TENDER FOR CIVIL, INTERIOR FURNISHING AND ELECTRICAL WORKS AT 7TH & 8TH FLOORS OF BARODA SUN COMPLEX ADMINISTRATIVE BUILDING, SURAT FOR PROPOSED SURAT ZONAL OFFICE, GUJARAT, INDIA.

ENVELOPE -I
(TECHNICAL BID)

LAST DATE OF SUBMISSION: 25.02.2025 up to 3.00 PM

Tender will be addressed to The General Manager – Zonal Head, Bank of Baroda, Zonal Office - Baroda, Baroda Bhavan Building, 5th Floor, RC Dutt Road, Alkapuri, Vadodara- 390007, Gujarat, India.

Tenders will be submitted to the following address

BANK OF BARODA- ZONAL OFFICE
BARODA BHAVAN BUILDING,
5TH FLOOR, RC DUTT ROAD,
ALKAPURI, VADODARA- 390007,
GUJARAT, INDIA.

ARCHITECT:
M/S BIMAL TALATI
Architects & Interior Designers, 304,
President House, Opp. C.N.Vidhyalaya,
Ambawadi, Ahmedabad - 380 006
Mob: 98240 33579; 94089 94093
Email: bimaltalati@gmail.com

1	**NAME OF THE WORK**	CIVIL, INTERIOR FURNISHING AND ELECTRICAL WORKS AT 7TH & 8TH FLOORS OF BARODA SUN COMPLEX ADMINISTRATIVE BUILDING, SURAT FOR PROPOSED SURAT ZONAL OFFICE, GUJARAT, INDIA.
2	**ESTIMATED COST**	**Appx. Rs. 32.77 lakhs**
3	**TIME AND LAST DATE OF SUBMISSION OF TENDER**	**25.02.2025 UP TO 3.00 PM**
4	**PLACE & ADDRESS FOR SUBMISSION OF TENDER**	BANK OF BARODA ZONAL OFFICE - BARODA BARODA BHAVAN BUILDING, 5TH FLOOR, RC DUTT ROAD, ALKAPURI, VADODARA- 390007, GUJARAT, INDIA
5	**CONTACT PERSON WITH TELEPHONE NO**	AR. BIMAL TALATI PH. 98240 33579; 94089 94093 ZONAL OFFICE - BARODA: 0265- 2316555/80852 81679 0265- 2316523/98955 36930 REGIONAL OFFICE – SURAT CITY REGION 0261-2294806/70547 32242
6	**DATE, TIME AND PLACE OF OPENING OF TENDERS**	TECHNICAL BID OPENING : 25.02.2025 AT 03:00 PM AT BANK OF BARODA ZONAL OFFICE - BARODA BARODA BHAVAN BUILDING, 5TH FLOOR, RC DUTT ROAD, ALKAPURI, VADODARA- 390007, GUJARAT, INDIA BIDDERS ARE REQUESTED TO BE PRESENT FOR TENDER OPENING FOR WHICH NO SEPARATE INFORMATION WILL BE GIVEN. ONLY TECHNCIALLY QUALIFIED BIDDERS WILL BE INFORMED TO JOIN FOR OPENING OF THEIR FINANCIAL BID.
7	**EARNEST MONEY DEPOSIT (EMD) IN THE FOR OF DD/BC TO BE SUBMITTED ALONG WITH TECHNICAL BID ONLY**	Rs. 32,750 DRAWN IN FAVOUR OF BANK OF BARODA, ZONAL OFFICE – BARODA PAYABLE AT VADODARA.
7B	**(ISD) INITIAL SECURITY DEPOSIT (PAYABLE BY L1 BIDDER AFTER AWARD OF THE WORK)**	2% OF VALUE OF THE TENDER VALUE INCLUDING EMD PAID BY L-1 BIDDER.
8	**RETENTION MONEY**	DEDUCTIBLE IN RUNNING BILLS: 10% OF THE VALUE OF EACH INTERIM BILL AND TOTAL DEDUCTIBLE AS DETAILED IN THE TENDER DOCUMENT.

Seal & sign of the bidder

9	**TERMS OF PAYMENT OF BILLS, IF ANY. SPECIFY THE MINIMUM VALUE OF WORK FOR PAYMENT OF RUNNING ACCOUNT BILLS.**	INTERIM BILLS OR PERIODICAL RUNNING BILLS ON SATISFACTORY COMPLETION OF MINIMUM VALUE OF WORK OF RS 9.50 LAKHS. NO ADVANCE OR MOBILIZATION ADVANCE SHALL BE PAID IN ANY CIRCUMSTANCES.
10	**(PENALTY CLAUSE)LIQUIDATED DAMAGES**	IN CASE OF DELAY A PENALTY @ THE RATE OF 1% OF ESTIMATED COST PER WEEK SUBJECT TO A MAXIMUM OF 10% OF ACCEPTED CONTRACT SUM BUT NOT EXCEEDING THE TOTAL SECURITY DEPOSIT. (INITIAL PLUS RETENTION) WOULD BE STRICTLY IMPOSED.
11	**STIPULATED TIME FOR COMPLETION OF THE WORK/SUPPLY.**	30 DAYS
12	**VALIDITY PERIOD OF THE TENDER.**	THREE MONTHS FROM DATE OF OPENING OF FINANCIAL BID
13	**TAXES**	RATES QUOTED SHOULD INCLUDE ALL TAX (EXCLUDING GST) AND OTHER CHARGES LIKE TRANSPORTATION ,LOADING/UNLOADING ETC. HOWEVER I.T AND TDS WILL BE DEDUCTED AT SOURCE AS APPLICABLE.
14	**ELECTRONIC PAYMENT**	ELECTRONIC PAYMENT SHALL BE PREFERRED.
15	**INSURANCE OF THE WORK**	WITHIN -7-DAYS FROM THE DATE OF WORK ORDER (CAR POLICY)
16	**DATE OF COMMENCEMENT**	FROM THE DATE OF WORK ORDER OR HANDING OVER THE PREMISES BY BANK WHICHEVER IS EARLIER
17	**PERIOD FOR CERTIFICATION OF INTERIM BILLS BY THE ARCHITECT**	8 DAYS FROM THE DATE OF RECEIPT OF THE BILL BY THE ARCHITECT
18	**PERIOD OF CERTIFICATE OF FINAL BILL BY ARCHITECT**	15 DAYS FROM THE DATE OF RECEIPT OF BILL BY THE ARCHITECT.
19	**DEFECT LIABILITY PERIOD**	12 MONTHS
20	**RELEASE OF INITIAL SECURITY DEPOSIT**	AFTER SATISFACTORY COMPLETION OF THE WORK AND CERTIFICATION OF FINAL BILL
21	**RELEASE OF RETENTION MONEY IN 2 PARTS**	50% OF THE RETENTION AMOUNT IS REFUNDED ON ISSUE OF COMPLETION CERTIFICATE BY THE ARCHITECT, BALANCE 50% WILL BE REFUNDED 14 DAYS AFTER DEFECT LIABILITY PERIOD PROVIDED ALL DEFECTS ARE ATTENDED SATISFACTORILY IN ACCORDANCE WITH CONTRACTOR

Seal & sign of the bidder

NOTICE INVITING TENDER

PROJECT: CIVIL, INTERIOR FURNISHING AND ELECTRICAL WORKS AT 7TH & 8TH FLOORS OF BARODA SUN COMPLEX ADMINISTRATIVE BUILDING, SURAT FOR PROPOSED SURAT ZONAL OFFICE, GUJARAT, INDIA.

Sir/Madam,

1. Sealed tenders are invited for the proposed work by the
The General Manager – Zonal Head
Bank Of Baroda
Zonal Office - Baroda
Baroda Bhavan Building,
5th Floor, RC Dutt Road,
Alkapuri, Vadodara- 390007,
Gujarat, India

2. Sealed tenders comprising TECHNICAL BID and PRICE/FINANCIAL BID, must be duly filled and signed in the prescribed form and to be kept in two separate sealed envelope respectively super-scribed as Technical Bid and Price/Financial Bid and both these two separate sealed envelopes to be kept in One Big envelope and should be addressed to the **THE GENERAL MANAGER – ZONAL HEAD, BANK OF BARODA, ZONAL OFFICE – BARODA, BARODA BHAVAN BUILDING, 5TH FLOOR, RC DUTT ROAD, ALKAPURI, VADODARA- 390007, GUJARAT, INDIA** The main envelope containing both aforesaid bids should be super scribed **CIVIL, INTERIOR FURNISHING AND ELECTRICAL WORKS AT 7TH & 8TH FLOORS OF BARODA SUN COMPLEX ADMINISTRATIVE BUILDING, SURAT FOR PROPOSED SURAT ZONAL OFFICE, GUJARAT, INDIA.**

a. **ENVELOPE NO.1: TECHNICAL BID** - TO CONTAIN CONTRACTOR'S TERMS AND CONDITIONS, WORK ORDERS, PERFORMANCE/COMPLETION CERTIFICATES, ALL REQUIRED PAPERS AS REQUIRED IN BASIC INFORMATION TECHNICAL ASSUMPTIONS ALONG WITH DEMAND DRAFT/BANKER'S CHEQUE FOR **Rs.32,750** IN FAVOR OF **BANK OF BARODA, ZONAL OFFICE – BARODA PAYABLE AT VADODARA** AS E.M.D ISSUED DURING TENDER NOTICE PERIOD OF PERIOD FROM **05.02.2025 TO 25.02.2025** WILL ONLY BE ACCEPTED SUBJECTED TO THE SUBMISSION OF THE BIDS WITHIN THE PRESCRIBED TIME OF SUBMISSION.

b. **Envelop No 2: Price Bid** - Tender documents along with B.O.Q Completed in all respect and duly signed and submitted to **THE GENERAL MANAGER – ZONAL HEAD, BANK OF BARODA, ZONAL OFFICE – BARODA, BARODA BHAVAN BUILDING, 5TH FLOOR, RC DUTT ROAD, ALKAPURI, VADODARA- 390007, GUJARAT, INDIA on or before 25.02.2025 up to 3:00 P.M**

c. Envelope 1 will be opened on **25.02.2025 at 03.30 P.M.** in the presence of the Contractors or their representatives. No separate information will be given in this regard. Envelop No 2 may be opened at later date, which will be communicated to those tenderers in advance, whose Technical Bid qualify. In case of holidays/strikes/bands or any reason causing a holiday exactly on the last date of submission of offers; the last date of submission will be shifted to immediate next working day.

EMD will strictly not to be kept in Envelope 2 or else otherwise tender will be considered as rejected.

3. 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 filling this tender and for entering into a Contract for the execution of the same and must examine the drawings and inspect the site of the work and acquaint himself with all local conditions and matters pertaining thereto.

4. Each of the tender document is required to be signed by the person or persons submitting the tender in token of his / their having acquainted himself / themselves with the General Conditions etc as laid down. Once the duly signed document submitted then it will be deemed as signing authority empowered or authorised to do so and binding over the bidder, and as and when said authority letter demanded by the bank then the bidder is bound to produce the same. Any tender with any of the documents not signed will be rejected.

5. The tender documents must be filled in English and all the entries must be made properly & clearly. If any of the documents are missing or un- signed or not legible or have overwriting without valid attestation through initial, the tender shall be considered invalid.

6. All erasures and alterations made while filling the tender must be attested by initial of the tenderer. Over writing of figures is not permitted. Failure to comply with either of these conditions will render the tender void. No advice or any change in rate or conditions after submission of the tender will be entertained. All the rates should be quoted both in figures and words. If on check there are differences between the rates given by the contractor, in words and figure or in amount workout by the contractor, the following procedure shall be followed.

i) When there is a difference between the rate in figures and in words, the rate, which corresponds to the amount worked out by the Contractor, shall be taken as correct.

ii) When the amount of an item is not worked out by the contractor or it does not correspond with the rate written either in figures or in words, then the rate quoted by the contractor in words shall be taken as correct.

iii) When the rate quoted by the contractor in figures and words tallies but the amount is not worked out correctly, the rate quoted by the contractor shall be taken as correct and not the amount.

7. In case of the rates/ amount quoted by the bidder exceeds the estimated cost/ estimated item rates, bank shall have the right for obtaining detailed rate analysis for such item/ items (i.e. material cost with quantity + labour cost with quantity + profit) which necessarily needs to be compatible with market rates for acceptance of the tender/ bid or else Bank shall be at liberty to reject such tender/ bid and no claim shall be entertained by Bank.

8. The intending tenderer shall deposit EMD by DD / BC drawn in favour of Bank of Baroda, Zonal Office-Baroda payable at Vadodara of Rs. 32,750 as the Earnest Money as guarantee of good faith, which amount

shall be forfeited as liquidated damages in the event of any evasive/ refusal or delay in signing the contract. The deposit of the unsuccessful tender will be returned without interest immediately after a decision is taken regarding the award of the Contract. The Earnest Money of the successful tender will be adjusted towards Security Deposit. A tender not accompanied by Earnest Money Deposit will not be considered. No concession will be made to public Sector companies from Payment of Earnest Money Deposit.

9. The successful tender will have to pay as the amount of initial security deposit which shall be 2% of the accepted value of the tender including the EMD, by means of D.D in favor of the Bank of Baroda, Zonal Office-Baroda payable at Vadodara. The initial security deposit is to be paid by the Contractor to Bank within 14 days of intimation to him of the acceptance of the tender. The initial security deposit will be invested with the bank for the duration of the contract period i.e. 3 months and will be refunded to the contractor without any interest, after issue of the virtual completion certificate. No interest is allowed on the retention money.

10. Retention of 10% of the value of the work done from every running bill will be deducted till total retention including EMD and SD paid earlier, is becomes 5% of the contract value, and shall be held by the Bank as Total Retention amount. On the Architect's certifying to the completion of the work, 50% of total security deposit shall be released to the contractor with the final certificate of payment and the balance payment will be retained for a further period of TWELVE months after the completion certificate is issued by the Architects and agreed by the Bank.

11. Within one week of the receipt of intimation from Architects of the acceptance of his / their tender, the successful tenderer shall be bound to implement the contract by signing an agreement in accordance with the Agreement and Conditions of Contract attached herewith, but the work order or the written acceptance by the Employer of a tender will constitute a binding agreement between the Employer and the person tendering whether such formal Contract is or not subsequently entered into.

12. All compensation or other sums of money payable by the Contractor to our Clients under the terms of this contract may be deducted from the security Deposit, or from any sum that may be or may become due to the Contractor on any account whatsoever and in the event of the Security Deposit being reduced by reasons of any such deductions, the Contractor shall within 15 days of being asked to do make good in cash or by cheque any sum which have been deducted from his security deposit.

13. The contractor shall arrange for the procurement of all the materials at site as required and directed, and store them in his go down at the site of construction and also bear all the expenses incurred in therewith payment of taxes, octroi, loading/unloading of material to the site, any local tax, cess etc.

14. The rates quoted by the Contractor shall include all eventualities such as heavy rain, sudden floods etc. which cause damage to the executed work or which may totally wash out the work. Until the completion certificate is issued to the Contracts, our Clients will not be responsible for such damage or wash out of the construction work.

15. Time is the essence of the contract. The work should be completed in **30 days** from the date of the work order issued to the contractor to commence the work. The successful Contractor will have to give CPM/PERT chart of various activities of work to be done so that the work gets completed within the stipulated time. The chart showing the item wise/location wise/floor wise progress which he (the contractor) intends to make to enable him to conveniently and practicably complete the work in all respects within the agreed time as per contract. The chart will be scrutinized and approved by the Architects with suitable modifications, as and if necessary and the approved chart will then form part of the agreement, being the basis for assessment of progress under the relevant conditions of contract shall be submitted within 7 days from the date of acceptance of the tender. The chart may from time to time during the progress of the work be reviewed and modified with the approval of the Architects keeping in view the agreed date of completion.

16. If the contractor fails to complete the work by the Scheduled date of completion or within any sanctioned extended time, he will have to pay liquidated damages at 1% of estimated amount for each week beyond the date that the work remains incomplete subject to maximum of 10% of the contract value (without extra items) as per Clause 17 of the General Conditions of Contract.

17. The quantities contained in the Schedule are only approximate. The work as carried out and done will be measured up from time to time, for which payment will made subject to the terms and conditions of contract.

18. The unit price shall be deemed to be fixed price. In case of extra items, a record of labor charges paid shall be maintained and shall be presented regularly to the Architects for checking. The settlement will be made based on figures arrived at jointly and taking unit price given in the contract assigned to the successful Tenderer. In case, of extra items where similar or comparable items are quoted in the tender, extra rates shall be based on tender rates.

19. Bank of Baroda do not bind themselves to accept the lowest or any tender and reserve to themselves the right to accept or reject any or all tenders either in whole or in part, without assigning any reason for doing so.

20. No employee of the Bank is allowed to work as a Contractor for a period of -2- years of his / her retirement from Bank Services without previous permission of the Bank. This contract is liable to be cancelled, if either the contractor or any of his employee is found any time to be such a person who had not obtained the permission of Bank as aforesaid before submission of the tender or engagement in the contractor's service.

21. The work Architect or any reference with architect may be read null and void in the present contract / agreement if architect is not employed in the project. Premises & Equipment Department, Bank of Baroda, Zonal Office - Baroda will act as architect if so specified.

PRE-QUALIFICATION CRITERIA:

CONTRACTOR/AGENCY/FIRM WHO ARE DESIROUS OF TENDERING FOR ABOVE WORK AND FULFILLS FOLLOWING MINIMUM REQUIREMENTS ONLY NEED TO APPLY

i. a) The contractors/Firms should have carried out a minimum of 1 work of similar nature successfully completed, each work valued at not less than Rs.26.20 lakhs during the last 7 years ending as on 31st March, 2024.

OR

ii. (b) 2 works of similar nature successfully completed valued at an amount not less than Rs.16.30 lakhs during the past seven years ending as on 31st March, 2024.

OR

iii.**(**c) 3 works of similar nature successfully completed of value not less than Rs. 13.10 lakhs during the last seven years ending as on 31st March, 2024.

The average annual turnover of the contractor during the last three year ending 31st March 2024 should not be less than Rs.13.00 lakhs

***Similar Job: Civil, interior, electrical works of commercial / administrative / Institutional buildings.**

THE BANK WILL NOT ENTERTAIN ANY SUBSEQUENT SUBMISSION MADE REGARDING ELIGIBILITY CRITERIA, PAST/EXISTING WORK ORDER, WORK COMPLETION CERTIFICATE, PERFORMANCE OF SIMILAR JOB ETC, EXCEPT MENTIONED BY THE BIDDER IN TENDER DOCUMENTS. THE BIDDER IS BOUND TO PROVIDE SUPPORTING DOCUMENTS AND PHOTOGRAPHS AS AND WHEN DEMANDED BY THE BANK. THE BANK HAVE RIGHT TO CHECK THE CREDENTIAL OF INFORMATION SUPPLIED BY THE BIDDER AT THEIR END.

The agency bidding for this job should have full-fledged office preferably in Gujarat and expertise in construction field,

The firm should have sufficient number of experienced personnel, technical know-how, and other resources for the completion of subject work.

1. APPLICATIONS BY THOSE FIRMS WHO DO NOT SUBMIT PERFORMANCE CERTIFICATES/COMPLETION CERTIFICATE & WORK ORDERS FROM THEIR PREVIOUS EMPLOYERS / CLIENTS ARE LIABLE FOR REJECTION .For certificates, the issuing authority shall not be less than an Executive In charge. Bank may obtain confidential reports of the bidders for the similar jobs which has to be satisfactory for technical pre– qualification of the bidder. Any relevant information/document/credential, found false at later stage not limited to, shall lead to the cancellation of contract irrespective of any stage of contract/work , without entertaining any claim but may also subject to suitable legal action. In case any loss posed to the Bank then the said contractor will indemnify suitably the bank against the said financial and reputational loss

2. BIDDERS ON WHOM BANK HAS IMPOSED PENALTY FOR THEIR PREVIOUS WORKS IN LAST ONE YEAR ARE NOT ELIGIBLE TO APPLY. THOSE TENDERS WILL BE REJECTED WITHOUT ANY INTIMATION.

BASIC INFORMATION

1	Name of the applicant / Organization Address of the Registered Office Address of office (preferably in Gujarat) (With Phone Nos Fax Nos & Email ID & Contact Person)	
2	Year of establishment	
3	Type of the organization (Whether sole proprietorship, Partnership, Private Ltd. or Ltd. Co. etc.) (Enclose certified copies of documents as evidence)	
4	Name & qualification of the Proprietor / Partners / Directors of the Organization / Firm	

Seal & sign of the bidder

	a) b) c) enclose certified copies of document as evidence	
5	Whether registered with Government / Semi – Government / Municipal Authorities of any other Public Organization and if so, in which class and since when? (Enclose certified copies of document as evidence)	
6	No. of years of experience in the field and details of work in any other field. Whether ISO certified, furnish the details.	
7	Area of business activities other than construction, if any, and place of business.	
8	Address of business activities other than construction if any, and place of business	
9	Address of the registered/office through which the proposed work of the Bank will be handled and the Name & Designation of officer in charge.	

Seal & sign of the bidder

	(ENCLOSE ADDRESS PROOF)	
	Work Completion Details	
	a. One similar completed work each costing not less than Rs.26.20 lakhs OR b. Two similar completed works each costing not less than Rs. 16.30 lakhs OR c. Three similar completed works costing not less than Rs.13.10 lakhs. (Enclose work completion certificate from client)	
11	[a] Yearly turnover of the organization during last 3 years (year wise) and furnish audited balance sheet and Profit & Loss A/c (Audited) for the last – 3- years.	

