The cradle shall be so designed and constructed as to permit smooth withdrawal and insertion of the breaker into it. The movement shall be free from jerks, easily operable and shall be on steel balls/rollers and not on flat surfaces.

There shall be four distinct and separate position of the circuit breaker on the cradle.

Service	Both main and secondary isolating contacts closed.
Test	Main isolating contacts separated and secondary isolating contacts closed.
Isolated	Both main and secondary isolating contacts isolated.

Maintenance Circuit breaker full outside the panel ready for maintenance. There shall be provision for locking the breaker in any or all of the first three positions.

Maintenance Circuit breaker full outside the panel ready for maintenance. There shall be provision for locking the breaker in any or all of the first three positions.

b. Moulded case circuit breaker (MCCB)

The Moulded case circuit breaker (MCCB) shall conform to latest IEC-60 947-2 / IS13947- 2. The MCCBs should have test certificates for breaking capacities from recognized independent test authorities. The circuit breaker shall comply with the isolation function requirement of IEC 60 947-2 section 7.1.2 to marked as suitable for isolation / disconnection to facilitate safety of operating personnel while the breaker is in use

MCCB shall be suitable for rated operational voltage of 690 V AC, 50 Hz.

The minimum service breaking capacity (Ics) shall be 35 KA upto 250A MCCBs and 50 KA for MCCBs above 250 Amp rating.

The MCCBs shall be current limiting type with total tripping time of less than 10 millisecond under short circuit conditions. The MCCBs shall be 3 pole or 4 pole, with 100% neutral rating for 4 pole version, unless otherwise specified in schedule of quantities.

The MCCBs shall have a rated short circuit breaking capacity (Ics) as specified in the schedule of quantities.

MCCBs shall be provided with thermal magnetic release up to 250 Amp and microprocessor trip unit above 250 Amp rating having adjustable overload and instantaneous short circuit protections unless otherwise specified in BOQ / SLD.

MCCB shall be provided with Class II insulation between from cover and internal power circuits to avoid any accidental contact with live current carrying path with the front cover open.

MCCBs shall be made of halogen free high strength heat resisting and flame retardant thermosetting insulating material.

MCCB shall conform to Glow Wire Test as per IEC-60695-2 with superior quality of engineering grade plastics used for insulation purpose.

The operating mechanism of the MCCB shall be quick make/break, trip free type. ON, OFF and TRIP indications shall be provided, unless otherwise specified.

All MCCBs shall be fitted with the rotary operating mechanism with facility of padlocking suitably interlocked with the door unless otherwise specified.

The MCCBs shall have spreader links and phase barriers as standard feature.

For motor application, motor duty MCCBs (as SCPD) shall be selected with reference to Type 2 coordination chart.

c. Protective Devices:

C.T. operated IDMT Relays for over voltage and short circuit earth fault protection shall be provided for all air circuit breakers. Suitable over and under voltage tripping mechanism for voltage greater or less than  $\pm 10\%$  of full rated voltage shall be provided. The release of circuit breakers, shall be magnetic/thermal type. The thermal type shall be triple pole fully enclosed and of the ambient temperature compensated type. The breakers and releases shall be designed to clear the faults with minimum delay to limit the effects of the thermal stress on the system.

The magnetic trips shall be of attracted armature type. The time delay in magnetic trips shall be obtained by mechanical means which are rugged and nonageing. Direct action releases shall be fitted with test strips for periodical checking of trip operations.

There shall be not less than 6 N/O 6N/C auxiliary contacts rated 5 amps on the breaker. The auxiliary contact blocks shall be so located as to be accessible from the front. The auxiliary contacts in the trip circuit shall close before the main contacts have opened. All other contacts shall close simultaneously with the main contacts.

d. Selector Switch:

When called for, selector switches of rated capacity shall be provided in control panels, to give the choice of operating equipment in selective mode

e. Starters:

Each motor shall be provided with a starter of suitable rating. Starter shall be in accordance with latest IS amendment upto date. Direct on line starters shall be provided for motors upto 10 HP. Star Delta Type starters shall be provided for motors 12.5 HP to 50 HP capacity. For fire emergency equipment, Direct on line starter shall be provided for motor.

Starters contactors shall have 3 main and 3 auxiliary contacts and shall be airbreak type suitable for making and breaking contact a minimum power factor of

0.35. For design consideration of contactors, the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of stardelta/reduced Voltage starters.

Main and auxiliary contacts shall be silver or silver alloy. The insulation for contactor coils shall be of class "E". Operating coils of contactors shall be suitable for 220/415 +/- 10% volts AC, 50 cycles supply system. The contactor shall drip out when voltage drops to 90% of the rated voltage. The housing of the contactors shall be heat resistant and having high impact strength. Each starter shall have thermal overload protection on all three phases.

f. Over Load Relays:

Contactors shall be provided with a three element, positive acting ambient temperature compensated time lagged hand-reset type thermal over load relay with adjustable setting. Hard reset button shall be flush with the front door for resetting with starter compartment door closed, Relays shall be directly connected for motors below 35 HP capacity. C.T. operated relays shall be provided for motors above 35 HP capacity.

g. Current Transformers:

Current Transformer shall be of accuracy class - I and suitable VA burden for operation for the connected meters and relays

h. Single Phase Preventers:

Single phase preventers shall be provided as per Bill of Quantities and shall be in conformity with relevant ISI standards. Single phase preventers shall act when the supply voltage drops down to 90% of the rated voltage or on failure of one or more phases.

i. Time Delay Relays:

Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and shall have one at auxiliary contacts for indicating lamp connection.

j. Indicating Lamp and Metering:

All meters and indicating lamps shall be in accordance with latest BS. Each main panel shall be provided with operated ammeter of suitable range with three Nos. CTs of suitable ratio with three way and off selector switch, phase indicating lamps, and other indicating lamps as called for. Each phase indicating lamp shall be backed up with 2 amps MCB. Other indicating lamps shall be backed up with MCB as called for.

k. Cables:

M.V. cables shall be XLPE insulated aluminum conductor and armoured cables conforming to latest IS. MV cables shall be armoured and suitable for laying in trenches, duct, and on cable trays as required. MV cables shall be termite resistant. Control cables, and indicating panel cables shall be termite resistant. PVC insulated copper conductor and armoured cables.

l. Wires:

1100 volts grade PVC insulated aluminum conductor wires in conduit shall be used.

## 11.0 CABLE LAYING:

Cable shall be laid generally in accordance with Indian Standard Code of practice. Cable shall be laid on 14 gauge perforated M.S. sheet (Galvanized tray for outdoor application) cable trays as approved by the Supervisor. Easy access to all cables shall be provided to allow cable withdrawal/replacement in the future. Where more than one cable is running, proper spacing shall be provided to minimize the loss in current carrying capacity.

Cable shall be suitably supported with wooden cleats when run on wall/floor ducts. When buried, they shall be covered with a layer of soft sifted sand and protected with cement concrete tiles bricks. Special care shall be taken to ensure that the cable are not damaged at bends. The radius of bend of the cables when installed shall not be less than 12 times the diameter of the cable.

## 12.0 EARTHING:

Shall be in galvanised Iron Strips/wires, or copper strips/wires as mentioned in Bill of Quantities.



a. G.I. Earthing:

The main panel shall be connected to the main earthing system of the building by means of 2 Nos. 25mm x 6mm GI strips. All single phase metal clad switches and control panels shall be earthed with minimum 3mm diameter GI conductor wire. All 3 phase motors and equipment shall be earthed with two numbers distinct and independent GI wires/tapes as follows:

- |      |   |   |
|------|---|---|
| i.   | Motors upto and including 10 HP rating. | 2 Nos. 4mm dia GI wires including 10 HP rating. |
| ii.  | Motors 12.5 HP to 40 HP                 | 2 Nos. 6mm dia GI wires capacity.               |
| iii. | Motors 50 to 75 HP capacity             | 2 Nos. 25 x 3mm GI strips city.                 |
| iv.  | Motor above 75 HP                       | 2 Nos. 25mm x 6mm GI strips                     |

All the switches shall be earthed with two numbers distinct and independent GI wires/tapes as follows:

- |      |   |                             |
|------|---|-----------------------------|
| i.   | 3 phase switches and control panels upto 60 Amps rating.              | 2 Nos. 4mm dia GI wires     |
| ii.  | 3 phase switches and control panel 63 Amps to 100 Amps rating.        | 2 Nos. 8mm dia GI wires.    |
| iii. | 3 phase switches and control panels 125 Amps to 200 Amps rating.      | 2 Nos. 25 x 3mm GI tapes.   |
| iv.  | 3 phase switches and control panels, bus ducts above 200 Amps rating. | 2 Nos. 25mm x 6mm GI tapes. |

b. Copper Earthing:

The main panel shall be connected to the main earthing system of the building by means of 2 Nos. 25mm x 3mm copper tapes. All single phase metal clad switches and control panels be earthed with minimum 2mm diameter copper conductor wire. All 3 phase motors and equipment shall be earthed with two numbers distinct and independent copper wires/tapes as follows:

- |      |                                  |                                    |
|------|----------------------------------|------------------------------------|
| i.   | Motors upto and including 10 HP  | 2 Nos. 3mm dia copper wire rating. |
| ii.  | Motors 12.5 HP to 40 HP capacity | 2 Nos. 4mm dia copper wire         |
| iii. | Motors 50 to 75 HP capacity      | 2 Nos. 6mm copper wires.           |
| iv.  | Motor above 75 HP                | 2 Nos. 25mm x 3mm copper wires.    |

All the switches shall be earthed with two numbers distinct and independent copper wires/tapes as follows:

- |     |  |                              |
|-----|--|------------------------------|
| i.  | 3 phase switches and control panels upto 60 Amps rating.       | 2 Nos. 3mm dia copper Wires. |
| ii. | 3 phase switches and control panel 125 amps to 200 Amps rating | 2 x 6mm dia copper wire.     |

- iii. 3 phase switches and control panels 63 2 Nos. 4mm dia copper wires. Amps to 100 Amps rating
- iv. 3 phase switches and control panels, bus 2 Nos. 3mm x 6mm copper. ducts above tapes 200 Amps rating.

### **13.0 RATING :**

All components, accessories, cables etc specified, shall be operational for rated capacities at 55°C operating temperature.

### **14.0 DRAWINGS:**

Shop drawings for control panels and wiring of equipment showing the route of conduit/cable shall be submitted by the contractor for approval of Architect/Consultant before starting the fabrication of panel and starting the work. On completion, four sets of completion "As-installed" drawings incorporating all details like, conduit routes, number of wires in conduit, location of panels, switches, junction/pull and cable route etc. shall be furnished by the Contractor.

### **15.0 PAINTING:**

All sheet steel work shall undergo a process of degreasing, through cleaning, and painting with a high corrosion resistant primer. All panels shall then be baked in an oven. The finishing treatment shall be by application of synthetic enamel paint of Siemens Gray, Pheroze or any other shade approved by Owner/Architect/Consultant.

### **16.0 TESTING:**

Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with latest Code of practice and test report furnished by a qualified and authorised person. The entire electrical installation shall be got approved by Electrical Inspector and a certificate from Electrical Inspector shall be submitted. All tests shall be carried out in the presence of supervisor.

## **H) BALANCING AND COMMISSIONING:**

### **1.0 General:**

Perform following testing and commissioning to approval:

Hydraulic tests (testing and balancing) including water flow balancing and thermal capacity testing of excessive noise & vibration testing.

### **2.0 Criteria:**

systems shall be balanced and adjusted to give design/operating conditions under following criteria:

- Tolerance of air flow quantities : 3% S.A. Ducts, 5% other ducts

- Tolerance of water flow quantities : 5%
- Maximum noise level reading : NC-35 in occupied spaces.
- Maximum current load on motors : 100% of nameplate capacity

### **3.0 Reports:**

- 3.1 On completion, supply at least six copies of balancing and test report, suitably bound, 8 ½” x 11” size for checking and review. submit completed reports within three weeks of testing and balancing.
- 3.2 Reports shall include all design data together with recorded data of all tests for comparison and schematic of each system and components.
- 3.3 Report all temperatures in Degree Celsius. For convenience, reports may also show temperature in Fahrenheit but only as secondary data.
- 3.4 Reports should show schematic of each system. Location of each traverse should be mark and each outlet should have corresponding number.
- 3.5 Keep a record of all tests and have these signed by General Contractor’s superintendent and where applicable, equipment Manufacturer’s Representative. Show in an approved schedule form, record of systems or parts of systems tested or intended to test, date of test, circumstances such as pressure, temperature, duration of test and any special remarks pertaining to events during test.

### **3.6 Final Report Shall Include:**

- Specified and achieved total air quantities per system.
- Specified and achieved individual air quantities for each VAV box complete with sp.
- Specified and achieved individual air quantities per outlet with supporting schematic diagrams.
- Specified and actual fan total SP with breakdown showing inlet and discharge pressure.
- Sheaves and belt sizes and quantities per unit.
- Each pump suction pressure, head pressure, amps and voltage, nameplate amperage and voltage.
- Specified and achieved total water flow per system.
- Specified and achieved individual water flow and pressure drop through Cooling Tower and Chiller.

#### **4.0 Testing:**

- 4.1 Carry out all tests specified. Test equipment to requirement of and where necessary, in presence of equipment manufacturer.
- 4.2 Tests for balancing shall proceed only after system installation has been completed and system has been put into continuous operation.

#### **5.0 Miscellaneous Exhaust Systems:**

- 5.1 Test each system as herein described. Pre-set system as follows:
  - Set exhaust (back draft) dampers to fully open position.
  - Close doors for those rooms being exhausted.
  - Start related supply air system.
- 5.2 Check fan speed, motor amperage and voltage. Compare to shop drawing data. Adjust fan speeds (except for direct drive fans) to within 5% of shop drawings figure.
- 5.3 Make pitot tube traverse, velocity and static pressure readings in ducts wherever needed as specified for test.
- 5.4 When airflow capacity is within 5% of design, test and balance individual inlets starting with those closets to fan.
- 5.5 Adjust system to normal operating condition and record all data.

#### **6.0 Miscellaneous Air Flow and Pressure Testing:**

After all systems are balanced, set supply air systems to maximum outdoor air and maximum relief position and test building pressures in main lobby relative to atmosphere. Adjust air flows to direction of engineer when unsuitable building pressure occurs.

#### **7.0 Fluid Carrying Systems:**

- 7.1 Test adjust and balance each fluid carrying system as further described by use of flow meter, fittings and pressure drop and temperature readings for components. Submit full test report listing actual data versus design and manufacturer data. Include in report, schematics, reference numbers, any changes that may have occurred, electrical and other pertinent information like noise level, vibration, etc. relative to particular system or components. Make visible all settings of adjusting devices showing proper setting of each device, valve or fitting.
- 7.2 Test each circulating pump for shut off head. Open valves gradually to obtain design flow rate as required and measured by flow meter. Record pump pressures for suction and discharge. Test and record motor data and load (amperage and voltage).
- 7.3 Test each alternate or standby pump in same manner for each zone and service and adjust balance valve to suit each zone flow rate and head.
- 7.4 Adjust and record all water flows to specified requirements through individual chilled water coil, heat exchanger; circulating pumps, chiller and through the cooling tower.

Insure that water temperature drop is based on unit Manufacturer's Catalogue ratings for conditions at time of test.

7.5 Test and balance each complete system by means of flow meter and system valves.

### **8.0 Temperature Testing:**

9.1 Record temperatures of air and liquid flow for all heat exchangers, refrigeration machines and DX coils on air and water sides as applicable. Calculate heat exchange performance in BTU/hour, compare to design data.

9.2 Record for each room DB<sup>o</sup>C and WB<sup>o</sup>C temperatures and R.H. and re-adjust readings for local conditions at time of test.

### **10.0 Excessive Noise & Vibration Testing:**

Test and explore all sources of excessive noise generation or vibration caused by mechanical system. Perform octave band sound measurements at locations requested by Architect/ Client. Tests shall be done after systems have been balanced.

## SPECIFICATION FOR FIRE FIGHTING WORK

### SECTION - 1: SPRINKLER SYSTEM

#### 1. Scope:

Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install the sprinkler system as required by the drawings and specified hereinafter or given in this Bill of Quantities.

- Sprinkler mains, branch and connection from external piping complete with valves, alarm, hangers, appurtenances and painting.
- Sprinkler heads with spare sprinklers.
- Connections to risers.
- Flow switches.
- Vertical drain pipes.

#### 2. General Requirements:

All materials shall be of the best quality conforming to the specifications and subject to the approval of the Project Manager. Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner. Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls. Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

#### 3. Pipes And Fittings:

Pipes for sprinkler system network shall be mild steel (black) conforming to IS:1239 (heavy class) or as given in the BOQ with screwed/welded joints having flanges at regular intervals not exceeding 24 M.

Fittings for steel pipes shall be of heavy class forged steel having tapered pipe threads for 50 mm and below. If fabricated fitting to be used then contractor should produce the factory test certificate. Welding M/C rectifier.

#### 4. Jointing

Joints for mild steel pipes and fittings shall preferably be metal to metal tapered thread joints. A small amount of red lead may be used for lubrication and rust prevention. Joints shall not be welded or caulked. Joints for 65mm dia and above, however, may be of butt-welded type using heavy class butt welded fittings. However, sprinkler heads shall be screwed with Teflon or equal bonding tape. Welding on pipes shall be done by Rectifier Welding machine only (D.C.).

Joints between CI or black steel pipes and valves and other appurtenances, pumps etc. shall be made with CI or MS flanges with appropriate number of bolts. Flanged

joints shall be made with 3mm thick compressed synthetic rubber insertion gaskets. All flanges shall confirm to IS:6392-1971 Table 17/18 with regards to material, thickness as well as dimensions.

## 5. Pipe Supports:

All pipes shall be adequately supported at a maximum interval as given in table below from slab or walls from existing inserts if available, by structural clamps fabricated from MS structurals e.g. rods, channels, angles and flats to the prior approval of Consultant. All clamps shall be painted with one coat of red lead and two coats of black enamel paint of approval quality. Where existing inserts not available, the Contractor shall provide anchor fasteners.

### HANGING SUPPORT FOR

### HORIZONTAL PIPING FOR 25 $\phi$ TO

### 150 $\phi$

PIPE DIA (MIN.)	ISA SIZE (mm)	CLAMP DIM (mm.)	DROP ROD DIM (mm.)	U BOLT DIM (mm.)	ANCHOR DIM (mm.)	SPACING FOR SUPPORT.(M)
25 $\phi$	40x40x5	28x1.2	M8	8	M8	2.0
32 $\phi$	40x40x5	28x1.2	M8	10	M8	2.5
40 $\phi$	50x50x6	28x1.2	M8	10	M8	2.5
50 $\phi$	50x50x6	34x2.0	M10	10	M10	2.5
65 $\phi$	50x50x6	34x2.0	M10	10	M10	2.5
80 $\phi$	50x50x6	40x2.5	M12	10	M12	2.5
100 $\phi$	50x50x6	40x2.5	M12	10	M12	2.5
150 $\phi$	50x50x6	40x2.5	M12	12	M12	3.0

Pipes shall be measured by linear meter and shall include all fittings, flanges, jointing, clamps, hangers, and all other material necessary and required whether specified or not to complete the system including painting, testing and commissioning.

## 6.0 Pipe Protection:

Exposed

All pipes in exposed locations shall be cleaned with wire brush and shall be painted with one or more coats of approved red oxide primer and finally two or more coats of approved synthetic enamel paint of approved shade after the hydro static test pressure



of the sprinkler piping network. Finally the painting should including of legends with directions, arrows as instructed by site in charge.

Contractor should apply the one coat of red oxide primer on pipe before shifting for installation at site.

## 7.0 Valves:

### 7.1 Butterfly Valve:

All the isolation valve 50cm and above on the equipment and water lines, where specified or shown on drawings shall be wafer type butterfly valves. They shall be designed to fit without gaskets, the water tight seal being obtained by Nitrile rubber seat projection at the faces compressed between the flanges. The valves shall be supplied inclusive of M.S. pipe flanges and high tensile steel bolts of dimensions recommended by suppliers of valves. The valves shall comply with following specifications:

a) Test Pressure	: PN 16
b) Valve Component	: Material of Construction
i) Body	: Cast Iron, Gr. FG 260, IS:210
ii) Disc	: Nylon or Epoxy powder coated highduty iron, Gr, FG 260
iii) Stem	: Stainless Steel or carbon steel – IS:1570, Part-II.
iv) Seat	: Nitrile rubber
v) Hand Lever	: Cast Iron(Mechanical Memory Stop)
vi) Bearings	: PTFE or Nylon covered S.S. bushbearings at stem and pivot.
vii) Primary Seal	: Reinforced PTEE slide bearings
viii) Temperature	: 80 Degree C (max.)

### Installation:

- Valve shall be install in a manner that allows future removal and service of the valve.
- Packing and gasket shall not contain asbestos.
- The valve shall be of the same size as the pipe to which they are install.
- Valve above 150mm diameter shall be self locking worm gear type water proof and protory lubricated.
- Provide chain operators w/chain cleats on all valves more than 2.4 meter above floor.

### 7.3 Drain Valve:

Provide 50mm diameter MS pipe to IS:1239 (heavy class) with 50mm gunmetal full way valve for draining any water in the system in low packets same to be extended to nearest drain point as directed by Project Manager.

**7.4 Air Valve:**

Provide 25mm diameter screwed inlet spring type single acting brass air valve on all high points in the system.

**8. Globe Valves For Testing & Draining:**

The Contractor shall provide 15mm dia Gun-metal globe valve with GI pipe as per IS:1239 heavy class for testing and draining any water in the system in low pockets wherever required. This item shall be measured by numbers and shall include 15mm dia, globe valve, 15mm dia GI pipe (max. 6 M length), fittings, tees, elbows, unions, supports, hangers and all other items necessary and required to complete the work.

**9. Air Vessel/Air Cushion Tank:**

Air vessel (air cushion tank) shall be of size and capacity indicated in Bill of Quantities. It shall be provided at the top most point/points or in pump house (as specified). The tank shall be complete with 20mm dia brass air valve (Ball type), stop valve (20mm dia), drain valve (20mm dia) and pressure gauge including 20mm dia mild steel galvanised pipes and fittings, unions, etc. as required to complete the work as per site conditions.

Air Cushions tank shall be measured by numbers and shall include air valve, pressure gauge, globe valves for testing and draining, M.S. clamps, pipes, fittings, tees, elbows, union and all other items required to complete the work.

**10. Flow Switch:**

Provide one electrically operated flow indicating switch of appropriate diameter at the head of each circuit. Flow switches should be capable of the required flow in the circuit. The electrical cabling for the flow switches and control panel shall be provided by the Contractor.

**11. Supervisory Switch:**

Provide a supervisory switch attached to each supervised valve. The where mentioned, supervisory switch shall monitor the valve position and signal valve tempering. The switch shall consist of a single pole, double throw switch with a roller type switch actuator and a spring loaded plunger. The switch shall be U. L. listed and F. M. approved.

**12. Sprinkler Heads:**

Sprinkler heads shall be provided at regular spacing so as to cover 12 M<sup>2</sup> per sprinkler head. The spacing shall however be in conformity with the drawings and properly coordinated with electrical fixtures, ventilation ducts and grills and other services along the ceiling. Sprinkler head shall be of brass quartz bulb type with a temperature rating of 68°C. Sprinkler heads shall be of pendent type.

Sprinkler heads shall be approved by the Underwriters Laboratories (U.L.) or Fire Officers Committee (FOC), Tarrif Advisory Committee (TAC). The finish shall be as

specified in Bill of Quantities.

Contractor shall install cabinet fabricated from 16 gauge MS sheet with lockable glass shutters. Shelves for keeping spare sprinklers and spanner at locations approved by the Project Manager and given in the Bill of Quantities.

**13. Testing:**

All piping in the system shall be tested in the presence of Consultant/ Project Manager to a hydrostatic pressure of 18 Kg./Sq.cm or 1.5 times the design pressure (whichever is higher) without any drop in pressure for at least 2 hours and thereafter the entire system shall be hydraulically tested at 3.5 Kg/Sq.cm above the pump shutoff pressure or 15Kg/Sq.cm (whichever is higher) for 24 hours without any drop in pressure.

Contractor shall rectify leakage, if any and replace all defective components and retest the system as per above requirements to the satisfaction of and Consultant/Project Manager.