Seal & sign of the bidder

	[b] Committed turnover in 2020 - 2021 2021 – 2022 2022 – 2023 2023– 2024	
13	Enclose copy of latest income tax clearance certificate (last 3 years) (ENCLOSE COPY)	Yes/No
14	PAN No. (ENCLOSE COPY PAN CARD)	
15	GST No. (ENCLOSE COPY OF REGISTRATION)	
16	Other infrastructural information to be used/ referred for this project (Proforma-4) List of available plants, machineries equipment etc.	
17	Furnish the names of –3- responsible persons along with their designation, address, Tel. No., etc., for whose organization, you have completed the above mentioned jobs and who will be in a position to certify about the performance of your organization.	1. 2. 3.

Seal & sign of the bidder

18	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. (Proforma-5) Give name of court, place, and status of pending litigation.	Attach a separate sheet if required.
19	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.	
20	No. of supplementary sheets attached for Part – II	

I hereby undertake that all the information provided above are true, and all the terms and conditions related to work order, eligibility and other are fully read over and after understand the same, submitting this tender. Further I also undertake that signing authority is authorized to submit this tender and possess all the required resolution, mandate etc in this regard.

In case of firm is other than individual/proprietorship, preferably submit the mandate/resolution copy, however at the time of acceptance of work order or execution of agreement, the same are necessarily required.

NOTE: Attach extra sheets with Sr. No if the space found less.

Seal & sign of the bidder

LIST OF SIMILAR PROJECTS EXECUTED BY THE CONTRACTOR/FIRM DURING THE LAST 7 YEARS ENDING AS ON DATE OF PUBLICATION.

(Each works costing not less than Rs.13.10 lakhs)

Sl No	Name of work/ project with address	Name & full postal address of the owner. Specify	Contract Amount (Rs.)	Stipulate d time of completion (Years)	Actual time of comple tion (years)	Any other relevant information Actual amount of the Project, if increased, give reasons.	Enclose clients certificate for satisfactory completion.
1	2	3	4	5	6	7	8

Notes:

Information has to be filled up specifically in this format.

Date shall be reckoned from the date of advertisement of the notice in news papers.

For certificates, the issuing authority shall not be less than an Executive In charge.

Performance/Completion certificates will necessarily be submitted along with Work Orders.

Seal & sign of the bidder

LIST OF IMPORTANT WORKS OF SIMILAR NATURE ON HAND.

(EACH WORKS COSTING NOT LESS THAN RS.13.10 LAKHS)

Sl no	Name of work/ project with address	Name & full postal address of the owner. Specify whether Govt. under taking along with name, address and contact nos. of –2- persons (Engineers or top officials of the organization)	Contract Amount (Rs.) (for construction work only) with copy of Work Order & completion certificate from project in- charge.	Stipulated time of completion (Years)	Present status of the project	Any other relevant information
1	2	3	4	5	6	7

Note:-

Information has to be filled up specifically in this format

Seal & sign of the bidder

GENERAL INSTUCTIONS / CONDITIONS TO THE TENDERERS

1. TENDERS ARE HEREBY INVITED FOR CIVIL, INTERIOR FURNISHING AND ELECTRICAL WORKS AT 7TH & 8TH FLOORS OF BARODA SUN COMPLEX ADMINISTRATIVE BUILDING, SURAT FOR PROPOSED SURAT ZONAL OFFICE, GUJARAT, INDIA.

2. THE TENDERS COMPRISING TECHNICAL BID AND PRICE BID BOTH SHOULD BE KEPT IN TWO SEPARATE SEALED ENVELOPES SUPER SCRIBED ON BOTH ENVELOPES (TECHNICAL BID-ENVELOPE-1 & FINANCIAL BID ENVELPOE-2 RESPECTIVELY ALONG WITH PROJECT TITLE) AND BOTH SEALED ENVELOPE SHOULD BE PLACED IN ONE BIG SIZE ENVELOPE SUPER SCRIBED WITH "CIVIL, INTERIOR FURNISHING AND ELECTRICAL WORKS AT 7TH & 8TH FLOORS OF BARODA SUN COMPLEX ADMINISTRATIVE BUILDING, SURAT FOR PROPOSED SURAT ZONAL OFFICE, GUJARAT, INDIA." THE TENDER ADDRESSED AND SUBMITTED TO

   THE GENERAL MANAGER, BANK OF BARODA ZONAL OFFICE – BARODA BARODA BHAVAN BUILDING,5TH FLOOR, RC DUTT ROAD, ALKAPURI, VADODARA- 390007, GUJARAT, INDIA

   The tender Documents must be reached/ received at the above address on or before 3:00 P.M OF 25.02.2025. Any tender received later will not be entertained.

   (I) ENVELOPE–I CONTAINING CONTRACTOR'S TERMS AND CONDITIONS, WORK ORDERS, PERFORMANCE/COMPLETION CERTIFICATES, ALL REQUIRED PAPERS AS REQUIRED IN BASIC INFORMATION TECHNICAL ASSUMPTIONS ALONG WITH **DEMAND DRAFT/BC (EMD) FOR Rs. 32,750 IN FAVOR OF BANK OF BARODA, ZONAL OFFICE - BARODA, PAYABLE AT VADODARA AS EMD** .EMD KEPT IN ENVELOPE –II SHALL LEAD TO CANCELLATION OF TECHNICAL BID. TENDER WILL BE OPENED AT THE **ZONAL OFFICE, BARODA** ON 25.02.2025 AT 03.30 P.M.

   (II) ENVELOPE–II containing Price bid – To contain Architects tender documents along with bill of quantities will be opened after evaluation of technical bid. Price Bid of only those bidders will be opened whose technical bid qualified successfully or found suitable.

3. The contractor should quote in figures as well as in words the rate, and amount tendered by them. The amount for each item should be worked out and requisite total given in English Language only.

   The EMD of the contractor whose tender is accepted, shall be forfeited in full in case he does not remit the initial security deposit within the stipulated period or start the work by the stipulated date mentioned in the work order

4. The acceptance of the suitable tender will be based on sole discretion of the Bank of Baroda, lowest tenderer will not claim as successful bidder till the bank declared him as successful bidder. It is not binding to the bank to accept the said tender just for the reason of lowest tender, the authority may reject any or all of the tenders in which any one of the prescribed conditions are not fulfilled or the information provided by the bidder untrue, or incomplete or credential of bidder found doubtful subsequently or negative feedback received about past work etc in any respect, liable to be rejected.

5. The bank reserves the right to accept the tender in full or in part and the tenderer shall have no claim for revision of rates or other conditions if his tender is accepted in parts.

6. Canvassing in connection with tenders is strictly prohibited and the tender submitted by the contractors who resort to canvassing will be liable to rejection

7. All rates shall be quoted on the proper format of the tender and before quoting the rates, the tender shall have to be read and understand the various clauses mentioned in general conditions and special conditions of this contract along with drawings and specifications.

8. Bills of quantities in respect of each work and a specification accompany this tender notice. The tenderers must use only the form issued by the Architects to fill in the rate. The Bills of quantities may be varied at the discretion of the Bank/Architects. Each tender should contain not only the rates but also the value of each item of work entered in a separate column and all the items should be totalled up in order to show the aggregate value of the entire tender.

9. In the event of the tender submitted by a Partnership firm, it must be signed separately by each member thereof, or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so; such power of attorney shall be produced along with the tender and it must disclose that the firm is registered under the Indian Partnership Act and a copy of the Partnership deed should be attached. In the case of Proprietary concern, the Sole Proprietor should sign.In the case of Limited Co., the Managing Director or any other Director authorized to sign, with name, ~~and~~ address and designations of all Directors and seal of the Company supported by a resolution of the Company.

10. The tenderer shall also inspect and examine the site and its surroundings and shall satisfy himself before submitting his tender as to the nature of the ground and subsoil (so far as practicable), nature of the site, the quantities and nature of work and materials necessary for the completion of the works and the means of access to the site, the accommodation how may require and accordingly it is responsibility of tenderer that they shall himself obtain all necessary information, as to rights contingencies and other circumstances which may influence or affect his tender and the Employer/ Bank makes no assurance or representation to the tenderer in this behalf.

11. Errors in the bills of quantities shall be dealt with in the following manner:

a) When there is a difference between the rates in figures and in words, the rates, which correspond to the amounts worked out by the contractor, shall be taken as correct.

b) When the amount of an item is not worked out by the contractor or it does not correspond with the rate written either in figures or in words, then the rate quoted by the contractors in words shall be taken as correct.

c) When the rate quoted by the contractor in figures and in words tallies but the amount is not worked out correctly, the rate quoted by the contractor shall be taken as correct and not the amount.

d) 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.

e) The tenderer whose tender is accepted shall not be entitled to make any claim for increase in the rates quoted and accepted excepting in pursuance of any specific provision in the contract for such and then only in terms of that specific provision or to make any representation on the ground that he was supplied with any information or given any promise or guarantee of any sort, by the employer his agents and servants, the Architects or their representatives or any other persons, unless such information, promise or guarantee is furnished to the tenderer in advance of the date of receipt of tenders and in writing under proper authority.

f) The work is to be carried out generally in accordance with I.E. Rules and Regulation the Local P.W.D. or C.P.W.D. specifications as the case may be and the I.S.S. in addition to the Tender/Architects' specifications, if any, forming part of the tender documents.

12. Electrical Installation shall comply in all respect with the requirements of the Indian Electricity Act 1916 as amended from time to time and the Indian Electricity Rules currently in force. Electrical works to be carried out through/ in supervision of electrical license holder issued by the appropriate statutory authority as per the existing laws of the concerned electricity board/Municipal Corporation/Panchayat, as the case may be. License copy to be produced, if required.

13. The materials to be used in electrical installations shall be of approved make and shall conform generally to the relevant Indian Standard Specifications.

14. On completion of the work the contractor shall furnish three sets of wiring diagrams and of conduit layout as executed in the installation. He shall also furnish a test certificate and guarantee in the standard form as prescribed by the Employer.

15. In the case of any class of work for which there is no specification in the said I.E. Rules and Regulations or Local P.W.D. specifications, the said Highways Manuals/specifications, the said regulations and rules, CPWD specifications and the I.S.S. or in the said Architects' specifications forming part of the tender documents or in case there is a variation, such work shall be carried out in all respects in accordance with the instructions and requirements of the Architects.

16. The work shall be carried out under the directions and supervision of the officials of the Employer and Architects and subject to the approval in all respects by the Employer and Architects.

17. On acceptance of the tender the Contractor shall in writing and at once inform the Employer and the Architects the names of his accredited representative (specifications) who will be responsible to take instructions from the Architects/Employer. The Contractor will be required to insure by obtaining CAR policy of the work and keep it insured up to one month after the date of taking over the works/installations by the Employer or otherwise in terms of the contract against loss or damage by fire and other usual risks other than the risks excepted in terms of the contract with the General Insurance Corporation of India or its subsidiaries. This CAR policy will be required to submit to bank within -7days from the date of acceptance of work order.

18. In carrying out the work the contractor shall comply with the provisions of the safety code, annexed to these papers. The tenderer shall comply with all provisions of laws including workmen's compensation Act, contract labour (Regulation & Arbitration) Act etc. If the Employer is made liable to pay any sum of money or incur any liability as a consequence of no performance or omission or commission on the part of the Contractor or otherwise, the Employer is entitled to recover the same from the contractor or adjust against any money due to the Contractor.

On acceptance of the tender, the name of the accredited representative (s) of the Contractor who would be responsible for taking instructions from the Employer/ Architects, shall be communicated to the Employer

GENERAL CONDITIONS OF CONTRACT

Except where as provided specifically for in the description of the individual items in the schedule of quantities and in the specifications and conditions laid down herein after and the drawings, the work shall be carried out as per standard specifications and under the direction of the Employer / Architect

1. INTERPRETATIONS

In constructing these conditions and the specifications schedule of quantities and contract agreement, the following words shall have the meaning herein assigned to them except where the subject or contract otherwise required.

a. 'Employer' shall mean **The General Manager, Bank Of Baroda, Zonal Office – Baroda, Baroda Bhavan Building, 5th Floor, Rc Dutt Road, Alkapuri, Vadodara-390007, Gujarat, India** and any of its Employer/ Representatives authorized on their behalf.

b. **'Contractor' shall mean**
And shall include his / their heirs, legal representatives, assignees and successors.

c. **'Site'** shall mean the lands and other places as shown bounded red on the site plan, on which the works are to be provided by the Employer or Architect for the purpose of the contract.

d. **'Site Engineer/Supervisor'** shall mean any other engineer/skilled experienced person appointed from time to time by the Employer and certified in writing to the Architects and the Contractor, to act as Engineer for the purpose of the Contract in The place of the said.

e. **'Employer's Representatives'** shall mean any site Engineer or any clerk of works appointed from time to time by the Employer to perform the duties set forth in Clause 27 hereof whose authority shall be notified in writing to the Architects and Contractor by the EMPLOYER.

f. **'Drawings'** shall mean the drawings referred to in the specifications and any modifications of such drawings approved in writing by the Architect and such other drawings as any from time to time during the execution of work be furnished or approved in writing of the Architect and Employer

The Contractor shall ask in writing for all clarifications on matters occurring any where in drawings, specifications and schedule of quantities or to additional instructions at least 10 days ahead from the time when it is required for implementation. So that Employer / Architect may be able to give decisions hereon.

h. **'Works'** shall mean the works to be executed in accordance with the contract specifications and schedule of quantities.

i. **'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.

j. **'Contract'** shall mean the Articles of Agreement, the general conditions special conditions, the appendix, the schedule of quantities, specifications and drawings attached here to and duly signed.

k. **'The Schedule of Quantities'** shall mean the schedule of quantities as specified and forming part of this contract.

l. **'Priced schedule of Quantities'** shall mean the schedule of quantities duly priced with the accepted quoted rates of the contractor.

m. **'Contract Price'** shall mean the sum named in the Tender subject to such additions thereto or deductions there from as may be made under the provisions hereafter contained.

n. **'Notice in Writing'** or written notice shall mean a notice in writing, type or printed characters sent (unless delivered personally or otherwise provided 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.

o. **'Net Prices'** any arriving at the Contract amount the Contractor shall have added to or deducted from the total of the items if the Tender any sum, either as a percentage or otherwise, then the next 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 a similar percentage or proportionate sum. Providing 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 account shall be hold to mean rates or prices so arrived it.

p. **'Actual Completion'** shall mean the building is in the opinion of the Architect and Employer fit for occupation.

q. Words importing persons include firms and corporations. Words importing the singular only, also include the plural and vice-verse where the Context requires.

2. SCOPE OF CONTRACT:

The scope of work covers Civil, Interior Furnishing and Electrical Works at 7th & 8th Floors Of Baroda Sun Complex Administrative Building, Surat for proposed Surat Zonal Office, Gujarat, India. in accordance with the drawings, tender specifications ,as per approved make etc. prepared by Banks Architects and under their direction and to the satisfaction of Architects and Banks Engineer. In regard to:

a. The contractor has to make his own arrangement for movement of his men and materials to the required site/floor of the premises (working areas) at his own cost. All types of safety measures will be taken by the contractor.

b. The variations or modifications of the designs, quality of works or the additions or omission or substitution of any work. No claim shall be entertained by the Bank in this regard.

c Any discrepancy in the drawings or between the schedule of quantities and / or drawings and / or specifications.

d. The removal from the site of any defective material brought thereon by the Contractor and the substitution of any other material thereof.

e. The demolition removal and / or re-execution of any work executed by the contractor/s.

f. The dismissal from the works any person employed thereupon.

g. The opening-up for inspection of any work covered –up.

h. The rectification and making good of any defect under clauses hereinafter mentioned and those arising during the maintenance period (retention period).

The Contractor shall forthwith comply and fully execute any work comprised in such Architect's Inspections provided always that instructions directions and explanations given to the Contractor or his representative upon the works by the Architect shall, if involving a variation, be confirmed in writing by the Contractor within 7 days and if not dissented from in writing within 7 days by the Architect, shall be deemed to be the Architect's instructions within the scope of contract.

If compliance with the Architect's instructions as aforesaid involved work and /or expense and /or loss beyond that contemplated by the contract, then unless the same were issued owing to some branch of his Contract by the contractor's, the Employer shall pay to the Contractor on the Architect's Certificate, the price if the said work (as on extra to be valued as herein after provided) and/or expenses and /or loss.

Regarding all factory made products for which ISI marked products are available, only products bearing ISI marking or otherwise specified shall be used in the work.

3. CONTRACTOR TO VISIT THE SITE:

Each tenderer must before submitting his tender, visit the site of works so as to examine the physical site conditions and prices, availability and quality of materials according to specifications, drawing and Schedule of Conditions of contract, as all clauses therein contained are intended to be strictly enforced and the tenderer must include in his tender for all the provisions therein contained and for all contingencies which may arise. Employer makes no assurance or representation to the tenderer in this behalf. No extra claim regarding non-availability of materials or charges in the price will be entertained or extra allowed on that account at any stage.

TENDERS:

The entire set of tender paper issued to the tenderer should be submitted fully priced and also signed on the last page together with initials on every page. Initial / signature will indicate the acceptance of the tender papers by the tenderer.

The schedule of quantities shall be filled in as follows:

i. The 'Rate' column to be legibly filled in ink in English, figures and English words.

ii. Amount column to be filled in for such item and the amount for each sub bead and detailed in the Schedule of Quantities.
iii. All corrections are to be initialed.
iv. The 'Rate column' for alternative items shall be filled up.
v. The 'Amount' column for alternative items of which the quantities are not mentioned shall not be filled up.

No modifications, writings or corrections can be made in the tender papers by the tenderer, but may at his option after his comments or modifications in a separate sheet of paper attached to the original tender papers.

The Employer reserves the right to reject the lowest or any tender and also to discharge any or all of the tenders for each section or to split up and distribute any item of work to any specialist firm or firms, without assigning any reason.

The tenderers should note that the tender is strictly on the item rate basis and their attention is drawn to the fact that the rates for each and every item should be correct, workable and self-supporting. If called upon by the Employer / architect detailed analysis of any or all the rates shall be submitted. The Employer / Architects shall not be bound to recognize the contractor's analysis. The works will be paid for as 'measured work' on the basis of actual work done and not as 'lumpsum 'contract.

All items of work described in the schedule of quantities are to be designed and paid as complete works and details including preparatory furnishing works involved, directly, related to and reasonably detectable from the drawings, specifications and schedule of quantities and no further extra charges will be allowed in this connection. In the case of lumpsum charges in the tender in respect of any item of works, the payment of such items of work will be made for the actual work done on the basis of lumpsum charges as will be assessed to be payable by the Employer/Architect.

The employer has power to add, omit from work as shown in drawings or described in specifications or included in schedule of quantities and intimate the same in writing but no addition, omission or variation shall be made by the Contractor without authorization from the Employer.

The tender shall note that the tender shall remain open for consideration for a period of 90 days from the date of opening of the financial bids.

5. AGREEMENT:

The successful Contractor shall be required to enter into an agreement in accordance with the Draft Agreement and Schedule of Conditions within 14 days from the date of work order whichever is earlier. The Contractor shall pay for all stamps and legal expenses incidental thereto. However, the written acceptance by the Employer, of the tender will constitute as a binding contract between the Employer and Contractor, whose tender has been accepted, whether such final agreement is or is not subsequently executed. These tender document will be part and parcel of the said agreement provided no specifically denied in the agreement.

6. OPENING UP WORKS:

The Contractor shall notify the Architect in writing immediately, the trenches or excavation as shown on the drawings are get ready or as soon as any ground is cut into which, from unexpected causes appears to need immediate attention, after notifying the Architect, he shall await instructions which shall within seven days of receipt of such notices, if the Contractor put in any parts of the foundations before he has so notified the Architect and received instructions, shall be liable to reinstate all work that may subsequently be, at any time, damaged on account of any defect or insufficiency of the foundations. The Contractor shall at the request of the Architect, within such time as the Architect so desires, open for inspection any other work, and should the Contractor refuse or neglect, to comply with such request, the Employer, through the Architect may comply other workmen to open up the same. If the said work has been covered up in contravention of the Architect's instructions, or if, on being opened up, it be found in accordance with the drawings and specifications, or the instructions of the Architect, the expenses of such other workmen shall be borne by and recoverable or which may become due to the contractor. If the works has not been covered up in contravention of such instructions, then the expenses aforesaid shall be done by the Employer and be added to or the Contract sum, provided always that in the case of foundations or of any other urgent work so opened up and requiring immediate attention, the Architect shall within seven days after receipt of the written notice from the Contractor that the work has been opened, make or cause the inspection thereof to be made, and at the expiration of such time if such inspection shall not have been made, the Contractor may cover the same and shall not be required to open it up again, except expenses of Employer.

7. AUTHORITIES, NOTICES, PATENT RIGHTS AND ROYALTIES:

The Contractor shall confirm to the provisions of the statutes relating to the works, and so to the regulation and bylaws of any local authority, and of any water, lighting and other companies or authorities with whose systems the structures are proposed to be connected and shall before making any variation from the drawings or specifications, that may be necessitated by so conforming given to the Architect's written notice, specifying the variations proposed to be made and the reason for making it apply for instruction thereon. In case, the Contractor shall not within the 10 days receive such instruction, he shall proceed with the work conforming with the provisions, regulations or bylaws in questions.