If required by Project Manager, at least 10% of all the welded joints shall be radiographically tested by the Contractor and half the joints radio-graphed shall be field joints. It will be Contractors responsibility to arrange radiography.

Contractor shall give the water flow test of pumps as required by the Project Manager.

**14.0 Measurements:**

Black steel pipes shall be measured per linear meter of the finished length and shall include all fittings (except flanges), welding, jointing, clamps for fixing to walls or hangers and testing.

Flanges shall be measured per numbers and shall include 3mm thick insertion rubber gasket, nuts and bolts and testing.

Sluice valves, check valves and full way valve and flow indicating switches shall be measured by numbers and shall include all items necessary and required for fixing as given in specifications.

Cabinet spare sprinkler heads with spanners shall be measured as per actual item given in the Bill of Quantities.

Sprinkler heads shall be measured by numbers.

No additional payment shall be admissible for cutting holes, or chases in the wall or floors, making connections to pumps, equipment and appliances.

**END OF SECTION - 1**

## SPRINKLER SYSTEM

### SECTION – 2: LIST OF APPROVED MATERIAL IN ORDER OF PREFERENCE

- a) All materials and product used in the works shall conform to the relevant standards / specification and shall be of approved make and design. A list of approved manufacture / vendors is given herein below. The approval of a manufacture / vendor shall be given only after review of the sample / specimen by the Engineer-In-Charge. The complete system and installation shall be in conformity with the “Applicable Codes Standards and Publication”.
- b) List of Approval makes for Product, Materials and specialist agencies is given below. Other equivalent manufacture may be considered with prior approval; however the decision of the Engineer-In-Charge shall be final.
- c) The Contractor while quoting shall quote for first make only. However at the time of execution, if first make is not available, then the other makes may be considered with prior approval from Engineer In charge/ Consultant/ Architects. However the decision of the Engineer-In-Charge shall be final.

Note- SPECIFICATIONS/BRAND NAMES of materials and finished approved by the Architect/Employer are listed below: However equivalent materials and finished of any other specialized firms may be used, in case it is established that the brands specified below are not available in the market are subject to the approval of the alternative brand by the EIC of Bank Only.

\*\*Contractor has to considered make as given in the list of Approved make only. If not mentioned in approved list for any item, then bank shall considered the make mentioned in the technical specification and approved by EIC.

### LIST OF ACCEPTABLE MAKES FURNISHING MATERIALS

S. NO.	ITEM	DESCRIPTION
1.	REINFORCEMENT STEEL	Tata,Sail,Jindal,Rathi
2.	AAC BLOCK	Bilt
3.	CEMENT	Ordinary Portland cement 53 grade manufactured by Acc/ Jaypee/ Ultra Tech/Ambuja Pozzolona cement shall not be used.
4.	POLYSULPHIDE SEALANT	Pidiseal by M/S Pidlite INDUSTRIES Ltd., Fosroc, Shalimar
5.	WATER PROOFING COMPOUND	Cico ,Fosroc, Dr Fixit,Pidilite
6.	SHUTTERING PLYWOOD	Indian Green Century.
7.	TOUGHENED GLASS	Sait Govind/Modi,Trutuf or equivalent
8.	GLASS/LACQUERED GLASS	Modi Float. St. Gobain.,
9.	WIRED GLASS	6mm thk. Wired glass manufactured by Hindustan Safety Glass Works Ltd. Calcutta, Or Vallabh Glass Works Gujrat./HARYANA SHEET GLASS.
10.	WHITE CEMENT	J.K. White Cement , Birla White Cement

11.	PLASTIC,ENAMEL PAINT	Enamel, Plastic Emulsion manufactured by Paint and Primer Berger Paints, Asian Paints, Nerolac ICI.
12.	PLASTER OF PARIS	Birla,J.K
13.	PUTTY	Asian Paints., JK, Birla
14.	EXPANSION BOLTS FOR FIXING	Dash Fasteners of appropriate size by HILTI OR M/S. Dev Ashish Trades
15.	WINDOW HARDWARE	Hettich, Kaff, Ebco.
16.	CERAMIC TILES	Johnson,Somany,Kajaria,AGL ,
17.	VINYL FLOOR	Armstrong, Rikvin , Wonder Floor.
18.	VITRIFIED TILES	Johnson, Somany, Kajaria,AGL,Nitco
19.	GLAZED TILES	Johnson,Somany,Kajaria.AGL,Nitco ,
20.	SPECIAL CERAMIC TILES	Khurja/AGL/Somany or approved by architect
21.	HINGES AND DRAWER SLIDE	Kaff, Hettich, ozone ( telescopic channel for drawer and key board and slide -on hingesfor wooden cabinet shutters)
22.	LOCKS, HANDLES	Godrej, Dorset, Dorma
23.	DOOR CLOSERS, FLOOR SPRING AND HARDWARE FITTING	Dorma, Dorset, Ozone,
24.	ALUM, TOWER BOLTS,HARDWARE FITTING	Ebco, Everite, Sigma
25.	MS SCREW	Nettle Fold,Crab
26.	M.S. PIPES (RAILING)	Jindal or Prakash.
27.	FLUSH DOORS	Duro, Century, Greenply, Archid
28.	VENEER	Duro, Century, Green
29.	LAMINATE DECORATIVE LAMINATE	Archid, Greenlam, Century,Sunmica
30.	PLYWOOD, BLOCK BOARD ,	Duro, Century, Green, Archid.
31.	STRUCTURAL STEEL	Sail, Tisco, Jindal.
32.	TEXTURE TILES FOR FALSE CEILINGS / FIBER CEMENT BOARD	Armstrong,Everest Industries Ltd.
33.	WOOD	Teak Wood First Class of CP or Burma
34.	M.S. ALUMINIUM LINEAL CEILING	Interarch, Vista.
35.	VENETIAL BLINDS,ROLLER BLIND	Trac, Vista, Mac. Hunter douglas
36.	GYPBOARD CEILING	Gypsum India, St. Gobain
37.	HEAT REFLECTIVE FILM	Garware, 3M,
38.	ADHESIVE	Fevicol SH, Century, Vemicol,bluecoat
39.	TILE ADHESIVE	Unitile, Roff Chemicals, Kajaria.
40.	MIRROR	Atul, Jolly, Modi Guard
41.	G.I.PIPE AND FITTINGS	Tata, Jindal, Appolo, Unik,
42.	CENTRIFUGALLY CAST (SPUN) IRON SOIL WASTE & VENT PIPE & FITTINGS	JayaswalNeco (Nagpur), C.I.A.L. (Durgapur)
43.	WOOD PRESERVATIVE	Wood Guard or Approved EQ/ICI.

44.	ALUMINIUM COMPOSITE SHEET	Alucobond, Alstone, Eurobond.
45.	ALUMINIUM SECTIONS	Jindal, Indal, Hindalco.
46.	C.I./R.W.P.	Neco, RIF, IIS OR EQ.
47.	C.P BRASS FITTING	Jaguar, Parko ,Parryware
48.	SANITARY WARE	Hindware, Parryware, Jaguar, Hindustan Sanitary Ware,
49.	STAINLESS STEEL SINK	Diamond ,Nirali, Jayna, Nilkanth,
50.	SANITARY FITTINGS VISIBLE	Jaguar, Cera Grohe OR Equivalent ISI Make
51.	PVC,U.P.V.C PIPE	Supreme, Prince, Astral, Finolex or Equivalent ISI Make
52.	CI BRASS LA PIPES	Electro Steel, Kesoram or approved
53.	STONE WARE PIPES	Bhaskar, Anand, ISI marked of approvedquality
54.	R.C.C PIPES	ISI marked of approved quality
55.	LOFT TANK	Syntax, Uniplas, Polycon
56.	CI PIPES & WORK	Neco, RIF,SIF,BIS OR Equivalent ISI Make
57.	Anti termite	Bayer,PCE, Lindane,chloropyriphos
58.	GATE VALVES	Leader, Zoloto
59.	PLASTIC W.C SEAT COVER	Commander, Diplomant
60.	GUN METAL VALVE(FULL WAY CHECK &GLEBE Valves)	Leasde,Sant, Zoloto
61.	C.I VALVE (FULL WAY CHECK & GLEBE VALVES	Kirloskar, Leader, Zoloto
62.	CPVC	Prince, Astral, Finolex , Supreme,
63.	READY MIX CONCRETE	Acc, Ultratech, RmcIndia ,Lafarge
64.	ACRYLIC SOILD SURFACE THERMOFORMED	Dupont,LG, Avonite
65.	CHAIRS/SOFA	Godrej,Methodex,Featherlite, Amardeep, Eurocoustic
66.	MODULAR FURNITURE	Godrej, Methodex, Featherlite, Amardeep, Eurocoustic
67.	Carpet	Unitex/Vista/Welspun/ Milliken

**Signature of the Tenderer/s  
With the Seal of the Company**

**Date:**

**Place  
:**



**LIST OF ACCEPTABLE MAKES HVAC AND EQUIPMENTS / MATERIALS**

S.No.	Details of equipment/ material	Makes
1	Ventilation Fans:	
	Inline Fan	Kruger /Nicotra/ Carryaire
2	Pressure Gauge	H. Guru/ Emerald
3.	Thermometers	H.Guru/ Emerald
4	Auto Air Vent	Anergy/Rapid Cool/ Emerald
5	G.I. Sheets	Sail/Tata
6	Duct (fabricated)	Rolastar / Zeco /GP spira/Ductofab
7	GI sandwich Round duct	GP Spira
8	Flexible insulated Round duct	GP Spira/ Atco
9	Fire Dampers	Ravistar/ Mapro/Air Master
10	Grills/Diffusers	Ravistar/ Mapro/Air Master
11	Fresh Air Louvers	Ravistar/ Mapro/Air Master
12	Glass Wool	UP Twiga/FGP Ltd.
13	Closed Cell Insulation	Armacell/Paramount K-Flex
14	Differential Pressure Switch (Water)	Johnson/Honeywell/Danfoss
15	Split AC Unit	Daikin/ Mitsubishi/Toshiba
16	MCB	Hager/MDS/ Siemens / ABB /MG
17	MCCB	L&T /Siemens /ABB /Merlin Gerin
18.	ACB	L&T /Siemens /ABB /Merlin Gerin
19	MV Contactors / Timer / Starters	L&T/Siemens/ MG/ GE
20	Protective Relays	L&T / Alstom/ABB/ Siemens/ MG
21	All Meters	Conzerv (Enercon) /Neptune/ Secure/ Havells/MG
22	Protective Relays	Alstom/ABB/ Siemens/ L&T / MG
23.	Indication Lamps / Push Button	L&T/Schneider/ BCH/GE
24	Starter	L&T /Siemens /ABB
25.	CT/PT	AE/Gilbert / Precise/ C&S
26	Terminal Blocks	BCH/Industrial Control/ L-Mak/ Jainson
27.	Selector Switch	Rishab – L&T/ Kaycee/ Siemens/ C&S
29	LT Cables / Control Cables	Universal / Polycab / Havells //Ravin
30	Cable Tray	Fabricated
31	Cable Gland	Commet/HMI/ Gripwell/Dowell
32	VRV SYSTEM	DAIKIN /SAMSUNG/HITACHI

**Signature of the Tenderer/s  
with the Seal of the Company**

**Date:**

**Place  
:**



**LIST OF ACCEPTABLE MAKES FIRE AND EQUIPMENTS /  
MATERIALS**

S.NO.	ITEM DESCRIPTION	
1	M.S. BLACK/G.I PIPES	JINDAL (HISAR) / TATA/PRAKASH SURYA
2	FORGED FITTINGS	V.S. ENGG. / JAIN SONS/
3	MALLEABLE IRON FITTINGS	'R' BRAND / CRESCENT
4	BUTTERFLY VALVE	SKS / ZOLOTO / SANT
5	NON RETURN VALVES (CI)	SKS/ ZOLOTO / SANT
6	QUARTZ BULB SPRINKLER HEAD	TYCO /VIKING/RAPIDROP
7	FLOW SWITCH	SYSTEM SENSOR /POTTER
8	PORTABLE FIRE EXTINGUISHERS	LIFE GUARD / CEASE FIRE
9	GROOVED COUPLING	VICTAULIC/JAINSONS
10	ANTICORROSIVE TAP E(PYPKOTE)	IWL INDIA LIMITED / EQUIVALANTS
11	WELDING ROD	ESAB / ADVANI
12	FLEXIBLE CONNETION	TYCO /VIKING/RAPIDROP

**Signature of the Tenderer/s  
With the Seal of the Company**

**Date:**

**Place**

**:**

## TECHNICAL SPECIFICATION OF ELECTRICAL WORKS

### SECTION- I

#### 1.0 CODES AND STANDARDS

The work shall be carried out as per the tender specifications confirming to following codes and standards for equipment and installation thereof.

#### STANDARDS

#### *TITLE*

#### Codes for Practice / Guide

IS: 732 - 1989	Code of practice for electrical wiring installations
IS: 4648 – 1968	Guide for electrical layout in residential buildings
IS: 8061 - 1976	Code of practice for design, installation and maintenance of service lines upto and including 650V.
IS: 8884 - 1978	Code of practice for installation of electric bells and call system.
IS: 5578 - 1985	Guide for marking of insulated conductor.
IS: 11353 - 1985	Guide for uniform system of marking and identification of conductors and apparatus terminals.
IS: 10118 (Part-1) - 1982	Code of practice for selection, installation and maintenance of switchgear and control gear: General.
IS: 4201 - 1983	Application guide for current transformers.
IS: 2309 - 1989	Code of practice for the protection and allied structures against lightning.
IS: 3043 - 1987	Code of practice for earthing.
IS: 5216 (Part-2) - 1982	Guide for safety procedures and practices in electricalwork: General.
IS: 5216 (Part-2) - 1982	Recommendation on safety procedure and practices in electrical works – life saving techniques.
IS: 374 - 1979	Electric ceiling type fans and regulators.

IS: 11037 - 1984      Electronic type fan regulators.

### **Low voltages switchgear and control gear**

IS: 12155 - 1987      General and safety requirements for fans and regulators for household and similar purposes.

IS: 8828 - 1996      Electrical accessories – circuit breakers for over current protection for household and similar installation.

IS: 13032 - 1991      A.C. Miniature circuit breaker boards for voltages upto and including 1000 volts AC.

IS: 12640 – Part I 1988      Residual current operated circuit breakers without integral over current protection.

IS: 12640 – Part II 1988      Residual current operated circuit breakers with integral over current protection.

IS: 2959 - 1985      Contactors for voltages not exceeding 1000 V AC or 1200 V DC.

IS: 8623 (Part-2) - 1993      Particular requirements for bus bar trunking system.

### **Power Cable**

IS: 694 - 1990      PVC insulated cables for working voltage upto and including 1100V.

IS: 1554 (Part –1) - 1988      PVC insulated (heavy – duty) electric cables: For working voltages upto and including 1100V.

IS: 3961 (Part –5) - 1968      Recommended current ratings for cables: PVC insulated light duty cables.

### ***Electric wiring accessories***

IS: 9537 (Part –1) – 1980      Conduits for electrical installations General requirements.

IS: 9537 (Part –2) - 1981      Conduits for electrical installations: Rigid steel conduits.

IS: 3480 – 1966      Flexible steel conduits for electrical wiring.

- IS: 2667 - 1988 Fittings for rigid steel conduits for electrical wiring.
- IS: 3837 - 1976 Accessories for rigid steel conduits for electrical wiring.
- IS: 9537 (Part –3) - PVC conduit for electrical installation rigid PVC conduit.  
1983
- IS: 3854 - 1997 Switches for domestic and similar purposes.
- IS: 4615 - 1968 Switch socket outlets (non-interlocking type)
- IS: 4160 - 1967 Interlocking switch socket outlet.
- IS: 1293 – 1988 Plugs and socket outlets of rated voltage up to and including 250 volts and rated current upto and including 16 amperes.

### **Electrical lamps and their auxiliaries**

- IS: 418 - 1978 Tungsten filament general service electric lamps.
- IS: 2418 (Part –1) - Tubular fluorescent lamps for general lighting service:  
1977 Requirements and tests.
- IS: 2215 - 1983 Starters for fluorescent lamps.
- IS: 1534 (Part –1) - Ballast for fluorescent lamps: For switch start circuits.  
1977
- IS: 1569 - 1976 Capacitors for use in tubular fluorescent high-pressure mercury and low-pressure sodium vapor discharge lamp circuits.

### **Miscellaneous**

- IS: 2551 - 1982 Danger notice plates.

### **Safety**

- IS: 4770 – 1991 Rubber gloves for electrical purposes.
- IS: 5424 – 1969 Rubber mats for electrical purposes.

### **END OF SECTION – I**

## SECTION –II

### 1.0 GENERAL SPECIFICATIONS

#### 1.1 Drawings:

The work shall be carried out in accordance with the drawings enclosed with the tender documents and also in accordance with modification thereto from time to time as approved by the Owner / Consultant/ Project Manager.

#### 1.2 Conformity to IE Act, IE Rules and Standards:

All Electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 1910 and Indian Electricity Rules, 1956 amended up to date (Date of call of tender unless specified otherwise).

#### 1.3 Quality of Materials:

All materials and equipments supplied by the contractor shall be new. They shall be of such design, size and materials as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

#### 1.4 Inspection of Materials and Equipments:

- a) Materials and equipments to be used in the work shall be inspected by the Owner / Consultant/ Project Manager. Such inspection will be of following categories:
  - i) Inspection of materials/equipments to be witnessed at the Manufacturer's premises in accordance with relevant BIS/ Agreement Inspection Procedure.
  - ii) To receive materials at site with Manufacturer's Test Certificate(s).
  - iii) To inspect materials at the Authorized Dealer's Godowns to ensure delivery of genuine materials at site. .
  - iv) To receive materials after physical inspection at site.
- b) The Consultant /Project Manager will take adequate care to ensure that only tested and genuine materials of proper quality are used in work.
- c) Similarly, for fabricated equipments, the contractor will first submit dimensional detailed drawings for approval before fabrication is taken up in the factory. Suitable stage inspection at factory also will be made to ensure proper use of materials, workmanship and quality control.
- d) The tender specifications will stipulate the Inspection requirements or their waiver for various materials/equipments including norms of inspection in specific cases.

### **1.5 Ratings of Components:**

- a) All components in a wiring installation shall be of appropriate ratings of voltage, current, and frequency, as required at the respective sections of the electrical installation in which they are used.
- b) All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current, which will normally flow through them, without their respective ratings being exceeded.

### **1.6 Conformity to Standards:**

- a) All components shall conform to relevant Indian Standard Specifications, wherever existing. Materials with ISI certification mark shall be preferred.

### **1.7 Interchangeability:**

Similar parts of all switches, lamp holders, distribution boards, switch gears, ceiling roses, brackets, pendants, fans and all-other fittings of the same type shall be interchangeable in each installation.

### **1.8 WORKMANSHIP:**

Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.

### **1.9 Proper Supervision/Skilled Workmen:**

The contractor shall be a licensed electrical contractor of appropriate class suitable for execution of the electrical work. He shall engage suitably skilled/licensed workmen of various categories for execution of work supervised by supervisors / Engineer of appropriate qualification and experience to ensure proper execution of work. They will carry out instructions of Owner / Consultant/ Project Manager during the progress of work.

### **1.10 Use of quality materials:**

Only quality materials of reputed make as specified in the Approved List of Makes will be used in work. Any other item to be used but not specified in the list shall be approved by Client/Consultants.

### **1.11 Fabrication in Reputed Workshop:**

Switch boards and LT panels shall be fabricated in a factory/workshop having modern facilities like quality fabrication, seven tank process, powder/epoxy paint plant, proper testing facilities, manned by qualified technical personnel.

The tender shall specify some quality makes of fabricators with modern facilities of design, fabrication and testing capable of delivering high quality LT panels and switch boards after testing as per relevant specifications.

**1.12 TESTING:**

All tests prescribed in these General Specifications, to be done before, during and after installation, shall be carried out, and the test results shall be submitted to the Project Manager in prescribed Performa, forming part of the Completion Certificate.

**1.13 COMMISSIONING ON COMPLETION:**

After the work is completed, it shall be ensured that the installation is tested and commissioned.

**1.14 GUARANTEE**

The installation will be handed over to the Client after necessary testing and commissioning. The installation will be guaranteed against any defective workmanship. Similarly, the materials supplied by the contractor will be guaranteed against any manufacturing defect, inferior quality.

**END OF SECTION – II**



## SECTION – III

### **1.0 HT PANEL 11KV (VCB)**

#### **1.1 GENERAL**

The technical specification cover the supply of 11 KV Switchboards suitable for 11 KV, 3 Phase earthed system 50 HZ AC supply with a fault level of 350 MVA at 11 KV. The equipment shall be suitable for continuous operation at the stipulated ambient conditions.

#### **1.2 STANDARDS AND CODES**

The following Indian Standards Specifications and Codes of Practice shall apply to the equipment covered by this Contract. In additions, the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Ruled 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the contract in line with Government Regulations. Necessary Test Certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

11000 volt Circuit Breaker	IS 13118:1991
Metal Enclosed Switchgear and Control gear for voltages above 1000 volts	IS 3427:1969
Electrical Relays for Power System Protection	IS 3231:1986
Voltage Transformers	IS 3156:1978
Current Transformers	IS 2705:1981
Rubber Mats for Electrical Works	IS 5424:1983
Danger Notice Plate	IS 2551:1982

### **2.0 11000 VOLTS CIRCUIT BREAKERS**

#### **2.1 Technical Parameters**

The 11000 volt circuit breakers shall be triple pole Vacuum type suitable for indoor mounting and shall comply with the requirements of the relevant Indian Standards. The Circuit Breakers shall be suitable for operation at 11000 volts 3 phase 50 Hz supply system and shall have a certified symmetrical breaking capacity of 350 MVA at 11000 volts or as stipulated in schedule of quantities.

#### **2.2 Technical Specifications.**

The Circuit Breaker shall be Vacuum type and shall consist of three identical single pole vacuum interrupter units which shall comprise of a pair of butt contacts enclosed

within a sealed ceramic body with SS end plates. The moving contacts shall be sealed into the enclosure via a SS steel bellow which shall permit axial movement of the contact. The contact arrangement shall be surrounded by SS sputter shield to prevent condensation of metal on the inside of the insulating envelope and also to provide good voltage grading across the gap and the outer envelope. The contact material and the contact geometry shall be suitable for the purpose so as to attain current chopping at minimum current to prevent build-up of unduly high over voltages and to prevent the arc to cause localized high spots on the contact. The Circuit Breaker shall be suitable for switching duty of Transformers.

### **3.0 CIRCUIT BREAKER CONSTRUCTIONAL FEATURES.**

The 11000 volt circuit breaker shall be flush front, metal clad, truck mounted, draw out type and fully interlocked. The truck that carries the Circuit Breakers shall be of rigid fabricated construction. Each Circuit Breaker shall be housed in a separate compartment enclosed on all side.

Each with draw-able truck shall have its own Circuit Breaker.

All electrical connections on the truck shall be brought to secondary plugs which engage similar sockets in the housing.

The Circuit Breakers shall be of the double break type. Interphase barriers and tank lining of insulation material shall be provided.

The draw out mechanism shall be so designed and constructed as to permit smooth withdrawal and insertion. The movement shall be free of jerks, easy to operate and positive.

All current carrying parts in the Circuit Breaker shall be silver plated and suitable arcing contacts shall be provided to protect the main contacts.

Isolating contacts of the spring loaded self aligning pattern shall be provided for the Circuit Breaker. Suitable arc control devices shall be mounted around the fixed contacts.

Terminal insulators of synthetic resin bonded paper shall be provided suitable for the specified short circuit level.

Sheet steel barriers shall be provided between.  
Instrument Panel and Potential Transformer.  
Instrument Panel and Current Transformers.  
Bus bar Chamber and Circuit Breaker compartments.

### **4.0 CIRCUIT BREAKER OPERATING MECHANISM.**

The Circuit Breaker shall be trip free and equipped with a motor power operated closing mechanism. The operating mechanism shall be such that the Circuit Breaker is at all times free to open immediately the trip coil is energized.

Mechanical ON/OFF position indication shall be provided on the front of the circuit breaker.

The operating mechanism shall be mounted on the front panel of the truck.

The operating handle and the mechanical trip push button shall be at the front of and integral with the Circuit Breaker.

The operating mechanism shall provided four distinct and separate positions of the Circuit Breaker on the cradle.