The Contractor shall bring to the attention of the Architect all notices required by the said acts, regulations or bylaws to be given to any Authority, and pay to such authority or to any Public Officer all fees that may be properly chargeable in respect of the works, and lodge the receipts with the Architect / Employer.

The Contractor shall identify the Employer against all claims in respect of patent rights, designs, trade marks or name or the protected rights in respect of any constructional plant, machine, work or material used for or in connection with the works or temporary works and from and against all claims, demands, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall defend all actions arising from such claims, unless he has informed the Architects, before any such infringement and received their permission to proceed and shall himself pay all royalties, license fees, damages, coat and charges of all and every sort that may be legally incurred in respect thereof.

8. TAXES AND DUTIES:

All works shall be measured net as finished and the rates quoted by the Contractors shall include for all cuttings, waste, breakages, etc. Tenderer must include in their rates, , any local tax, Excise loading/unloading of material at site, Octroi and other tax and duty levied by the Central Government or any State Government or Local Authority, if applicable but **excluding GST**. The rates quoted shall be firm till the completion of the entire work and no variation of rates will be entertained. The various statutory tax deductions implemented by the state and central government from time to time shall also be affected in the respective running bills. Electricity consumption charges as per the MGVCL. tariff should be borne by the contractor based on the actual consumption. No extra claim on this account will in any case be entertained.

9. NOTICES AND STATUTORY REGULATIONS:

The Contractor shall give all notices and pay all fees and shall comply all Acts and Regulations for the successful completion of the contract works. The whole of the work including sanitation and electrical is to be complied with as per the requirements and bylaws of the relevant statutory authorities including contract labor (Regulation and Abolition) Act 1970.

10. PRIME COST AND PROVISIONAL SUMS:

a. Where 'Prime Cost' (P.C) prices or provisional sums of money are provided for any goods or works in the specifications or Schedule of Quantities, the same are exclusive of any trade discount, or allowances, discount for cash, or profit which the Contractor may require and or carriage and fixing.

b. All goods or work for which prime cost prices or provisional sums of money are provided may be selected or ordered from any manufactures or firms, at the discretion of the Architect or the Employer. The Employer reserves to himself the right of paying directly for any such goods or work and the Architect may deduct the said prices or sums from the amount of the contract. Should any goods or works for which prime costs or provisional sums are provided or portions of some be not required, such prices are sums together with the profits allow for such additional amount as the Contractor may have allowed for carriage and fixing will be deducted in full from the amount of the Contract. Whether the goods be ordered by the Contractor or otherwise the Contractor shall, at his own cost fix the same, if called upon to do so, and the Contractor shall also receive and sign for such goods and be responsible for their safe custody as and from the date of their delivery upon the works.

c. In cases in which provisional quantities of materials are contained in the contract, the Contractor shall provide such materials to such amounts or to greater or lesser amounts, as the Architect shall direct in writing at the net rates at which he shall have priced such items in his Schedule of Quantities. Should however, any such items be omitted, which omissions shall be at the Architect's decretion, no profit on such items shall be allowed to the contractor.

d. No prime cost sum or sums (or any portion thereof) shall be included in any certificate for payment to the Contractor until the receipted accounts relating to them have been produced by the Contractor to the Architect. Such accounts shall show all discounts and any sum or sums in respect of such discounts shall be treated as a trade discount. Provided always, that should the Contractor in lieu of

producing such receipted accounts, request the Architect in writing to issue a certificate on the Employer for such sum or sums due either on account or in settlement to a sub-Contractor direct, the Architect shall, upon satisfying himself that the sub-contractor, at the settlement of accounts and any profit or sum to which the Contractors properly entitles, in respect of such sub-contract, and which is in conformity with the terms of Contract as through of such certificates, to the sub-Contractor had been included in a certificate drawn in favour of the Contractor.

e. If the Contractor neither produces the receipt nor gives to the Architect to issue a Certificate in favour of such sub-Contractor direct, the Architect may upon giving the contactor 'SEVEN DAYS NOTICE' in writing of his intentions to do so, issue to the sub-Contractor such certificate direct to the Employer and obtain a receipt from the sub-Contractor which receipt shall be deemed a discharge for the amount of such certificates as through given by the contract. In such event, the Contractor shall not be allowed any profit he may have added in the Schedule of Quantities upon such sub-contract.

f. The exercise of the option before referred to by the Contractor and the issue of Certificates, as before described to sub-Contractor direct of certificates by the Architect, shall not however relieve the Contractor from any of the liabilities in respect of insufficient, faulty or incomplete work of the sub-Contractor for which he may liable under the terms of the Contract.

11. SCHEDULE OF QUANTITIES & SUFFICIENCY OF SCHDULE OF QUANTITIES:

The Schedule of Quantities unless otherwise stated shall be deemed to have been prepared In accordance with the Standard Procedure of the Architects shall be considered to be approximate and no liability shall attach to the Architect for any error may be discovered therein. The Employer reserves the right to execute only a part or the whole or any excess thereof without assigning any reason therefore.

The Contractor shall be deemed to have satisfied himself before tendering to the correctness and sufficiency of his tender for the works and of the prices stated in the Schedule of Quantities and /or the Schedule of Rates and Prices, which rates and prices shall cover all things necessary for the completion of the works.

12. OTHER PERSONS ENGAGED BY THE EMPLOYER:

The Employer reserves the right to use the premises and may portions of the site for the execution of any work not included in the contract which he may desires to have carried out by other persons, and the contractors is to allow all reasonable facilities for the execution such work, but is not required to provided any plant or materials for the execution of such work, except by special arrangement with the Employer. (Such work shall be carried out in such a 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 be occasioned by such work)

13. EARNEST MONEY DEPOSIT & SECURITY DEPOSIT:

The tenderer will have to deposit an amount of **Rs.32,750** in the form of Bank Demand draft/Banker's Cheque only drawn in favour of **Bank of Baroda ,**

Zonal Office – Baroda payable at Vadodara. At the time of submission of tender as an Earnest Money. The Employer is not liable to pay interest on the Earnest Money. The earnest money of unsuccessful tenderer will be returned without any interest soon after the decision to award the work is taken or after the expiry of the validity period of the tender.

The successful tenderer to whom the contract is awarded will have to deposit as initial security deposit a further sum to make up 2% of the value of the accepted tender including the earnest money. The initial security deposit will have to make within 7days from the date of acceptance of the tender, failing which the Employer at his discretion may revoke the letter of acceptance and forfeit the earnest money deposit furnished along with the tender. The initial security deposit will be held by the Employer for the duration of the contract period it shall be refunded to the Contractor without any interest within 14 days after the issue of certificate of work completion.

Apart from the initial security deposit made as above retention money shall be deducted from progressive running bills @ 10% of the gross value of each running bill as per the following: till total retention amount will be 5% of contract value. 50% of the retention money shall be released with final certificate of payment after removing all his material, equipment, labour force, temporary sheds/ store from the site.

Balance retention money shall be released 14 days after completion of the defects liability period of one year from the date of work completion.

14. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY:

The Contractor shall provide everything at own cost necessary for the proper execution of works according to the true intent and meaning of the drawings, specifications and Schedule of Quantities taken together whether the same may or may not be particularly shown or described there in provided that the same can be referred there from and if the Contractor finds any discrepancy in the drawings or between the drawings, specifications and Schedule of Quantities, he shall immediately refer the same in writing to the architect, who shall decide which shall be followed and his decisions shall be final and binding on all parties.

The Contractor shall provide for himself fresh water, electricity, halting labours facility for the carrying out of the work at his own cost. The Employer shall charge the Contractor for his own unrented ground and shall on no account be responsible for the expense incurred by the Contractor for hired ground. If water from any source other than Municipal main is to be used for construction the same shall be tested at the contractors cost and a report submitted to the Architect for his approval, before such water is used for the works.

The Contractor shall supply, fix and maintain at his cost, during the execution of any works, all the necessary centering, scaffolding, staging, timbering, strutting, shoring, pumping, fencing, hoarding, watching and lighting by night as well as day required not only for the proper execution and protection for the said works, but also for the streets, collars, vaults, pavements, walls hoses, buildings and all their erections matters or things. The Contractor shall take down and remove any or all such centering, scaffolding, staging, planking, strutting, shoring etc as fully

reinstate at his own cost and make good all the matters and thins disturbed during the execution of the works to the satisfaction of the Architects.

15. SITE INSTRUCTION BOOK:

The contractor shall at his own expense keep a site instruction book at the site in which shall be entered all instructions given by the Architects or public authorities. A copy of the orders shall be sent to Architects for their confirmation within 3 days after the orders are given. The book shall not be removed from the site without the Architects' permission. Contractor will submit the photograph of work completion at different stages.

16. TIME OF COMPLETION, EXTENSION OF TIME AND PROGRESS CHART:

The Contractor shall be allowed admittance to the site on the 'Date of Commencement' stated in the Appendix, and he shall thereupon and forthwith begin the works and shall regularly proceed with and complete the same (except such painting or other decorative work as the Architect may desire to delay). On or before the 'Day of Completion' stated in the Appendix subject nevertheless the provision for extension of time hereinafter contained.

If in the opinion of the Architect the works be delayed:

a. by force majeure or

b. by reason of any exceptionally inclement weather or

d. By reason of proceedings taken or threatened by or dispute with adjoining or neighboring owners of public authorities arising, than through the Contractor's won default or

e. By the works or delays of the contractors tradesmen engaged or nominated by the Employer / Architect and not referred in the Schedule of Quantities and / or specifications or

f. By reason of the Architect's instructions as per clause 2, or

g. In consequence of the Contractor not having in due time, necessary instructions from the architect for which he shall have specifically applied in writing ahead of time, giving the Architect reasonable time to prepare such instructions, the Architects shall make a fair and reasonable extension of time for completion of the Contract works

In case of such strike or lock-out, the Contractor shall as soon as possible, give written notice thereof the Architect, but the Contractor shall nevertheless constantly use his endeavors to prevent delay and shall do all they may reasonably be required, to the satisfaction of the Architect to proceed with the work.

The Contractor on starting the works shall furnish to the Employer / Architect a PERT / CPM Programme for carrying out the work stage in the stipulated time fore the approval of Architect /Employer and follow strictly the approved time schedule incorporating charges if any, to ensure the completion of construction work in

stipulated time. A graph or chart on individual work shall be maintained showing the proportionate progress of work week by week by Architect a weekly progress report stating the number of skilled and un skilled laborers employed on the work, working hours done, quality of cement used, place, type, and quantity of work done during the period.

The Contractor must inform the Architect within 10 days in advance of all drawings and details required by him from time to time. The Contractor shall adhere to the approved program and arrange for the materials and labour etc accordingly.

Despite repeated instructions, of the Contractor fails to show proportionate progress of the work, the Architect / Employer may take suitable action and deemed fit without prejudice to any terms and conditions of the contract.

17. CERTIFICATE OF WORK COMPLETION:

The contractors shall intimate in writing to the Architect as and when the works are completed in all respects in order to enable the architect to intimate the Employer to take possession of the same. The works shall not be considered as completed, until the Architect has certified and accepted by the Employer in writing that the same have been 'Completed'. The defects liability period shall commence from the date of such work completion certificate.

18. LIQUIDATED DAMAGES:

Should the work be not completed to the satisfaction of the Architect / Employer within the stipulated period of 12 month the Contractor shall be bound to pay to the Employer, a sum calculated as given below by way of liquidated damages and not as penalty during which the works remain un-commenced or unfinished after the expiry of the completion date.1% of the estimated amount shown in the tender per week subject to a ceiling 10 % the accepted contracted sum.

19. PROTECTIVE MEASURES:

The Contractor from the time of being placed in possession of the site must make suitable arrangements for watching, lighting and protecting the work, the site and surrounding property by day, by night, on Sundays and other holidays. In case of sudden bans, political strikes special care to be taken regrading safety of work executed on site, labours and materials. Contractor shall indemnify the Employer against any possible damage to site i.e. the tile floor, walls, glass, sanitary/plumbing fittings etc along with member of the public in course of execution of the work.

20. STORAGE OF MATERIALS:

The Contractor shall provide proper arrangements and maintain proper storage and adequate protection of materials and other work that may be executed on the site including the tools and materials of sub-contractors and remove same on completion.

21. NOTICE AND PATENTS OF APPROPRIATE AUTHORITIES AND OWNERS:

The Contractor shall indemnify the Employer against all claims in respect of patent rights, royalties, and damages to building, roads or member of public in course of execution of work and shall defend all actions arising from such claims and shall keep the Employer saved harmless and indemnified in all respects from such actions, costs and expenses.

22. CLEARING SITE AND SETTING OUT WORK:

The site shown on the plan shall be cleared of all waste loose articles, and materials rubbish of all kinds. All hold or hollows whether originally existing or produced by removal or loose stone or materials shall be carefully filled-up with earth well rammed and leveled off as directed at the contractor's own cost.

The Contractor shall at his own expense, set out the works accurately in accordance with the plans and to the complete satisfaction of the Architect. The Contractor shall be solely 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 error shall appear during the progress or on completion of any part of the work, the Contractor shall at his cost rectify such error if called upon to the satisfaction of the Architects and Employer. The work shall from time to time inspected by the Architect and / or his representatives, but such inspection shall not exonerate the Contractor in any way from his obligations to remedy defects at his own cost which may be found to exist at any stage of the work or after the same is completed. The site shall be delivered in a clean neat condition as required by Architect within a period of one week after job is completed. In case of failure by the contractor, Employer, under advice of the Architect have the right to get the site cleared to his satisfaction at the risk and cost of the Contractor.

23. CONTRACTOR IMMEDIATELY TO REMOVE ALL OFFENSIVE MATTERS:

All waste loose articles, and materials rubbish of all kinds shall be disposed off as per the rules and regulations of the Local Authorities concerned at contractor's cost. The Contractor shall keep the site clean and works free from water and shall provide and maintain at his own expenses electrically to the satisfaction of Architect / Employer for the purpose, until the site/premises is handover to the Employer completed in all respects. The accumulated to the satisfaction of the Employer and the local authority and no claims will be entertained afterwards if he does to include in his rates for the purpose. The contractor will hand over the site/premises in cleaned condition and completed in all respects.

24. ACCESS TO WORKS:

The Architect, the Employer and any person authorized by them shall at all reasonable times have free access to the works and to the workshops factories or other places where materials are being prepared or constructed for the Contract and also to any place where the materials are lying or from which they are being obtained. The Contractor shall give every facility to the Architect and the Employer and their representatives if inspection and examination and test of the materials and workmanship. No person unless authorized by the Architect or the Employer, except the representatives of Public Authorities shall be allowed on the works at any time. If any work is to be done at a place other than the site of works, the

Contractor shall obtain the written permission of the Architect / Employer for doing so.

25. MATERIALS, WORKMANSHIP, SAMPLES TESTING OF MATERIALS:

All materials and workmanship shall, so far as procurable be of the respective kinds specified in the schedule of quantities and / or specifications and in accordance with the Architect's instructions and the Contractor shall be on the request if the Architect's furnish to them all invoices, accounts receipts and other vouchers to prove that the materials comply therewith. The Contractor shall at his own cost arrange for and / or carry any test of any materials which the Architect and employer may require. Any materials brought on site or incorporated in the works are found to be defective or unsound or not as per approved material with required dimensions, the Contractor shall remove the same and re-erect at his own cost. **The Contractor shall as and when directed by the Architect / Employer arrange to test materials and / or proportions of the work at site or in any approved laboratory** at his own cost in order to prove their soundness and efficiency. The Contractor shall transport all the materials from site to the approved laboratory at own cost. The Contractor shall carryout all the mandatory tests, as required.

26. REMOVAL OF IMPROPER WORK AND MATERIALS:

The Architect / Employer 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 as may be specified in order to, of any materials which in the opinion of the Architect / Employer are not in accordance with the specification or the instructions of Architect / Employer, and the substitution of proper materials and the removal and proper re-execution of any work, which has been executed with materials or workmanship, not in accordance with the drawings and specifications or instructions, and the Contractor shall forthwith carry out such orders at his own cost. In case, of default on the part on the Contractor to carry our such orders, the Employer shall have to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the Contractor, and shall recoverable from on behalf of the Employer or may deducted by the Architect from any money due or may become due to the Contractor

In view of correcting work not done in accordance with the contract, the Architect / Employer may allow such work to remain and in that case may make allowance for the difference in value together with such further allowance for damage to the Employer, as in his opinion may be reasonable.

No certificate, which may be given by Architects, shall relieve the Contractor from his liability in respect of unsound work or bad material.

27. EMPLOYER'S REPRESENTATIVE:

The Employer may appoint a supervisor or clerk of works who shall be representative of the Employer and also of the Architect. The duties of the Employer representative are to watch and supervise the works and to test any materials to be used of workmanship employed in connection with the works. He 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 works.

The contractor shall afford the Employer's representative every facility and assistance for examining the works and materials and checking the measuring time and materials. Neither the Employer's representative nor any assistant to the Architect shall have power to revoke, alter enlarge or relax the requirements of this Contract, or to Sanction any day-work, additions, alterations, deviations or omissions unless such an authority may be specially conferred by a written order of the Architect / Employer.

The Employer's Representative shall have to give notice to the Contractor or his foreman about the non-approval of any work or materials and such works shall be suspended or the use of such material should be discontinued until the decision of the Architect is obtained., the work will from time to time be examined by the Architect or the Employer's representative but such examinations shall not in any way exonerate the Contractor from the obligation to remedy defects which may be found to exist at any stage of the work of after the same is completed. Subject to the limitations of this cause, the Contractor shall take instruction from the Architect / Employer.

28. CONTRACTOR'S SUPERINTENDENCE & REPRESENTATIVE ON THE WORKS:

The Contractor shall give all necessary personal superintendence during the execution of the work and so long thereafter as the Architect any consider it necessary until the expiration of the 'Defects Liability Period' stated in clause 42. The Contractor shall meet the Architect or his representative whenever required and so informed by the Architect.

The Contractor shall maintain and be represented on site, at all times while the work is in progress, by a responsible and efficient Foreman, approved by the Architect / Employer and who must thoroughly understand all the trades entitled and be constantly in attendance while the men are at work. Any directions, explanations, instructions or notices given by the Architect / Employer to such foreman shall be deemed to the given to the Contractor and shall be binding as such on the Contractor. The Foreman shall be thoroughly conversant with the English language and should be able to read, write and speak English.

29. CONTRACTOR EMPLOYEES:

The Contractor shall employ technically qualified and competent supervisors for the work who shall be available (by turn) throughout the working hours and receive and comply with instructions of the Architect / Employer .The Contractor shall employ in connection with the works persons having the appropriate skill or ability perform their job efficiently. The Contractor shall employ local laborers on the work as Indian National shall be employed on the work.

Any laborer supplied by the Contractor to be engaged on the work on day work basis either wholly or partly under the direct order or control of the Employer or his representative shall be deemed to be a person employed by

the Contractor. The contractor shall comply with the provisions of all labour legislation including the requirements of

a. The payment of Wages Act
b. Employer's liability Act
c. Workmen's compensation Act
d. Contractor labor (Regulation & Abolition) Act, 1970 and central rules 1971
e. Apprentice Act 1961
f. Any other Act or enactment relating thereto and rules framed there under from time to time.

The Contractor shall keep the Employer saved harmless and indemnified against claims if any of the workmen and all cost and expenses may be incurred by the Employer in connection with any claim that may be made by any workman.

The Contractor shall comply at his own cost with their order of requirement of any Health Office of the State or any local authority or of the Employer regarding the maintenance of proper environmental sanitation of the area when the Contractor's laborers are housed or accommodated, for the prevention of small pox, cholera, plague, typhoid, malaria and other contagious diseases. The Contractor shall provide, maintain and keep in good sanitary condition adequate sanitary accommodation and provide facilities for pure drinking water at all times for the use of men engaged on the works and shall remove and clear away the same on completion of the works. Adequate precautions shall be taken by the Contractor to prevent nuisance of any kind on the works or the lands adjoining the same.

The Contractor shall arrange to provide first aid treatment to the laborers engaged on the work. He shall within 24 hours of to the occurrence of any accident at or about the site or in the connection with execution of the works, report such accident to the Employer and also to the competent authority where such report is required by law.

30. DISMISSAL OF WORKMEN:

The Contractor shall on the request by the Architect / Employer immediately dismiss from the works any person employed there who may, in the opinion of the Architect / Employer, be unsuitable or incompetent or who may misconduct himself and such person shall not again be employed or allowed on the works without the permission of the Architect / Employer.

31. DAMAGE TO PERSONS AND PROPERTY INSURANCE ETC.,

The Contractor shall be responsible for all injury to persons, animals or things and for all structural and decorative damage to property which may arise from operation or neglect of himself or any sub-contractor or of any of his or a sub-contractor's employees, whether such injury or damage any arise from carelessness, accident or any other cause whatever in any way connected with the carrying out of this Contract. This clause shall be held to include, interalia, any damage to buildings, whether immediately adjacent or otherwise, any damage to roads, streets, footpaths, bridges, or ways otherwise any damage caused to the buildings and works forming the subject of this Contract, by frost or other inrlement 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 injury or damage under the acts of Governments or otherwise, and also in respect of any award of compensation or damages consequent upon such claim.

The Contractor shall reinstate all damages of every sort 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.

The Contractor shall indemnify the Employer against all claims which may be made against the Employer, by any member of the public or other party, in respect of anything which may arise in respect of the works or in consequence thereof and shall at his own cost, effect and maintain until the end of defects liability period of the Contract with an approved office, a policy of Insurance in the joint names of the Employer and the Contractor against such risks and deposit such policy or polices with the Employer on the signing of the Contract. The Contractor shall also indemnify the Employer against all claims which may be made upon the Employer whether under the Workmen's compensation Act or any other statute if force during the currency of this contract or at Common Law in respect of any employee of the Contractor or of any sub-contract and shall at his own expense effect and maintain until the end of defects liability period of the Contract, with an approved office a policy of Insurance in the joint names of the Employer and the Contractor against such risks and deposit such policy or polices with the Employer from time to time, during the currency of the Contract. In default of the Contractor insuring as provided above, the Architect on behalf of the Employer may so insure and may deduct the premium paid from money due or which may become due to the Contractor.

The Contractor shall be responsible for anything which may be excluded from the Insurance Polices above referred to and also for all other damages to any property arising out of and incidental to the negligent or defective carrying out of this contract however, such damage shall be caused.

The Contractor shall also indemnify the Employer in respect of any costs, charges or expenses arising out of any claim or proceedings and also in respect of any Award of or compensation of damages arising there from.

32. CONTRACTOR'S ALL RISK POLICY (INSURANCE):

The Contractor shall within -7- days from the date of acceptance of the work insure the works at his cost and keep them insured until one month after the works are taken over by the Employer or three months after the date of completion whichever is earlier, against loss or damage by fire and usual risks other than fire against which insures generally provide cover in a CONTRACTOR'S ALL RISK POLICY, with an insurer to be approved by the Architects, in the joint names of the Employer and Contractor (the name of the former being placed first in the policy), progressively for the full amount of the Contract , in three stages, beginning with 1/3 of the Contract value, and for any further sum as called upon to do so by the Architect, with the prior written consent of the Employer, the premium of such further sum being allowed to the Contractor as an authorized extra such policy shall cover the property of the Employer only and Architects and Supervisors fees for assessing the claim and in connection with his services generally in re-instatement and shall not cover any property of the Contractor or of any sub-contractor or employee. The

Contractor shall deposit the policy and receipts for the premiums paid with the Architects within twenty-one days of the date of commencement of the work unless otherwise instructed by the Architects. In default of the Contractor insuring as provided above, the Employer or the Architect on his behalf may insure and may deduct the premium paid from any money that may be due or that may become due to the Contractor. The Contractor shall as soon as the claim under the policy is settled, or the work reinstated by the insurers should they elect to do so, proceed owth all diligence with the completion of the works in the same manner as though the fire or other such risk had not occurred and in all respects under the same conditions of Contract.

The Contractor in case of rebuilding or reinstatement after fire or other such usual risk shall be entitled to such extensions of time for completion as recommended by the Architect.

33. ACCOUNTS RECEIPTS AND VOUCHERS:

The Contractor shall upon from the request of the Architect / Employer furnish them with all the invoices, accounts receipts and other vouchers that they may require in connection with the works under this Contract. If the Contractor shall use materials less than that he is required under this Contract, the value of the difference in the quantity of the materials he was required to use and that he actually used shall be deducted from his dues. The decision of the Architect / Employer shall be final and binding on the Contractor as to the amount of materials the contractor is required to use for any work under this Contract.

34. MEASUREMENTS:

The Architect may from time to time intimate the Contractor that he requires the works measured and the Contractor shall forthwith attend or send a qualified agent to assist Architect or the Architect's representative in taking such measurements and calculations and to furnish all particulars or give all assistance required by either of them.

Should the Contractor not attend or neglect or omit to send such an agent, then the measurements taken by the Architect is approved by him shall be taken to be correct measurements. The measurements shall whenever not mentioned in the under, be taken in accordance with the Indian Standard Method of Measurements of Building works (I.S.1200-1958) and its revisions, if any.

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

All authorized extra costs, omissions and all variations made without the Architect's knowledge, if subsequently sanctioned by him in writing shall be included in such measurements.

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

35. PAYMENT:

All bills shall be prepared by the Contractor in the form prescribed by Architect / Employers. Normally one interim bill shall be prepared subject to minimum value for **work executed of as stated in these documents**. The bills in proper formats must be duly accompanied by detailed measurements in support of the quantities of work done and must show deductions for all previous payments, retention money etc. The Architect / Employer shall issue a certificate after due scrutiny of the Contractor's bill stating the amount due to the Contractor from the Employer and the Contractor shall be entitled to payment thereon within the period of honouring certificates named in these documents.

36. FINAL PAYMENT

The final bill shall be accompanied by a certificate of completion from the Architect / Employer. Payments of final bill shall be made after deduction of retention money as specified in the clause 13 of these conditions, which sum shall be refunded after the completion of defects liability period after receiving the Architect / Employer certificate that the Contractor has rectified defects to the satisfaction of the Architect / Employers. The acceptance payment of the final bill by the contractor would indicate that he will have no further claim in respect of the work executed.

37. VARIATIONS / DEVIATIONS:

The Contractor shall when directed in writing by the Architect, omit from or vary works shown upon the drawings or described in the specifications or included in the priced Schedule of Quantities, but the Contractor shall not make any alterations or additions to or omissions from the works or any deviations from the provisions of the Contract without such authorizations or directions in writing from the Architect / Employer.

No claim for extra shall be allowed unless it shall have been executed by the Authority of the Architect / employer as herein mentioned. Any such extra is hereinafter referred to as on authorised extra. No variations i.e. additions, omissions or substitutions shall vitiate the Contract.

The pries of all such additional items will be worked out on the basis of rates quoted for similar items in the contract wherever existing or on engineering rate analysis based on prevalent fair price of labour, material and other components as required.

38. SUBSTITUTIONS:

Should the Contractor desired to workmanship, he / they must obtain the approval of the Architect / employer in writing for any such substitutions well in advance. Materials designated in this specification indefinitely by such term as 'Equal' or 'Other Approved' etc.specific approval of the architect / Employers has been obtained in writing.

39. HANDOVER POSSESSION FOR OCCUPATION AND USE ON COMPLETION

The contractor shall handover possession to the Employer of the completed works in stages as and when required and directed by the Architect / Employer. The work

site till the hand over to the Employer with all required furnishing will be contractor's responsibility. The Employer will take over the possession of completed works in stages as directed by the Architect and defect liability period will commence only from the date of final handling over of all the works accordingly.

40. CLEARING THE SITE ON COMPLETION.

On completion of the works the Contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish and temporary works of any kind and leave the whole of the site and the works clean and in a workman like condition to the satisfaction of the Architect / Employers.

41. DEFECTS AFTER COMPLETION:

Any defect, shrinkage, settlement or other faults which may appear with the 'Defects Liability Period' stated in the Appendix hereto or if none is stated then within 45 days after the virtual completion of the works arising in the opinion of the Architect, from materials or workmanship not in accordance with the contract, shall upon the directions and writing of the Architect / Employer and within such reasonable time as shall be specified therein, be extended and made good by the Contractor at his own cost and the Architect / Employer shall decide that the ought to be paid for such amending and making good and in case of defaults, the Employer may employ and pay any other person to amend make good such defects, shrinkage, settlements or other fault and all damages, loss and expenses consequent therein or incidental thereto shall be made good and borne by the Contractor and such damage, loss and expenses shall be recoverable from by the Employer or may deducted by the Employer upon the Architect's certificate in writing from any money due or that may become due to the Contractor, a sum to be determined by the Architect equivalent to the cost of amending such works and in the event of the amount retained under clause 37 (certificate and payment) being insufficient, recover the balance from the Contractor.

42. CONCEALED WORK:

The Contractor shall give notice to the Architect / Employer whenever any work is to be buried in the earth, concrete or in the bodies of walls otherwise becoming inaccessible later on, in order that the work may be inspected and correct dimensions taken before such burial, in default whereof the same shall, at the option of the Architect / Employer be either opened up for measurements at the Contractor's expenses or no payment may be made for such materials. Should any dispute or difference arise after the execution of any work as to measurements etc., or other matters which cannot be conveniently tested or checked, the notes of the Architect / employer shall be accepted as correct and binding on the contractor.

43. IDLE LABOUR:

Whatever the reasons may be, no claim for idle labour, additional establishment cost of hire and labour charges of tools and plants would be entertained under any circumstances**.**

44. SUSPENSION OF WORKS:

If the Contractor, except on account of any legal restraint upon the Employer preventing the continuance of the works, or on account of any of the causes mentioned in the clause 'Extension of Time' or in the case or certificate being withheld of not paid when due, shall suspend works or in the opinion of the Architects, shall neglect of fail to proceed with due diligence in the performance of his part of the contract or if he shall more than once make default in the respects mentioned in clause (removal of improper work and materials), the employer through the architect shall have the power to give notice in writing to the Contractor requiring that the works be provided within a reasonable manner, and with reasonable dispatch, such notice shall not be unreasonably given and must signify that it purports to be a notice under the provisions of this clause and must specify the acts or defaults on the part of the Contractor upon which it is based. After such notice shall have given, the Contractor shall not be liberty to remove from the site of works, or from any ground contiguous thereto, any plant or materials belonging to the him which shall have been placed thereon for the purpose of work, and the Employer shall have lien upon such plants and materials to subsists from date of such notice being given until the notice shall not under complied with. Provided always that such lie shall not under any circumstance subsist after the expiration of 30 (thirty) days from the date of such notice given, unless the Employer shall have entered upon and taken possession of the works and site as hereinafter provided.

If the Contractor shall fail for seven days after such notice has given, to proceed with the works as therein prescribed, the Employer may enter upon and take possession of the works and site, and of all such plants and materials thereon intended to be used for the works, and the Employer shall retain and held a lien upon all such plants and materials until the work shall have been completed under powers hereinafter conferred upon him.

If the Employer shall exercise the above power, he may engage another person to complete the works and exclude the Contractor, his agents and servants from entry upon or access to the same, except that the Contractor or any person appointed in writing may have access at all times during the progress of the works to inspect, survey and measure the works. Such written appointments or a copy thereof shall be delivered to the Architects before the person appointed comes on to the works and the Employer shall take such steps as in the opinion of the architect may reasonably necessary for completing the works, without undue delay or expenses using for that purpose the plant and materials above mention in so far as they are suitable and adopted to such use.

Upon the completion of the works, the architects shall certify the amount of the expenses properly incurred consequent on and incidental to the default of the Contractor as aforesaid and in completing the works by other persons.

Should the amount to certified as the expenses properly incurred be less than amount which should have been due to the Contractor upon the completion of the works by him, the difference shall be paid to the Contractor by the employer, should the amount of the former exceed the latter, the difference shall be paid by the Contractor to the Employer. The Employer shall not be liable to make any further payments or compensations to the contractor for or on account of the proper use of the plant for the completion of the works under the provision herein before mentioned other than such payments as is included in the contract.

After the works shall have been completed by persons other than the Contractor under provisions hereinbefore contained, the Architect shall give notice to the Contractor to remove his plant and all surplus materials as may not have been used in the completion of the works from the site, if such plant and materials are not removed within a period of 14 days after the notice shall have been given the Employer may remove and sell the same, holding the proceeds less the cost of the removal and sale, to the credit of the Contractor. The Employer shall not be responsible for any loss sustained by the Contractor from the sale of the plant in the event of the contractor not removing it after notice.

45. TERMINATION OF CONTRACT BY THE EMPLOYER:

If the Contractor being an individual or a firm, commit any act of insolvency, or shall be adjudged an insolvent or being on incorporated company shall have an order for compulsory winding up made against it or pass on effective resolution for winding up voluntary or subject to the supervision of the court and if the Official. Assignee of 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 that he is able to carry out and fulfill the contract, and to give security thereof, if so required by the Architect.

Or if the Contractor (whether an individual, firm or incorporated Co.) shall suffer execution to be issued.

Or shall suffer any payment under this Contract~~or~~ to be attached by or on behalf of any of the creditors of the Contractor.

Or shall assign or subject this contract without the consent in writing of the Architects / Employer first obtained.

Or shall charge or encumber this Contract or any payments due or which may be due to the Contract there under.

Or 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 14 days after receiving from the Architect written notice to protect, 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 completed within the time agreed upon, or
d. has failed to remove materials from the site or to pull down and replace work for 7 days after written notice shall have been given to the contractor requiring the Contractor to observe or perform the same, or
e. has neglected persistently to observed and perform all or any of the acts, matters or things by this contract to be observed and performed by the Contractor for 7 days after written notice shall have been requiring him to observe and perform the same, or
f. has to the determinant of good workmanship or in defiance of the Architect's instructions to the contrary sublet any part of the Contract.

Then and in any of the said cases the Employer with the written consent of the Architect may not withstanding any previous waiver, after giving 7 days notice in written to the Contractor, determine the Contract, but without hereby affecting the powers of the Architect to continue in force as full as if the contract had been so determined and as if the works subsequently executed have been executed by or on behalf of the Contractor

And further, the Employer under instructions of the Architect, by his Agents, or servants may enter upon take possession of the works and all plants, tools, scaffoldings, sheds, machinery, steam and other power utensils and materials laying up on 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 in carrying on and completing the works or by employing any other contractors or other person to complete the works and the Contractors or the persons to complete the works and the contractor shall not in any way interrupt or do not act, matter or thin to prevent or hinder such other contractor or other persons or person employed for completing and finishing or using the materials and plant for the works. When the works shall be completed of as soon thereafter as convenient, the Architect 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 there of by him, the Employer shall sell the same by publication and shall give credit to the Contractor for the amount realized. The Architect shall thereafter ascertain and certify in writing under his hand when (if thing) when shall be due of payable to or by the Employer for the value of the said plant and materials so taken a possession of by the expense or loss which the Employer shall been owing to the Contractor and the amount which shall be so certified shall thereupon the paid by the Employer to the Contractor or by the Employer as the case may be.

46. ARBITRATION

All disputes or differences of any kind whatsoever which shall at any time arise between the parties here to touching or concerning the works or the execution or maintenance there of this contract or the rights touching or concerning the works or the execution or maintenance thereof this contract or the construction remaining operation or effect there of or to the rights or liabilities of the parties or arising out of or in relation thereof whether during or after determination, foreclosure or breach of the contract (other than those in respect of which the decision of any person is by the contract expressed to be final and binding) shall after written notice by either party to the contract to the either of them and to the appointing Authority who shall be appointed for this purpose by the employer be referred for adjudication to a sole arbitrator to be appointed as hereinafter provided.

a. For the purpose of appointing the sole arbitrator referred to above, the Appointing Authority will send within thirty days of receipt by him of the written notice aforesaid to the contractor a panel of three names of persons who shall be presently unconnected with the organization for which the work is executed.

b. The Contractor shall on receipt by him of the names as aforesaid, select any one of the persons named to the appointed as a sole arbitrator and communicate his name to be appointed as a sole arbitrator and communicate his name to the Appointing Authority with in thirty days of

receipt of the names by him. The Appointing Authority shall there upon without any delay appoint the said persons as the sole arbitrator. If the contractor fails to communicate such selection as provided above within the period specified, the Appointing Authority should make the selection and appoint the selected person as the sole arbitrator.

c. If the Appointing Authority fails to send to the Contractor the panel of three names as aforesaid with in the period specified, the Contractor shall send to the Appointing Authority a panel of three months of persons who shall be unconnected with either party. The Appointing Authority shall on receipt by him of the names as the sole arbitrator. If the Appointing Authority fails to select the person and appoint him as the sole arbitrator within thirty days of receipt by him of the panel and inform the Contractor accordingly, the contractor shall be entitled to appoint one of the persons from the panel as the sole arbitrator and communicate his name to the Appointing Authority.

d. If the Arbitrator so appointed is unable or unwilling to act or resign from his appointment or vacates his office due to any reasons whatsoever another sole arbitrator shall be appointed as aforesaid.

e. The work under the Contract, shall how ever, continue during the arbitration proceedings and no payment due or payable to the Contractor shall be with held on account of such proceeding.

f. The arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties fixing the date of first hearing. The arbitrator may from time to time, with the consent of the parties, enlarge the time making and publishing the award.

g. The arbitrator shall give from time to time, with the consent of the parties, enlarge the time for making and publishing the award.

h. The arbitrator shall give a separate award in respect of each dispute or difference referred to him The Arbitrator shall decide each dispute in accordance with the terms of the contract and give a reasoned award. The venue of arbitration shall be such place as may be fixed by the Arbitrator in his sole direction.

i. 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 costs referred and of the award including the fees, if any, of the Arbitrator who may direct any by whom and in what manner, such costs or any part there of shall be paid and may fix or settle the amount of costs to be so paid.

j. The award of the Arbitrator shall be final and binding on both the parties. Subject aforesaid the provisions of the Arbitration Act 1999 or any statutory modifications of reenactment thereof and the rules made there under, and for the time being in force, shall apply to the arbitration processing under this clause.
The place for arbitration shall be in Vadodara, Gujarat

47. WORK EXECUTION, DIMENSION & SUPERVISION

The execution of work (timings) has to carried out the work in the site, partly day time and / or partly night time and / or partly day and partly night time to the best convenience of the occupant and the building society. More labour need to deployed during holidays and Sundays with suitable pre planning to carryout more work to the best convenience of the occupants. The bank will not pay any idle wages or over time wages or extra charges on any reason what so ever. Hence contractor may factor these aspects while quoting the rates in the tender. Figures, dimensions, are in all case to be accepted preferences to scaled sizes. Large-scale details take precedence over small scale drawings. In case of discrepancy, the contractor is to ask for a clarification before proceeding with the work. Accordingly if any work is executed without prior clarification it is liable to be rejected and shall not be paid for.The contractor shall appoint at his own cost competent and adequate number of qualified & experienced at site, for (1) joint measurements and preparations of bills, (2) for testing materials at site and outside laboratory, (3) for other general supervision. Their appointment shall be approved by the Employer / Architect.

48. PROCUREMENT OF MATERIALS

Contractor shall procure all the materials for the work from the open market. Time is the essence of the contract. Acceptance of the completion date by the contractor shall mean that he has taken into consideration the availability of all material of approved make and quality in sufficient quantities at site to enable him to complete the entire work in the stipulated period.

Contractor will get sample of all materials approved by the Employer / Architect before placing order / purchase / procurement. They shall conform to I.S. codes and or tender specification as applicable.

For all materials the contractor shall quote for the best quality of the materials of Bank's approved make / source or supply and it will be got approved by Employer / Architect before procurement.

In case sufficient quantities of approved quality materials from approved source are not available in time, contractor may have to procure the same for neighboring area with longer leads as required and directed at no extra cost. The material will be, however as per relevant I.S code as and wherever applicable.

49. UNFIXED MATERIALS

When any materials intended for the works shall have been placed at site by the Contract, such material shall not be removed there from (except for the purposes of being used on the works) without the written authority of the Employer / Architect and when the contractor shall have received payment in respect of any certificate in which the architect shall have stated that he has taken in to account to value of such unfixed materials on the works such material shall become the property of the Employer and the contractor shall be liable for any loss or damage to any such materials.

50. CUSTODY AND SECURITY OF MATERIALS: The contractors shall be responsible for the Custody and security of all materials and equipment at site and

he will provide full time watchman / watchmen to lock after his materials, stores equipment etc.

51. ARCHITECT'S DRAWINGS AND INSTRUCTIONS

A set of major drawings along with the contract documents shall be provided to the contractor. For any clarifications or further drawings are required by the contract, during or before the start of work, the Contractor shall inform the Architects in writing to provide the same. Working details will be given to the contractor from time to time during the progress of work as and when required. Incase of other drawing is required by the contractor he will give a minimum ten days notice to the Employer / Architect.

52. FAILURE BY CONTRACTOR COMPLY WITH ARCHITECT EMPLOYER'S INSTRUCTIONS

If the contractor after receipt of written notice from the architect requiring compliance with such further drawings and / or Architects instruction, fails within seven days to comply with the same, the Employer / Architect may employ and pay other persons to execute any such work whatsoever as may be necessary to give effect thereto and all cost incurred in connection there with shall be recoverable from the contractors by the Employer on a Certificate by the Architect as a debit or may be deducted by him from any money due or which become due to the Contractors.

53. INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

The contractor shall furnish the Employer / Architect the following:

a. Detailed industrial statistics regarding the labor employed by him etc.

b. The Power of Attorney, name and signature of his authorized representative who will be in charges for the execution of work, if applicable or consented by the employer.

c. The list of technically qualified persons employed by him for the execution of this work.

d. The total quantity and quality of materials used for the works.

e. The list of plant and machinery employed for this work.

54. ARCHITECT'S DELAY IN PROGRESS

The Architect may delay the progress of the works in case of rains or otherwise, without vitiating the contract and grant such extension of time with the approval of the employer for the completion of the contract as he may think proper and sufficient in consequences of such delay, and the contractor, shall not make any claim for compensation or damage in relation there to.

55. DELAYED PAYMENTS

Any amounts payable by the Employer to the contractor in pursuance of any Certificate given by the Architect hereunder shall, if not paid within the 'Period of honoring of Certificate' no interest paid by the Employer.