Service

Test

Isolated

Maintenance

## **5.0 CIRCUIT BREAKER INTERLOCKING**

Each Circuit Breaker shall be provided with the following mechanical safety interlocks to ensure protection to the equipment and the operator.

The Circuit Breaker cannot be closed unless it is in the 'PLUGGED IN' position.

The Circuit Breaker cannot be withdrawn form or pushed into the housing unless the main contacts are open.

The Circuit Breaker cannot be put into service without making the secondary connections between the truck and housing.

The cover of the draw out voltage transformer cannot be opened unless the transformer is isolated.

## **6.0 CIRCUIT BREAKER AUXILIARY CONTACTS.**

The Circuit Breaker shall have minimum of 6 N.O and 6 N.C auxiliary contacts rated at 5 amps. These contacts shall close before the main contacts when the Circuit Breaker is plugged in and vice versa when the Circuit Breaker is lowered.

## **7.0 PROTECTIVE RELAYS.**

The Circuit Breaker shall have over current, earth fault protection and auxiliary relay devices as specified in the Schedule of Quantities. These relays shall be mounted flush on a separate compartment with access from the rear for wiring and maintenance.

## **8.0 POTENTIAL AND INSTRUMENT TRANSFORMERS**

A draw out type cast resin voltage transformer shall be mounted in the panel and connected to the line. The tank shall be arranged for horizontal isolation.

The Circuit Breaker shall have the required current transformers as specified in the Schedule of Quantities for metering and protection mounted outside the Circuit Breaker compartment but within the free standing cubicle. The transformers shall comply to the relevant Indian Standard. All current transformers for metering shall be Accuracy Class I and of capacity and ratio as required. Separate sets of current transformers shall be provided of metering and protection.

## **9.0 INSTRUMENTATION**

Instruments and indicating lamps as required in the Schedule of Quantities shall not be mounted on the Circuit Breaker compartment door. A separate adequate compartment shall be provided. The instruments and relays shall be accessible for testing and maintenance without danger of accidental contact with live parts in the Switchgear Panel.

Square pattern flush mounting meters and selector switches of the three way and OFF pattern complying with the requirements of the relevant Indian Standards shall be used.

The current transformers for metering and protection shall be mounted on the solid copper busbars with proper supports.

Neon type indication lamps shall be provided for phase and other operational indications.

## **10.0 TYPE TEST CERTIFICATES.**

The Contractor shall submit type test certificates of the Circuit Breaker complying to the relevant Indian Standards form a recognized Test House.

## **11.0 11 KV SWITCHGEAR PANEL**

### **11.1 General**

The switchgear panels shall be suitable for operation at 11000 volt 3 phase 50 Hz supply system with a short circuit withstand of 350 MVA at 11,000 volts and a corresponding short time rating for I second.

The Switchgear panels shall comply with the requirements of the latest edition with upto date amendments of the relevant Indian Standards Specification, Indian, Electricity Rules and Regulations.

### **11.2 Switchgear Configuration.**

The panel shall be configured with 11,000 volt Circuit Breakers, associated metering and protective devices and other equipment as called for in the Bill of Quantities.

### **11.3 Equipment Specifications.**

All equipment used to configure the Switchgear Panel shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and the detailed technical specifications as included in this tender document.

### **11.4 Constructional Features.**

The 11000 volts Switchgear Panel shall be totally enclosed, dead front, metal clad, cubicle pattern, floor mounting, extensible on both sides and suitable for indoor use. The Switchgear Panels shall be totally enclosed and completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.

The Switchgear Panels shall be fabricated with CRCA sheet steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provided a rigid support for all components. The doors and covers shall be constructed from CRCA Sheet Steel of thickness not less than 1.6 mm. Joints of any kind in sheet steel shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame. The holes in the panels shall be correctly positioned.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switchgear Panels.

### **11.5 Switchgear Panel Limitations.**

A base channel of 75 mm x 5 mm thick shall be provided at the bottom.

The Switchgear Panel height shall normally be restricted to a maximum of 2300 mm.

### **11.6 Switchgear Panel Compartmentalization.**

The Switchgear Panels shall be divided into distinct separate compartments comprising.

A completely enclosed ventilated dust and vermin proof bus bar compartment for the vertical and horizontal busbars.

Each Circuit Breaker shall be housed in a separate compartment enclosed on all sides.

Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, protective relays, control fuses etc as required. These shall be accessible for testing and maintenance without any danger of accidental



contact with live parts.

A horizontal wire way with screwed covers shall be provided at the top to take interconnecting control wiring between vertical sections.

Cable compartment shall be of adequate size for easy termination of all incoming and outgoing cables. Adequate and proper supports shall be provided in the compartment for supporting the cables.

### **11.7 Switchgear Panels Busbars.**

The main horizontal and vertical interconnection busbars shall be of hard drawn high conductivity electrolytic copper and of rectangular cross sections suitable for full rated current. The current density for copper shall be 1.6 amps per sq. mm and suitable to withstand the electromagnetic and thermal stresses of a 350 MVA fault level at 11000 volts for 1 second.

The busbars and interconnections shall be insulated glass sleeves. The

busbars shall be extensible on either side of the Panels.

The busbars shall be supported on non-breakable, non-hygrosopic insulated supports at regular intervals to withstand the stresses of a 350 MVA fault level.

All busbars and interconnections shall be colour coded.

The main horizontal busbars shall run through the entire length of the Switchgear Panels.

### **11.8 Switchgear Panel Interconnections.**

All interconnections shall be with solid electrolytic copper of adequate size to carry the full rated current and fiber glass insulated.

### **11.9 Draw out Features.**

All Circuit Breakers shall be provided in fully draw out cubicles. These cubicles shall be such that draw out is possible without disconnection of the wires and the cables. The power and control circuits shall have self aligning and self isolating contacts which shall be easily accessible for maintenance. Mechanical interlocks shall be provided on the draw out cubicles to ensure safety and compliance to the relevant Standards.

### **11.10 Switchgear Panel Interlocks.**

Each group of busbars and feeder connections shall be fitted with automatically operated safety shutters with positive opening and closing when the Circuit Breaker is raised or lowered.

Facility shall be provided for hand operation of the shutters and latching in either open or closed position.

Padlocking provision of the shutter in the closed positions shall be included for maintenance purposes.

#### **11.11 Instruments and Protection Relays.**

Instruments, indicating lamps and all protection and control relays shall not be mounted on the Circuit Breaker compartment door. A separate adequate compartment shall be provide. The instruments and relays shall be accessible for testing and maintenance without danger of accidental contact with live parts in the Switchgear Panel.

#### **11.12 Switchgear Panel Internal Wiring**

All wiring for relays and metering shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 2.5 sq. mm.

#### **11.13 Cable Terminations.**

Knock out holes of appropriate size and number shall be provided in the Panels in Conformity with the location of the incoming and outgoing cables.

The cable terminations of the Circuit Breakers shall be brought out to terminal cables sockets suitable located in the cable chamber at the rear of panels.

#### **11.14 Space Heaters.**

The Switchgear Panel shall have in each panel thermostatically controlled space heaters with a controlling 16 amp 230 volt socket outlet with MCB to eliminate condensation.

#### **11.15 Earthing**

Two main earth bars of G.I./ copper as required shall be provided throughout the length of the Switchgear Panels with a provision to make connections on both sides to the sub-station earth.

#### **11.16 Designation Labels.**

Suitable engraved white on black name plates and identification labels of metal for all Panels and circuits shall be provided. Theses shall indicate the feeder number and the designation.

#### **11.17 Sheet Steel Treatment And Painting**

Sheet steel materials used in the construction of the Switchgear Panels should have undergone a rigorous rust proofing process comprising of alkaline degreasing,



descaling in dilute sulphuric acid and a recognized phosphating process. The sheet steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel work shall after metal treatment by spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stored and the paint thickness shall be not less than 50 microns.

**END OF SECTION – III**

## SECTION – IV

### **OIL TYPE TRANSFORMER**

#### **1.0 SCOPE:**

This specification generally describes the power transformers and associated auxiliary equipment for use on the electrical power distribution system and cover the design, manufacture, testing at works, supply and delivery, site erection, testing and commissioning aspects of the same. The details are given in the data sheet.

#### **2.0 STANDARDS:**

- 2.1 The equipment and accessories covered by this specification shall be designed, manufactured and tested in compliance with the latest relevant standards published by the Indian Standards institution wherever available in order that specific aspects under Indian conditions are taken care of.
- 2.2 The equipment and accessories for which Indian Standards are not available shall be designed, manufactured and tested in accordance with the latest standards published by any other recognised national standards institution.
- 2.3 The equipment shall also conform to the latest Indian Electricity Rules as regards safety, earthing and other essential provisions specified therein for installation and operation of electrical plants.
- 2.4 Generally the transformer shall conform to IS:2026 and unless otherwise stated following standards shall be applicable.
  - i) IS: 1180
  - ii) IS: 3839
  - iii) IS: 6600
  - iv) IS: 335
  - v) IS: 1271
  - vi) IS: 2099
  - vii) IS: 3639
  - viii) IS: 2147
  - ix) IS: 3202
  - x) IS: 2705

#### **3.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES:**

- 3.1 All materials used shall be of best quality and of the class most suitable for working under the site conditions and shall withstand the variations of temperature and atmospheric conditions, overloads, over-excitation, short circuits as per applicable standards, without distortion or deterioration or the setting up of undue stresses in

any part, and also without affecting the strength and suitability of the various parts for the work which they have to perform.

- 3.2 The design shall be such that the risk of accidental short-circuit due to birds or vermin's are obviated. All apparatus, including bushing insulators and fittings shall be so designed that water cannot collect at any point. Marshaling kiosks, boxes etc. shall be adequately ventilated to prevent condensation of moisture and so treated internally as to prevent growth of fungi on any coils, wires and insulating materials used.
- 3.3 The transformers shall operate with minimum noise and vibration. The cores, tank and other structural parts shall be properly constructed so that the mechanical vibrations are kept to the minimum, thus reducing the noise.
- 3.4 The design of the transformer shall be such that changes in transformer connection can be made by a simple change of link connection inside the tank. The transformers shall be designed to suppress harmonic voltages, specially the third and fifth, so as to eliminate distortion in wave form, and the possibility of circulating currents between the neutrals at different transformer stations.
- 3.5 All transformers shall be of the latest design, oil filled as called for in the main specification. Unless otherwise specified, all transformers shall be suitable for indoor installation. The type of cooling and the corresponding ratings for each transformer shall be as indicated in the main specification.
- 3.6 The magnetic circuit of each transformer shall be so designed as to minimise eddy-current and hysteresis losses in the core.
- 3.7 All electrical connections and contacts shall be of ample section for carrying the rated current without excessive heating.
- 3.8 All mechanisms shall be of stainless steel, brass, gunmetal, or other suitable material to prevent sticking due to rust or corrosion.
- 3.9 **TANK:**
  - 3.9.1 The transformer tank shall be made of steel plate, shaped in such a way that minimum of welding is required. The tank shall be electrically welded and all welding stresses shall be properly relieved. Tank walls shall be reinforced by adequate stiffeners to ensure mechanical rigidity permitting hoisting of complete transformers filled with oil and also to damp transformer-noise. The tank shall be sufficiently strong to withstand shocks likely to be encountered during transport of the transformer without any deformation or weakening of joints. The joints shall be oil-tight. Guides shall be welded on the inner side of the tank to facilitate tanking and unloading of the transformer core and coil assembly.
  - 3.9.2 Tank cover shall be bolted on to the flanged rim of the tank with a suitable weather-proof, hot-oil-resistant gasket in between for oil-tightness. The bolted tank

cover shall be so arranged that it can be removed and the core inspected without removal of the radiators. All requisite access and inspection holes shall be provided with bolted oil-tight, gasket-seated cover-plates. Bushing-turrets, covers of access holes, covers of pockets to prevent leakage of water into the tank shall be provided.

- 3.9.3 The exterior of tank and other steel surface exposed to the weather shall be thoroughly cleaned and have a priming coat of zinc chromate applied. The second coat shall be of an oil and weather resistant nature preferably of distinct colour from the prime and finish coats. The final coat shall be of a glossy, oil and weather resisting non-fading paint of specified shade. The interior of the tank shall be cleaned by shot blasting and painted with two coats of heat resistant and oil insoluble paint.
- 3.9.4 Steel bolts and nuts exposed to atmosphere shall be galvanised however, surfaces of the transformer or other parts of the transformer or auxiliary equipment which are in contact with oil shall not be galvanised.
- 3.9.5 The transformer tank, auxiliary equipment and fittings shall be provided with necessary devices for lifting and haulage facilities. The tank shall be mounted on a substantial under-carriage.
- 3.9.6 Unless otherwise stated the tank together with radiators, conservator, bushings and other fittings shall be designed to withstand without permanent distortion the following conditions.
- a) Full vacuum of 760mm of Hg for filling oil by vacuum.
- b) Internal gas pressure of 0.35 Kg/Sq.cm. with oil at operating level.

Valves shall not leak nor any welded joints sweat under above conditions.

- 3.9.7 Adequate space shall be provided at the bottom of the tank for collection of sediments.

### **3.10 CORE:**

- 3.10.1 The magnetic circuit shall be built of transformer grade cold rolled grain oriented low loss steel stampings having high permeability and conforming to adopted standards. Stampings shall be insulated from each other with material having high inter-lamination insulation resistance and rust inhibiting property and also capable of withstanding pressure, mechanical vibration and action of heat and oil, thus reducing the possibility of sludge formation to a minimum.
- 3.10.2 The framework, clamping arrangement and general structure of the cores of each transformer shall be of robust construction and shall be capable of withstanding any shock to which they may be subjected during transport, installation and service. The assembled core shall be securely clamped, on the limbs and the yoke, to build up a rigid structure. The clamping pressure shall be uniform over the whole of the core and so adjusted as to minimize noise and vibration in the core when the transformer is in service. The framework and the core bolts shall be efficiently insulated from the core so as to reduce the circulating currents to a minimum.

- 3.10.3 The core clamping frame shall be provided with lifting eyes for the purpose of tanking and untanking the core with winding mounted thereon and shall have ample strength to take the full weight of the core and winding assembly.
- 3.10.4 An approved type of core grounding system shall be used; the grounding connections being located at the top of the core for easy access from the inspection hole.

### **3.11 WINDING:**

- 3.11.1 The coils used for transformer winding shall be circular in shape, made of paper insulated, continuous and smooth, tinned or enameled electrolytic copper conductors of high conductivity.
- 3.11.2 The transformer winding shall be designed for basic impulse insulation level not lower than that specified in the main specification.
- 3.11.3 Liberal ducts shall be provided to prevent any hot spot temperature in the winding that may adversely affect the life of the transformer. Adequate supports, wedges and spacers of hard insulating material shall be so fitted that they will neither move nor permit relative movement of any part of winding during transit of normal service or under terminal short-circuit, nor damage the winding insulation in any way. All leads and connections shall be robust, adequately insulated, protected and clamped. The winding assembly shall be dried in vacuum with tested insulating oil of approved standard. The windings shall be subjected to a thorough shrinking and seasoning process so that no further shrinkage of windings occur during service at site. However adjustable devices shall be provided for taking up any possible shrinkage of coils in service. The assembly shall be held in position under adequate axial compression to withstand the axial thrust likely to occur under terminal short-circuit.
- 3.11.4 The end turns on the high voltage winding shall have reinforced insulation to take care of the voltage surges likely to occur during switching or any other abnormal system condition.
- 3.11.5 The transformers shall be suitable for operation at full rated power on all tapplings without exceeding the specified temperature rise as indicated in the applicable standards.

### **3.12 INSULATING MATERIALS:**

- 3.12.1 The insulating oil shall conform to IS-335 and shall be suitable in all respects for operating the transformer at the rating and under conditions specified in the main equipment specification. Sufficient oil shall be supplied for the first filling of transformer, the oil circulating equipment and the tank containing tap-changing mechanism and an extra 10% shall be supplied in non-returnable drums. The tender shall contain information about the grades of oil recommended by the transformer manufacturer for use in the transformer. Test certificates for the oil shall be furnished before dispatch of transformer and acceptance by owner.

3.12.2 Class A insulating materials specified in IS:1271 shall be used. Paper insulation shall be new and free from punctures. Wood insulation, where used shall be well seasoned and treated.

### **3.13 TRANSFORMER TAPPINGS :**

Transformer shall be provided with ON load tap changer arrangement in steps of 1.25% with range from + 5% to – 15.00%.

### **3.14 COOLING EQUIPMENT:**

3.14.1 Natural cooling by means of banks of detachable type radiators made from pressed/round tubes around transformer tank shall be provided. The tubes shall be of seamless mild steel sheet with clean bright internal surface and shall be suitably braced to protect them from shock.

3.14.2 The radiators shall be provided with butterfly type of shut off valves.

3.14.3 Cooling tubes/radiators shall permit every part of the cooling surface to be cleaned by hand.

### **3.15 TERMINAL ARRANGEMENT**

#### **3.15.1 High Voltage Side (11 KV)**

Cable box shall be provided suitable for terminating one no. 3C x 185 sq. mm XLPE insulated armoured 11 KV cable complete with disconnecting chamber, compression glands, tinned copper lugs, Armour earth clamp and body earth terminal.

Cable box shall be fitted with bushing insulators for H.T. cable termination side.

#### **3.15.2 Medium Voltage Side (433 V)**

LT Termination shall be suitable for termination of 5 nos x 3.5 x 300 sq. mm XLPE cable.

#### **3.15.3 Disconnecting Chamber**

The disconnecting chamber shall be air insulated and complete with sealoff bushing, removable flexible connectors / links and removable covers. It shall be possible to trail out the transformer without having disconnecting the bus duct. Phase to phase and phase to ground clearances within the chamber shall be such as to enable either the transformer or cable to be subjected separately to H.V. test.

#### **3.15.4 Bushing :**

Bushings shall conform to IS: 2099 and other relevant standards. Bushings shall be supplied with terminal connector clamp suitable for connecting the bushing terminal to the owner's conductor. Creep distance of bushing shall be (41mm/kv phase ground) adequately,

### 3.16 MARSHALLING BOX

3.16.1 Whenever optional fittings, temperature indicators, with auxiliary contacts and Bushing CT's are specified then the bidder shall provide a Marshalling box and Marshall to it all the contact terminals of electrical devices mounted on the transformer. It shall be in the contractor's scope to provide:

- a) The interconnection cabling between the Marshalling box and the accessory devices either by PVC insulated copper wire in G.I. conduits or PVC insulated copper conductor armoured cables.
- b) Necessary compression type brass cable glands at the Marshalling box for above cables.

3.16.2 The Marshalling box shall be tank mounted, water/dust tight sheet steel (2mm thick) enclosed with hinged door having padlocking facility. All doors, covers and plates shall be fitted with neoprene gaskets. Top surface shall be sloped and bottom shall be atleast 600mm from floor and provided with gland plate and cable glands as required.

3.16.3 Terminals shall be clipon type rated for 10A. All contacts for alarm/trip indication shall be potential free, wired up to the terminal block. Wiring shall be done with stranded copper conductor wires of sizes not less than 1.5 sq.mm for control and 2.5 sq.mm for CT circuits. C.T. terminals shall be provided with shorting facility.

### 4.0 ELECTRICAL & PERFORMANCE REQUIREMENT:

5 Transformer shall operate without injurious heating at the rated KVA at any voltage within +/- 10% of the rated voltage of that particular tap.

5.0 Transformer shall be designed for 110% continuous over fluxing withstand capability.

5.1 The neutral terminals of the winding with star connection shall be designed for the highest over current that can flow through the winding.

- a) Overloads shall be allowed with in the conditions defined in the loading guide of the applicable standard. Under these conditions, no limitations by terminal bushings, tapchangers, or other auxiliary equipment shall apply.
- b) Temperature Rise shall be continuously rated for full load. The temperature rise shall not exceed 45 degree C by thermometer in oil or 55 degree centigrade by resistance over an ambient of 38 degree C.

### 5.0 EARTHING :

5.1 Two separate earthing terminals to be provided at the bottom of the tank on opposite sides. The terminals shall be of clamp type suitable for connection to owners ground-ing strip (50 x 6mm G.I.).

### 5.2 Internal Earthing :

The frame work and clamping arrangements of core and oil shall be securely earthed inside the tank by adequately sized G.I. strip connections to the tank.

5.3 Neutral to be earthed with size, of copper (6mm x 50mm)

### 6.0 FITTINGS AND ACCESSORIES :

The transformer shall be provided with all standard fittings and accessories specified in the applicable standard for the size and type of transformer concerned. The accessories and fittings shall generally be as specified below:



### **Oil Conservator :**

The transformer to be provided with an oil conservator with welded end plates. It is to be bolted to the cover and can be dismantled for purpose of transport. It shall be provided with plain oil level gauge with marking for minimum level and an oil filling hole with a cap which can be used for filling oil. For draining purpose a plug shall be provided. An equaliser pipe between the conservator and the main tank is to be provided, which projects inside conservator. Separate conservator shall be provided for OLTC chamber.

### **Breather:**

The transformer shall be provided with an indicating dehydrating silica-gel breather with glass window for inspection of sufficient capacity.

### **Explosion Vent.**

An explosion vent with diaphragm shall be provided for relieving the pressure within the transformer.

### **Diagram and Rating Plate:**

Diagram and rating plate of stainless steel shall be provided indicating the details of transformer, connecting diagram, vector group, tap changing diagram etc.

### **Earthing Terminals**

Two earth terminals of adequate mechanical and electrical capacity shall be provided. One separate earthing terminal shall also be provided on each separate radiator banks.

### **Dial type Thermometer (OTI)**

Dial type thermometer (150mm dia) with maximum set pointer at 75 degrees c and electrical contacts for electrical alarm at high temperature with thermometer pocket shall be provided.

### **Winding Temperature Indicator (WTI)**

Shall comprise of :

- i) Temperature sensing element
- ii) Image coil
- iii) Bushing or turret mounted
- iv) C.T. Local indicating instrument with electrically independent trip/alarm contact brought out to separate terminals.

### **Buchholtz Relay :**

To be provided with double float for operation through oil pressure

### **Lifting Lugs :**

The arrangement for lifting the active part out of the transformer tank along with cover by means of lifting lugs without disturbing the connections shall be provided.

#### **Swivel Type Rollers :**

The transformer to be provided with 4 Nos. bi-directional rollers fitted on cross channels to facilitate the movement of transformer in both directions.

#### **Air Release Plugs :**

An air release plug shall be provided on the top of the tank cover/radiators to facilitate the release of the entrapped air and filling of oil.

#### **Drain-cum-oil Filter Valves with Plug on Cover Plate:**

The transformer shall be provided with a drain-cum-oil filter valve with blanking plate & locking arrangement at the bottom of the tank.

Filter valve of at top with blanking plate. Sample

valve with blanking plate.

Inspection cover.

Oil filling hole with cap.

#### **Jacking Pads**

#### **Skids**

Neutral bushing terminals complete with connector for earth conductor.

### **7.0 DRAWINGS AND O&M MANUALS:**

7.1 Four copies of manual of complete instructions for the installation, operation, maintenance and repairs circuit diagrams, foundation and trenching details shall be provided with the transformers.

List of spare parts shall also be indicated.

7.2 Two copies of the drawings incorporating the following particulars shall be submitted with the offer for preliminary study.

- a) GA drawing showing dimension, net weight and shipping weight, quantity of insulating oil etc.
- b) Crane requirements for assembly and dismantling of the transformer.
- c) Drawing indicating GA of cable box and its dimension for cable entry cut out requirements etc.

7.3 The drawings in (four sets) to be furnished by the supplier for approval after

acceptance of his order shall include the following.

- a) GA showing front and side elevations and plan of transformer and all accessories and external features, detailed dimensions, oil quantity, H.T./L.T. clearances etc.
- b) Drawings of Bus duct/cables termination arrangement.
- c) HV cable box arrangement & disconnecting chamber GA & details drawings.
- d) Drawing of each type of bushing.
- e) Name plate and terminal making and connection diagram.
- f) Control wiring & schematic diagram showing polarity and vector group of windings, CTs and OTI, WTI, circuits, Alarm/trip circuits etc.

7.4 Reproducible copy of the above drawings for records

## 8.0 TESTING:

The transformer shall be subjected to all routine tests in accordance with IS : 2026 at the factory before dispatching the same and test certificates shall be furnished.