56. FORCE MAJEURE

Neither party shall be held responsible by the other for breach of any condition of this agreement attributable to any 'Act of God' Act of state, lockout of control or any other reason, beyond the control of the parties and any breach of clauses arising from much force majeure conditions as aforesaid shall not be regarded as a breach of the provision of this Agreement

57. INCOME-TAX, TDS AND WORKS CONTRACT TAX

Income Tax, TDS and Works Contract Tax (if applicable), GST TDS shall be deducted at source by the client from the contractor' interim and final bill payments as per Statutory Regulations.

58. SITE MEETINGS

A senior representative of the contractor shall attend weekly meetings at works site and in addition meetings as and when arranged by employer / Architect to discuss the progress of the work and sort out problems, if any and ensure that the work is completed in the stipulated time.

59. WORKING HOURS

Since the site is with all Working Departments, the Contractor has to execute the work judiciously without disturbance to the functioning of the Bank during the day and after working hours, nights & on holidays. No extra payments will be made for the work being done during odd hours.

60. ACTION WHERE THERE IS NO SPECIFICATION

In case of any class of work for which is there is no specification mentioned, the same will be carried out in accordance with the Indian Standards Specifications subject to the approval of the Employer / Architect.

61. REPORTING OF ACCIDENT TO

The contractor shall be responsible for the safety of persons employed by him on the works and shall reports serious accidents to any of them whenever and wherever occurring on the works to employer who shall make every arrangement to render all possible assistance. This shall be without prejudice to the responsibility of the contractor under the Insurance Clause of the general conditions. Contractor shall take all precaution detailed in the safety code attached separately.

62. TYPOGRAPHICAL CLERICAL ERRORS

The Employer / Architect clarification regarding partially omitted particulars of typographical or Clericals errors shall be final and binding on the contractors.

63. WORK PERFORMED AT CONTRACTOR'S RISK

The contractor shall take all precautions necessary and shall be responsible for the safety of the work and shall maintain all lights, goods, signs, temporary passages or other protection necessary for the purpose. All works shall be done bye the contractor's risk and if any loss or damage shall result from fire or from others cause, the contractor shall promptly repaid or replace such loss or damage free from all expenses to the employer.

The contractor shall be responsible for any loss or damage to materials, tools or other articles used held for use in connection with the work. The work shall be carried on to completion without interferences with the operations of existing machinery or equipment, if any.

64. CARRYING OUT PART OF WORK AT THE RISK AND COST OF THE CONTRACTOR

64.1. IF THE CONTRACTOR

(I) AT ANY TIME MAKES DEFAULT DURING THE CURRENCY OF WORK OR DOES NOT EXECUTE ANY PART OF THE WORK WITH DUE DILIGENCE AND CONTINUES TO DO SO EVEN AFTER A NOTICE IN WRITING OF 7 DAYS IN THIS RESPECT FROM THE EMPLOYER/ARCHITECT'; OR

(II) COMMITS DEFAULT IN COMPLYING WITH ANY OF THE TERMS AND CONDITIONS OF THE CONTRACT AND DOES NOT REMEDY IT OR TAKES EFFECTIVE STEPS TO REMEDY IT WITHIN 7 DAYS EVEN AFTER A NOTICE IN WRITING IS GIVEN IN THAT BEHALF BY THE EMPLOYER/ARCHITECT'; OR

(III) FAILS TO COMPLETE THE WORK (S) OR ITEMS OF WORK WITH INDIVIDUAL DATES OF COMPLETION, ON OR BEFORE THE DATE (S) SO DETERMINED, AND DOES NOT COMPLETE THEM WITHIN THE PERIOD SPECIFIED IN THE NOTICE GIVEN IN WRITING IN THAT BEHALF BY THE EMPLOYER/ARCHITECT'.

64.2. THE EMPLOYER/ARCHITECT' WITHOUT INVOKING ACTION MAY, WITHOUT PREJUDICE TO ANY OTHER RIGHT OR REMEDY AGAINST THE CONTRACTOR WHICH HAVE EITHER ACCRUED OR ACCRUE THEREAFTER TO EMPLOYER/BANK, BY A NOTICE IN WRITING TO TAKE THE PART WORK/ PART INCOMPLETE WORK OF ANY ITEM (S) OUT OF HIS HANDS AND SHALL HAVE POWERS TO:

(A) TAKE POSSESSION OF THE SITE AND ANY MATERIALS, CONSTRUCTIONAL PLANT, IMPLEMENTS, STORES, ETC., THEREON; AND/ OR

(B) CARRY OUT THE PART WORK/ PART INCOMPLETE WORK OF ANY ITEMS (S) BY ANY MEANS AT THE RISK AND COST OF THE CONTRACTOR.

64.3. THE EMPLOYER/ARCHITECT' SHALL DETERMINE THE AMOUNT, IF ANY, IS RECOVERABLE FROM THE CONTRACTOR FOR COMPLETION OF THE PART WORK/ PART INCOMPLETE WORK OF ANY ITEM (S) TAKEN OUT OF HIS HANDS AND EXECUTE AT THE RISK AND COST OF THE CONTRACTOR, THE LIABILITY OF CONTRACTOR ON ACCOUNT OF LOSS OR

DAMAGE SUFFERED BY BANK BECAUSE OF ACTION UNDER THIS CLAUSE SHALL NOT EXCEED 10% OF THE TENDERED VALUE OF THE WORK.

64.4. IN DETERMINING THE AMOUNT, CREDIT SHALL BE GIVEN TO THE CONTRACTOR WITH THE VALUE OF WORK DONE IN ALL RESPECT IN THE SAME NUMBER AND AT THE SAME RATE AS IF IT HAD BEEN CARRIED OUT BY THE ORIGINAL CONTRACTOR UNDER THE TERMS OF HIS CONTRACT, THE VALUE OF CONTRACTOR'S MATERIALS TAKEN OVER AND INCORPORATED IN THE WORK AND USE OF PLANT AND MACHINERY BELONGING TO THE CONTRACTOR. THE CERTIFICATE OF THE EMPLOYER/ARCHITECT' AS TO THE VALUE OF WORK DONE SHALL BE FINAL AND CONCLUSIVE AGAINST THE CONTRACTOR PROVIDED ALWAYS THAT ACTION UNDER THIS CLAUSE SHALL ONLY BE TAKEN AFTER GIVING NOTICE IN WRITING TO THE CONTRACTOR. PROVIDED ALSO THAT IF THE EXPENSES INCURRED BY THE EMPLOYER/BANK ARE LESS THAN THE AMOUNT PAYABLE TO THE CONTRACTOR AT HIS AGREEMENT RATES, THE DIFFERENCE SHALL NOT BE PAYABLE TO THE CONTRACTOR.

64.5. ANY EXCESS EXPENDITURE INCURRED OR TO BE INCURRED BY EMPLOYER/BANK IN COMPLETING THE PART WORK/ PART INCOMPLETE WORK OF ANY ITEM (S) OR THE EXCESS LOSS OF DAMAGES SUFFERED OR MAY BE SUFFERED BY EMPLOYER/BANK AS AFORESAID AFTER ALLOWING SUCH CREDIT SHALL WITHOUT PREJUDICE TO ANY OTHER RIGHT OR REMEDY AVAILABLE TO EMPLOYER/BANK IN LAW OR PER AS AGREEMENT BE RECOVERED FROM ANY MONEY DUE TO THE CONTRACTOR ON ANY ACCOUNT, AND IF SUCH MONEY IS INSUFFICIENT, THE CONTACTOR SHALL BE CALLED UPON IN WRITING AND SHALL BE LIABLE TO PAY THE SAME WITHIN 30 DAYS.

64.6. IF THE CONTRACTOR FAILS TO PAY THE REQUIRED SUM WITHIN THE AFORESAID PERIOD OF 30 DAYS, THE ENGINEER-IN-CHARGE SHALL HAVE THE RIGHT TO SELL ANY OR ALL OF THE CONTRACTORS' UNUSED MATERIALS, CONSTRUCTIONAL PLANT, IMPLEMENTS, TEMPORARY BUILDING AT SITE ETC. AND ADJUST THE PROCEEDS OF SALE THEREOF TOWARDS THE DUES RECOVERABLE FROM THE CONTACTOR UNDER THE CONTRACT AND IF THEREAFTER THERE REMAINS ANY BALANCE OUTSTANDING, IT SHALL BE RECOVERED IN ACCORDANCE WITH THE PROVISIONS OF THE CONTRACT.

64.7. IN THE EVENT OF THE ABOVE COURSE BEING ADOPTED BY THE EMPLOYER/ARCHITECT', THE CONTRACTOR SHALL HAVE NO CLAIM TO COMPENSATION FOR ANY LOSS SUSTAINED BY HIM BY REASON OF HIS HAVING PURCHASED OR PROCURED ANY MATERIALS OR ENTERED INTO ANY ENGAGEMENTS OR MADE ANY ADVANCE ON ANY ACCOUNT OR WITH A VIEW TO THE EXECUTION OF THE WORK OR THE PERFORMANCE OF THE CONTRACT

64.8. WHEN THE CONTRACT CAN BE DETERMINED

64.8.1 SUBJECT TO OTHER PROVISIONS CONTAINED IN THIS CLAUSE, THE EMPLOYER/ARCHITECT'MAY, WITHOUT PREJUDICE TO HIS ANY OTHER RIGHTS OR REMEDY

AGAINST THE CONTRACTOR IN RESPECT OF ANY DELAY, INFERIOR WORKMANSHIP, ANY CLAIMS FOR DAMAGES AND/OR ANY OTHER PROVISIONS OF THIS CONTRACT OR OTHERWISE, AND WHETHER THE DATE OF COMPLETION HAS OR HAS NOT ELAPSED, BY NOTICE IN WRITING ABSOLUTELY DETERMINE THE CONTRACT IN ANY OF THE FOLLOWING CASES:

(I) IF THE CONTRACTOR HAVING BEEN GIVEN BY THE EMPLOYER/ARCHITECT'A NOTICE IN WRITING TO RECTIFY, RECONSTRUCT OR REPLACE ANY DEFECTIVE WORK OR THAT THE WORK IS BEING PERFORMED IN AN INEFFICIENT OR OTHERWISE IMPROPER OR UN-WORKMAN LIKE MANNER SHALL OMIT TO COMPLY WITH THE REQUIREMENT OF SUCH NOTICE FOR A PERIOD OF SEVEN DAYS THEREAFTER.

(II) IF THE CONTRACTOR HAS, WITHOUT REASONABLE CAUSE, SUSPENDED THE PROGRESS OF THE WORK OR HAS FAILED TO PROCEED WITH THE WORK WITH DUE DILIGENCE SO THAT IN THE OPINION OF THE EMPLOYER/ARCHITECT'HE WILL BE UNABLE TO SECURE COMPLETION OF THE WORK BY THE DATE FOR COMPLETION AND CONTINUES TO DO SO AFTER A NOTICE IN WRITING OF SEVEN DAYS FROM THE EMPLOYER/ARCHITECT'.

(III) IF THE CONTRACTOR FAILS TO COMPLETE THE WORK WITHIN THE STIPULATED DATE OR ITEMS OF WORK WITH INDIVIDUAL DATE OF COMPLETION, IF ANY STIPULATED, ON OR BEFORE SUCH DATE(S) OF COMPLETION AND DOES NOT COMPLETE THEM WITHIN THE PERIOD SPECIFIED IN A NOTICE GIVEN IN WRITING IN THAT BEHALF BY THE EMPLOYER/ARCHITECT'.

(IV) IF THE CONTRACTOR PERSISTENTLY NEGLECTS TO CARRY OUT HIS OBLIGATIONS UNDER THE CONTRACT AND/ OR COMMITS DEFAULT IN COMPLYING WITH ANY OF THE TERMS AND CONDITIONS OF THE CONTRACT AND DOES NOT REMEDY IT OR TAKE EFFECTIVE STEPS TO REMEDY IT WITHIN 7 DAYS AFTER A NOTICE IN WRITING IS GIVEN TO HIM IN THAT BEHALF BY THE EMPLOYER/ARCHITECT'.

(V) IF THE CONTRACTOR SHALL OFFER OR GIVE OR AGREE TO GIVE TO ANY PERSON IN EMPLOYER/BANK SERVICE OR TO ANY OTHER PERSON ON HIS BEHALF ANY GIFT OR CONSIDERATION OF ANY KIND AS AN INDUCEMENT OR REWARD FOR DOING OR FORBEARING TO DO OR FOR HAVING DONE OR FORBORNE TO DO ANY ACT IN RELATION TO THE OBTAINING OR EXECUTION OF CONTRACT.

(VI) IF THE CONTRACTOR SHALL ENTER INTO A CONTRACT WITH EMPLOYER/BANK IN CONNECTION WITH WHICH COMMISSION HAS BEEN PAID OR AGREED TO BE PAID BY HIM OR TO HIS KNOWLEDGE, UNLESS THE PARTICULARS OF ANY SUCH COMMISSION AND THE TERMS OF PAYMENT THEREOF HAVE BEEN PREVIOUSLY DISCLOSED IN WRITING TO THE EMPLOYER/ARCHITECT'.

(VII) IF THE CONTRACTOR SHALL OBTAIN A CONTRACT WITH EMPLOYER/BANK AS A RESULT OF WRONG TENDERING OR OTHER NON-BONA-FIDE METHODS OF COMPETITIVE TENDERING OR COMMITS BREACH OF INTEGRITY PACT.

Seal & sign of the bidder

(VIII) IF THE CONTRACTOR BEING AN INDIVIDUAL, OR IF A FIRM, ANY PARTNER THEREOF SHALL AT ANY TIME BE ADJUDGED INSOLVENT OR HAVE A RECEIVING ORDER OR ORDER FOR ADMINISTRATION OF HIS ESTATE MADE AGAINST HIM OR SHALL TAKE ANY PROCEEDINGS FOR LIQUIDATION OR COMPOSITION (OTHER THAN A VOLUNTARY LIQUIDATION FOR THE PURPOSE OF AMALGAMATION OR RECONSTRUCTION) UNDER ANY INSOLVENCY ACT FOR THE TIME BEING IN FORCE OR MAKE ANY CONVEYANCE OR ASSIGNMENT OF HIS EFFECTS OR COMPOSITION OR ARRANGEMENT FOR THE BENEFIT OF HIS CREDITORS OR PURPORT SO TO DO, OR IF ANY APPLICATION BE MADE UNDER ANY INSOLVENCY ACT FOR THE TIME BEING IN FORCE FOR THE SEQUESTRATION OF HIS ESTATE OR IF A TRUST DEED BE EXECUTED BY HIM FOR BENEFIT OF HIS CREDITORS.

(IX) IF THE CONTRACTOR BEING A COMPANY SHALL PASS A RESOLUTION OR THE COURT SHALL MAKE AN ORDER THAT THE COMPANY SHALL BE WOUND UP OR IF A RECEIVER OR A MANAGER ON BEHALF OF ACCREDIT OR SHALL BE APPOINTED OR IF CIRCUMSTANCES SHALL ARISE WHICH ENTITLE THE COURT OR THE CREDITOR TO APPOINT A RECEIVER OR A MANAGER OR WHICH ENTITLE THE COURT TO MAKE A WINDING UP ORDER.

(X) IF THE CONTRACTOR SHALL SUFFER AN EXECUTION BEING LEVIED ON HIS GOODS AND ALLOW IT TO BE CONTINUED FOR A PERIOD OF 21 DAYS.

(XI) IF THE CONTRACTOR ASSIGNS, TRANSFERS, SUBLETS (ENGAGEMENT OF LABOUR ON A PIECE-WORK BASIS OR OF LABOUR WITH MATERIALS NOT TO BE INCORPORATED IN THE WORK, SHALL NOT BE DEEMED TO BE SUBLETTING) OR OTHERWISE PARTS WITH OR ATTEMPTS TO ASSIGN, TRANSFER, SUBLET OR OTHERWISE PARTS WITH THE ENTIRE WORKS OR ANY PORTION THEREOF WITHOUT THE PRIOR WRITTEN APPROVAL OF THE EMPLOYER/ARCHITECT'.

WHEN THE CONTRACTOR HAS MADE HIMSELF LIABLE FOR ACTION UNDER ANY OF THE CASES AFORESAID, THE EMPLOYER/ARCHITECT' ON BEHALF OF THE EMPLOYER/BANK WITH THE APPROVAL OF THE COMPETENT AUTHORITY MENTIONED IN SCHEDULE 'B' SHALL HAVE POWERS:

(A) TO DETERMINE THE CONTRACT AS AFORESAID (OF WHICH TERMINATION NOTICE IN WRITING TO THE CONTRACTOR UNDER THE HAND OF THE ENGINEER-IN-CHARGE SHALL BE CONCLUSIVE EVIDENCE). UPON SUCH DETERMINATION, THE EARNEST MONEY DEPOSIT, SECURITY DEPOSIT ALREADY RECOVERED AND PERFORMANCE GUARANTEE UNDER THE CONTRACT SHALL BE LIABLE TO BE FORFEITED AND SHALL BE ABSOLUTELY AT THE DISPOSAL OF THE EMPLOYER/BANK.

(B) AFTER GIVING NOTICE TO THE CONTRACTOR TO MEASURE UP THE WORK OF THE CONTRACTOR AND TO TAKE SUCH WHOLE, OR THE BALANCE OR PART THEREOF, AS SHALL BE UN-EXECUTED OUT OF HIS HANDS AND TO GIVE IT TO ANOTHER CONTRACTOR TO COMPLETE

THE WORK. THE CONTRACTOR, WHOSE CONTRACT IS DETERMINED AS ABOVE, SHALL NOT BE ALLOWED TO PARTICIPATE IN THE TENDERING PROCESS FOR THE BALANCE WORK.

IN THE EVENT OF ABOVE COURSES BEING ADOPTED BY THE EMPLOYER/ARCHITECT', THE CONTRACTOR SHALL HAVE NO CLAIM TO COMPENSATION FOR ANY LOSS SUSTAINED BY HIM BY REASONS OF HIS HAVING PURCHASED OR PROCURED ANY MATERIALS OR ENTERED INTO ANY ENGAGEMENTS OR MADE ANY ADVANCES ON ACCOUNT OR WITH A VIEW TO THE EXECUTION OF THE WORK OR THE PERFORMANCE OF THE CONTRACT. AND IN CASE ACTION IS TAKEN UNDER ANY OF THE PROVISION AFORESAID, THE CONTRACTOR SHALL NOT BE ENTITLED TO RECOVER OR BE PAID ANY SUM FOR ANY WORK THEREOF OR ACTUALLY PERFORMED UNDER THIS CONTRACT UNLESS AND UNTIL THE EMPLOYER/ARCHITECT'HAS CERTIFIED IN WRITING THE PERFORMANCE OF SUCH WORK AND THE VALUE PAYABLE IN RESPECT THEREOF AND HE SHALL ONLY BE ENTITLED TO BE PAID THE VALUE SO CERTIFIED.

65. WORK NOT TO BE STOPPED

THE CONTRACTOR EXPRESSLY AGREES THAT THE EVENT THERE ARISE ANY KIND OF DISPUTE / DISPUTES OR THE MATTER OF DISPUTE / DISPUTES IS REFERRED TO ARBITRATION, THE CONTRACTOR SHALL AT NO STAGE STOP OR SLOW DOWN THE WORK ON THIS EXCUSE AND SHALL PROCEED DILIGENTLY TO COMPLETE AND HAND OVER ALL WORKS AS PER CONTRACT WITHIN THE SCHEDULED COMPLETION PERIOD.

66. DAMAGE TO WORKS BY EXCEPTED RISKS

IF THE WORKS OR TEMPORARY WORKS OR ANY MATERIALS (WHETHER FOR THE FORMER OR THE LATTER) BROUGHT TO SITE SHALL SUSTAIN DESTRUCTION OR DAMAGE BY REASONS OF ANY OF THE SAID EXCEPTED RISKS, THE CONTRACTOR SHALL BE ENTITLED TO PAYMENT FOR ANY PERMANENT OR TEMPORARY WORKS AND FOR ANY MATERIALS SO DESTROYED OR DAMAGED AND / OR SHALL BE PAID BY THE EMPLOYER THE COST OF MAKING GOOD SUCH MATERIALS SO FAR AS MAY BE NECESSARY FOR THE COMPLETION OF THE WORKS ON A PRIME COSTS BASIS AS THE EMPLOYER/ARCHITECT MAY CERTIFY TO BE REASONABLE.

FORM OF AGREEMENT

ARTICLES OF AGREEMENT MADE THIS _____ DAY OF _____ YEAR 2024 BETWEEN **BANK OF BARODA, ZONAL OFFICE – BARODA, BARODA BHAVAN BUILDING, 5TH FLOOR, RC DUTT ROAD, ALKAPURI, VADODARA- 390007, GUJARAT, INDIA.** (HEREINAFTER REFERRED TO AS THE "EMPLOYER /OWNER" WHICH EXPRESSION SHALL, UNLESS EXCLUDED BY OR REPUGNANT TO THE CONTEXT, INCLUDES ITS SUCCESSORS AND ASSIGNS) OF THE ONE PART AND _____ OF _____(HEREINAFTER REFERRED TO AS "CONTRACTOR" UNLESS EXCLUDED BY OR REPUGNANT TO THE CONTEXT, INCLUDES ITS SUCCESSORS AND ASSIGNS) OF THE OTHER PART.

WHEREAS the Employer intends to carry out of furnishing to Bank of Baroda Baroda Main Branch, Mandvi, Vadodara, Gujarat (Herein referred to as "Project").

AND WHEREAS the Employer in order to effectively carry out the said works has engaged M/s Bimal Talati, Ahmedabad (Hereinafter referred to as "Architects") to prepare plans, drawings and specifications describing the works to be executed by the contractors, namely, interior etc. for the project, to open tenders received at the office of the Employer, to scrutinize and recommend to the Employer the name(s) of the Contractor(s) from whom tenders were received and recommended to the Employer for the issue of work order to the contractor.

AND WHEREAS for the purpose of the said project, the Employer invited sealed tenders from experienced, resourceful and bonafide contractors vide his Notice Inviting Tender (NO._____dated. _____

WHEREAS the contractor submitted his Tender Documents containing General Notes, General Conditions of the Contract, Technical Specifications and Schedule of

Quantities etc. for the works, prepared with the assistance of Consultants (Hereinafter collectively referred to as the "said conditions"), duly signed on each page as a token of his acceptance of the same, along with requisite Earnest Money Deposit of _____(Copy enclosed Vide Annexure-1).

AND WHEREAS out of the Tenders received, the Tender of the contractor was found to be most suitable for the project.

AND WHEREAS the Employer/Architect has accordingly issued the work order (NO.___dt._____) to the contractor subject to his furnishing the requisite Security Deposit (Copy enclosed Vide Annexure-II).

AND WHEREAS the Contractor has accepted the aforesaid Work Order vide his letter of acceptance NO._____dt._____(Copy enclosed Vide Annexure III) and has also deposited with the Employer a sum of Rs._____ which with the Earnest Money of RS._____forms the requisite Security Deposit @ 2 % of the accepted Tender Value of Rs._____.

AND WHEREAS the Employer has caused the plans, drawings, specifications, schedule of quantities etc. relating to the project at the work site at to be issued to the Contractor.

NOW, therefore, it is hereby agreed to and between the parties as follows:

Contract documents

The following documents shall constitute the Contract Documents.
a) This Article of Agreement.
b) Tender submitted by the Contractor included the N.I.T and Tender Documents
c) All correspondence between the Bank/Architects and the Contractor from the date of issue of N.I.T and the date of issue of work order.
d) Work order No._____dt._____with amount of……..

1) In consideration of the payments to be made to the Contractor as hereinafter provided the Contractor shall upon and subject to the said conditions, execute and complete the contracted works shown upon the said drawings etc. and such further detailed drawings as may be furnished to the contractor by the said Owner/Employer through the Architects and described in the said Specifications and the said Schedule of Quantities.

2) Notwithstanding what are stated in the N.I.T conditions of Tendering, Conditions of Contract of herein before stated by the Employer through the Architects, reserves itself the right of altering the drawings and the nature of the work and addition to or omitting any items of work or of having portions of same carried out departmentally or otherwise and such alterations or variations shall be carried out without prejudice to this contract.

3) Any dispute arising under this agreement shall be referred to the Arbitration in a manner specified in the General Conditions of the Contract and all legal disputes shall be limited within the territorial jurisdiction of the Vadodara thereto. The decision of the arbitration shall be final and binding on both the parties.

IN WITNESS WHEREOF THE PARTIES to there present have hereunder set and subscribed their hands, the day, month and year first above written.

Signed and delivered for and on behalf of
Bank of Baroda
Shri._____

_____
Its duly authorized official

In the presence of –

1. (Name and Address)

2. (Name and Address)

Signed and delivered for and on behalf of
The Contractor _____by
Shri_____his
Duly authorised official

In the presence of –

1. (Name and Address)

2. (Name and Address)

BANK OF BARODA

ELECTRICAL INSTALLATION WORK SPECIFICATION

1. RULES AND REGULATIONS

The installation shall be carried out in accordance with the Indian Electricity Rules 1956 /Electrical Inspectorate local Electrical Authorities rules/ National Electrical Code/National Building Code and other all relevant rules and regulation.

2. APPROVAL

Necessary approval shall be obtained from the Electrical Authorities before commissioning. It shall be the responsibility of the successful tenderer to prepare necessary documentation, apply, follow up and obtain approval from Electrical Inspectorate, Local Electrical Authorities and any other competent authorities for all electrical designs, manufacture, erection of materials and equipment used. The approval shall be obtained both for the drawing stage and on completion of installation, which shall be obtained within the overall completion period stipulated in the tender documents. The statutory fees payable to the Electrical Inspectorate will be paid by the Client.

3. QUOTED RATES

The rates quoted shall be firm till completion of the work. No variation of rates will be allowed due to increase in cost of materials, labour, transport, taxes, Octroi, or any other reason whatsoever. The rates shall include all taxes. The rate shall be indicated net. The rates shall include Excise Duty, Sales tax on Works Contract etc.

4. CIVIL WORKS

The rates shall all civil works/repairs to civil works/repairs to civil works and fabrication required for the work required for the work. Nothing extra will be paid for these works.

5. COMMISSIONING

The rates quoted includes supply, transport, erection and commissioning.

6. MATERIALS

All materials, equipment, fittings, accessories and applications used on the electrical installation shall be of best quality obtainable and of approved installation shall conform to the latest Indian Standard Specifications, wherever these exist. Wherever Indian Standard Specifications are not available, relevant British Standards shall applicable. The tenderer must submit along with the tender, the name of manufacturers/catalogues etc., and shall be procured by the successful tenderer and used on the works unless he has obtained the prior approval of Consultants in writing.

Note:

Any materials supplied by the Bank like light fittings, ceiling fans, exhaust fans etc., should be under the safe custody of the contractor after receiving it from the Bank.

Any damage to such materials while under storage with the contractor is responsible for such damages and the contractor should replace such damaged and the contractor should replace such damaged items by new one at no extra cost to the Bank/Client.

7. WORKMANSHIP

Good workmanship and neat installation are the pre-requisite for compliance with the various completion sections of these specifications. The work shall be carried out under the direct and constant supervision of a person, technically qualified sufficiently experienced, holding certificate of Competency issued by the Gujarat State Government and in accordance with the statutory rules and regulations in force. The relevant I.S.I. Code of Practice shall be followed wherever applicable.

8. DRAWINGS

Two copies of wiring diagram and layout plans, the schedule of quantities and specifications shall be furnished by the Architects to the Contractor for their own use until the completion of the contract, which shall be accessible at all reasonable times to the consultants or their representatives. The tender drawings indicate only the general scheme of requirements. It shall be the responsibility of the contractor that the location of distribution boards, cable routings etc., are got approved by Consultants/Banks Engineer well before the commencement of the work. Wherever required by the Architects, detailed drawings shall be prepared by the successful tenderer and got approved by Consultants and Banks Engineer.

On completion of the work, complete drawing and 'as built' shall be prepared by the successful tenderer and six copies of the same along with the reproducible print submitted to the employer through CONSULTANTS. The completion drawings shall indicate clearly the main switch board, the runs if various mains and sub-mains,

position of points and their controls. All circuits shall be clearly indicated and numbered in the wiring diagram and all points shall be given the same number as the circuit to which they are electrically connected.

9. PROVISION OF EARTHING

The buried earth wire/flat lead will be properly protected from mechanical injury by inserting them in to a suitable G.I. pipe recessed in wall and floor wherever considered necessary and carried upto the earth electrode. It shall be fixed over its entire length by clamps, saddles, staples etc. the earthing lead shall be securely bolted/welded to the earth electrode with bolt and washers of the base metal. The earthing lead shall be securely connected at the other end to main board and all items and mountings looped to all other iron clad switches and distribution boards.

10. GUARANTEE

The installation including the equipments, switchboards, cabling, earthing, etc., as specified in the Scheduled executed at site shall be guaranteed for a period of twelve months from the date of satisfactory commissioning after obtaining necessary approvals from Electrical Authorities.

11. All the switchboards and MCB DB' shall be powder coated. All other angle iron frame, metal parts shall be neatly painted with one coat of red oxide paint and two coats of enamel paint as required.

12. Definition and conventional symbols The definition of terms in I.E.E. wiring regulations shall apply except the definition of a point.

12.1 Point wiring shall include all works necessary in complete wiring of a tumbler switch circuit of any length from the tapping point on the distribution board (viz. Sub-mains) to the following, via the switch:-

a) Ceiling rose (in the case of ceiling and exhaust fan points).

b) Ceiling rose or connector (in the case of pendants except stiff pendant points).

c) Back plate (in case of stiff pendants).

d) Socket outlet (in the case of socket outlet points).

e) Lamp holder (in case of wall brackets, batten points, bulk head fittings and similar other fittings).

f) The following shall be deemed to be included in the point wiring:

g) Switch and ceiling raws as required.

h) in the case of wall brackets, bulk head fittings and all other light fittings cable as required up to the lamp holder.

i) Brushed conduit or porcelain tubing or cilica pipe where cables pass through walls etc.

j) Earth wire from three pin socket point to the common earth station.

k) All wood or metal blocks, boards and boxes sunk or surface type including those required for mounting fan regulator but excluding those under the distribution board and main control switch.

l) All fixing accessories such as clips, nails, screws, phil, plugs, rawl plug, wooden plug etc., as required.

m) Joint for junction boxes and connecting the same as required.

n) Connections to ceiling rose or connector, socket outlet, lamp holder, switch, fan regulator, etc.

Note – I

In the case of points with more than one light point controlled by the same switch, the complete item shall be considered as one point and the rate shall be accordingly quoted.

Note – II

A light point controlled by two nos. of two way switches shall be measured as one point from the fittings to the switches on either side.

13. JOINTS AND LOOPING BACK

Unless otherwise specified, the wiring shall be done in the 'Looping system' Phase and live conductors shall be looped at the switch box and neutral conductor can be looped either from the switch box or from the light, fan or socket outlet. Where 'Box system' is specified, all joints in the conductors shall be made of approved mechanical connectors in suitable and approved junction boxes.

14. WIRING OF DISTRIBUTION BOARDS:

In wring a branch distribution board, the total of the consuming devices shall be divided as far as possible evenly between the numbers of ways of the board, leaving the spare circuit for future extension.

All connections pieces of apparatus or between apparatus and terminals on a board shall be neatly arranged in a definite sequence following the arrangement of the apparatus mounted thereon, avoiding unnecessary crossing.

Cable shall be connected to terminal only by soldered lugs, unless the terminal is of such a form that can be securely clamped without cutting cable strands.

All bare conductors shall be rigidly fixed in such a manner that a clearance of at least 2.5cm (1") is maintained between conductors of opposite polarity or phase and between the conductors and any material other than insulating material.

In a hinged board, the incoming and outgoing cables shall be neatly bunched and shall be fixed in such a way that the door shall be capable of swinging through an angle not less than 90 degrees.
If required in the Schedule of Quantities a pilot lamp shall be fixed and connected through an independent single pole switch and fuse to the bus-bars of the board.

15. CONDUIT WIRING SYSTEM

Surface conduit wiring system:
All conduit pipes shall be conforming to I.S. Specification as per IS 9537 part II. All conduit accessories shall be of threaded type. No conduit less than 20mm. In diameter shall be used. The capacity of conduits shall be in accordance with the Table I. The conduits shall bear the ISI mark and the name or trade mark of the conduit manufacturer on each length.

Table – I

Cross Sectional area (copper conductor)	Size of MS conduit mm			Of cable
	20	25	32	38
1.5 Sq.mm	5	10	14	---
2.5 Sq.mm	5	8	12	---
4.0 Sq.mm	3	8	10	---
6.0 Sq.mm	2	5	8	---

10.0 Sq.mm	-	-	3	5	6
16.0 Sq.mm		-	-	3	6

19.1 CONDUIT JOINTS

Conduit pipes shall be joined by means of threaded couplers and threaded accessories only. In long distance straight runs of conduit, inspection type couplers or running thread with couplers and jam nuts (bare threaded portion suitably protected with anti-corrosive paint) shall be provided. Thread in all cases shall be between 11mm to 27mm long sufficient to accommodate pipes to full threaded portion of couplers of accessories. Cut end of conduit pipes shall have no sharp edges or any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

19.2 PROTECTION AGAINST DAMAGES

In order to minimize condensation or sweating inside the tube, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects.

19.3 PROTECTION OF CONDUIT AGAINST RUST

The outer surface of the conduit pipes, including all bends unions, tees, 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 preservative or covered with approved plastic compound.

19.4 FIXING OF CONDUIT

Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or any other approved plugs with screws in an approved manner at an interval o f not more than one metre, but on either side of couplers or bends, or similar fittings, saddles shall be fixed at a distance of 30 cm. from the centre of such fittings.

19.5 BENDS IN CONDUITS

All necessary bends in the system including diversion shall be done by bending pipes; or by inserting suitable solid or inspection type normal bends, elbows or similar fittings; or by fixing cast iron inspection boxed whichever is more suitable. Conduit fittings shall be avoided as far as possible on conduit system exposed to weather. Wherever necessary, solid type fittings shall be used. Radius of such bends in conduits pipes shall be not less than 7.5 cm. No length of conduit shall have more than three equivalent 90 bends from outlet to outlet, the bends at the outlets not being counted.

19.6 OUTLETS

All outlets for fittings, switches, etc. shall be boxes of suitable metal of either surface mounting or flush mounting system. Wall thickness shall not be less than 1mm.

19.7 ERECTION AND EARTHING OF CONDUIT

The conduit of each circuit or, section shall be completed before conductors are drawn in. the entire system of conduit after erection shall be tested for mechanical and electrical continuity, throughout and permanently connected to earth conforming to the requirements specified under section 15 by means of special approved type earthing clamp efficiently fastened to conduit pipe in a workmanlike manner for a perfect continuity between each wire and conduit. Gas or water pipes shall not be used as earth medium. If conduit pipes are liable to mechanical damage they shall be adequately protected.

19.8 RECESSED CONDUIT WIRING SYSTEM

This system of wiring shall comply with all the requirements of surface conduit wiring system specified in clauses 12.1 to 12.9 in addition to the following clauses.

19.9 MAKING THE CHASE

The chase in the wall shall be neatly made and be ample dimensions to permit the conduit to be fixed in the manner desired. In case of buildings under construction, chases shall be provided in the wall, ceiling, etc. at the time of their construction and shall be filled up neatly after erection of conduit and brought to the original finish of the wall.

19.10 FIXING OF CONDUIT IN CHASE

The conduit pipe shall be fixed by means of staples or by means of saddles not more than 60 cm. Apart. Fixing of standard bends or elbows shall be avoided as far as practicable and all curves maintained by bending the

conduit pipe itself with a long radius which will permit easy drawing in of conductors.

19.11 Inspection boxes

Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. Theses shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers.

20. EARTHING

Except for equipment provided with double insulation, all non-current carrying metal parts of electrical installations are to be earthed properly. All metal conduits, cable sheaths, switchgear, distribution fuse boards, etc. shall be bonded together and connected to an efficient earth electrode. Medium voltage energy consuming plant and equipment shall have two separate and distinct connections with earth.

20.1 EARTHING CONDUCTOR:

Earthing conductor shall be of high conductivity copper circular or G.I. wire or any other suitable approved material to give equivalent conductivity and shall not be less than half the largest current carrying conductor for poly phase or (2.032 mm) dia copper wire but subject to an upper limit of 65 sq.mm. For equipment exceeding 750 KVA size shall be as per IS : 1886 – 1961.

20.2 INSTALLATION

The buried earthing lead will be properly protected from mechanical injury by a ½" (12 mm.) G>I. Pipe recessed in wall and floor where considered necessary and carried upto the earth electrode. It shall be fixed over its entire length by clamps, saddles, staples, etc. The earthing lead shall be securely bolted and soldered to the earth electrode with bolt and washers of the base metal. The earthing lead shall be securely connected at the other end to the main board and all its mountings and at the other iron clad switches and distribution boards.

20.3 ELECTRODES

a) PIPE:

The C.I. pipe shall not be less than 100 mm. Dia. And 3.0 m. long and shall be buried vertically into the earth with the top not less than 1.25m. (4 ft.) below ground level.

b) PLATE:

The G.I. Plate shall be of size not less than 60 completion. X 60 cm. X 6mm. And the copper plate 60 cm. X 60 cm. X 3 mm. And shall be buried in the earth with their faces vertical and their tops not less than 3m. below ground level.

The electrodes shall be surrounded by alternative layers of charcoal or coke and salt. Watering arrangement with 12mm dia G.I. pipe with a funnel shall be provided, the latter being housed in a chamber 30 cm. X 30 cm. The resistance of earth electrode shall not exceed 5 ohms; that of earth continuity path from any point with the electrode shall not exceed 1 ohm and that of earthing connection of 1 ohm. The chamber should also have C.I. cover as specified in the B.O.Q.

UNDERGROUND CABLES

20.4 TRENCH:

Trenches shall not be less than 45cm. Wide and 60 cm. Below ground level. Whatever necessary, suitable propping and shoring may be done to avoid caving of the adjoining trench wails. Where the cables cross other service lines adequate protection should be taken to prevent accidental exposure and/or damage to the cables.

20.5 SPACING BETWEEN CABLES

Where more than one cable is laid in the same trench the actual space between the cables should normally be 23 cm. Apart leaving a clear distance of 15 cm. From the cable and the trench walls.

20.6 LAYING OF CABLES:

Before the cables are laid, a layer of 75mm sand face is to be provided for purposes of cushioning. The cables after being uncoiled and laid into the trench from the rollers should be covered with another layer of sand of about 15 cm. In depth, and the top surface to be suitably leveled to receive the cable covers. These covers may be of second class bricks or tiles and laid in a manner to overlap the cables on either sides by at least 5 cm. Cables markers of aluminum or G.I. shall be provided at ground level after being suitably embedded in concrete blocks of 20 cm. X 20 cm. X 5 cm. And spaced at a distance of about 30 m. from centre to centre and at every change in direction. Cables may also be laid in tire formation in the same trench. In this case also after the first 5 cm. sand cushion, the first tier of cable is laid and sand filled in the trench to form a bed of 23 cm. above this tier. After this the second cable is laid and process repeated the top most tier being at least 45 cm. below the ground level. The cable shall be suitably covered with bricks or tiles.

When laying the cables, care should be taken to see that the paper insulted cables are bent or straightened slowly and sharp radii avoided. The minimum safe bending radius for single-core cables is 20 diameters and for multi-core cables 15 diameters and for armoured cables 12 diameter being the overall diameter of the cable. Where the cables are required to cross roads this should be normally taken through sleeve pipes at least 10 cm. in diameter which may be either in stoneware, steel or spun reinforced concrete. For more than one cable the diameter should not be less than 15 cm. steel pipe shall be used where it is not possible to obtain sufficient depth to withstand vibrations due to traffic.

Cables laid inside the building should be properly and be carried either in ducts with suitable covers with slab or chequered plates or fixed to walls by clamps, brackets or cable trays.

20.7 TESTING THE CABLES:

High voltage test should be undertaken to ensure that no damage has occurred during the laying operation and that the joints are in order. Cables of 1.1 kv. Suitable for low and medium voltage should withstand for 15 minutes, 3000 volts D.C. current applied between the conductors and between the conductors and between each conductor and sheath. In absence of pressure testing arrangement it is sufficient to test for 1 minute with 1000 volts. If the test results are found to be not satisfactory the contractors shall arrange for having this set right at their cost, including removal of rejected materials, re-laying etc.

21 ADDITIONAL SPECIFICATIONS

a) Any damage to walls, floors, etc. during installation and erection must be repaired by the contractor to match the original surface for which no extra amount will be paid.

b) Rawl plug and rawl paste can be used for fixing the conduit etc.

c) For surface (open) conduit system, Conduits shall be painted with two coats of synthetic enamel paint of approved quality and shade for protecting against corrosion.

d) For conduits all the junction boxes, bends, etc. should be of inspection type and there must be electrical continuity throughout the length.

e) Approved materials and fittings shall only be used. The Contractor shall replace the unapproved materials and fittings at his own cost.

f) The contractor shall submit test report in duplicate for installation and for earth in the form specified by the concerned Electric Supply Company.

g) As per relevant IEE regulation, all electrical equipment such as motors, switchgears, etc. should have two separate distinct earth connections.

h) When aluminum cables are connected to copper bimetallic bus-bars etc. due care must be taken to prevent effects and the work must be of high standard ensure that Copper is tin coated.

i) Always the copper bus-bar chambers of panel should be of tin coated.

j) Intending tenders are advised to study all the drawings, specifications, conditions etc. in detail and inspect the site before submitting tenders so as to ascertain the nature and scope of the work involved and the methods to be adopted in executing the work.

k) The rate quoted shall include cost of cutting holes and chase in walls, floor slabs, repairing the same and restoration of original surface. Noting extra shall be entertained on this account.

l) The Contractor will also be required to submit the 'Form of Completion Certificate' in the required Performa.

m) Any excess materials brought at site shall be taken back without any extra cost. If any payment is made for the excess payment shall be deducted in their final bill.