- a) Measurement of winding resistance.
- b) Ratio polarity and phase relationships.
- c) Impedance voltage.
- d) Load losses
- e) No-load losses and No load current
- f) Insulation resistance (Before & after carrying out all tests)
- g) Induced over voltage withstand test
- h) Separate source voltage withstand test
- i) Bidders may quote for the HV impulse test. Alternatively they may submit the test certificate for the test conducted on the similar transformer.
- j) Test will be witnessed by Owners representative/consultant if so desired by owner/consultant.
- k) Oil Test (BDV) will be done, if required.

## 9.0 TEST REPORTS

Four copies of the test reports in bound volume shall be submitted for approval.

## 10.0 SPARES

The bidder shall quote item wise prices for his recommended spares for the period of operation of transformer for 5 years.

## TRANSFORMER DATA SHEET

### 1.0 GENERAL

- 1.1 Application : Distribution, Mixed lighting, power, Air-conditioning and Fire Fighting etc.
- 1.2 Quantity Required : 1 No.
- 1.3 Installation : Compact Unit

### 2.0 RATINGS

- 2.1 Rating KVA : 800 (Outdoor Type)
- 2.2 Number of phases & Frequency : 3 PHASE, 50Hz
- 2.3 Type of cooling : ONAN
- 2.4 No Load Voltage
- HV : 11000 V
- MV : 433 V
- 2.5 Vector Group : DYn11
- 2.6 Percentage Impedance : 4.5%
- 2.7 Percentage Efficiency : 98%

### 3.0 VOLTAGE

- 3.1 Nominal System Voltage
- HV : 11000 V
- MV : 433 V
- 3.2 Highest System Voltage
- HV : 12000 V
- MV : 433 V

### 4.0 TAPCHANGING GEAR

- 4.1 TAPS ON LOAD : ON LOAD FULL RATING
- 4.2 Tapping on windings HV/LV : HV
- 4.3 Total tapping range : +5% to to -15.00%
- 4.4 Steps : 1.25%



## 10.0 TERMINATION ARRANGEMENT

- 10.1 H.V. SIDE  
(CABLE BOX) : Cable box and disconnecting chamber suitable for 3C x 185 Sq mm 11 KV XLPE cable.
- 10.2 M.V. SIDE  
(CABLE BOX) : .Cable box and disconnecting chamber suitable for 5 x3.5C x 300 Sq mm XLPE cable.

### DATA TO BE FURNISHED BY BIDDER:

#### 1.0 POWER TRANSFORMER:

- 1.1 Name of Manufacturer :
- 1.2 Standards followed in design  
manufacture and testing :
- 1.3 Continuous maximum rating in KVA:
- 1.4 Transformer no-load voltage :
- 1.4.1 High voltage :
- 1.4.2 Medium voltage :
- 1.5 Vector group reference :
- 1.6 Temperature rise over specified  
ambient temperature in degree C :
- 1.6.1 In oil by thermometer :
- 1.6.2 In winding by resistance :
- 1.6.3 Maximum hot spot temperature  
in degree C :
- 1.7 Terminal Arrangement.
- 1.7.1 H.V. Side :
- 1.7.2 M.V. Side :
- 1.8. One-ninute dry power frequency  
test withstand voltage in KV :
- 1.8.1 High voltage :
- 1.8.2 Medium voltage :

- 1.9 Impulse test withstand voltage with 1.2 x 50 microseconds wave in KV :
- 1.10 Type of tap changer :
- 1.10.1 No. of plus taps :
- 1.10.2 No. of minus taps :
- 1.11 Iron losses in KW at rated voltage and frequency :
- 1.12 Copper losses in KW at rated full load current and frequency at 75 degree C :
- 1.13 Reactance voltage with guaranteed tolerance in percent at rated full load current and frequency 75 Deg C :
- 1.14 Impedance voltage with guaranteed tolerance in percent at rated full load current and frequency at 75 Deg C :
- 1.15 Regulation in percent of no-load voltage at full load current at 75 degree C and with power factors of :
- 1.15.1 Unity :
- 1.15.2 0.8 lagging :
- 1.16 Efficiency in percent at 75 degree C and unity power factor for :
- 1.16.1 100 percent load :
- 1.16.2 75 percent load :
- 1.16.3 50 percent load :
- 1.17 No-load current in amperes at rated voltage and frequency :
- 1.18 Inrush magnetizing current



- in percent of normal full load current. :
- 1.19 Details of winding insulation :
- 1.19.1 Class of insulation materials :
- Turns insulation high voltage in meg ohm :
- 1.19.3 Turns insulation low voltage in meg ohms :
- 1.19.4 Insulation core to low voltage in meg ohms :
- 1.19.5 Insulation high voltage to low voltage in mega ohms :
- 1.20 Details of 415 V neutral current transformer :
- 1.20.1 Name of manufacturer :
- 1.20.2 Current ratio :
- 1.20.3 VA capacity :
- 1.20.4 Accuracy & performance characteristics :
- 1.21 Quantity in liters and grade of oil :
- 1.22 WEIGHTS :
- 1.22.1 Core and windings in kg :
- 1.22.2 Tank and fittings in kg :
- 1.22.3 Oil :
- 1.22.4 Complete transformer filled with oil :
- 1.23 OVERALL DIMENSIONS :
- 1.23.1 Length in mm :

1.23.2 Breadth in mm :

1.23.3 Height in mm :

## 2.0 TESTS:

2.1 List of tests proposed to be carried out at the factory :

2.2 List of tests proposed to be carried out at the site before commissioning. :

## INFORMATION TO BE FURNISHED BY THE VENDOR AFTER AWARD OF CONTRACT

Information to be furnished within 2 weeks of award of contract.

- 1.0 Positive sequence impedance at maximum voltage tap.
- 2.0 Positive sequence impedance at maximum voltage cap.
- 3.0 Zero sequence impedance at principal tap.
- 4.0 Efficiency at 75°C winding temperature:
  - 4.1 At full load
  - 4.2 At 75% full load
  - 4.3 At 50% full load
- 5.0 Maximum efficiency and load at which it occurs.
- 6.0 Regulation at full load at 75°C winding temperature at:
  - 6.1 Unity power factor
  - 6.2 0.85 power factor lag.
- 7.0 Resistance per phase of :
  - 7.1 H.V. winding : Ohms
  - 7.2 M.V. winding : Ohms
- 8.0 Conductor area (sq.cm) and current density (Amps/cm<sup>2</sup>)
- 8.1 HV winding

- 8.2 M.V. winding
- 9.0 Type of windings
  - 9.1 HV
  - 9.2 MV
- 10.0 Insulating materials for interterm insulation :
  - 10.1 HV winding
  - 10.2 MV winding
- 11.0 Insulating materials for winding insulation
- 12.0 Insulating materials
  - 12.1 Winding and core
  - 12.2 Laminations of the core.
- 13.0 Make, type, dial rise, number of contacts and contact ratings (current following items, if provided).
  - 13.1 Magnetic oil level gauge.
  - 13.2 Dial type thermometer.
  - 13.3 Winding temperature indicator.
  - 13.4 Gas and oil actuated relay.
- 14.0 Thermal withstand capability under full short circuit conditions in terms of number of times of calculation of short circuit and corresponding anticipation percentage reduction in transformer life. Relevant calculations shall be submitted.

## **15.0 DRAWINGS**

The following drawings shall be submitted for the PURCHASER'S approval in the stipulated time.

- 15.1 General outline drawings showing plan, front elevation, rear elevation, cable boxes/disconnecting chamber section views, locating dimensions of cable entries, terminals foundation floor fixing details and weights.
- 15.2 Bushings : Plan, elevation terminals details, mounting details make and type number, current and voltage rating,



Creepage distances and principal characteristics.

15.3 Rating and diagram plate

15.4 Marshalling box terminal connections, wiring diagram

## **16.0 TEST REPORTS**

Test results shall be corrected to a reference temperature of 75 Deg C.

16.1 Two copies of test results shall be submitted for the Owner's/Consultants approval before dispatch of transformer.

16.2 Additional bound copies, as required by the Owners/Consultants contract, of complete test results including all tests on transformer, bushing, current transformer (if provided), shall be furnished with the transformer.

**END OF SECTION -IV**

## SECTION – V

### **MV CABLES AND CABLE TRAY**

#### **1.0 STANDARDS OF CODES**

This chapter covers the specifications for supply and laying of Medium Voltage XLPE cables.

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

#### **2.0 CABLES**

Medium voltage cables shall be aluminum conductor XLPE insulated, PVC sheathed armoured conforming to latest IS Code. Cables shall be rated for a 1100 Volts.

**All Conductor cables shall be as per BOQ.**

Conductors shall be insulated with high quality XLPE base compound. A common covering (bedding) shall be applied over the laid up cores by extruded sheath of unvulcanised compound. Armouring shall be applied below outer sheath of PVC sheathing. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with following colour scheme of PVC insulation.

1 Core	:	Red/Black/Yellow/Blue
2 Core	:	Red and Black
3 Core	:	Red, Yellow and Blue
3 ½ /4 Core	:	Red, Yellow, Blue and Black

#### **3.0 STORING, HANDLING, LAYING, JOINTING AND TERMINATION**

##### **Storing**

All the cables shall be supplied in drums. On receipt of cables at site. It should be ensured that both ends of the cables are properly sealed to prevent ingress/absorption of moisture lay the insulation. The cables shall be inspected and stored in drums with flanges of the cable drum in vertical position. Whenever cable drums have to be moved over short distances, they should be rolled in the direction of the arrow, marked on the drum and while removing cables from the drums the drum shall be properly mounted on jacks or on a cable wheel or any other suitable means making sure the spindle, jack etc. are strong enough to take the weight of the drum.

## **Laying**

Cables shall be laid as per the specifications given below :

### **i) Cable on Trays/Racks**

- a) Cable shall be laid on cable trays/racks wherever specified. Cable racks/trays shall be of ladder, trough or channel design suitable for the purpose. The nominal depth of the trays/racks shall be 150 mm. The width of the trays shall be made of steel or aluminium. The trays/racks shall be completed with end plates, tees, elbows, risers, and all necessary hardware, steel trays shall be hot dip galvanized. Cable trays shall be erected properly to present a neat and clean appearance. Suitable cleats or saddles made of aluminium strips with PVC covering shall be used for securing the cables to the cable trays. The cable trays shall comply with the following requirements :
- b) The tray shall have suitable strength and rigidity to provide adequate support for all contained cables.
- c) It shall not present sharp edges, burrs or projections injurious to the insulation of wiring/cables.
- d) If made of metal, it shall be adequately protected against corrosion or shall be made of corrosion-resistant material.
- e) It shall have side rails or equivalent structural members.
- f) It shall include fittings or other suitable means for changes in direction and elevation of runs.

## **Installation**

1. Cable trays shall be installed as a complete system. Trays shall be supported properly from the building structure. The entire cable tray system shall be rigid.
2. Each run of the cable tray shall be completed before the installation of cables.
3. In portions where additional protection is required, non combustible covers/enclosures shall be used.
4. Cable trays shall be exposed and accessible.
5. Where cables of different system are installed on the same cable tray, non combustible, solid barriers shall be used for segregating the cables.
6. Cable trays shall be grounded by two nos, earth continuity wires. Cable trays shall not be used as equipment grounding conductors.

## **Jointing and termination's**

Cable jointing shall be done as per the recommendations of the cable manufacturer. All jointing work shall be done only by qualified/licensed cable joiner.

All jointing pits shall be of sufficient dimensions as to allow easy and comfortable

working.

Jointing materials and accessories like conductor, ferrules, solder, flex, insulating and protective tapes, filling compound, jointing box etc. of right quality and correct sizes, confirming to relevant Indian Standards.

Each termination's shall be carried out using brass compression glands and cable sockets. Hydraulic crimping tool shall be used for making the end termination's. Cable gland shall be bonded to the earth by using suitable size copper wire/tape.

## 1.0 TESTING

- Cable jointing shall be tested at factory as per the requirements of latest IS amendment upto date. The tests shall incorporate routine tests, type tests and acceptance tests.
- Cable shall be tested at site after installation and the results shall be submitted to the Project Manager.
- Insulation resistance between conductors and neutral and conductors and earth.
- Pressure test for 15 minutes.

## 2.0 CABLE TRAY & LADDER SPECIFICATION

### General Requirement:-

Cable Tray and Cable Ladder systems are intended for the support and accommodation of cables and possibly other Electrical equipment in Electrical/Instrumentation/Communication systems.

### Design and Fabrication of Cable Trays / Ladders:-

The cable trays / ladders shall be fabricated according to the design specified by IEC 61537 and should be tested for Safe Working Load (SWL). The relevant details of SWL and the load chart with respect to SWL, supporting distance and the deflection should be according to the following chart.

Safe Working Load (SWL) with a span length up to 3 meters						
Description	Side Height (in mm)	Width (in mm)	Span length (in meters)			
			1.5m	2m	2.5m	3m
			Permitted Load (in kg/meter)			
Perforated Cable Tray	35	50 - 300	125	90	50	-
	60	50 - 600	150	100	50	-
	85	100 - 600	175	110	50	-
	110	100 - 550	185	130	75	60



Cable Ladder	45	200 - 600	180	140	100	55
	60	200 - 600	-	225	150	100
	110	200 - 600	-	310	200	140

Safe Working Load (SWL) with a span length up to 10 meters									
Description	Side Height (in mm)	Width (in mm)	Span length (in meters)						
			4m	5m	6m	7m	8m	9m	10m
			Permitted Load (in kg/meter)						
Perforated Cable Tray for long span distance	110	200 - 300	160	110	75	-	20	-	-
		400 - 600	200	150	100	-	40	-	-
	160	200 - 300	230	180	140	100	70	-	-
		400 - 600	250	200	160	130	100	-	-
Cable Ladder for long span distance	110	200 - 300	160	110	80	40	-	-	-
		400 - 600	210	150	100	70	-	-	-
	160	200 - 300	230	180	140	100	70	-	-
		400 - 600	250	200	160	130	100	-	-
	200	200 - 600	-	-	300	250	200	140	100

Fabrication of Tray / Ladder and accessories at site and welding is not permitted. In unavoidable circumstances, If any cut or holes are made in the trays/Ladder/accessories, zinc spray need to be applied over the surface. The metal edge has to be protected by edge protection sleeves to avoid cable damage. Edge of the supports has to be protected with plastic END caps. Screwed connections and internal fixing Devices should not create any damage to the cable when correctly fixed. Sudden or jerky motions shall not be used to tighten reusable screw connections.

Cables shall run in cable tray/ladder mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures using mounting accessories

#### **Cable Tray:-**

The cable tray and all accessories shall be fabricated from sheet steel and has to be hot dip galvanized against corrosion confirming to ISO 1461-1999 for installations in both indoor and outdoor applications & should have a Base Perforation Class B according to IEC 61537. The cable trays shall be supplied in standard lengths of 3000mm and the width of the tray shall be as follows.

Width: 50, 100, 150, 200, 300, 400, 500, 600 & 750 mm.

All the cable tray accessories like Bend's, TEES's, Cross over's etc should be designed

in accordance with IEC 61537 and shall be factory fabricated. The accessories shall be from the same material as of the tray and modular type, it should be connected with the trays by using fasteners. Typical details of trays, fittings and accessories etc are shown in the enclosed drawings.

For Cable trays designed, tested and confirming to IEC 61537, thickness of cable tray should be according to the manufacturers catalogue. For locally fabricated and non tested tray, thickness should be 2 mm up to span length of 1.5 meter, 2.5 mm for span length between 2 to 3 meter and 3 to 4 mm for span length between 4 and 10 meter

#### **Cable ladder:-**

The cable Ladder and all accessories shall be fabricated from sheet steel and has to be hot dip galvanized against corrosion confirming to ISO 1461-1999 for installations in both indoor and outdoor applications & should have a Free Base Area classification Y according to IEC 61537. The cable ladders shall be supplied in standard lengths of 3000/6000 mm and the width of the tray shall be as follows.

Width: 200 to 1200 mm in multiples of 100 mm

Maximum rung spacing in the ladder shall be 300mm. The rung's should be made of C profiles suitable to fix cables by special metal clamps according to the drawing. The ladder shall be of riveted and foldable type for easy transportation and to avoid damage during transportation and storage. All the ladder accessories like Bend's , TEES's, Cross over's etc should be designed in accordance with IEC 61537 and shall be factory fabricated . The accessories shall be made from the same material as of the ladder and modular type, it should be connected with the ladder by using fasteners. The details of ladders, fittings and accessories etc are shown in the enclosed drawing.

For Cable Ladders designed, tested and confirming to IEC 61537, thickness of cable Ladder should be according to the manufacturer's catalogue. For locally fabricated and non tested Ladder, thickness should be 2.5 mm up to span length of 1.5 to 2 meter, 3 mm for span length between 2.5 to 4 meter and 3 to 4 mm for span length between 5 and 10 meter

#### **Cover for Cable Trays / Ladders:-**

Cover for trays/ladders to protect the cable insulation from falling objects, water droplets, harmful effects of ultraviolet rays and accumulation of dust. The cover shall be made either from Hot Dip Galvanized sheet steel or superior quality Double Dip Galvanized Sheets. For Outdoor application, Double dip Galvanized material shall be used. The covers should be fitted properly to the Ladder / Tray by using pre fixed and tested locks which ensure that covers are fitted rigidly to Tray / Ladder. For outdoor application in high wind areas, additional cross over beadings to be used for fixing the cover on tray / ladder of width more than 500 mm.

#### **Mounting Accessories (supports and Brackets):-**



The mounting accessories shall be fabricated from steel and has to be hot dip galvanized against corrosion confirming to ISO 1461-1999 for installations in both indoor and outdoor applications and should be of completely modular type.

All supports and Brackets should be factory made, hot dip galvanized after completing welding, cutting, drilling, other machining operations and tested according to IEC 61537 according to the arrangements in the enclosed drawing. The system shall be designed such that it allows easy assembly at site by using Bolts and Nuts. The main support and brackets shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hard ware etc to form various arrangements required to support the cable trays. Welding of the components at the site shall not be allowed.

**END OF SECTION V**

## SECTION – VI

### **MEDIUM VOLTAGE PANELS:**

#### **1.0 GENERAL**

Medium voltage power control centres (generally termed as switchboard panels) shall be in sheet steel clad cubicle pattern, free floor standing, totally enclosed, compartmentalized design having multitier arrangement of the incomers and feeders as per details given in the schedule of quantities. All panels shall conform to the requirements of the latest addition of IS Code and shall be suitable for 415 V, 3 phase AC supply or 230 V single phase AC supply as required.

#### **2.0 CONSTRUCTIONAL FEATURES**

The Switch Boards shall be totally enclosed, sheet steel cubicle pattern, extensible on either side, dead front, floor mounting type (wall mounting if specifically asked for in BOQ) and shall have a bus bar chamber at the top and the cable entry from the bottom. (For panel requiring top cable entries if any, refer to BOQ). The cable terminations should be **inside the feeder compartment only**.

The Switch Boards shall be completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of ingress protection of IP 43 for indoor & IP 55 for outdoor. All doors and covers shall also be fully gasketed with synthetic rubber. All the live parts shall be properly shrouded with FRP sheets.

The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal. Base channel shall be fabricated from ISMC 75 and door shall be provided at the bottom with arrangement for fixing bolts in the foundation.

All panels and door covers shall be properly fitted and square with the frame. The cutouts in the panel shall be correctly positioned.

Lifting lugs of adequate strength shall be provided on each transport section of the panels.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

#### **3.0 SWITCHBOARD DIMENSIONAL LIMITATIONS**

A base channel 75 mm x 5 mm thick shall be provided at the bottom.

The overall height of the Switch Board shall be limited to 2200 mm

The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1900 mm from finished floor level.

#### **4.0 BUS BARS**

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminum. The bus bars shall have uniform cross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate busbar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral busbars shall be provided). The interval between the two insulators will be designed after considering the following:

- a) Strength and safe load rating of the insulator,
- b) The vibrating force generated during a fault,
- c) A Factor of safety of 1.25
- d) A set of insulators at both ends of the bus.

Bus bars shall be sized considering maximum current density of 1 Amps/ cross section sq.mm area. The size of the bus bar calculations must be approved by the consultants. The bus bars shall be designed to withstand a temperature rise of 45°C above the ambient. To limit the temperature rise in the bus bar chamber a set of louvers can be provided at strategical places considering the air circulation.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanised high tensile steel nuts, bolts, plain or spring washers of suitable size will be used in connecting the various section of the bus bars.

#### **5.0 SWITCH BOARD INTERCONNECTIONS**

All connections between the bus bars/Breakers terminations shall be through solid Aluminum strips of adequate size to carry full rated current which shall be PVC/fibre glass insulated.

For switch unit ratings upto 63A PVC insulated copper conductor wires of adequate size to carry full load current can be used. The terminations of all such interconnections shall be properly crimped.

#### **6.0 CABLE TERMINATIONS**

Knockout holes of appropriate size and number shall be provided in the SwitchBoard in conformity with the location of incoming and outgoing conduits/cables. All cable entries shall be from bottom until & unless specifically asked for in the BOQ.

The cable terminations of the circuit breakers shall be brought out to terminal cable sockets suitably located in the panel.

All outgoing links for FSU\MCB feeders shall be in the feeder compartment only.

The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC cables.

## **7.0 EARTHING**

The panels shall be provided with an aluminium earth bus of suitable size running through out the length of the switchboard. Suitable earthing eyes/bolts (at min. two points) shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

## **8.0 WIRING**

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq.mm except for the circuits related to current transformers or circuits with current carrying capacity more than 5 Amps (for which min. 2.5 Sq.mm copper conductor wires shall be used).

## **9.0 SHEET STEEL TREATMENT AND PAINTING**

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulfuric acid and a recognised phosphating process. The steel work shall then receive two coats of oxide primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment shall be powder coated with shade RAL 7032 (Siemens Gray) on the outside of the panel and mounting plates shall be of orange shade. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns (shade of paint may be changed if the client so desires).

## **10.0 NAME PLATES AND LABELS**

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

## **11.0 INSTALLATION**

Installation shall be done by other agencies. However, the foundation requirements



shall be submitted by the supplier. In addition the supplier shall coordinate with the erection contractor for shifting & installation of the panels.

## **12.0 TESTING AND COMMISSIONING**

Copies of type tests and routine test as per relevant specification, carried out at manufacturer's work shall be submitted to the CLIENT as required.

Wiring and connections including earthing shall be checked for continuity and tightness.

Insulation shall be measured with a 500 V megger and insulation resistance shall not be less than 100 Mega ohms

Interlocking operation to be checked as per requirement.

Tests shall be performed in presence of authorized representative of the CLIENT for which the contractor shall give due prior notice.

## **13.0 HIGH VOLTAGE TEST**

A high voltage test with 2.5 KV for one minute shall be applied between the poles and earth. Test shall be carried out on each pole in turn with the remaining poles earthed, all units raked in position and the breakers closed. Original test certificate shall be submitted along with panel.

## **14.0 PRE-COMMISSION TESTS:**

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of Architect's/Consultant's or their representatives.

- i) All main and auxiliary bus bar connections shall be checked and tightened.
- ii) All wiring termination and bus bar joints shall be checked and tightened.
- iii) Wiring shall be checked to ensure that it is according to the drawing.
- iv) All wiring shall be tested for insulation resistance by a 1000 volts meggar.
- v) Phase rotation tests shall be conducted
- vi) All relays and protective devices shall be tested for correctness of settings and operation by introducing a current generator and an ammeter in the circuit.

## **15.0 CLIMATIC CONDITIONS:**

The panels & switch gear components shall be suitable for following climatic conditions:





<b>Maximum</b>	<b>Minimum</b>	
DBT	45°C	10°C
RH	90%	40%

#### **17.0 HEATING ARRANGEMENT:**

The panel shall be provided with a thermostatically controlled heating arrangement for monsoon (200 Watt) to take care of high humidity conditions. A 6/16A service socket outlet (single phase) shall be provided in one of the compartments in all the panels.

**END OF SECTION – VI**

## SECTION – VII

### **SURGE PROTECTION DEVICES (SPD) FOR 230 / 415V AC 50 HZ POWER SUPPLY**

#### **1.0 APPLICABLE STANDARDS**

- a) **IEC 62305** : Protection against Lightning  
Part 1: Basic Principles  
Part 2: Risk Assessment  
Part 3: Protection of structures  
Part 4: Electrical & Electronic equipments within structures

Note: IEC 61024 & IEC 61312 are old standards and are replaced by IEC 62305.