TEST OF INSTALLATION

Insulation resistance

a) The insulation resistance shall be measured by applying between earth and the whole system of conductors or any section thereof with all fuses in place and all switches closed and except in earthed concentric wiring all lamps in position or both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it need not exceed 500 volts for medium voltage circuits. Where the supply is derived from the three wire (A.C. or D.C.) or a poly phase system, the neutral pole of

which is connected to earth either direct or through added resistance, the working pressure shall be deemed to be that which is maintained between the outer of phase conductor and the neutral.

b) The insulation resistance in meg-ohms of an installation measured as above shall not be less than the value of fifty divided by the number of points on the circuit provided in the installation. And the insulation resistance need not be greater than one mega ohm.

c) Control rheostats, heating and power appliances and electric signs may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case of frame work and all live parts or each rheostat appliance and sign shall not be less than that specified in the relevant Indian Standard Specification or where there is no such specification shall not be less than half a megohm.

d) The insulation resistance shall also be measured between all conductors connected to one or phase conductor of the supply and all the conductors connected to the middle wire or the neutral of to the other pole or phase conductors of the supply and its value shall not be less than that specified in sub clause (b).

e) On completion of an electric installation (or an extension to an installation) a certificate shall be furnished by the contractor countersigned by the qualified supervisor under whose direct supervision the installation was carried out. The certificate shall be in the prescribed from as required by the local Electric Supply Authorities..

TESTING EARTH CONTINUITY PATH:

The earth continuity conductor including metal conduits and metallic envelopes of cables 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 or earth leakage circuit-breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one oh,.

TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCHES:

a) In a two wire installation a test shall be made to verify that all non-linked single pole switches have been fitted in 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.

b) 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 outer or phase conductor of the supply.

EXTRACT FROM INDIAN ELECTRICITY RULES, 1956 :

Identification or earthed and earthed neutral conductors and position of switches and cutouts therein:

Where the conductors include an earthed conductors of two-wire system or an earthed neutral conductor of a multi - wire system or a conductor which is to be connected thereto, the following conditions shall be complied with :-

A indication of a permanent nature shall be provided by the owner of the earthed or earthed neutral conductor, or the conductor which is to be connected thereto, the enable such conductor to be distinguished from any live conductor. Such indication shall be provided :-

a) Where the earthed or earthed neutral conductor is the property of the supplier, at or near the point of commencement of the supply.

b) Where a conductor forming part of a consumer's system is to be connected to the supplier's earthed or earthed neutral conductor, at the point where such connection is to be made; and

c) In all other cases, at a point corresponding to the point of commencement of supply or at such other point as may be approved by an inspector.

2. No cut-out, link or switch other than a linked-switch arranged to separate simultaneously on the earthed or earthed neutral conductor and live conductor shall be inserted or remain inserted in any earthed or earthed neutral conductor of a two-wire system or in any earthed or earthed neutral conductor of a multi-wire system or in any conductor connected thereto with the following exceptions;

a) A link for testing purposes, or

b) A switch for use in controlling a generator or transformer.

Earthed terminal on consumer's premises:

1. The supplier shall provide and maintain on the consumer's premised for the consumer's use a suitable earthed terminal in an accessible position at or near the point of commencement of supply as defined under Rule No. 58.

   Provided that in the case of medium, high or extra high-voltage installation the consumer shall, in addition to the aforementioned earthing arrangement, provide his own earthing system with an independent electrode;

   Provided further that the supplier may not provide any earthed terminal in the case of installations already connected to his system, on or before the date to be specified by the State Government in this behalf if he is satisfied that the consumer's earthing arrangements is efficient.

2. The consumer shall take all reasonable precautions to prevent me mechanical damage to the earthed terminal and its lead belonging to the supplier.

3. The supplier may recover from the consumer the cost of installation of such earthed terminal on the basis laid down in sub-rule(2) of Rule No. 82.

4. Connection with earth:

The following provisions shall apply to the connection with earth of systems at low voltage in cases where the voltage normally exceeds 125 volts and of systems at medium voltage:-

The neutral conductor of a three-phase four-wire system and the middle conductor of a two-phase three-wire system shall be earthed by not less than two separate and distinct connections with earth both at the generating station and at the cub-station. It may also be earthed at one or more points along the distribution system or service-line in addition to any connection with earth which may be at the consumer's premises.

The frame of every generator, stationary motor and so far as is practicable, portable motor and the metallic parts (not intended as conductors) of all transformers and any other apparatus used for regulating or controlling energy and all medium voltage energy consuming apparatus shall be earthed by the owner by two separate and distinct connections with earth.

DISTRIBUTION BOARD:

1.0 it is proposed to install suitable size distribution board for power and lighting distribution. It shall have adequate rating of incomer and outgoing isolator/breaker and shall be suitable for indoor installation. The distribution board shall include all accessories and shall be complete in all respects and any item not included in the specification but essential for proper operation of the equipment and also to meet safety and relevant agencies requirements shall be deemed to be within the scope of the specification whether it is specifically mentioned in the tender/document or not.

1.1 The distribution boards shall be made out of (2.032mm) sheet steel metal clad, totally enclosed, dust, damp and vermin proof suitable for front operation. The DBs shall be suitable for wall/column mounting. It shall have bolted type front door. an overall door of hinged type shall be provided with lock provision.

All distribution boards shall have removable gasketted top and bottom plates suitable knock-out. Cover plate shall be provided inside the panels to shroud all the live parts. All live parts or terminals shall be shrouded with high non-conducting material. The front door shall have neoprene gaskets to make and DB totally vermin proof air tight. The inner door shall have projecting handle or operating knobs.

1.2 All unused outgoing MCBs shall be blanked with PVC plates. The incoming terminals should be fully shrouded to avoid accidental contract after opening of the bolted door. ALL phases shall be suitable shrouded with FRP/hylam plates. All panels shall be factory wired and assembled. All buzz bars shall have uniformity. All screws, buzz bars, bolts and nuts shall have uniform size uniform ratings.

1.3 The top cover shall be provided with identification sheet for DB number, ratings, circuit identification, load etc. Temporary sheet shall be fixed till the completion of the job. On completion a sheet be permanently pasted in the DB after approval from Owner/Architect. The identification sheet shall laminated to make it moisture proof before fixing it permanently.

1.4 For DB of triple pole and neutral, 4 pole Isolator/MCB shall be provided as incoming control and for single pole and neutral and double pole isolator/MCB shall be provided. All the MCBs provided in the DB shall have:

a) 9 KA short circuit capacity (9 KA RMS symmetrical)
b) It shall have dual crimping mechanism - thermal bimetal for overload and magnetic coil for short circuit
c) MCB housing shall be of heat resistant material

1.5 The buzz bars shall be air insulated and made out of high conductivity high strength copper with adequate rating to handle both short circuit and continuous load circuit currents. The buzz bars shall be to grade 63401 of IS: 5002. Adequate neutral buzz bars with adequate entry holes and earth buzz bars shall be provided in each DB.

1.6 The MCB shall be of high resistance, mounded type and shall be designed and manufactured as per IS : 8828. The breakers shall have inverse time tripping characteristics against overload and instantaneous trip against short circuits. It shall be designed to operate at 45 degree C ambient temperature. The incoming and outgoing knobs of the MCBs shall be accessible only after opening the front door of the DB. All MCBs shall be suitable for 415 V., 3 -Ph-4--wire, 50-Hz. system. It shall have adequate size terminal screws to terminate cable lugs. The Dp, Tp & 4-pole MCB/ Isolators shall have a common handle. All DBs shall be provided with two numbers brass earthing stud terminals with 2 Nos. nuts and washers for each connection. The earth bolts shall be marked suitably.

1.7 All DB locks shall have independent keys and overall common key (master key) to open any locks in case of emergency.

1.8 Painting shall be carried out as per the latest revision of IS - 5. The shade of paint shall be as required by the Client. All sheet steel surfaces shall due chemically cleaned to remove all scales, rust and foreign materials, rinsed and dried before painting.

All panels shall be painted with anti-corrosive poly urethene rubber based paints before going in for final painting. The final finish shall be uniform.

1.9 Along with the offer the vendor shall submit the following:
a) Detailed G.A. drawing showing the total construction details
b) Mounting details of DBs
c) Size of DBs, weight etc.
d) Buzz bar details, interconnection details etc.

EARTHING:

1.0 It is proposed to earth the low tension, lighting installation etc., with suitable size of copper conductor for effective earthing. the earthing system shall be complete in all respects and any device not included in the specification but essential for proper operation of the equipment to meet the statutory requirement shall be deemed to be with in the scope of the specification whether specifically mentioned in the technical specification or not.

1.1 The earthing installation shall conform to the latest Indian Standards and other statutory provisions. It shall generally conform to:

a) Code of practice for earthing - IS : 3043
b) Indian Electricity Rules – 1956

c) Indian Electricity Act 1910
d) Local FEIG requirement

1.2 The main earth bus shall be 25 x 3mm copper conductor. The conductors shall be soft and flexible. The main earth bus shall be clamped with spacer clamp. The spacer clamp shall be of adequate size. The spacer clamps shall be fixed at the centre with one screws of cadmium plated, counter shunk. The screw shall have effective depth inside the wall/RCC, etc. of 37 mm for horizontal conductors and shall be screwed in such a way that the top surface shall be plane with the spacer. The top plate shall have two tapped holes of 6 mm.

1.3 The location of horizontal and down conductors shall be decided at site in consultation with the Owner/Architect. Any changes of methods, housing shall be subject to approval of the owner. All joints shall be brazed and shall not be bolted. Bolted joints shall have cadmium plated bolts and nuts with adequate number of spring and flat washers.

1.4 Excavation and refilling of earth required for laying underground earth bus and earth pit shall be the responsibility of the Contractor. Wherever it is required, mechanical protection shall be given.

1.5 Earth electrode shall be as per the diagram enclosed. All civil works, soil treating media, pouring water, ramming, brick work, cover slabs, etc., shall be the responsibility of the contractor. The civil work shall be carried out neatly to match with the quality of building general civil work.

1.6 The location of earth electrode shall be decided in consultation with the Owner/Architect, before excavation.

1.7 Each electrode shall be tested for earth resistance test by earth megger. The test results shall be within the allowable limit. If required number of electrodes shall be connected in parallel to bring down the values within allowable limits.

1.8 All equipment shall be earthed with two separate and distinct earth connection from main earth bus.

1.9 The earthing conductor size shall be as per the tender.

1.10 The earthing resistance of the total system shall not exceed 2 Ohms.

1.11 All earth bus shall be painted with distinct colour enamel paint.

SPECIFICATION FOR CUBICLE SWITCH BOARDS

SYSTEM :

The CUBICLE Panels shall be suitable for operation of 3 phase 4 wire, 433 Volts, 50 Cycles, system with neutral earthed at transformer and paving short circuit fault level not less than 35 KA at 415 Volts. Rated normal voltage shall be 415 Volts.

STANDARDS:

The design, manufacture and testing of the various equipment covered by this specification shall comply with the latest edition of the relevant Indian Standards and Indian Electricity Rules and Regulations.

CONSTRUCTION FEATURES:

The switch board shall be made from CFCA sheet steel (1.626mm) thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet shall be seam welded, all welding slag grounded off and welding pit wiped smooth with plumber metal. All panels and covers shall be properly fitted and square with the frames and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with shunk nuts. Self threading screws shall not be used in the construction of switch boards. The board shall be of totally enclosed design, completely dust tight and vermin proof. Gaskets between all adjacent and beneath all covers shall be used to render the joint effectively dust tight. Soft compressible gasket shall be used between all metal joints, doors and covers to prevent in deposit of dust.

All similar materials and removable parts of the switch board shall be interchangeable. The switch boards shall be fixed with the same family of

switches for various ratings with a view to ensure uniformity of design, maintenance and replacements. A horizontal wire way with screwed cover shall be provided at the top to take inter-0connecting control wiring between different vertical sections. Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contractors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contract with live parts of the circuit breaker buzz bar connections.

INSTRUMENT ACCOMMODATION:

Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, and control fuses etc. These shall be accidental contract with live parts of circuit breaker, buzz bar and connections.Buzz bar and rectangular cross section suitable for full rated current for phase buzz bars and or neutral buzz buzz bar shall be extendable on either side. The horizontal buzz bar shall runs the entire length of the panel.

The buzz bars shall be fully insulated with heat shrinkable PVC sleeves. The interconnections shall be sleeved with PVC insulation tapes and color coded. The buzz bars shall be supported on suitable insulation supports at shorts intervals to withstand the forces arising from short circuit on the system. Automatically operated safety shutters to screen the live parts cluster when the breaker is withdrawn from the cubical shall be provided.

Horizontal buzz bars shall run at the top or at the bottom of the panel in a separate chamber and the chamber shall be adequately ventilated.
TERMINALS:
The outgoing terminals of the breaker and neutral link shall be brought out to a terminal block suitably located at the rest side of the panel. Separate cable compartment shall be provided for incoming and outgoing cables.

PAINTING: All steel work shall undergo a process of degreasing, pickling in acid, cold rinising, phosphating, passivating using sever tank process and then powder coated or sprayed with two coats of a high corrosion resistant primer each coat preferably of different colour.

The Primer shall be baked in an oven. The finishing treatment shall be by application of two coats synthetic enamel parts of approved paint thickness shall be 100 to 125 microns.

FABRICATION:
The panels shall be fabricated at such work shops where the following facilities are available.

a) Sand blasting

b) Pretreatment (Seven tank process)

c) Spray booth for painting / Powder coating

d) Heating over for all sizes of panels

e) Heat shrinking of PVC sleeves covered over busbars, etc.

LIST OF ACCEPTABLE MAKES FURNISHING MATERIALS

LIST OF APPROVED MAKE OF MATERIALS FOR CIVIL- INTERIOR WORK		
NO.	**MATERIAL**	**COMPANY (BRAND NAME)**
1	CEMENT	ULTRATECH, AMBUJA, BIRLA ,ACC
2	PLY-WOOD SHEET	CENTURY, GREENPLY, KITPLY, DURIAN, ARCHID PLY
3	BRICKS	ISI MARKED
4	GLAZED TILES / CERAMIC TILES	KAJARIA, NITCO, SOMANI, SIMPOLO, AGL,JOHNSON
5	VITRIFIED TILES	KAJARIA, NITCO, SOMANI, SIMPOLO, AGL,JOHNSON
6	QUARTZ MARBLE	ASIAN, KALINGA,JOHNSON,AGL
7	ITALIAN MARBLE	PREMIUM QUALITY
8	GI PIPES & FITTINGS	ASIAN, SURYA, TATA, ZINDAL, ALL GI FITTING SHOULD BE OF ISI BRAND
9	RIGID PVC PIPE & FITTINGS	ASTRAL, SUPREME, ASHIRWAD, FINOLAX, TRUELO, ALL PVC FITTINGS SHOULD BE OF SAME BRAND.
10	CP BRASS FITTINGS	GROHE, DELTA, KOHLER, HINDWARE, JAQUAR
11	STOP / FULLWAY WHEEL VALVE	LEADER, ZOLOTO, CRS
12	PVC TANK	SINTEX (SINTEX RENO BRAND SHALL NOT BE ALLOWED),VECTOS, POLYCON
13	SANITARY WARE	DURAVIT, KOHLER, JAQUAR, HINDWARE,CERA
14	WATERPROOFING COMPOUND	PIDILITE, DUBOND, FOSROCK, KERAKOLL, CICO, DR. FIXIT
15	CEMENT PAINT / ACRYLIC PAINT	SNOW CEM, INDO CEM, ASIAN, JOTUN,
16	TEXTURE PAINT	ASIAN, NEROLAC, , DULUX, BERGER
17	ENAMEL PAINT	ASIAN, NEROLAC, , DULUX, BERGER
18	DISTEMPER	ASIAN, NEROLAC, , DULUX, BERGER
19	PU PAINT	ASIAN, ICI DELUX, NIPPON, INDIGO
20	WALL PUTTY	BIRLA, JK, ASIAN PAINTS

21	HARDWARE FITTINGS - SCREWS, HINGES & NAILS-	R.K, MEHTA, SWASTIKA. KAFF, HETTICH,OZONE, EBCO
22	HARDWARE ACCESSORIES	DORMA, HETTICH, HAFFLE, EBCO, KICH
23	TOILET DOORS	PVC ACCUSEL, FIBER - TECH
24	ALLUMINIUM SECTION	JINDAL, NATIONAL
25	FRP DOOR	JAINIK, FIBER TECH
26	DOUBLE GLAZED WINDOW	ALUMILITE, PERFECT GLAZE, KALCO
27	ACP SHEET	ALUDECOR, EUROBOND, VIVA, ALSTRONG
28	SOLID SURFACE (CORIAN)	DUPONT, NEONEX, LG, MARINO,
29	TEAK WOOD	GANNA, BURMA, NIGERIA TEAKWOOD
30	ADHESIVE	PIDILITE, BLUECOAT, EUROBOND
31	TOUGHNED CLEAR GLASS	SAINT GOBAIN, AIS, MODIGUARD
32	CLEAR GLASS	SAINT GOBAIN, AIS, MODIGUARD
33	BACK PAINT 5MM GLASS	SAINT GOBAIN, ASIAN PAINTS
34	GYPSUM BOARD	INDIAN GYPSUM (SAINT-GLOBIN), GYPSONITE,
35	595 X 595 MINERAL FIBRE TILES	ARMSTRONG, ANUTONE , AMAZONE
36	CALCIUM SILICATE BOARD	AEROLITE, HILUX, NEW AGE
37	METAL CEILING	ARMSTRONG, HUNTER DOUGLAS ,DIAMOND, AMAZONE
38	DASH AND ANCHORING FASTENERS	HILTI, FISCHER, BOSCH, CANON
39	FABRIC CURTAIN	CORTINA , DE DÉCOR,PURE,ALMONARD,R R DÉCOR,GREENTERIORS.
40	VENETIAN / VERTICAL BLIND	VISTA, MAC, HUNTER DOUGLES
41	ACOUSTIC CEILING	AEROLITE/ AQUATECH (KANUFF) & CERAMAGAURD
42	WALL ACOUSTIC PANELLING	ARMSTONG , FIBRECRETE,AMAZONE,DIAMOND
43	CARPET	SHAW, MILLIKEN, INTERFACE, UNITEX, VISTA , WELSPUN
44	CARPET TILE	SHAW, MILLIKEN, INTERFACE, VISTA , WELSPUN
45	GLASS PARTITION FITTING HARDWARE	DORMA, HAFFLE, HETTICH, OZON
46	PRINTABLE DECORATIVE TRANSLUCENT FILM/HEAT REFLECTIVE FILM	GARWARE, 3M
47	STEEL	VIZAG, TATA, SAIL,ET TMT
48	MDF EXTERIOR GRADE	CENTURY, GREENLAM, DURIAN. EURO
49	LAMINATE SHEET	GREENLAM, ROYAL TOUCH, MERINOLAM
50	VENEER SHEET	GREEN, NATURAL, DURIAN, ARCHID, TIMEX
51	DECORATIVE SHEET	GREENLAM, ROYAL TOUCH, MERINOLAM
52	FLUSH DOOR SHEET -35MM	CENTURY, GREENPLY, KITPLY, DURIAN, ARCHIDPLY
53	FLUSH DOOR SHEET -32MM	CENTURY, GREENPLY, KITPLY, DURIAN, ARCHIDPLY
54	FLUSH DOOR SHEET -25MM	CENTURY, GREENPLY, KITPLY, DURIAN, ARCHIDPLY

55	TOILET CUBICAL PARTITION WITH HIGH PRESSURE LAMINATE	CENTURY, GREENLAM, MERINOLAM, ACTION TESSA,REX
56	ANTI-TERMITE TREATMENT	(CHLORPYRIPHOS / LINDANE)
57	GYPSUM PLASTER	FERROUS CRETE, GYPROC SAINT GOBAIN, BORAL GYPSUM
58	WEATHER SEALANT	KERAKOLL, DOWNCORNING , FOSROC, HILTI, PIDILITE, WACKER , DR.FIXIT
59	TILE ADHESIVE	KERAKOLL, FOSROC, PIDILITE, ROFF, DR. FIXIT
60	EPOXY GROUTING	DUBOND, KERAKOLL, HILTI, BAL ENDURA , K2
61	AUDITORIUM CHAIR	GODREJ, WIPRO, DURIAN, HOF, METHODEX, AMARDEEP
62	ADMIXTURES, PLASTICIZERS	FOSROC, SIKA, BASF, PERMA
63	WHITE PORTLAND CEMENT	BIRLA WHITE, JK WHITE, ACC
64	PERFORMANCE COATING FOR FIRE PROTECTION	PROMAT, JOTUN, ASIAN PAINTS
65	EXTERIOR WALL PRIMER	BERGER, ASIAN, ICI DULUX, NEROLAC
66	FLOAT GLASS, REFLECTIVE GLASS, MIRROR GLASS	MODI GUARD, SAINT GOBAIN, TATA- ASHAI
67	PRE-LAMINATED PARTICLE BOARD	MERINO, KITPLY, GREENPLY, GREENLAM, KITPLY, ARCHID
68	FLOOR SPRING FOR ALUMINUM DOORS	HARDWYN, GODREJ, DORMA, DORSET,OZNE
69	POLYURETHANE INSULATION	LLOYD INSULATIONS, HUNTSMAN
70	SILICONE SEALANT / SEALANT	G.E, DOW CORNING, WACKER, SIKA, BECKER
71	POLYCARBONATE SHEET	COXWELL,SUNPAL,DANPALON,GALLINA
72	POWDER COATED GI SHEET	TATA, ESSAR, JSW STEEL LTD.
73	MELAMINE POLISH	ASIAN PAINTS, PIDILITE, ICI DULUX
74	STAINLESS STEEL RAILING	JINDAL STAINLESS STEEL, DORMA, GEZE, GODREZ, OZONE
75	FIRE RATED VISION PANELS	SAINT GOBAIN, PILKINGTON, SCHOTT, FERILITE
76	EPDM GASKET	HANU, OSAKA, ALPS
77	POLY-SULPHIDE SEALANT	FOSROC, SIKA, PIDILITE
78	SFRC MANHOLE COVERS AND GRATINGS	KK, JAIN, PARGATI
79	CHAIRS/SOFA	Godrej, Methodex, Featherlite, Amardeep, EUROCOUSTIC
80	MODULAR FURNITURE	Godrej, Methodex, Featherlite, Amardeep, EUROCOUSTIC
81	CARPET	Unitex /Vista/Welspun/ Milliken
82	CHAIR	Godrej, Methodex, Featherlite, Eurocoustic

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

Seal & sign of the bidder

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 CONSIDER THE MAKE MENTIONED IN THE TECHNICAL SPECIFICATION OR APPROVED BY BANK.