- b) **IEC 61643-1**: - Surge Protective Devices Connected to Low-Voltage Power Systems:  
Performance requirements and testing methods.
- c) **IEC 61643-12**: - Surge Protective Devices Connected to Low-Voltage Power Systems:  
Selection and application principles

Type of Network – 3 phases, 4 wires.

#### **2.0 MAINS INCOMING PANEL**

Protection at the main in-comer of the power supply system – i.e. at the Main Distribution Board (after the incoming breaker)

#### **2.1 Class B/Class I (according to IEC 61643)**

3 numbers of lightning arrester for the connection between Phase and Neutral and one number of lightning arrester between Neutral and Earth with the following ratings: ( 1 no for each phase)

Sl. No	Parameters	Specifications	
		Line to Neutral (3 nos)	Neutral to Earth (1 no)
1.	Type	Encapsulated/Non-exhausting Spark Gap	
2.	Nominal Voltage, Un	230V, 50/60 Hz	
3.	Over Voltage withstanding capacity	400V	
4.	Lightning Impulse Current	50 KA(10/350 □sec)	125 KA(10/350 □sec)
5.	Voltage Protection Level, Up	< 1.3 KV	
6.	Response Time	< 100 nano seconds	
7.	Operating temperature range	-40□C to +85□C	

Visual Indication of the flag in the surge arrester (Line to Neutral)

8.	Mounting on	Din Rail	
9.	Degree of Protection	IP 20	
10.	Max. Back-up fuse	500 A gL/gG	NA

**3.0 SUB DISTRIBUTION BOARD (SDB)/LT PANEL**

Second Stage Protection at the Sub distribution board or in LT panel of the power supply system

**3.1 Class B+C/Class I+II (according to IEC 61643)**

3 numbers of pluggable type surge arrester with potential free contact, thermal disconnecter & provision for inbuilt common remote indication for defective arresters to connect between Line and Neutral and one number arrester Spark Gap type to connect between Neutral and Earth of following ratings including baseelement & pluggable arresters.

Sl.No	Parameters	Specifications	
		Line to Neutral	Neutral to Earth
1.	Type	Single MOV with built in thermal fuse	Spark Gap Encapsulated / Non-exhausting
2.	Nominal Voltage, Un	230V, 50/60 Hz	
3.	Maximum Continuous Operating Voltage, Uc	≥ 320 Volt	255 Volt
4.	Nominal Discharge Current In	30 KA(8/20 □sec)	50 KA(8/20 □sec)
5.	Maximum Discharge Current I <sub>max</sub>	50 KA (8/20 □sec)	
6.	Lightning Impulse Current	7 KA(10/350 □sec)	25 KA(10/350 □sec)
7.	Voltage Protection Level at 1 KA	≤ 750 volts	≤1200 Volt
8.	Response Time	< 25 nano seconds	< 100 nano seconds
9.	Operating temperature range	-40□C to +80□C	
10.	Mounting on	Din Rail	

**Visual Indication of the flag in the surge arrester (Line to Neutral)**

11.	Degree of Protection	IP 20	
12.	Max. Back-up fuse	160 A gL/gG	NA

Healthy condition : Green Colour

Faulty condition : Red Colour

**4.0 EQUIPMENT LEVEL (UPS, MCB DB'S CNC MACHINE/DRIVES, ETC)**

Protection for Sensitive Equipments at the input of the end equipments like UPS, CNC machine, VFD's or at Important MCB DB's feeding power to Computer / Server etc

**4.1 Class C/Class II (according to IEC 61643)**

3 numbers of pluggable type surge arrester with potential free contact, thermal disconnecter & provision for inbuilt common remote indication for defective arresters to connect between Line and Neutral and one number arrester Spark Gap type to connect between Neutral and Earth of following ratings including baseelement & pluggable arresters.

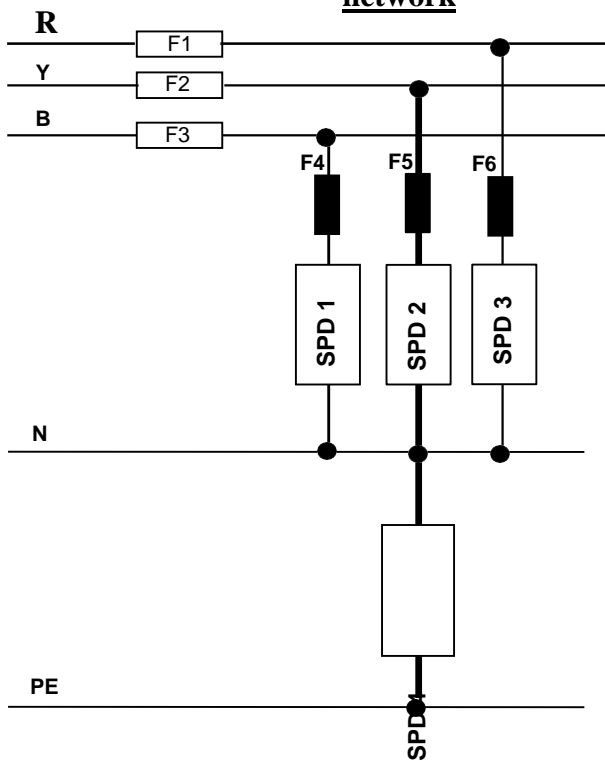
Sl.No	Parameters	Specifications	
		Line to Neutral	Neutral to Earth
1.	Type	Single MOV <sub>in</sub> with built thermal fuse	Spark Gap Encapsulated / Non-exhausting
2.	Nominal Voltage, Un	230V, 50/60 Hz	
3.	Maximum Continuous Operating Voltage, Uc	≥ 320 Volt	255 Volt
4.	Nominal Discharge Current I <sub>n</sub>	20 KA(8/20 □sec)	50 KA(8/20 □sec)
5.	Maximum Discharge Current I <sub>max</sub>	40 KA	50 KA (8/20 □sec)
6.	Voltage Protection Level at 1 KA	< 1000 Volts	≤ 1200 Volts
7.	Response Time	< 25 nano seconds	< 100 nano seconds
8.	Operating temperature range	-40□C to +80□C	
9.	Mounting on	Din Rail	

**Visual Indication of the flag in the surge arrester (Line to Neutral)**

10.	Degree of Protection	IP 20	
11.	Back-up fuse	125 A gL/gG	NA

Healthy condition : Green Colour  
 Faulty condition : Red Colour

**Connection diagram for SPD for 3 phase 4 wire network**



- : Incoming ACB/MCCB/SFU  
 - : Back up fuse for Surge Arrester  
 - : R,Y,B and N Bus bar or looping after the incomer  
 - : Earth Bus bar in the panel  
 - : Surge Arrester to connect between Line and Neutral  
 - : SPD to connect between Neutral and Earth.

F1, F2, F3  
 F4, F5, F6  
 R,Y,B and N  
 PE  
 SPD1,2,3  
 SPD 4

**Note:** In US, SPD is called as TVSS- Transient Voltage Surge Suppressor. BUT, IEEE also will be changing the name to SPD in 2009 April. Then, throughout the world, the common name will be SPD.

**END OF SECTION – VII**

## SECTION – VIII

### **METERING, INSTRUMENTATION AND PROTECTION**

Ratings, type and quantity of meters, instruments and protective devices shall be as per Bill of Quantities.

#### **1.0 CURRENT TRANSFORMERS**

CTs shall conform to latest IS codes in all respects. All CTs used for medium voltage application shall be rated for 1 kV. CTs shall have rated primary current, rated burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be 0.5 to 1 and for protection class 10. CTs shall be capable of withstanding magnetic and thermal stresses due to short circuit faults. Terminals of CTs shall be paired permanently for easy identification of poles. CTs shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each CT shall be provided with rating plate indicating :

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounted such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

#### **2.0 POTENTIAL TRANSFORMER**

PTs shall conform to latest amendment upto date IS Codes.

#### **3.0 MEASURING INSTRUMENTS**

Direct reading electrical instruments shall conform to latest IS codes in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between  $-10^{\circ}\text{C}$  and  $+500^{\circ}\text{C}$ . Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from out side. Direction of deflection shall be from left to right. Selector switches shall be provided for ammeters and volt meters used in three phase system.

#### **4.0 AMMETERS**

Ammeters shall be of digital type. Ammeters shall be manufacture and calibrated as per latest IS.

Ammeters shall normally be suitable for 5 A secondary of current transformers. Ammeters shall be capable of carrying substantial over loads during fault conditions.

#### **5.0 VOLTMETERS**

Voltmeters shall be digital type of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection of 2A MCB.

#### **6.0 KWH METER**

Meter shall be of 3 phase digital type and shall be provided with a maximum demand indicator.

#### **7.0 POWER FACTOR METERS**

3 phase power factor meters shall be of digital type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be calibrated for 50% lag - 100% - 50% lead readings. Phase angle accuracy shall be +40.

#### **8.0 ENERGY AND REACTIVE POWER METERS**

Trivector meters shall be two element, integrating type, KWH, KVA, KVA hour reactive meters. Meters shall confirm to latest IS in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy conception of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

#### **9.0 RELAYS**

Protection relays shall be provided with flag type indicators to indicate cause of tripping. Flag indicators shall remain in position till they are reset by hand reset. Relays shall be designed to make or break the normal circuit current with which they are associated. Relay contacts shall be of silver or platinum alloy and shall be designed to withstand repeated operation without damage. Relays shall be of draw out type to facilitate testing and maintenance. Draw out case shall be dust tight. Relays shall be capable of disconnecting faulty section of network without causing interruption to remaining sections. Analysis of setting shall be made considering relay errors, pickup and overshoot errors and shall be submitted to Project Manager for approval.

#### **10.0 OVER CURRENT RELAYS**

Over current relays shall be induction type with inverse definite minimum time lag characteristics. Relays shall be provided with adjustable current and time settings. Setting for current shall be 50 to 200 % in steps of 25%. The IDMT relay shall have time lag (delay) of 0 to 3 seconds. The time setting multiplier shall be adjustable



from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5 Amps.

#### **11.0 EARTH FAULT RELAY**

Same as over current relay excepting the current setting shall be 10% to 40% in steps of 10%.

#### **12.0 UNDER VOLTAGE RELAY**

Under voltage relays shall be of induction type and shall have inverse limit operation characteristics with pickup voltage range of 50 to 90% of the rated voltage.

#### **13.0 POWER FACTOR CORRECTION CAPACITORS**

Power factor correction capacitors shall conform to latest IS codes in all respects. Approval of insurance association of India shall be obtain if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 25, 50 & 100 kVAR sizes as specified. Capacitor shall be usable for indoor use, permissible overloads being as below.

- Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.
- Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.
- Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacitory unit shall be provided with its own built in protection. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnants The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitors terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

#### **14.0 CONTROL DEVICES**

##### **a) Push Buttons**

The push buttons used in the panels will be rated for more than 415 volts and 2 amps. All the push buttons will be mounted on the front door and the assembly will be in two parts. All the push buttons will be mounted on the front door of the cubicle in regular symmetrical fashion as per the general norms being practiced. Only one make of push buttons will be used in the assembly of all the panels. The selection of the colour of the push buttons will be as follows

Function	Colour
Starting/Switching ON	Green
Stopping/Switching OFF	Red
Resetting	Black
Forward ON	Yellow
Reverse ON	Blue
Emergency OFF	Red/Mushroom

**b) Indicating Lights**

The indicating lights used in the panel will be pleasant looking and round shape having the following features;

1. A separate front lens for it's easy replacement.
2. Facility to replace the bulb from the front.
3. Baynet pin cap bulbs of standard size to be used.
4. The shape of the lens to allow viewing from sides.
5. Series resistance with use of low voltage bulb for longer life.
6. Clear and distinct indication for light ON and OFF with differences of brightness of the lens.

The selection of the colours of the indicating lamps will be as follows:

- Red for system in operation
- Amber for system ready for operation.
- Green for system being put off.
- Red, yellow and blue for incoming supply.

**15.0 TESTING**

15.1 Instrument transformers shall be tested at factory as per IS:2705 & IS:3156. The test shall incorporate the following:

- a) Type tests
- b) Routine tests

Original test certificates in triplicate shall be provided.

15.2 Meters shall be tested as per IS: 1248. The tests shall include both type tests and routine tests. Original test certificate in triplicate shall be furnished.

- 15.3
  - a) Suitable injection tests shall be applied to the secondary circuit of every instrument to establish the correctness of calibration and working order.
  - b) All relays and protective devices shall be tested to establish correctness of setting and operation by introducing a current generator and an ammeter in the circuit.

**END OF SECTION – VIII**



## **MINIATURE CIRCUIT BREAKERS**

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system. MCB's shall be quick make and break type conforming to relevant IS. Housing shall be heat resistant and have a high impact strength. MCB's shall be flush mounting type and shall be provided with trip free manual operating lever with ON/OFF indications

MCB's shall be provided with magnetic thermal releases for over current and short circuit protection. The overload or short circuit device shall have a common trip bar in case of DP and TPN MCB's. The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with H.R.C. fuse/PVC cable characteristic.

The MCB's shall have a minimum breaking capacity of 10 kA at 230/415 volts in accordance with IEC : 898 - 1995 and IS : 8828 – 1996

## **MOULDED CASE CIRCUIT BREAKERS**

### **1.0 GENERAL**

Moulded case circuit breakers shall be incorporated in the switch board wherever specified. MCCB shall conform to IEC:947-II or IS:13947-II in all respects. MCCB shall be suitable for three phase 415 volts AC. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds. All MCCBs will have earth fault module (if specifically asked) and front operated. All four pole MCCB shall be suitable for three phase four wire system, with the neutral clearly identified and capable of first make last break feature.

### **2.0 CONSTRUCTION**

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material, operating handle shall be quick make/quick break. The operating handle shall have suitable 'ON' 'OFF' and 'TRIPPED' mechanical indicators notable from outside. All MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases. The MCCB should be suitable for disconnection and isolation with marking on front name plate.

Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Thermal magnetic tripping device shall have IDMT characteristics for sustained over load and short circuits. All MCCBs above 250 Amps will also have short circuit magnetic pickup level adjustment.

#### ***MCCBs***

All MCCBs shall have variable thermal overload releases which can be adjusted at site.

- 3.0 Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances. All MCCBs of higher ratings above 250 Amps, shall be provided with separate extended arcing contacts.

### **4.0 INTERLOCKING**

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switch board.

- a) Handle interlock to prevent unnecessary manipulations of the breaker.
- b) Door interlock to prevent the door being opened when the breaker is in ON or OFF position.

- c) Defeat-interlocking device to open the door even if the breaker is in ON position.

#### **5.0 BREAKING CAPACITY**

The moulded case circuit breaker shall have a rated service. Short circuit breaking capacity of not less than 25 KA rms at 415 volts AC. Wherever required, higher breaking capacity breakers to meet the system short circuit fault shall be used.

#### **6.0 ACCESSORIES**

All the accessories like shunt, under voltage contact blocks shall be of snap fitting possible at site.

#### **7.0 TESTING**

- a) Original test certificate of the MCCB shall be furnished.
- b) Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

## **MEDIUM VOLTAGE AIR CIRCUIT BREAKER**

### **1.0 GENERAL**

The ACBs shall comply to IEC 60947 Part I & II and IS 13947 Part I & II and shall be suitable for operation on 415 Volts, 50 Hz 3 Phase system.

1. The breaker shall comply with Isolation function requirements of IEC 60947, Part-II, section 7.12 and shall be clearly marked as “Suitable for Isolation / Disconnection” to ensure safety of operating personnel.
2. The ACB shall provide Class –II insulation between front panel and internal power circuit as per IEC 60947 Part II Section-7.12 to avoid accidental contact with live parts during inspection & maintenance.
3. The ACB shall be 3/4 pole with modular construction, draw out, manually/electrical operated and shall be capable of providing short circuit, overload and earth fault protection with time delay through micro processor based control unit sensing the true RMS value to ensure accurate measu
4. Arc Chute covers wherever necessary shall be provided.
5. The incoming panel accommodating ACB shall be provided with indicating lamps for ON-OFF positions, digital voltmeter and ammeter of size not less than 96 mm x 96 mm. Selector switches, MCB for protection circuit and current transformers.
6. It shall be possible to bolt the draw out frame not only in connected position but alrement meeting the EMI/EMC requirement as per standard.

The circuit breakers shall be for continuous rating and service short Circuit Breaking capacity shall be “:y ”{also in TEST and DISCONNECTED position to prevent dislocation due to vibrating and shocks.

## **WIRING**

### **1 GENERAL**

Technical Specifications in this section cover the Internal Wiring Installations comprising of :

- Wiring for lights and convenience socket outlets etc. in concealed/surface conduit/raceways.
- Wiring for telephone outlets.
- Submain wiring.
- Conduiting for Low Voltage System

## 2 STANDARDS AND CODES

Latest upto date Indian Standard (IS) and Code of Practice will apply to the equipment and the work covered by the scope of this contract. In addition therelevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards arenot available, relevant British and / or IEC Standard shall be applicable.

## 3 CONDUITS

### 3.1 Steel Conduits

**These shall be of mild steel 16 gauge upto 32mm and 14 gauge for sizes above 32mm,** electric resistance welded (ERW), electric threaded type having perfectly circular tubing. Conduits shall be precession welded ERW and shall be fabricated from tested steel strips of thickness as per IS by high frequency induction weld process. Weld shall be smooth and of consistent of high quality to ensure crack proofbending. The conduits shall be black enamel painted inside and outside in its manufactured form. Wherever so specified, the conduit shall be galvanized. All conduits used in this work shall be ISI embossed.

### 3.2 MS Conduits

The electrical wiring shall be done in recessed MS Conduits, unless mentioned otherwise.

No conduit less than 25 mm in diameter shall be used, unless otherwise specifically ask by Consultant / Project Manager.

### 3.3 PVC Conduits (if required)

Wiring shall be carried out in recessed /surface PVC conduits. The PVC conduits conform to latest and shall be ISI embossed. The conduits shall be heavy gauge



(minimum 2 mm wall thickness) and the interiors of the conduits shall be free from all obstructions. All joints in conduits shall be sealed/cemented with approved solvent cement. Damage conduits/fittings shall not be used. Cut ends of conduits shall not have sharp edges.

### **3.4 Bends**

As far as possible, the conduit system shall be so laid out that it shall obviate use of tees, elbows and sharp bends. No length of conduit shall have more than the equivalent of two quarter bends from inlet to outlet.

### **3.5 Conduit Accessories.**

#### **3.5.1 Standard accessories**

The conduit wiring system shall be complete in all respects, including their accessories. 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. The accessories shall conform in all respects to the relevant IS. Samples shall be got approved by Consultant / Project Manager before use.

#### **3.5.2 Fabricated accessories**

Wherever required, outlet/junction boxes of required sizes shall be fabricated from 1.6 mm thick MS sheets excepting ceiling fan outlet boxes which shall be fabricated from minimum 3 mm thick sheets. The outlet boxes shall be of approved quality, finish and manufacture. Suitable means of fixing connectors etc., if required, shall be provided in the boxes. The boxes shall be protected from rust by zinc phosphate primer process. Boxes shall be finished with minimum 2 coats of enamel paint of approved colour. A screwed brass stud shall be provided in all boxes as earthing terminal.

### **3.6 Open/Surface Conduit System with FRLS PVC Conduits:**

- a) Wherever specifically called for, surface conduit system shall be adopted. All conduits shall be of rigid FRLS PVC pipe. All conduits and its accessories shall be of threaded type. Conduits shall run in parallel, perpendicular, square and Symmetrical lines. Before the conduits are installed, the exact route shall be marked at the site and approval of the Construction Manager/ Consultant shall be obtained. Conduits shall be fixed by heavy duty FRLS PVC saddles (or as per standard accessories specified by the manufacturer and as approved by the Consultant), secured by suitable rawl plugs, at an interval of not more than 1 meter. Wherever, couplers, bends, or similar fittings are used saddles shall be provided at either side at a distance of 300 mm from the center of such fittings. Conduits shall be joined by means of screwed couplers and screwed accessories only. In long distance straight runs of conduit, inspection type couplers /junction boxes shall be provided. Threading shall be long enough to accommodate pipe to the full

threaded portion of the couplers and accessories. Cut ends of conduits shall have neither sharp edges nor any burrs left to avoid damage to insulation of wires.

- b) Bends in conduit runs shall be done by using readymade bends with inspection elbows / standard elbows as per the instructions of the Consultant / Construction Manager / as per site requirements. Sharp bends shall be accomplished by introducing solid bends, inspection bends or heavy duty PVC / FRLS PVC inspection boxes. Radius of solid bends shall not be less than 75mm. Not less than 90-degree bend shall be used in a conduit run from outlet to outlet.
- c) Wherever conduits terminate into control boxes, outlet boxes, distribution boards etc, they shall be rigidly connected to the box with check nuts on either side of the entry.
- d) Steel wire /fish wire shall be drawn in each conduit.
- e) Separate PVC insulated copper conductor earth wire shall be drawn in each conduit.
- f) Draw boxes shall be located at convenient location for easy drawing of wires.
- g) Every mains and submains shall run in an independent conduit with an independent earth wire of specified capacity along the entire length of conduit.
- h) The conduit to be installed shall be of ample cross section area to facilitate the drawing of wires. The diameter of the conduit shall be selected as per table specified in these specifications; but in no case it shall be less than 20 mm diameter.
- i) Entire conduit layout shall be done such as to avoid additional junction boxes other than for outlet points. Conduits shall be free from sharp edge and burrs. Conduits shall be laid in a neat and organized manner as directed and approved by the Construction Manager/Consultant. Conduit runs shall be planned so as not to conflict with any other services pipe, lines/duct.
- j) The conduit shall be painted with two coats of enamel paint, color as approved by the Construction manager/ Consultant after installation.
- k) If required, connection between PVC or FRLS PVC and steel conduits shall be through a junction box. Direct connection between PVC and steel conduits are not allowed.
- l) Where exposed conduits are suspended from the structure, they shall be clamped firmly and rigidly to hangers of design to be approved by the Construction Manager/Consultant. Where hanger supports are to be anchored

to reinforced concrete, appropriate inserts and necessary devices for their fixing shall be left in position at the time of concreting, making holes and opening in the concrete will generally not be allowed. Where inserts are not provided, contractor shall use only anchor fasteners. In case, it is unavoidable, prior permission of the Construction Manager /Consultant shall be obtained to make any openings in the concrete surface.

m) **Conduit Joints:**

Conduit pipes shall be joined by means of screwed couplers and screwed accessories, as per IS: 2667. The threads shall be free from grease or oil. In long distanced straight runs of conduit, inspection type couplers at reasonable intervals shall be provided or running threads with couplers and lock nuts shall be provided. The bare threaded portion shall be treated with anti- corrosive paints. Threads on conduit pipes in all cases shall be between 11mm or 27mm long, sufficient to accommodate pipes to full threaded portion of couplers or accessories. Cut ends of conduit pipes shall have neither sharp edges nor any burrs left, to avoid damage to the insulation of conductors while pulling them through such pipes.

Brass female bushes shall be used in each conduit termination in a switch box, outlet box, electrical panel or any other box.

Conduit shall be secure in each outlet box, switch box, electrical panel or any other box by means of one PVC / FRLS FRLS PVC/brass hexagonal lock nut and bush, outside and inside the box.

At each building expansion joints, approved oil tight double wire wound flexible steel conduit or any other approved method shall be used. This shall be united on both sides with the rigid conduits by suitable union.

Conduits installed in the plant room for mechanical equipment shall be properly clamped with the mechanical supports, but in no case, it shall be fixed with the body of the equipment.

The connection of conduit to the mechanical equipment shall be through oil tight double wire wound flexible steel conduit. In any case the length of the flexible conduit shall not exceed one meter. The flexible conduit shall be properly clamped with the body of the equipment. They shall not in any case be clamped to any cover or any removable parts of the equipment.

n) **Bends of Conduits:**

All necessary bends in the system including diversion shall be done by bending pipes or by inserting suitable solid or circular inspection type normal box or similar fittings. Conduit fittings shall be avoided as far as possible on conduit system exposed to weather, where necessary, solid type fittings shall be used. Radius of such bends in conduit pipes shall be not less than 75mm. No length of conduit shall have more than the equivalent of four-quarter bends from outlet, the bends at the outlets not being counted.

o) Protection against Dampness:

In order to minimize condensation or sweating inside the conduit, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects, as far as possible.

p) Protection of Conduit Against Rust:

The outer surface of the conduits including bends, junction boxes, etc., forming part of the conduit system shall be adequately protected against rust, particularly when such system is exposed to weather. In all cases, no bare/ threaded portion of conduit pipe shall be allowed unless such bare threaded portion is treated with anti-corrosive coating or covered with approved plastic compound.

All screwed and socketed connections shall be adequately made fully water tight by the use of proper joining material i.e. white lead for metal conduits.

q) Bunching of Cables:

Unless otherwise specified, insulated conductors of different phases shall be bunched in separate conduit.

Wires carrying current shall be so bunched in the conduit that the outgoing and return wires are drawn in to the same conduit. Wires originating from two different phases shall not be run in the same conduit.

The number of insulated wires/cables that can be drawn into the conduits shall be as per the following table.

**MAXIMUM PERMISSIBLE NUMBER OF 1100 VOLTS GRADE SINGLE CORE CABLE THAT CAN BE DRAWN INTO FRLS FRLS PVC CONDUITS.**

CABLE SIZE IN SQ. MM	SIZE OF CONDUITS (MM) [ MAX.NO. OF CABLES]				
	20	25	32	40	50
1.5	5	10	14	-	-
2.5	5	8	12	-	-
4.0	3	6	10	-	-
6.0	2	5	8	-	-
10.0	-	4	7	10	-
16.0	-	3	5	6	-

25.0	-	-	3	4	6
35.0	-	-	2	3	5
50.0	-	-	-	-	4

#### 4. WIRES

Wiring shall be carried out with FRLS PVC insulated 660/1100 volt grade unsheathed single core wires with electrolytic annealed stranded copper (unless otherwise stated) conductors conforming to latest IS Code. All wire rolls shall be ISI marked. All wires shall bear manufacturer's label and shall be brought to site in new and original packages. Manufacturer's certificate, certifying that wires brought to site are of their manufacture shall be furnished as required.

#### 5 COAXIAL CABLES

The coaxial cables shall be of videband type with operation up to 300 MHz capability. Aging resistance shall comply with latest code i.e. maximum 5% increase in attenuation at 200 MHz measured by artificial aging (14 days at 80o C) cables shall meet all exceed following specifications

Center core Dia	0.8 mm
Diaelectric Dia	4.8 mm
Dielectric	PE
Outer Conductor Dia	5.4 mm
Outer Dia	7.0 mm
Bending radius	more than 30 mm
Impedance	75 ohms
D.C Resistance	50 ohms/KM
Screening factor	more than 50
Attenuation	
50 MHz	6.5
100 MHz	9
200 MHz	13
300 MHz	16

#### 6 LAYING OF CONDUITS

- Conduits shall be laid either recessed in walls and ceilings or on surface on walls and ceilings or partly recessed and partly on surface, as required.
- Same rate shall apply for recessed and surface conduiting in this contract.
- Stranded copper conductor insulated wire of size as per schedule of quantities shall be provided in entire conduiting for loop earthing.

- GI wire of suitable size to serve as a fish wire shall be left in all conduit runs to facilitate drawing of wires after completion of conduiting.

## 6.1 Recessed Conduiting

Conduits recessed in concrete members shall be laid before casting, in the upper portion of slabs or otherwise as may be instructed, so as to embed the entire run of conduits and ceiling outlet boxes with a cover of minimum 12 mm concrete. Conduits shall be adequately tied to the reinforcement to prevent displacement during casting at intervals of maximum 1 meter. No reinforcement bars shall be cut to fix the conduits. Suitable flexible joints shall be provided at all locations where conduits cross expansion joints in the building.

Conduits recessed in brick work shall be laid in chases to be cut by electrical Contractor in brick work before plastering. The chases shall be cut by a chase cutting electric machine. The chases shall be of sufficient width to accommodate the required number of conduits and of sufficient depth to permit full thickness of plaster over conduits. The conduits shall be secured in the chase by means of heavy duty pressed steel clamps screwed to MS flat strip saddles at intervals of maximum 1 meter. The chases shall then be filled with cement and coarse sand mortar (1:3) and properly cured by watering.

Entire recessed conduit work in concrete members and in brick work shall be carried out in close coordination with progress of civil works. Conduits in concrete members shall be laid before casting and conduits in brick work shall be laid before plastering. Should it become necessary to embed conduits in already cast concrete members, suitable chase shall be cut in concrete for the purpose. For minimising this cutting, conduits of lesser diameter than 25 mm and outlet boxes of lesser depth than 50 mm could be used by the Contractor for such extensions only after obtaining specific approval from Consultant /Project Manager. For embedding conduits in finished and plastered brick work, the chase would have to be made in the finished brick work. After fixing conduit in chases, chases shall be made good in most workmanlike manner to match with the original finish.

Cutting chases in finished concrete or finished plastered brick work for recessing conduits and outlet boxes etc shall be done by the Contractors without any extra cost.

## 6.2 Surface Conduiting

Wherever so desired, conduit shall be laid in surface over finished concrete and/or plastered brickwork. Suitable spacer saddles of approved make and finish shall be fixed to the finished structural surface along the conduit route at intervals not exceeding 600 mm. Holes in concrete or brick work for fixing the saddles shall be made neatly by electric drills using masonry drill bits. Conduits shall be fixed on the saddles by means of good quality heavy duty MS clamps screwed to the saddles by counter sunk screws. Gitti not to be used for fixing the saddle. Neat appearance and good workmanship of surface conduiting work is of particular importance. The entire conduit work shall be in absolute line and plumb.

### 6.3 Fixing of conduit fittings and accessories

For concealed conduiting work, the fittings and accessories shall be completely embedded in walls/ceilings leaving top surface flush with finished wall/ceiling surface in a workman like manner.

Loop earthing wire shall be connected to a screwed earthstead inside outlet boxes to make an effective contact with the metal body.

### 6.4 Painting and Colour coding of conduits

Before laying, conduits shall be painted specially at such places where paint has been damaged due to vice or wrench grip or any other reason.

If so specified, surface conduits shall be provided with 20 mm wide and 100 mm long colour coding strips as below

<u>Use</u>	<u>Code colour</u>
Low voltage	Grey
Telephone	Black
Earthing system	Green
Control system lighting	Purple

### 6.5 Protection of Conduits

To safeguard against filling up with mortar/plaster etc. all the outlet and switch boxes shall be provided with temporary covers and plugs which shall be replaced by sheet/plate covers as required. All screwed and socket joints shall be made fully water tight with white lead paste.

### 6.6 Cleaning of Conduit Runs

The entire conduit system including outlets and boxes shall be thoroughly cleaned after completion of erection and before drawing in of cables.

### 6.7 Protection against Dampness

All outlets in conduit system shall be properly drain and ventilated to minimise chances of condensation/sweating.

### 6.8 Expansion Joints

When crossing through expansion joints in buildings, the conduit sections across the joint shall be through approved quality heavy duty metal flexible conduits of the



same size as the rigid conduit. **The expansion joint crossing shall be done as approved by Project Manager.**

## **6.9 Loop Earthing**

Loop earthing shall be provided by means of insulated stranded copper conductor wires of sizes as per Schedule of Quantity laid along with wiring inside conduits for all wiring outlets and sub-mains. Earthing terminals shall be provided inside all switch boxes, outlet boxes and draw boxes etc.

## **7 LAYING AND DRAWING OF WIRES**

### **7.1 Bunching of Wires**

Wires carrying current shall be so bunched in conduits that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

### **7.2 Drawing of Wires**

The drawing of wires shall be done with due regard to the following precautions:-

- No wire shall be drawn into any conduit, until all work of any nature, that may cause injury to wire is completed. Burrs in cut conduits shall be smoothen before erection of conduits. Care shall be taken in pulling the wire so that no damage occurs to the insulation of the wire. Approved type bushes shall be provided at conduit terminations.
- Before the wires are drawn into the conduits, conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction by forcing compressed air through the conduits if necessary..
- While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which cause breakage of conductors.
- There shall be no sharp bends.
- The Contractor shall, after wiring is completed, provide a blank metal/sunmica plate on all switch / outlet / junction boxes for security and to ensure that wires are not stolen till switches / outlets etc.. are fixed at no extracost the contractor shall be responsible to ensure that wires and loop earthing conductors are not broken and stolen. In the event of the wire been partly / fully stolen , the contractor shall replace the entire wiring alongwith loop earthing at no extra cost. No joint of any nature whatsoever shall be permitted in wiring and loop earthing.

### **7.3 Termination /Jointing of Wires**

- Sub-circuit wiring shall be carried out in looping system. Joints shall be made only at distribution board terminals, switches/buzzers and at ceiling roses/connectors/lamp holders terminals for lights/fans/socket outlets. No

joints shall be made inside conduits or junction/draw/inspection boxes.

- Switches controlling lights, fans or socket outlets shall be connected in the phase wire of the final sub circuit only. Switches shall never be connected in the neutral wire.
- Wiring conductors shall be continuous from outlet to outlet. Joints where unavoidable, due to any special reason shall be made by approved connectors. Specific prior permission from Project Manager in writing shall be obtained before making such joint.
- Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or wringing.
- Strands of wires shall not be cut for connecting terminals. All strands of wires shall be twisted round at the end before connection..
- Conductors having nominal cross sectional area exceeding 1.5 sq. mm shall always be provided with crimping sockets. Tinning of the strands shall be done wherever crimping sockets are not available as per instructions of the Project Manager
- All wiring shall be labelled with appropriate plastic ferrules for identification.
- At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used.
- Brass nuts and bolts shall be used for all connections.
- The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.
- Switches controlling lights, fans, socket outlets etc. shall be connected to the phase wire of circuits only.
- Only certified valid license holder wiremen shall be employed to do wiring / jointing work.

#### **7.4 Load Balancing**

The Contractor shall plan the load balancing of circuits in 3 phase installation and get the same approved by the Project Manager before commencement of the work.

## 7.5 Colour Code of Conductors

Colour code shall be maintained for the entire wiring installation - red, yellow, blue for three phases, black for neutral and green for earth.

## 8. SWITCHES AND FIXTURES

### 8.1 SWITCHES

All 6 and 16 amps switches shall be of the modular enclosed type flush mounted 220 Volt AC of the best quality and standard or as approved by Interior designer/Architect/Project Manager. The switch moving and fixed contacts shall be of silver nickel and silver graphite alloy and contact tips coated with silver. The housing of switches shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

### 8.2 FLUSH PLATES

Switches, receptacles and telephone system outlets in wall shall be provided with molded cover plates of shape, size and colour approved by the Project Manager made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material, and secured to the box with counter sunk round head chromium plated brass screws. Where two or more switches are installed together, they shall be provided with one common switch cover plate as described above with notches to accommodate all switches either in one, two or three rows.

One and two gang switch cover plate, telephone outlet cover plate, 6 and 16 amps switched/unswitched plates, shall have the same shape and size. Three and four gang switch cover plates shall have the same shape and size. Six and eight gang switch cover plates shall have the same shape and size. Nine and twelve switch cover plates shall have the same shape and size. Wherever five switches, seven switches, ten switches and eleven switches are to be fixed the next higher size of gang switch cover plate to be used and extra openings shall be provided with blank-off.

### 8.3 EXTERNALLY OPERATED SWITCHES

Externally operated switches, shall be of general purpose type, 250 volts of the proper size and rating and shall be provided in weather proof enclosures, complete with weather proof gasketed covers. The MCB's for all externally operated switches shall be separate and of proper rating.

### 8.4 WALL SOCKET OUTLETS

All 6/16 Amps wall socket outlets unless otherwise mentioned on the drawings shall be switched, five/six round pin and fitted with automatic linear safety shutters to ensure safety from prying fingers. Un-switched 6/16 amp wall socket outlets where called for in the drawings shall be of five/six round pin type. The socket outlets shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

The switch and sockets shall be located in the same plate. The plates for 6 amp switched/un-switched plugs and telephone outlets shall be of the same size and shape.

All the switched and un-switched outlets shall be of the best standard.

An earth wire shall be provided along the cables feeding socket outlets for electrical appliances. The earth wire shall be connected to the earthing terminal screw inside the box. The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

## **8.5 LIGHTING FIXTURES**

The light fixtures and fittings shall be assembled and installed complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Project Manager.

Wires brought out from junction boxes shall be encased in GI flexible pipes for connecting to fixtures concealed in suspended ceiling. The flexible pipes shall be provided with a checknut at the fixture end.

Pendant fixtures specified with overall lengths are subject to change and shall be checked with conditions of the job and installed as directed.

All suspended fixtures shall be mounted rigid and fixed in position in accordance with drawings, instructions and to the approval of the Project Manager.

Fixtures shall be suspended true to alignment, plumb, level and capable of resisting all lateral and vertical forces and shall be fixed as required. All suspended light fixtures etc. shall be provided with concealed suspension arrangement in the concrete slab/roof members. It is the duty of the Contractor to make these provisions at the appropriate stage of construction.

All switch and outlet boxes shall be bonded to earth with insulated stranded copper wire as specified.

Wires shall be connected to all fixtures through connector blocks.

Flexible pipes, wherever used, shall be of make and quality approved by the Project Manager.

## **9. MEASUREMENT AND PAYMENT OF WIRING**

Wiring for lights, fans, convenience socket outlets and telephone outlets etc. shall be measured and paid for on **POINT BASIS** as itemized schedule of quantities and as elaborated as below unless otherwise stated.

### **9.1 Primary and Secondary light point wiring**

In respect of group control of lights (more than one light controlled by one switch or

MCB), wiring upto the first light in the group shall be measured and paid for as a primary light point. Wiring for other lights looped in one group for switch controlled as also MCB controlled lights shall be measured and paid for as secondary light points. Primary light points for switch controlled lights shall include the cost of control switch whereas primary light points controlled by MCBs shall not include the switch cost. The cost of MCB controlling such lights shall not be included in the primary light point rate since the MCB shall be paid for in the item of DB.

The point wiring basis shall assume average wiring length and average conduiting length per point based on parameters stipulated in para 9.2 below. The average wiring length and average conduiting length forming the basis of point wiring payment, shall take the electrical layouts of the entire project into consideration. Tenderers are advised to seek clarifications, if they so desire, on this aspect before submitting their tenders. No claim for extra payment on account of electrical layouts in part or whole of the project requiring larger average wiring and conduiting length per point, whether specifically shown in tender drawings or not, shall be entertained after the award of contract.

**9.2 Parameters:** Wiring shall be carried out as per following parameters in recessed/surface conduit system.

- Only looping system of wiring shall be adopted throughout. No joints excepting at wiring terminals shall be permitted.
- All accessories shall be flush type unless otherwise stated.
- Lights, fans and 6 amp socket outlets shall be wired as per the item given in the Bill of Quantities.
- Power circuits shall normally have maximum two/one 16 amps socket outlet unless otherwise stated. Separate circuit shall be run for each Geyser, Window/Split air conditioners and similar appliances.
- Wiring rates shall include painting of conduits and other accessories as required.
- Wiring rates shall include cleaning of dust, splashes of colour wash or paint from all fixtures, fans, fittings etc. at the time of taking over of the installation.
- Wiring rates shall include blanking of outlet boxes to prevent damage/pilferage of wires.
- Wiring rates shall include circuit wiring from DB to first control switch & shall be done as per Bill of Quantities.

**9.3 Definitions**

**9.3.1 Wiring for Lights**

**Primary Light Points :** Wiring for primary light points, as defined in para 9.1 above,

shall commence at the Distribution Board terminals and shall terminate at the ceiling rose/connector in ceiling box/lamp holder via the control switch (for switch controlled lights). Rates for primary light point wiring shall be deemed to be inclusive of the cost of entire material and labour require for completion of primary light point thus defined including : .

- Recessed / surface conducting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required,
- Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.
- Control switch with switch box and cover plate of specified type including fixing screws, earth terminal etc. complete as required. Cost of this switch is applicable only for switch controlled points. This cost shall not be applicable for DB controlled points.
- Loop earthing with insulated copper wires.

**Secondary Light points:**

Secondary light points, as defined in para 9.1 above, shall cover the cost of interconnection wiring between group controlled light fittings and shall be deemed to be inclusive of the cost of entire materials and labour required for completion of the secondary light point thus defined including

- Recessed / surface conducting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required.
- Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.
- Loop earthing with insulated copper wires.

**9.3.2 Wiring for Ceiling Fans**

Wiring for ceiling fan points shall be same as for primary light points.

**9.3.3 Wiring for Exhaust Fans**

Wiring for exhaust fan points shall be same as for primary light points and shall in addition include the cost of providing a 3/5 pin 6 amp socket outlet near the fan alongwith plug top and a 6 amp control switch at convenient location near the room entry.

**9.3.4 Wiring for Call Bell Points**

Wiring for call bell points shall be the same as for primary light points. A call bell



switch which include in lieu of the control switch at a convenient location as required.

### **9.3.5 Wiring for Telephone Outlets**

Wiring for telephone outlets points shall include the entire wiring and conduiting from the telephone tag block to the telephone outlet including the telephone outlet complete as required and as itemized in the Schedule of Quantities

### **9.3.6 Wiring for TV Outlets**

Wiring for TV outlet points shall include the entire wiring and conduiting from the central point to the TV outlet including the TV outlet complete as required and as itemized in the Schedule of Quantities

### **9.3.7 Wiring for Convenience Socket Outlets**

3/5 pin 6 amps and 3/6 pin 16 amps single phase switched convenience socket outlets shall be provided in the building as indicated in the layout drawings. In addition, combined 3 pin 6 / 16 amps socket outlets at modular intervals in special PVC raceway over the work tables in laboratories shall be provided. Wherever required, 20/32/50 amps single phase and 32/50 amps 3 phase outlets shall also be provided.

#### **Wiring for 3/5 pin 6 amps convenience socket outlets**

Point wiring for 3/5 pin 6 amps socket outlets (in locations other than over the laboratory work tables) on point wiring basis shall be the same as primary light point defined in para 8.3.1 and shall in addition include 3/5 pin 6 amp socket outlet with 6 amp control switch in MS box with cover including loop earthing of the third pin complete as required as as itemised in scheduled of quantities.

#### **Wiring for 3/6 pin 16 amps convenience socket outlets**

Point wiring for 3/6 pin 16 amps socket outlets (in locations other than over the laboratory work tables) on point wiring basis shall be the same as primary light point defined in para 8.3.1 and shall in addition include 3/6 pin 16 amp socket outlet with 16 amp control switch in MS box with cover including loop earthing of the third pin complete as required as itemised in scheduled of quantities.

#### **Wiring for special socket outlets**

In addition to the above, special convenience outlets of 20/32/63 Amps single phase and 32/63 Amps three phase, required in few locations as indicated in the layout drawings, shall be paid for on linear basis as itemised in schedule of quantities. Outlets only shall be paid separately in numbers as per actuals. Wiring alongwith loop earthing shall be paid separately on running meter basis and conduiting /PVC raceway shall be paid separately on running meter basis.



### **9.3.8 Submains wiring**

Submains wiring shall be measured from outer end of the boxes. Extra Loop length shall be left at each end as required.

## **10. ROUTINE AND COMPLETION TESTS**

### **10.1 Installation Completion Tests**

At the completion of the work, the entire installation shall be subject to the following tests:

1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test
4. Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

### **10.2 Wiring Continuity Test**

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

### **10.3 Insulation Resistance Test**

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all protection in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 megaohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one megaohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between The two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a Megaohm or when PVC insulated cables are used for wiring 12.5 Megaohms divided by the number of outlets. Where a whole installation is being tested a lower

value than that given by the above formula subject to a minimum of 1 Megaohms is acceptable.

#### **10.4 Testing Of Earth Continuity Path**

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same alongwith the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

#### **10.5 Testing Of Polarity Of Non-Linked Single Pole Switches**

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three of four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Project Manager as well as the local authorities.

#### **10.6 Earth Resistivity Test**

Earth resistivity test shall be carried out in accordance with latest IS Code of Practice for earthing.

#### **10.7 Performance**

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

#### **10.8 Tests And Test Reports**

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Project Manager for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge. All test reports shall be approved by the Project Manager prior to energizing of installation.

## **EARTHING & LIGHTNING PROTECTION**

### **1.0 EARTHING**

- 1.1 The scope of this section covers supply, installation and testing of earthing system for all non-current carrying metal parts of electrical installation.
- 1.2 Installation of earthing system for electrical equipment shall be carried out in accordance with IS 3043 - code of Practice for earthing and conforming to Indian electricity Rules 1956 as ammended upto date.

### **1.3 Earthing System & Equipment Bonding:**

- 1.3.1 Earthing system shall comprise earth electrodes at each building. Test link boxes shall be provided at each earth electrodes for periodical resistance measurement. All such earth electrodes shall be interconnected forming a main loop - (MEL).
- 1.3.2 The entire conduit installation, cable sheaths and cable armour shall also be bonded to earth at both ends. It must be ensured that the conduit installations maintain electrical continuity throughout its entire length. Conduits shall be effectively bonded together at each joint, such as couplings, junction boxes, draw boxes or any other accessories and equipments. Where conduits and screwed cable glands are terminated at equipment enclosures with slip-holes, an earthing/bonding washer (e.g. star-washer) shall be used to maintain electrical continuity.
- 1.3.3 All earth connections with solid conductors shall be made by means of soldered cable lugs. Connections with G. I. copper tapes shall be directly bolted type. All hardware used shall be galvanised steel, brass or passivated to prevent corrosion. Spring washer or lock washers shall be used to make all connections secure and vibration-proof. All contact surfaces shall be thoroughly cleaned and coated with conducting petroleum jelly to prevent corrosion.
- 1.3.4 Earth connections from Switch Boards shall be taken as directly as possible to the earth buses or test links  
Main earth conductors from earth bus or test-link to the Earth Electrode shall be coated with bitumastic to reduce straddle potential.
- 1.3.5 All earth terminations on all switch board/switch panels shall be with suitable size crimped lugs of Dowel or equivalent make.

### **1.4 Earth Electrodes:**

Earth electrodes shall consist of Copper/G.I. plates burried in ground or G.I. pipes laid in ground. The type of electrodes shall be as specified in the BOQ. The

method of installation earth electrode shall be in accordance with IS:3034. Earth plates shall be buried minimum 3 meters below virgin ground. Salt or charcoal shall be filled around the electrode to reduce the resistivity of the soil and 20mm dia G.I. pipes (class heavy) shall be suitably installed to treat it with water. Every earth electrode shall have earth test link. Additional earth electrode shall be provided if necessary to bring down earth resistance within one-ohm.

### **1.5 Main Earth Conductor:**

Main earth conductors shall be Galvanised Iron or copper strip as specified in BOQ or solid conductors with or without PVC sheath as specified. They shall be connected at one end to the earth electrode and to the earth bus or test link at the other end. All connections below ground shall be made by bolting or rivetting and brazing or welding. Sizes of main earth conductors shall be as specified. All connections to the test-link or earth bus shall be securely bolted. Contact surfaces shall be tinned and suitably protected with Petroleum Conducting Jelly to prevent corrosion.

### **1.6 Installation :**

- 1.6.1 All joints shall be reworked and sweated. Joints in the earth bar between the switch gear units or to cable sheaths shall be bolted at the joints.
- 1.6.2 Where the diameter of the bolt for connecting earthbar to apparatus exceeds one quarter of the width of the earth-bar, the connection to the bolt shall be made with a wider piece to earth bar. These shall be tinned at the point of connection to equipment and special care taken to ensure a permanent low resistance contact to iron or steel. All bolts, nuts, washers, etc. shall be cadmium plated.
- 1.6.3 Main earth-bars shall be spaced sufficiently away from the surface to which they are fixed, such as walls or the side of trenches, to allow for ease of connections.
- 1.6.4 The earthing lead shall be suitably protected from mechanical injury by galvanised iron pipe wherever it passes through wall and floor. The portion within ground shall be buried at least 60 cm deep.
- 1.6.5 The earthing lead shall be securely bolted and soldered to the plate or pipe as the case may be. In the case of the plate, the lead shall be connected by means of a cable socket, with two bolt and nuts. All washers shall be of the same material as the plate or pipe. All iron bolt, nuts and washers shall be galvanized.
- 1.6.6 The earthing plate shall be surrounded by alternate layer of charcoal or coke and salt. There shall be a 20mm G.I. pipe running from the top of the plate or pipe. The top of this pipe shall be provided with a funnel and mesh for watering the earth. This will be housed in a masonry enclosure not less than 30cm x 30cm x 30cm deep. A cast iron frame with 10 mm thick cover shall be suitably embedded in the masonry.

1.6.7 Earth electrode resistance shall be measured as per IS 3043. No earth electrode installed shall have a greater ohmic resistance than 1.0 ohms as measured by an approved earth testing apparatus.

## **1.7 CHEMICAL EARTHING**

In maintenance free earthing copper bonded earthing rod electrode shall be of 14.35 mm in diameter and 3 meter length. The rod shall be placed in a 150 mm dia an augured hole in the ground and then surrounded by ground enhancement material in either a dry form or pre mixed in a slurry. Once set, ground enhancement material becomes hard and as such holds positively to the rod as well as surrounding ground.

Earth rod offered shall have passed the test required of BS7430/ANSI/UL-467 and confirm to the adhesion of the copper coating to the steel core (Design feature that prevents the ingress of moisture and subsequently the integrity of the rod.

Minimum 0.25 mm thickness of copper shall be deposited over the steel core as per BS 7430/UL 467. Average life of the ground rod shall be 30 years in most soil.

Ground enhancement material shall be as per IEEE-80 clause 14.5 with a resistivity of less than 0.12 ohm – meter. The ground enhancement material shall be permanent and not leach any chemicals in to the ground. The pH value of the ground enhancement material shall be 6.9 to 7.2 of 100gm / lit@20 deg.C.

Minimum 30 Kg of ground enhancement material shall provided for each earth electrode.

Inspection chamber shall be of 400 x 500 mm with concrete base CI manhole cover with frame painted with bitumastic paint. 2 Nos.of 50 x 6 mm cross section & 300 mm long copper strip to be cjumped with copper claded rod electrode have sufficient nos. (But not less than 4 Nos.) of 10Φ mm GI nuts & bolts for connection to the equipment / interconnection to the other pits to form equi-potential bonding.

## **2.0 LIGHTNING PROTECTION SYSTEM:**

### **2.1 Advanced LIGHTNING ARRESTOR Generation-2**

#### **2.1.1 Technical specification**

Advanced Proactive -Early Streamer Emission(ESE) without aid of any primary power, to provide optimum protection against any negative Lightning in its zone of protection. Model DP 25/ 45/60 , dameks, Turkey.

#### **2.1.2 Special features of Protector ESE sensor type Lightning protector**

1. The active conductor should be ESE (Early Streamer Emission) type certified by High Volt Test Lab for 8/20 wave form at over 100kA.

2. As well as tested by CPRI Bangalore, India as per their available capacity.
3. The active conductor should derive the energy from the electrostatic field intensity variations that is formed in the air, for which no extra energy source like wind energy, solar energy or kinetic energy that is created by the vibrations are required. The inner structure should not consist of either coils or condensers which could be flammable or explosive during the discharge nor should it use Piezo crystals that might be broken during the discharge or vibration.
4. The active conductor should be made from special materials to prevent the system from chemical corrosion.
5. The conductor should have a protection mechanism that prevents any internal damage due to the lightning discharge.
6. The active conductor should be designed as compact and small (weight below 3kg) to maintain installation and transportation advantage.
7. The Basic Model of the Air terminal should have Protection Radius of 42 m at 5 meter clear height above highest structure. Data on other ranges if required shall be furnished on case to case basis.

## 2.2 PROTECTOR LIGHTNING COUNTER(optional)

### Specifications:

Dimensions	: 173 x 82 x 44 mm
Weight	: 740 gr
Temperature range	: -20 to +50oC
Counter	: 6 digits
Protection	: IP 65
Starting treshold	: 1 100 kA in 8/20 wave
Min. Time between 2 discharges	: 100 ms
Connection	: □8 30x2 30x3 available
RES M	

### WORKING PRINCIPLE

The lightning counter is to count the lightning strike discharges that goes through the conductor down to the ground. The counter is to be installed on the down conductor. It can either be installed serial or parallel.

No maintenance should be required. The device should be a high technology product and conform to the working and laboratory test conditions.

## 2.3 PROTECTOR TESTER(optional)

### Specifications:

Dimensions	: 107 x 148 x 44 mm
Weight	: 930 gr

Operation Frequency : Standard  
Power : 6 V battery  
RES M

### WORKING PRINCIPLE

The tester is developed for specific use where it is required to maintain the highest security and make sure that the lightning conduction system works properly such as in remote installed areas, where services may not be available on demand.

The tester enables to verify that the Air terminal conductor is in standard operation by making a connection both to the upper tip and the lower shaft. By using the tester, the lightning conductor is tested in addition to the ground resistivity tests and these two tests together creates a common and proper control on the system.

### 2.4 ESE LIGHTNING CONDUCTOR PROTECTION RADIUS CALCULATION (NF C 17-102 S 2.2.3.2) FOR ALL MODELS OF PROTECTOR

The protection radius of air terminal is calculated by the standard formula given in the French Standard NF C 17-102.

The formulation is based on the lightning conductor triggering advance ( $\Delta T$ ), installation height (h) and the triggering distance ( $\Delta L$ ).

$$R_p = \sqrt{h(2D-h) + \Delta L(2D + \Delta L)} \quad h \geq 5m.$$

$$\Delta L = V \times \Delta T$$

$R_p$  : Conductor protection area radius

h : The distance between the point of the conductor and the area to be protected

$\Delta T$  : Triggering time

D : Triggering distance according to the NF C 17 102 standard

$$\Delta L(m) = v (m/\mu s) \cdot \Delta T(m/\mu s)$$

The values of Triggering advance & triggering distance for each model should be stated against the requirement given in the table below. Deviations if any must be explained

TYPE	( $\Delta T$ )	(D)
DP 25	25 $\mu s$	20 M.
DP 45	40 $\mu s$	45 M.
DP 60	60 $\mu s$	60 M.



## INSTALLATION SCHEME

### DP type / model select

ESE CONDUCTORS	h = Conductor tip height (m)								
	2	4	5	7	10	15	20	45	60

### LEVEL -1

DP 25	17	34	42	43	44	45	45	45	45
DP 40	26	50	63	64	64	65	65	65	65
DP 60	32	64	79	79	79	80	80	80	80

### LEVEL -2

DP 25	23	46	57	59	61	63	65	70	70
DP 40	34	64	76	77	78	80	82	85	85
DP 60	40	78	97	98	100	101	103	105	105

### LEVEL -3

DP 25	26	52	65	66	70	72	75	84	85
DP 40	36	72	89	90	92	95	97	104	105
DP 60	44	87	107	108	110	111	114	119	120

### Components of LPS

ESE lightning conductor

1. Mast to ensure desired free height
2. Down Conductor for grounding
3. Protector lightning strike counter
4. Test joint
5. Protection guard
6. Earthing

### MEDIUM VOLTAGE DISTRIBUTION BOARDS:

#### 1 GENERAL

This section covers specification of DBs.

#### 2. STANDARDS AND CODES

The latest and amended upto date Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian

Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

### 3. MINIATURE CIRCUIT BREAKERS

- The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system.
- The MCB's shall have a rupturing capacity of 10 KA at 0.5 p.f.
- The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with XLPE cable characteristic.
- Type test certificates from independent authorities shall be submitted with the tender.

### 4. FINAL DISTRIBUTION BOARDS

- **Final distribution boards shall be flush mounting, totally enclosed, dust and vermin proof and shall comprise of miniature circuit breakers, earth leakage circuit breakers, neutral link etc as detailed in the schedule of quantities.**
- The distribution equipment forming a part of the Distribution Boards shall comply to the relevant Standards and Codes of the Bureau of Indian.
- The board shall be fabricated from 16 gauge CRCA sheet steel and shall have a hinged lockable spring loaded cover. All cutouts and covers shall be provided with synthetic rubber gaskets. The entire construction shall give a IP42 (double door and four tier-arrangement) degree of protection.
- The bus-bar shall be of electrical grade copper having a maximum current density of 1.6 ampere per square mm and PVC insulated throughout the length. The minimum spacing between phases shall be 25 mm and between phase and earth 19 mm
- Separate neutral link for each phase shall be provided.
- All the internal connections shall be with either solid copper PVC insulated or copper conductor PVC insulated wires of adequate rating.
- All the internal connections shall be concealed by providing a hinged protective panel to avoid accidental contact with live points.
- All outgoing equipment shall be connected direct to the bus bar on the live side. The equipment shall be mounted on a frame work for easy removal and maintenance.
- The sheet steel work shall undergo a rigorous rust proofing process, two coats of filler oxide primer and final powder coated paint finish.

- All the circuits shall have an independent neutral insulated wire, one per circuit, and shall be numbered and marked as required by the Project Manager.
- A sample of the completed board is to be got approved by the Project Manager before commencement of supply and erection.
- Before commissioning, the distribution boards shall be megger tested for insulation and earth continuity.

## **5 SHEET STEEL TREATMENT AND PAINTING**

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.
- All sheet steel shall after metal treatment be given powder coated finish painted with two coats of approved shade on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be **less than 50 microns**.

## **6. NAME PLATES AND LABELS**

- Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

## **1.0 TELEPHONES / MATV/DATA SYSTEM WIRING**

### **1.1 Scope:**

The scope of this section covers the supply, laying and testing of conduits and cables for Telephones, Computer Data and MATV System Wiring. The supply of associated equipments are not included in the scope of this tender.

### **1.2 Telephone Cables:**

1.2.1 The telephone cables shall be of copper conductor, PVC insulated and PVC sheathed armored or unarmored as specified. The telephone cables shall comply with as specified. The telephone cables shall comply with I.T.I. or I.T.L. specifications and in case of armoring, to IS - 1554 Part -I - 1964. Copper conductors shall be of 0.51 mm, 0.61 mm diameters, as specified, where specified cat 5 LAN Cable shall be used.

1.2.2 Each conductor shall be PVC insulated with a different colour as per the colour and shall be twisted together with its mate conductor to form a pair. All pairs shall be PVC insulated and supplied with Nylon Rip Cord to facilitate easy unsheathing without damaging the PVC insulation.

1.2.3 The raw material used in the manufacture shall be of high grade and quality. The conductors shall be drawn from high purity electrolytic copper and shall be annealed and tinned. The PVC insulation shall be of high grade and shall be resistant to ageing and fading, to ensure identification of colours etc., after prolonged use.

1.2.4 The type, size and pairs shall be as given in the Bill of Quantities.

1.2.5 All multi-pair cables and 2-core telephone distribution unarmored cables shall be laid in steel or PVC conduits, as per BOQ. Wherever multi-pair cables are to be laid in the open on walls and ceilings, these cables shall be of the armored type. Separate conduits shall be used for external and intercommunication system. The conduits shall be coloured as per the ITD colour code. The extended rims of conduits shall be fitted with 150mm x 150mm x 75mm MS pull boxes. The pull boxes shall be suitably painted for easy identification and shall be provided at intervals of 10 meters. The pull-boxes can be of the surface mounting type or flush-mounting type as specified.

### **1.3 Tag Boxes:**

The tag boxes shall be of sheet steel, suitably painted suitable for multi-core telephone cables. For single pair telephone cables, suitable terminal connections shall be provided.

### **1.5 MATV System Wiring:**

Wiring for MATV system equipment shall be carried out with insulated coaxial cable to Delton specified Model laid in surface/recessed conduit as shown in the drawings. RG6 and RG 11 coaxial cables shall be used for final distribution and main feeders/risers.



## **1.6 DATA CABLE SYSTEM**

1.6.1 Data cables for LAN shall be Cat-6 or Cat-6a as specified.

1.6.2 The cables shall be laid in conduits or channels as specified in BOQ.

1.6.3 Data cables shall be terminated in RG 45 Complete terminals.

## CONVENTIONAL FIRE ALARM SYSTEM / PA SYSTEM

### 1.0 CONVENTIONAL FIRE ALARM SYSTEM

#### 1.1 Control Panel : ( With Pre Alarm)

The fire detector control panel must be designed according to EN 54-2 and EN 54-4.

The control panel must have the following features:

CE identification Microprocessor controlled

Programmable using existing keypad without additional auxiliary equipment

On primary lines that are monitored for short-circuit and interruption

2 , 4 or 6 primary lines for connecting automatic detectors and manual fire detectors using limit-line technology

Each having a potential-free relay contact as an output for

- Alarm Total

- Pre-Alarm Total

- malfunction total, also functions during total power failures, can withstand 5 A / 30 V

Two fixed, assigned open collector outputs for each detector zone for alarm and malfunction, each output can withstand at least 20 mA / 40 V

24 V operating voltage, suitable for controlling existing external signaling devices

One monitoring output for signaling devices, able to withstand up to 1 ampere

24 V output for powering external consumption units

Separate, monitored fuse for external consumption units

Battery monitoring

Separate, monitored battery circuit protection

Monitoring of mains voltage

Switch-off of individual detector zones

Programmable 2 detector dependency for each detector zone

Adjustable delay times of 30 to 120 seconds for subsequent alarm

Simple switching to temporary cancellation of 2 detector dependency for maintenance purposes

Automatic reset of the control panel after trouble shooting

Manual day/night switchover

Manual control of the signaling devices using buttons without there being an alarm to the fire detector control panel

on/off of the signaling device from the control panel during an alarm

Individual display for each detector zone for

- Zone switch off
- Alarm
- Test
- Malfunction

Cumulative displays for Pre-alarm



- Alarm
- System error
- Zone switch off

3 Authorization levels for various operational processes, higher priority levels with password

Level 0:	Message processing, testing Display elements
Level 1:	Testing of detector zones
Level 2:	Maintenance

Technical data:

- Power supply of 230 V AC, +10 % / -15 %
- Second power supply with a backup time of at least 45 hours
- Protection category: min. IP30

## 1.2 Control Panel : ( With 2 sounder outputs “Monitored”)

The fire detector control panel must be designed according to EN 54-2 and EN 54-4.

The control panel must have the following features:

- Microprocessor controlled
- Manual day/night switchover
- Each having a potential-free contact for
  - Alarm
  - Malfunction- Two monitored outputs for signaling devices each capable of with standing up to 100 mA
- Individual outputs per detector zone
- Option for creating 3 message levels
- Restriction of access to the message levels using password protection
- Ability to switch off individual zones
- Individual display for each zone for
  - Zone switch-off
  - Alarm
  - Test
  - Malfunction
- Cumulative displays for



- Alarm
- System error
- Zone switch-off
- Evacuation function
- Control of the signaling devices using buttons without there being an alarm to the fire detector control panel
- Ability to switch the signaling device on/off (silence function)

**One-man test**

- Power supply with a backup time of max. 59 hours in normal operating condition
- IP 30
- Final expansion to 2, 4 or 6 detector zones, using limit-line technology

Individual switch-off of detector zones

## **2.0 Fire Alarm Detectors / Devices**

### **2.1 Optical Smoke Detector :**

- Smoke detector in compliance with DIN EN 54 part 7 with equal response sensitivity for all fires with smoke development.
- Response sensitivity independent of air pressure and ambient temperature.
- Alarm LED can be seen from all angles
- Detector and transmission electronics in the detector head for easy exchange in the event of a malfunction. Therefore, no electronics are permitted in the base.
- Standby value updating
- High level of immunity to electromagnetic influences,
- Detector socket/detector with bayonet connection for detector exchange using dismount tool reaching up to 8m
- The base is compatible with any detector in the Same series, thus enabling a simpler exchange of detectors during usage changes in the conventional system and subsequent upgrading to LSN Technology
- Theft protection to protect against unauthorized removal of the detector from the socket, included in the standard version and can be activated as desired.
- Smoke-repelling covers and labyrinth design, optimized for smoke reception.
- Option to connect a remote External detector alarm display.

### **2.2 Thermal Heat Detector :**

- Heat detector compliant with DIN EN 54 part 54 to detect fires with rapid rises in temperature and/or a maximum temperature value.
- Alarm LED can be seen from all angles

- Detector and transmission electronics in the detector head for easy exchange in the event of a malfunction. Therefore, no electronics are permitted in the base.

Maximum trigger temperature is 58°C

- Differential unit 1C/min – 30 C/min
- High level of immunity to electromagnetic influences,
- Detector socket/detector with bayonet connection for detector exchange using dismount tool reaching up to 7.5m
- The base is compatible with any detector in the Same series, thus enabling a simpler exchange of detectors during usage changes in the conventional system and subsequent upgrading to LSN Technology.
- Theft protection to protect against unauthorized removal of the detector from the socket, included in the standard version and can be activated as desired.
- Option to connect a remote External detector alarm display

### **2.3 Multiple Optical – Thermal detector :**

- Smoke detector in compliance with DIN EN 54 part 7 with equal response sensitivity for all fires with smoke development.
- Heat detector compliant with DIN EN part 5 for detecting fires with rapid rises in temperature and/or a maximum temperature value.
- Protection against deception alarms via the evaluation of the fire characteristics smoke and heat with selected algorithm.
- Detection of smoke and heat
- Response sensitivity independent of air pressure and ambient temperature.
- Alarm LED can be seen from all angles.
- Detector and transmission electronics in the detector head for easy exchange in the event of a malfunction. Thus, no electronics permitted in the base.
- Standby value recalibration in optical unit.
- Maximum trigger temperature is 58°C Differential unit 1C/min – 30C/min.
- High level of immunity to electromagnetic influences,
- Detector socket/detector with bayonet connection for detector exchange using dismount tool reaching up to 8m

- The base is compatible with any detector in the MAGIC.SENS series, thus enabling a simpler exchange of detectors during usage changes in the conventional system and subsequent upgrading to LSN Technology.
- Theft protection to protect against unauthorized removal of the detector from the socket, included in the standard version and can be activated as desired.
- Smoke-repelling covers and labyrinth design, optimized for smoke reception.
- Option to connect a remote External detector alarm display.

#### **2.4 Multiple Optical – Chemical Detector:**

- Smoke detector in compliance with DIN EN 54 part 7 with equal response sensitivity for all fires with smoke development.
- Chemo sensors to detect combustible gas.
- High level of protection against deception alarms via an evaluation of the fire characteristics gas and smoke using a selected fire characteristic pattern algorithm (comparison).
- Detection of smoke and combustible gas.
- Reliable detection of fires via the additional detection of combustible gas.
- Response sensitivity independent of air pressure and ambient temperature.
- Alarm LED can be seen from all angles
- Detector and transmission electronics in the detector head for easy exchange in the event of a malfunction. Thus, no electronics are permitted in the base.
- Standby value recalibration in the optical and chemical unit
- High level of immunity to electromagnetic influences,
- Detector socket/detector with bayonet connection for detector exchange using dismount tool reaching up to 8m.
- The base is compatible with any detector in the MAGIC. SENS series, therefore enabling easy detector exchange during usage changes in the conventional system and subsequent upgrading to LSN Technology.
- Theft protection to protect against unauthorized removal of the detector from the socket, included in the standard version and can be activated as desired.
- Smoke-repelling covers and labyrinth design, optimized for smoke reception.

- Option to connect a remote External detector alarm display.

## 2.5 Detector Base :

- suitable for surface and flush mounting
- Intended for mounting on 55-type switch box for flush mount cable routing
- Anti-removal protection can be activated on-site without tools
- Sufficient connection room also for cable while maintaining function
- Direction of mounting can be selected as desired because the detector display can be read from all sides
- Cable in and out feed separated into different directions, yet can be jointly routed in one direction
- Terminal technology for the connection technology for mounting that is easy on the cable Connection for parallel detector display (Response indicator)

## 2.6 Beam Type Smoke Detectors :

With transmission, receiver, and evaluation units, for detecting light and dark smoke over a distance of min. 10 m and max. 100 m with extra width of up to 14 m.

- Stable metal housing.
- Volume control with 15 increments for self-activated compensation for contamination and intentional aging.
- Separate outputs for alarm and malfunction.
- Measurement output for calibration and service mode.
- Connection to detector's primary line using potential-free relay double-throw contacts.

Protection category	:	IP	54
Operating temperature range	:	-20 C to +55 C	
Response sensitivity	:	40% VdS compliant	
Response time: Alarm		5s	
Malfunction		1s	

## 2.7 Manual call points:

Intended for Indoor/ Outdoor mounting, Surface-mounted, in plastic housing, Color is red, can be labeled using overlays, with display of the alarm feedback (illuminated in red) and second potential-free switch contact.

## 2.8 Signaling Devices:

### a) Sounders :

12 V and 24 V, red,



- 28 programmable tones,
- Maximum 111 dB (A), at 24V-

Max. Current consumption : 33 mA at 24V-  
Starting current : 30 mA

Intended for flush-mount cable feed.

Flat design: Sounder includes base for flush-mount cable feed, 63 mm depth

Protection category : IP 54  
Temperature range : -25° C to +80°C

#### b) Strobes:

to issue a local alarm in interior rooms and out in the open

Strobe energy : 2 Joule  
Protection category : IP54 (IEC) with flat base (Indoor)  
Protection category : IP65 (IEC) with flat base (Outdoor)  
Housing color : ABS, red  
Operating voltage : 24 V-

#### c) Sounder Base:

Sounder for sounding a local alarm, designed for and can also be used as a base for detectors with integrated tone generator and sound converter. Monitored control and voltage supply via the ring bus system; function is maintained if there is a short circuit or interruption in the loop. Designed for surface and flush mounting cable feed. Individual control of base sounders via assignment to any desired detector in the fire detector system.

11 tones programmable from the fire detector control panel;

at least one of these tones can be selected to comply with with at least 110 dB (A) Frequency range of 440 Hz to 2 850 Hz

Volume can be adjusted from the fire detector control panel  
Various signals for pre-alarm and alarm.

## 2.0 PUBLIC ADDRESS SYSTEM

### 2.1 Amplifiers 240 Watts

This product shall be manufactured by a firm whose quality system is in compliance with the ISO 9001, QUALITY SYSTEM.

### 2.2 General Requirements

- 240 Watts Power Amplifier with at least 4 mic level inputs.

- b. All input channels have a power supply to provide power to condenser microphones, 2 input channels should also be switched to line sensitivity. Separate music inputs are available with their own input selector and volume control.
- c. The power is directly available on 70V and 100V constant voltage connections and on allows impedance connection for an 8ohm load. Moreover the amplifiers have separate 70V/100V call-only output channel for addressing areas where only priority announcement are required, and 70V/100V mix only output channels for areas where no priority announcement should be heard.
- d. for more output power than the built-in power stage can deliver additional Plena power amplifiers can be connected to the balanced line output in a loop-through arrangement.
- e. It should have two front panel switches to direct the amplifier output to two separate zones, so that certain announcement or background music should not be heard in part of building. Priority calls are always routed to both zones.
- f. Provision shall be made to connect the PA system to Lift Car Speaker.

### 2.3 Technical Specifications

- Electrical
  - Mains Power Supply Voltage - 230/115VAC+/- 10%
- Performance
  - Frequency response - 50Hz to 20 kHz
  - Distortion - <1% at rated output power,1 kHz
  - Bass Control - -8/+8dB at 100Hz
  - Treble Control - -8/+8dB at 10 kHz
  - Dynamic range - 100dB
- Mic input - 4x
- Sensitivity - 1mV
- Impedence: >1kohm
- S/N (flat at max volume) - 63dB
- Headroom: >25dB
- Speech filter: -3dB at 315 Hz, high –pass,6dB/oct
- Phantom power supply - 16V via 1.2kohm
- VOX input
- Loudspeaker Output (70/100V)
- Connector - Screw, Floating
- Power - 360/240W (Max/rated)

### 2.4 ENVIRONMENTAL SPECIFICATIONS:

- A. Temperature:

- 1) Operating: 0°C to +40°C.
- 2) Storage: 0°C to +70°C.

B. Humidity: <95% relative condensing.

#### 2.4.1 REGULATIONS

CE, EN / Any international standard

### 2.5 CEILING SPEAKERS

This product shall be manufactured by a firm whose quality system is in compliance with the ISO 9001, QUALITY SYSTEM. This will mainly be installed at Floors lobby of both Tower A and Tower B

#### 2.5.1 General Requirements

- 6 Watts false ceiling speaker
- 15Watts Horn type wall mounted speaker
  - A. Easy to install with spring-loaded mounting clamps
  - B. Power handling capacity-6 watts/4 watts

#### 2.5.2 Technical Specifications

- Power Handling Capacity - 6 watts
- Sound pressure level - 93dB
- Effective Frequency Range - 300-15kHz
- Rated Input Voltage - 100 Volts
- Color - IFB White
- Weight - 600Grams
- Mounting - Clamps

#### 2.5.3 ENVIRONMENTAL SPECIFICATIONS:

##### a) Temperature:

- 1) Operating: 0°C to +50°C.
- 2) Storage: 0°C to +60°C.

b) **Humidity:** 5% to 93% relative condensing.

#### 2.5.4 REGULATIONS

CE, EN, EVAC

### 3.0 HORN TYPE SPEAKERS.

This product shall be manufactured by a firm whose quality system is in compliance with the ISO 9001, QUALITY SYSTEM.



This will mainly be installed at Basement parking Area.

### 3.1 General Requirements

High efficiency horn loudspeaker with excellent speech reproduction and sound distribution for a wide range of outdoor application

- a) It should be circular or rectangular horn loudspeaker with 100V line input, made up of ABS.
- b) It should include 100V transformer with taps on the primary winding to allow different power settings. Nominal full-power, half power or quarter power radiation) i.e. in 3dB steps) can easily be selected by connection the amplifier output to the appropriate tap.
- c) The horn loudspeaker should have sturdy adjustable mounting brackets, allowing the sound beam to be accurately directed.
- d) It should be designed to withstand operating at their power for 100hrs in accordance with IEC 268-5 Power handling capacity standards.

### 3.2 Technical Specifications

- a) Max Power - 22.5 W
- b) Rated power - 15 W
- c) Sound pressure level at rated power (1W/1m) - 103 dB
- d) Effective frequency range (-10dB) - 500Hz to 5kHz
- e) Opening angle (at 1kHz/4kHz,-6dB)
  - Horizontal - 130deg/50deg
  - Vertical - 130deg/50deg
- f) Rated Voltage - 100V
- g) Rated Impedance - 667 ohm
- h) Connection - 4 wire cable

### 3.3 ENVIRONMENTAL SPECIFICATIONS:

- a) Temperature:
  - 1) Operating: 0°C to +55°C.
  - 2) Storage: 0°C to +70°C.
- b) Design rating: IP65

### 3.4 REGULATIONS

CE, EN OR ANY OTHER INTERNATIONAL STANDARD

### 4.0 TABLETOP CALL STATION

This product shall be manufactured by a firm whose quality system is in compliance with the ISO 9001, QUALITY SYSTEM.

This will mainly be installed at Control room of whole establishment

#### 4.1 General Requirements

The tabletop microphone should be a stylish, high-quality tabletop unidirectional condenser microphone, intended for making calls in a public address system. It should have heavy metal base and rubber feet ensure stability on any flat surface.

This PTT should not only switch on the microphone, but also provides priority contacts, that are compatible with the amplifiers. The switching characteristic of the PTT-key should be configured internally for PTT-mode (on as long as pressed) or toggle mode (press to switch on, press again to switch off). If the priority contact is not required, the microphone can be connected to amplifiers with 3- pin Euro style connector. A green LED indicates when the microphone is active.

#### Technical Specifications

- Phantom Power Supply
- Voltage range 12 to 48Vvvv
- Current Consumption <8mA

#### Performance

- Sensitivity 0.7mV@85dB SPL
- Max input Sound level 110dB SPL
- Distortion <0.6%
- Input Noise level 28dB
- Frequency response 100Hz to 16 kHz
- Outdoor impedance 200 ohms

#### 4.2 ENVIRONMENTAL SPECIFICATIONS:

##### A. Temperature:

- 1) Operating: 0°C to +45°C.
- 2) Storage: 0°C to +70°C.

##### B. Humidity: <95%

#### 4.3 REGULATIONS

##### A. CE, EN

## C.C.T.V. SYSTEM

### 1. SCOPE

This section covers the design, supply, installing, testing and commissioning of Closed Circuit Television system comprising CCD Cameras, DVR and Monitors.

### 2. CCD FIXED INDOOR CAMERAS (DOME TYPE)

The CCD Cameras shall have the following features:-

- i. It shall be general purpose colour video cameras.
- ii. It shall have standard resolution with excellent sensitivity for fine performance at low light levels.
- iii. It shall have signal to noise ratio of more than 48 dB.
- iv. It shall be provided with linear shutter and back light compensation.
- v. The linear electronic shutter shall be capable of automatically selecting integration period appropriate for the illumination level. The range of speeds shall be 1/50-1/100,000 seconds.
- vi. **Video Characteristics**
  - a. Image Device : 1/3-inch interline transfer CCD
  - b. Sensitivity : 0.1 to .002 lux Scene illumination.  
Conditions: usable video (50 IRE) output
  - c. Resolution : EIA: 510 lines horizontal.
  - vii. Electronic Shutter : EIA speed range: 1/50 sec to 1/100,000 sec.
  - viii. **Backlight**
    - a. Compensation : Switch selectable, on-off.
    - b. Geometric Distortion : 0%
  - ix. Signal-to-Noise Ratio (SNR) : Greater than 48 dB
  - x. Video Signal Output : 1.0 v p-p (140 IRE) composite video, consisting of 714 mV (100 IRE) of luminance and of negative-going sync signal of 286 mV (40 IRE)
  - xi. White Balance : ATW or AWB

- xii. Synchronization : Line locking with vertical phase adjustment.
- xiii. Automatic Gain Control : Required.

### 3. COLOUR MONITOR

The colour Closed circuit Video monitor shall be suitable for providing high 450 TV lines horizontal, resolution, high contrast picture on a 21 inch diagonal screen. The monitor shall have solid state circuitry. It shall include video loop through connectors with a switchable high-2 Nos. 75-ohm out put (one for extension) termination on the rear panel. The monitor shall be suitable for 240 V, 50 Hz. The monitor shall be housed in an enameled steel cabinet with a recessed plastic carrying handle. The monitor shall be provided with controls for brightness, contrast, vertical hold, horizontal hold and power on/off. These shall be located at the front of the unit. The monitor shall comply with UL standard 1410. It should have SVHS input / output.

### 4. DIGITAL VIDEO RECORDER

- a) The system will combine the functions of a multiplexer, VCR and telemetry switcher for system versatility and functional use a with large system. It shall offer full triplex operation.
- b) It shall use the latest high performance Wavelets <sup>TM</sup> compression technology, and record pictures up to a resolution upto SVHS standard.
- c) It shall use the built-in hard disk drive or external archive medium to both record to, and play back from these media.
- d) The unit will support connection to Ethernet networks/IP Connectivity. Software will permit view of either live pictures or playback from the Hard Disks Recorder, while simultaneously recording.
- e) It will have Ethernet compatibility, 10/100 MBPS Base-T network interfacecard on Ethernet units
- f) It will permit video transmission via Ethernet.
- g) It will have 2 selectable record levels: VHS & S-VHS. It will have user-friendly Windows<sup>TM</sup> style menus, SCSI port for VAIDe, AIT1, AIT2 and CD-RW arching devices
- h) It will have capability of VMD and activity detection

### 5. PTZ INDOOR CAMERAS

- a) **It shall be colour integrated speed dome camera.**
- b) It shall be remotely configurable with integrated telemetry receiver.
- c) It shall have 360<sup>0</sup> continuous pan and 180<sup>0</sup> continuous tilt..

- d) It shall have minimum 50 pre-set positions.
- e) It shall have auto tour facility for automatic operation.
- f) It shall have sector tilting / camera tilting.
- g) It shall have auto IRIS / auto focus.
- h) It shall have minimum 450 TV lines.
- i) Sensitivity shall be 1-lux, usable video.

**6. OUTDOOR P/T/Z WEATHER PROOF DAY / NIGHT DOME CAMERA**

- a) It shall be colour integrated weather proof IP-65 outdoor.
- b) It should be suitable to operate both in day / night mode with low lux sensitivity. Day mode shall be 2-lux and Night mode shall be 0.016 lux.
- c) It shall have optical zoom 18x and digital zoom 10x.
- d) It shall have 360<sup>0</sup> continuous pan and 180<sup>0</sup> continuous tilt..
- e) It shall have auto IRIS / auto focus.
- f) It shall have minimum 450 TV lines.
- g) It shall have auto tour facility for automatic operation.

## **MODE OF MEASUREMENTS**

- 1.0 Wiring light points, fan points, exhaust fan points, call bell points, socket outlets, telephone / TV outlets shall be measured and paid on point basis as per BOQ, and as elaborated below unless stated otherwise.
- 2.0 In case of group control light points i.e. more than one light points controlled by switch or MCB, wiring from switch / MCB upto first point shall be primary light point and subsequent points in the group shall be deemed as secondary light points and paid as per item in BOQ. The rate shall include all the items mentioned in the BOQ. Wiring point shall include circuit wiring from DB to 1<sup>st</sup> tap off point including the earth wire. 6A socket outlet points, power points, fan points, bell points shall be paid on point basis at schedule rates.
- 3.0 Telephone outlets points shall include wiring from Tag block to 1<sup>st</sup> tap off point and 1<sup>st</sup> tap off point to subsequent telephone outlet points. This would include conduit with conduit accessories telephone wire outlet box, with cover plate and telephone jack.
- 4.0 Wiring for TV outlet shall include wiring from Tap / Splitter box to the 1<sup>st</sup> outlet and 1<sup>st</sup> outlet to subsequent outlets. In case DTH connectivity conduit from switcher to various outlets shall be paid on linear measurement basis. The outlet box with cover plate shall be paid separately as per item of BOQ. Wiring shall be drawn by service provider and would not be in the scope of electrical contractor.
- 5.0 Wiring for fire alarm system shall be measured and paid on linear basis at schedule rates.
- 6.0 Submain wiring and cables, conduits for various services shall be measured on linear basis and paid as per item of the work.

## **1.0 TESTING OF THE INSTALLATION**

### **1.1 Installation Completion Tests**

At the completion of the work, the entire installation shall be subject to the following tests:

1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test
4. Earth resistivity test
5. Polarity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

### **1.2 Insulation Resistance Test**

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all protection in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 mega ohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one mega ohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between the two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant standard specification or where there is no such specification, shall not be less than half a Megaohm or when PVC insulated cables are used for wiring 12.5 Megaohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Megaohms is acceptable.



### **1.3 Wiring Continuity Test**

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

### **1.4 Testing Of Earth Continuity Path**

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

### **1.5 Testing Of Polarity Of Non-Linked Single Pole Switches**

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three or four-wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Project Manager as well as the local authorities.

### **1.6 Earth Resistivity Test**

Earth resistivity test shall be carried out in accordance with latest IS Code of Practice for earthing.

### **1.7 Polarity Test**

1.7.1 In two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply. In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.

1.7.2 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in “on” position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

### **1.8 Performance**

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor



shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

### **1.9 Tests And Test Reports**

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Project Manager for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge. All test reports shall be approved by the Project Manager prior to energizing of installation.

**LIST OF APPROVED MAKES OF MATERIAL**

S. No.	Item	Approved Make
1)	Rigid PVC Conduit ( FRLS only )	Precision Plastic Industries, Nihir, Astral,
2)	Accessories for conduit	Same make as of pipe.
3)	Flexible Copper Wires (FRLS)	Finolex, RR Kable, Havells/polycab
4)	Modular Switches	Legrand (Myrius), MK (Blenze),D- link
5)	Telephone cables Jelly Filled	Finolex, RR cable, Havells
6)	PVC tape	Steel grip, Anchor
7)	Panel Manufacturer	ISO Certified & CPRI approved Panel Builder
8)	MCBs/ELCBs/ELMCBs Contactor Time Switch ( Timer )	Legrand, L&T, Siemens
9)	Distribution boards- TPN & SPN DB (IP 43), VTPN DB (IK 43)	Hensel, Legrand (MDS-DX3), L&T, Siemens Hensel, Legrand (MDS-DX3), L&T,
10)	LT Cables	XLPE armoured cable for 1.1 KV as per ISI 1554. Finolex, Polycab, RR Kable, Hawells.
11)	Glands	Single Compression type, Heavy duty and deep threading
12)	Cable Lugs	Dowells, 3-D, Raychem.
13)	Metal Clad Plugs	Indoor –Legrand, Scame, Hensel. Outdoor - Legrand, Scame, Hensel.
14)	Button holder, Angle holder,	Anchor, CPL
15)	Digital Meter	Rishabh, L &T, Schneider
16)	Cable Tray	i) Ladder/Perforated - Hot deep GI -Indiana, MEM, OBO Better man, Rico steel
17)	CT	AE, Kappa, Rishabh
18)	Telephone tag block	Krone.
19)	TV Cable R G 6 / 11	Finolex, RR Cable, Polycab.
20)	Fire Extinguisher	Should be of ISI approved - Safex,Firex,Safeline
21)	Cat-6 Wire & Fibreoptic Cable and Accessories	Legrand, SYSTIMAX, Panduit, Siemon/D-link
22)	UPVC Cable trucking	Legrand, OBO Betterman, MK
23)	RJ 45 Data outlet	Legrand, SYSTIMAX, Panduit, Siemon/D-link
24)	Network Switch	HP, Cisco,Legrand,D-link
25)	Rack	Legrand, Rittal, Panduit, Vellrack
26)	Modular Patch Panel	Legrand, SYSTIMAX, Panduit, Siemon,D-link
27)	Light Fixture	Philips, Wipro, Havells

28)	Fan(Grey colour, Mat finish / White colour as Required Site).	Crompton, Usha, Havells, Bajaj – Sample to be approved By consultant.
29)	Emergency Signage Light	Legrand, Sigma, Prolight
30)	Exhaust Fan ( Should be with louvers )	Usha, Havells, Crompton
31)	Floor Junction Box	Fabricated
32)	Floor Raceway	Fabricated
33)	Addressable Fire Detection System	Honeywell/BOSCH/SIEMENS/UTC/Ravel/Hik vision.
34)	Access Control System	Zk-teco / Honeywell / Seimens
35)	CCTV	Pelco / Honeywell/ AXIS/hikvision
36)	Monitors Display units	Samsung, LG, Sony
37)	Hard Disk	WD / Seagate
38)	Speakers	Bosch, Yamaha, Honeywell
39)	Amplifier	Bosch, Yamaha, Honeywell
40)	Telephone instrument	BEETEL /BINATONE/PANASONIC
41)	Digital PIR Sensor	Legrand / MK
42)	Display Panel ( TV )	SAMSUNG , SONY
43)	HDMI Cable	MX, Kramer, Crestron
44)	Projector	EPSON , PANASONIC, SONY
45)	POP-UP BOX	LEGRAND / MK
46)	Video Conferencing Unit	Cisco / Polycom
47)	Flexible Cable / Flexible ShildedCable	RR / Finolex / Polycab
48)	Fire Suppression System	Novec or equivalent

SR.No.	ITEM	STANDARD MAKE
1	LT PANELS ENCLOSURE	A.D ENTERPRISE / ACTIVE ENGINEER / SHIVSHAKTI ENGINEER
2	DISTRIBUTION BOARDS	LEGRAND - EKINOXE / SCHNEIDER - ACTI9 / L&T / ABB
3	MEDIUM VOLTAGE CABLE	FINOLEX / POLYCAB / RR KABEL
4	CABLE TRAY (LADDER TYPE / PERFORATED)	INDIANA / KEW / STARLWART
5	UPS	EATON / APC / EMERSON / SOCOMEC
6	LT SWITCHGEAR (ACB)	L&T / ABB / LEGRAND / SCHNEIDER-MG
7	LT SWITCHGEAR (MCCB)	L&T / ABB / LEGRAND / SCHNEIDER-MG
8	LT SWITCHGEAR (MCB)	L&T / ABB / LEGRAND / SCHNEIDER-MG
9	LT SWITCHGEAR (CONTACTOR, RELAY, MPCB)	SCHNEIDER / SIEMENS / ABB / L & T / ALSTHOM
10	COMPACT SANDWITCHED TYPE BUS DUCT / BBT	L & T / LEGRAND / SCHNEIDER
11	METERS (ANALOG)	SCHNEIDER (CONZERV) / L&T / TRINITY / NEPTUNE / SECURE / IMP/SIEMENS/ ABB/ELMEASURE
12	METERS (DIGITAL)	SCHNEIDER (CONZERV) / L&T / TRINITY / NEPTUNE / SECURE / IMP/SIEMENS/ ABB/ELMEASURE
13	ENERGY METER	SCHNEIDER / L&T / NIPPEN / HPL / SOCOMEC/SECURE/ ELMEASURE/ CRYSTAL/ NAPTUNE
14	LOAD MANAGER	CONZERV / ELMEASURE / L&T / TRINITY
15	INDICATING LAMPS	L&T / SCHNEIDER / SIEMENS / TECHNIK / BCH / SALZER / AE / IEC / EE / C & S
16	ELECTRIC TIMER	SIEMENS / LEGRAND / L&T / LEGRAND / MECO / SIEMENS/ BCH
17	ROTARY SWITCH	L&T / SCHNEIDER / SIEMENS / TECHNIK / BCH / SALZER / AE / IEC / EE / C & S
18	PUSH BUTTON AND PUSH BUTTON SET	L&T / SCHNEIDER / SIEMENS / TECHNIK / BCH / SALZER / AE / IEC / EE / C & S
19	SELECTOR SWITCH	L&T / SCHNEIDER / SIEMENS / TECHNIK / BCH / SALZER / AE / IEC / EE / C & S
20	APFC RELAY	L & T / SIEMENS / ABB / CGL / NEPTUNE / SCHNEIDER / INDUSTRIAL CONTROL / SCHNEIDER / SWATI SWITCHGEAR / SUN / GSONS / PATEL BROTHERS
21	LT CAPACITORS	L&T / NEPTUNE / EPCOS / ABB / CROMPTON GREAVES / KHATAU JUNKER / UNIVERSAL
22	LUGS	DOWELLS / JAINSON / 3M
23	BIMETALLIC LUGS	DOWELLS / JAINSON / 3M
24	CABLE GLAND	COMET(COSMOS) / DOWELLS / HMI / ATEX
25	PVC CONDUITS AND ACCESSORIES	PRECISION / NIHIR/ BLP/ VRAJ

26	M.S. CONDUIT AND ACCESSORIES	STEELCRAFT/ BEC/AKG/ PRECISION
27	MODULAR SWITCHES, SOCKETS & OTHER ACCESSORIES	LEGRAND –MYRIUS / NORAYSIS / MK-HONEYWELL
28	PVC TAPE	STEEL GRIP
29	PVC JUNCTION BOX	HENSEL / SCAME / SINTEX
30	WIRES FOR INTERNAL WIRING - FRLSH	FINOLEX / POLYCAB / RRKABLE
31	FLEXIBLE CU. WIRES-FR/FRLS GRADE	FINOLEX/POLYCAB/RR KABLE
32	SIGNAL CABLE	FINOLEX / POLYCAB / RRKABLE
33	MULTICORE FLEXIBLE CABLE	FINOLEX / POLYCAB / RRKABLE
34	CONNECTORS (COLOURS AS PER PHASE & NEUTRAL)	WAGO / PHOENIX CONTACT/ CONNECTWELL
35	LIGHT FIXTURES	PHILIPS /WIPRO / CGL /Halonix
36	OUTDOOR DECORATIVE LIGHT LUMINAIRE	PHILIPS /WIPRO / CGL /Halonix
37	CONTROL TRANSFORMER [ PT/ CT ]	KAPPA / SILKANS / ABB / L & T / GILBERT/CROMPTON / AE /ASHMORE
38	CEILING FAN / EXHAUST FAN	CROMPTON / ORIENT / HAVELLS / USHA
39	FIRE EXTINGUISHER	FIREX/ MINIMEX / SAFEX / CEASEFIRE
40	CHEMICAL EARTHING	OBO BETTERMANN / ASHLOK / JETF / JSR
41	SMF BATTERY	EXIDE / ROCKET / PANASONIC
42	CAT-6/6A CABLE/WIRE	D-LINK / LEGRAND / HONEYWELL
43	INFORMATION OUTLET-CAT-6/6A WITH FACE PLATE, PATCHMAX PANEL & ACCESSORIES	D-LINK / LEGRAND / HONEYWELL
44	TELEPHONE CABLE	FINOLEX / POLYCAB / RRKABLE
45	FLOOR RACEWAY & JUNCTION BOX	FABRICATED
46	CCTV	DAHUA / HONEYWELL / CP PLUS
47	FIRE ALARM SYSTEM	HONEYWELL / GST / Ceasefire
48	PA SYSTEM	BOSE / HONEYWELL / AHUJA

#### Datasheet of EATON make Online UPS System

Sr No.	Description	Technical Specification	Compliance Yes/ No
1	Rating (in KVA)	20 KVA / 18KW	
2	Make	APC / Vertiv / EATON	
3	Model	Vendor Specify	
[ A ]	Input		
1	Rectifier Design	IGBT Based Rectifier and Charger	
2	Nominal Voltage	415 VAC	
3	Nominal Frequency	50 Hz	
4	Input Power Factor	0.99	
5	Input Voltage Range	-15%, + 15%	
6	Frequency Range	40 to 72 Hz	

7	THDi	< 5%	
<b>[ B ]</b>	<b>Output</b>		
1	Inverter Design	IGBT Based Technology	
2	Inverter Type	DSP Based	
3	Voltage	380 / 400 / 415 V AC	
4	Waveform	Pure Sine wave	
5	Total Harmonic Distortion	< 3% for linear load & ≤5 % for non linear load	
6	Crest Factor	3 :1	
7	Overload capacity	125% for 10 min, 150% for 1 Min	
<b>[ C ]</b>	<b>Environmental</b>		
1	Operational Temperature	0 to 40 Deg.	
2	Altitude	1000m above sea level	
3	Relative Humidity	5 to 95%, no condensation allowed	
<b>[ D ]</b>	<b>Physical</b>		
1	Enclosure Protection	IP 20	
2	Cooling	Forced Air Cooling	
3	Colour	RAL9005	
4	Cable Entry	Bottom	
<b>[ E ]</b>	<b>Bypass</b>		
1	Phase	3 Phase	
2	Static Bypass	Auto & Manual	
4	Type of Bypass	Automatic Static Bypass with integral Manual Maintenance Bypass	
5	Voltage	415 V AC	
6	Frequency	50Hz	
7	Transfer	No Break	
<b>[ F ]</b>	<b>Battery</b>		
1	Type	Sealed Maintenance Free	
2	DC Voltage	Vendor Specify	
3	Recharge Time	8-10 hrs	
4	VAH Mentioned	17100	
5	Battery Backup	30 Min	
6	Charger details	10% of the battery AH capacity	
7	Battery make	Exide / HBL / Quanta	
<b>[ G ]</b>	<b>General</b>		
1	Overall Efficiency on Full load	94%	
2	High Efficiency mode	98%	
3	Acoustic Noise (in dbA)	< 55 dbA @ 1 Meter	
4	Alarms	Audible Alarm required for Mains Failure, Low Battery, Inverter Trip, Over Temperature, Over Load	



5	Electrical Protection	To be provided	
6	Parallel Redudancy	Parallel Compitible up 4 units	
7	Display Panel	Graphical LCD with backlight, Mimic Diagram with LED status, Alarm LED	
8	Battery rack thickness CRCA sheet	M.S. Angle stand	
9	Switchgear & MBS	Provided Input, Output, Battery, Maintenance bypass switch	
<b>[ H ]</b>	<b>Approx. Dimensions(mm)</b>		
<b>A.</b>	<b>UPS (mm)</b>		
1	Width	Vendor Specify	
2	Depth	Vendor Specify	
3	Height	Vendor Specify	
4	Approx. Weight (Kg)	Vendor Specify	
<b>B.</b>	<b>Battery Stand (mm)</b>		
1	Width	Vendor Specify	
2	Depth	Vendor Specify	
3	Height	Vendor Specify	
4	Approx. Weight (Kg)	Vendor Specify	
<b>[ I ]</b>	<b>Standard</b>		
1	Classification	IEC62040-3:1999, EN62040-3:2001	
2	Electromagnetic Compatibility	IEC62040-2, EN50091-2	
3	Marking	CE	
<b>[ J ]</b>	<b>Protection</b>		
1	Battery Over voltage	Required	
2	Battery Under Voltage	Required	
3	DC High	Required	
4	Output Over/Under Voltage	Required	
5	O/P short Circuit	Required	
6	Inv Over Temp	Required	
7	Surge	Required	

NOTE: -

1. Make of any other item left out shall be approved by Client/Consultants before procurement.
2. Make of the accessories for Transformer, HT Panel etc. and any other items shall also be approved by Project Manger.
3. The specifications indicated above are minimum requirement only. The Contractor should supply, erect and commission the equipments/ system according to latest editions of IEC and EI/IS Standards.

Signature of Tenderer