SIGNATURE OF THE TENDERER/S WITH THE SEAL OF THE
COMPANY DATE:
PLACE:

HVAC TECHNICAL SPECIFICATION

Seal & sign of the bidder

A) SYSTEM DESIGN DATA:

1.0 GENERAL:

1.1 THE SYSTEM DESIGN, THE BASIS OF DESIGN, ESTIMATED REQUIREMENTS AND THE PROPOSED HVACSYSTEM FOR THE ABOVE MENTIONED PROJECT ARE OUTLINE IN THIS SECTION.

THE DETAILED SPECIFICATIONS & SPECIFIC REQUIREMENT 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 andair-conditioning	IS : 3615
q	Glossary of terms, symbols and units relatingto 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: GANDHINAGAR 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°FDB (32.2°C)	60°F DB
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 & Office areas	24±1°C DB	24±1°C DB

RH < 55%	RH < 60%
RH < 60%	RH < 60%

3.3 Fresh Air:

Office	5 CFM per person

3.4 Lighting Load:

Corridor	:	1.0 W/SFT
Office	:	1.1 W/SFT

3.5 Noise Criteria:

Office:	<40 DB

4.0 HVAC DUCTING:

a.	Maximum flow velocity in Ducts for Air conditioning	:	1500fpm (7.5 meters per second
b.	Maximum flow velocity in Ducts for Ventilation in pump room, boiler room, Generator room, toilet exhaust & Kitchen Exhaust	:	1500 – 2500 fpm (7.5 – 12.5 m/s)
c.	Maximum friction	:	0.1 inch WG / 100FT
d.	Maximum velocity supply air outlet	:	<500 fpm (2.5 m/s) , basedon noise criteria level and required throw.

***CONTRACTOR HAS TO ENSURE AND VERIFY THE DRAWINGS /DESIGNING AND GET IT APPROVED FROM ARCHITECT BEFORE COMMENCEMENT.**

5.0 VENTILATION FANS:

a.	Maximum fan outlet velocity for fans upto 450 mm dia	:	550 M / Min

B) CHILLED WATER BASED SPLIT TYPE INDOOR UNIT:

1.0 SCOPE:

THE SCOPE OF THIS SECTION COMPRISES SUPPLY, ERECTION, TESTING AND COMMISSIONING OF SELF- CONTAINED CHILLED WATER BASED INDOOR AIR- CONDITIONING UNITS AND AUXILIARIES CONFORMING TO THESE SPECIFICATIONS AND IN ACCORDANCE WITH THE DRAWINGS.

2.0 INDOOR UNITS:

THIS SECTION DEALS WITH SUPPLY, INSTALLATION, TESTING, COMMISSIONING OF VARIOUS TYPE OF INDOOR UNITS CONFIRMING 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 LEAD VARIATIONS OF THE ROOM.

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.

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 CHW COIL SECTION. THE HOUSING OF THE UNIT SHALL BE POWDER COATED GALVANIZED STEEL. THE BODYSHALL 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

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 HIGH WALL MOUNTED UNITS

THE UNITS SHALL BE WALL-MOUNTED TYPE. THE UNIT INCLUDES PRE FILTER, FAN SECTION & CHW 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.

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 ANDAIR-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 CONDENSATE 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 CHILLED WATER PIPING:

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 COATINGAT 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)

Rectangula rDucts 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	Nil
	sealant	
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	4 Bolt TDC-J	Zeebar stiffener 1-

mm		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 OFMATERIAL USED FOR JOINING OF DUCT SECTIONS.

2.2.3 FOR ROUND DUCTS

Duct diametermm	Upto 50 mm Wg staticpressure (+ve)		51 – 250 mm Wg static pressure (+ve)		Upto 50 mm Wgstatic pressure (-ve)	
	Spiral seam gauge	Longitudinalseam gauge	Spiral seam gauge	Longitudinalseam 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 ORBREATHING.

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-FT2-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 PRACTICE

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. THE REDUCES UN FAVORABLE PRESSURE LOSES AND IS PARTICULARLY IMPORTANT FOR METAL BASED PRODUCTS WHICH ARE MORE SUSCEPTIBLE TO STRESS RUPTURING. DOUBLE BENDS SHOULD BE AVOIDED, HOWEVER IF UN-AVOIDABLE, ENSURE THAT EACH RADIUM 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 RODSCAN 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 ATALL 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 ATLEAST 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 GUAGE 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 ATLEAST 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 POSITIONTHROUGH 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 SHALLBE & 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 PROPERDOCUMENTATION 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□K AT AN AVERAGE TEMPERATURE OF 0□ 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 10-10 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^3.

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 12 MM THICK ACCOUSTIC INTERNAL DUCT LINING OF NITRILE RUBBER OPEN CELL FOAM OR SEMI OPEN CONVOLUTED ELASTOMERIC NITRIL /EPDM RUBBER FOAM WITH FIRE SAFETY RATING CLASS 1 (BS476 PART7), IS 15061 & TO PASS FUNGI RESISTANCE AS PER ASTM G21 & BACTERIAL RESISTANCE AS PER ASTM 2180. IT SHOULD HAVE HIGH DENSITY RANGE OF 140-180 KG/CU.M. & TO WITHSTAND 100'C SURFACE TEMP.

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 CADMIUM PLATED 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 ASPER 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

Seal & sign of the bidder

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 OUT DOOR 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.

Seal & sign of the bidder

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 FINES 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 AN 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..

Seal & sign of the bidder

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 QUALITYAND 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 OFFUNCTIONING 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 LONGREFRIGERANT PIPING.SYSTEM SHALL BE DESIGNED FOR PROPER OIL RETURN TO COMPRESSOR ALONG WITH THE DISTRIBUTIONOF OIL TO

INDIVIDUAL COMPRESSOR.

THE REFRIGERANT PIPING SHALL BE EXTENDED UPPED 150 M WITH 50-M LEVEL DIFFERENCE.

Seal & sign of the bidder

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 ± 5% OF THE SPECIFIED DATA, TO FULFILL THETENDER REQUIREMENTS.

12) INDOOR UNIT

THIS SECTION DEALS WITH SUPPLY, INSTALLATION, TESTING, COMMISSIONING OF VARIOUS TYPE OF INDOOR UNITS CONFIRMING 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 UNITSSHALL HAVE ELECTRONIC CONTROL VALVE TO CONTROL REFRIGERANT FLOW RATE RESPOND TO LEAD VARIATIONS OF THE ROOM.

a) THE ADDRESS OF THE INDOOR UNIT SHALL BE SET AUTOMATICALLY IN CASE OF INDIVIDUAL AND GROUPCONTROL

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.

1.2 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.

1.3 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.

1.4 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.

1.5 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 PIPING 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 IF 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:

Pipe Size in mm (OD)	**Wall Thickness in mm**
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

S.No.	DESCRIPTION	UNIT	CONDITION OF SERVICE
	OUTDOOR UNITS		
1	Make		
2.	Origin of Outdoor Units		
3.	Model		
4.	Cooling Capacity HP		
5.	Nominal At 35 deg C ambient & standard rating conditions	TR	
6.	Actual capacity at operating condition AT 43 deg C ambient & standard rating conditions	TR	

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 At 43 deg C ambient & standard rating conditions	KW	
18.	Type of Refrigerant		

19. COP AT 100%

20. COP AT 50%

21. Machine Weight Kg

Seal & sign of the bidder

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 ROOMCONTROL PANEL.

ii. SUPPLY, INSTALLATION, WIRING AND EARTHING OF 15 AMPS THREE PIN SOCKET IN VICINITY OFEACH 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, FLOORMOUNTING/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 BEPROVIDED 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 WEIGHTOF 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 TIP 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 CLOSED.	BOTH MAIN AND SECONDARY ISOLATING CONTACTS
TEST	MAIN ISOLATING CONTACTS SEPARATED AND SECONDARY ISOLATINGCONTACTS CLOSED.
ISOLATED SOLATED.	BOTH MAIN AND SECONDARY ISOLATING CONTACTS I
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 AND50 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 OFPADLOCKING 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 WITHREFERENCE 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 +/- 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 MAINCONTACTS.

d. SELECTOR SWITCH:

WHEN CALLED FOR, SELECTOR SWITCHES OF RATED CAPACITY SHALL BE PROVIDED INCONTROL 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 SUIT ABLE FOR 220/415 +/- 10% VOLTS AC, 50 CYCLES SUPPLY SYS TEM. 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 FOROPERATION 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 0-180SECONDS 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 BEUSED.

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 SHIFTED SAND AND PROTECTED WITH CEMENT CONCRETE TILES BRICKS. SPECIAL CARE SHALL BE TAKEN TO ENSURE THAT THE CABLE ARE NOT DAMAGED AT BANDS. THE RADIUS OF BAND 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	2 NOS. 4MM DIA GI	WIRES

INCLUDING 10 HPRATING.

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 GIWIRES/TAPES AS FOLLOWS:

I. 3 PHASE SWITCHES AND CONTROL PANELS UPTO 60 AMPS RATING. 2 NOS. 4MM DIA GI WIRESII.3 PHASE SWITCHES AND CONTROL PANEL 63 AMPS TO 100 AMPS RATING.2 NOS. 8MM DIA GI WIRES.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. <u>COPPER EARTHING:</u>

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 WIRED. 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 rating.	2 Nos. 3mm dia copper wire
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 INDEPENDENTCOPPER 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 Amps to 100 Amps rating	2 Nos. 4mm dia copper wires.

iv.	3 phase switches and control panels, bus ducts above tapes 200 Amps rating.	2 Nos. 3mm x 6mm copper.

13.0 RATING :

ALL COMPONENTS, ACCESSORIES, CABLES ETC SPECIFIED, SHALL BE OPERATIONAL FOR RATED CAPACITIES AT 55OC 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 THERMALCAPACITY TESTING OF .

EXCESSIVE NOISE & VIBRATION TESTING.

2.0 CRITERIA:

SYSTEMS SHALL BE BALANCED AND ADJUSTED TO GIVE DESIGN/OPERATING CONDITIONS UNDERFOLLOWING 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 OFTESTING 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 SCHEMATICDIAGRAMS.

- SPECIFIED AND ACTUAL FAN TOTAL SP WITH BREAKDOWN SHOWING INLET AND DISCHARGEPRESSURE.
- SHEAVES AND BELT SIZES AND QUANTITIES PER UNIT.
- EACH PUMP SUCTION PRESSURE, HEAD PRESSURE, AMPS AND VOLTAGE, NAMEPLATE AMPERAGEAND VOLTAGE.
- SPECIFIED AND ACHIEVED TOTAL WATER FLOW PER SYSTEM.
- SPECIFIED AND ACHIEVED INDIVIDUAL WATER FLOW AND PRESSURE DROP THOUGH COOLINGTOWER AND CHILLER.

4.0 TESTING:

4.1 CARRY OUT ALL TESTS SPECIFIED. TEST EQUIPMENT TO REQUIREMENT OF AND WHERE NECESSARY, INPRESENCE OF EQUIPMENT MANUFACTURER.

4.2 TESTS FOR BALANCING SHALL PROCEED ONLY AFTER SYSTEM INSTALLATION HAS BEEN COMPLETED ANDSYSTEM 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. ADJUSTFAN 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 AUDITION 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 FORCONDITIONS 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 $DB^{O}C$ AND $WB^{O}C$ 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.

LIST OF ACCEPTABLE MAKES HVAC AND EQUIPMENTS /

MATERIALS

S. No.	Details of equipment/ material	Makes
1	Ventilation Fans:	
	Inline Fan	Kruger /Nicotra/ Carryaire/Ostberg
2	Pressure Gauge	H. Guru/ Emerald
3.	Thermometers	H.Guru/ Emerald
4	Auto Air Vent	Anergy/Rapid Cool/ Emerald
5	G.I. Sheets	ESSAR /Jindal /SAIL /TATA /Lioyd
6	Duct (fabricated)	Fabricated on Site
7	GI sandwich Round duct	GP Spira
8	Flexible insulated Round duct	GP Spira/ Atco
9	Fire Dampers	Fairflow/Airtech /Dynemic
10	Grills/Diffusers	Fairflow/Airtech /Dynemic
11	Fresh Air Louvers	Fairflow/Airtech /Dynemic
12	Glass Wool	UP Twiga/FGP Ltd.
13	Closed Cell Insulation	Armacell/Paramount K-Flex
14	Differential Pressure Switch (Water)	Johnson/Honeywell/Danfoss
15	CHW based AHU / IDUs	Midea/Bria / Zeco/Citizen/Ethos/VTS/Nutech
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

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S. No.	Details of equipment/ material	Makes
27.	Selector Switch	Rishab – L&T/ Kaycee/ Siemens/ C&S
29	LT Cables / Control Cables	Universal / Polycab / Skytone / Havells / Neeco / Grandlay /Ravin
30	Cable Tray	Pilco/Slotco/Rico/ M&M/Needo
31	Cable Gland	Commet/HMI/ Gripwell/Dowell
32	VRV/VRF SYSTEM	DAIKIN /SAMSUNG/HITACHI
33	MS /GI PIPE	TATA / GST / Zenith / Surya
34	THREE WAY MOTORIZED DIVERTING/ MIXING VALVE FOR FCU'S & AHU'S	JOHNSON CONTROL /HONEYWELL /DANFOSS /TSC/ siemens

SIGNATURE OF THE TENDERER/S
WITH THE SEAL OF THE
COMPANY

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.

a) SPRINKLER MAINS, BRANCH AND CONNECTION FROM EXTERNAL PIPING COMPLETE WITH VALVES,ALARM, HANGERS, APPURTENANCES AND PAINTING.

b) SPRINKLER HEADS WITH SPARE SPRINKLERS.

c) CONNECTIONS TO RISERS.

d) FLOW SWITCHES.

e) VERTICAL DRAIN PIPES.

2. GENERAL REQUIREMENTS:

ALL MATERIALS SHALL BE OF THE BEST QUALITY CONFORMING TO THE SPECIFICATIONS AND SUBJECT TOTHE 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) CONFIRMING 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 PRODUCED THE FACTORY TEST CERTIFICATE.

WELDING M/C RECTIFIER.

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Bank of Baroda
VIJAYA DENA

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 PIPINGFOR 25ø TO

150 ø

PIPE DIA (MIN.)	ISA SIZE (mm)	CLAMP DIM (mm.)	DROP ROD DIM (mm.)	U BOLT DIM (mm.)	ANCHOR DIM (mm.)	SPACING FOR SUPPORT.(M)
25ø	40x40x5	28x1.2	M8	8	M8	2.0
32ø	40x40x5	28x1.2	M8	10	M8	2.5
40ø	50x50x6	28x1.2	M8	10	M8	2.5
50ø	50x50x6	34x2.0	M10	10	M10	2.5

65ø	50x50x6	34x2.0	M10	10	M10	2.5
80ø	50x50x6	40x2.5	M12	10	M12	2.5
100ø	50x50x6	40x2.5	M12	10	M12	2.5
150ø	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:

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- 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 WARM GEAR TYPE WATER PROOF ANDPROTORY 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, GLOBEVALVE, 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:

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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^2 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 $68^{O}C$. 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 TOA 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 15 KG/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 RADIO- GRAPHICALLY 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 GIVENIN 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.

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.

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LIST OF APPROVED MAKE / MANUFACTURER FOR FIRE FIGHTING WORK MATERIALS		
No.	**MATERIAL**	**COMPANY (BRAND NAME)**
1	AIR RELEASE VALVE	SWATI / SANT / NEWAGE
2	BUTTERFLY VALVES, GATE / SLUICE VALVE AND NON RETURN VALVE	SANT / LEADER / ZOLOTO / AUDCO / HONEYWELL / L&T / CRI
3	BRANCH PIPE & COUPLING	SWATI / SAFEX / NEWAGE - KHOPOLI
4	FIRE BRIDGED INLET CONNECTION	SWATI / SAFEX / NEWAGE
5	FIRE EXTINGUISHERS	SAFEX / MINIMAX / KANEX / CEASE FIRE
6	FLOW SWITCH	HONEYWELL / SYSTEM SENSOR / POTTER / NEWAGE
7	GLOBE VALVE / BALL VALVE	SANT / LEADER / ZOLOTO / AUDCO / HONEYWELL / L&T
8	HYDRANT VALVE	SWATI / SAFEX / NEWAGE
9	HOSE PIPE	SWATI / SAFEX / NEWAGE
10	HOSE REEL	SWATI / SAFEX / NEWAGE
11	HOSE BOX	SWATI / SAFEX / NEWAGE
12	G. I. PIPES	TATA / JINDAL (HISSAR) / SAIL
13	PRESSURE GAUGE	H. GURU / FIBIG / GENERAL INSTRUMENT
14	PRESSURE SWITCH	HONEYWELL / INDFOSS / SWITZER / DANFOSS
15	POWER AND CONTROL CABLE	POLYCAB / HAVELL'S / FINOLEX / RR CABLE
17	PANELS	CPRI APPROVED
18	STRAINER	SANT / LEADER / ZOLOTO
19	SPRINKLERS & FLEXIBLE HOSE	SAFEX / HD / TYCO / NEWAGE / RELIABLE (USA), VIKING
20	ALARM VALVE	HD / TYCO / NEWAGE

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LIST OF INDIAN STANDARDS REFEREED TO

1. I.S. NO. 1200 – Latest measurement of building and engineer work.
2. I.S. NO. 287 – 1973 recommendation for maximum permissible moisture content of timber used for different purpose in different climatic zones
3. I.S.NO. 1141 – 1973 code of practice for seasoning of timbers.
4. I.S.NO. 6534 – 1971 guiding principles for grading and inspection of timber.
5. I.S.NO. 1200 (part XXI) 1973.
6. I.S.NO. 3845 – 1966 code of practice for joints used in wooden furniture.
7. I.S.NO. 4450 – 1967 wooden flush doors. Type to method of test for.
8. I.S.NO. 4970 – 1973 key for identification of commercial timber.
9. I.S.NO. 3364 (part II) – 1975 methods of measurements and evaluations of defects in timber, part II converted timber.
10. I.S.NO. 1708 – 1969 methods of testing shall clear specimens of timber.
11. I.S.NO 6342 – 1971 Rose wood logs for production of sliced veneers.
12. I.S.NO 5248 – 1969Teakloges for production of sliced veneers.
13. I.S.NO. 2202 (part I) 1973. Specification for wooden flush door shutters (solid core type cat I plywood).
14. I.S.NO. 2338 (part 1) 1967 code pf practice for finishing of wood-based materials part 1 operations and workmanship.
15. I.S. No. 7360 – 1975 Methods of sampling of plywood.
16. **I.S.NO. 303 – 1975 Specification for plywood for general purposes.**
17. I.S.NO. 3129 – 1965 Specification for article board for insulation purposes.
18. I.S.NO. 3513 – 1966 (part – III & part iV) High and medium density wood-based laminates part III general purposes. Part IV sampling test.
19. I.S. NO. 1659 – 1979 Block boards.
20. I.S.NO. 7916 – 1974 Decorative plywood using plurality or veneers for decorative faces.
21. I.S NO. 3478 – 1966 Height density wood particle boards.
22. I.S. NO. 1734 (part 1 to XX) Plywood method of test for
    Part I -General
    Part II -Plywood
    Part III -Battens
23. I.S.NO. 1328 – 1970 veneer decorative plywood.
24. I.S. NO 710 Marine ply.
25. I.S.NO 3087 – 1965 Wood particle boards (medium density)
26. I.S. NO. 3087 – 1965 Specification for synthetic rising adhesives for plywood (phonolic & Amino plastic)
27. I.S.NO. 2046 – 1969 Specification for decorative laminate.
28. I.S. NO. 8273 – 1976 Fibrous gypsum plaster boards.
29. I.S. No. 2095 – 1964 Gypsum plaster boards.
30. I.S.NO. 2542 (part 1) – 1978 Gypsum plaster concrete products, methods of test for part 1 – plaster and concrete.
31. I.S NO. 8272 – 1976 Gypsum plaster for use in the manufacture of fibers plaster boards.
32. I.S.NO. 2441 – 1963 Fixing coiling covering code of practice for.
33. I.S.NO. 2835 – 1977 Specification for flat transparent sheet glass.
34. I.S NO. 2395 (part 1) – 1966, 2395 (part 11) – 1967 painting to concrete masonry, plaster surface code of practice for part –1 operation and workmanship part II schedule.
35. I.S.NO. 3548 – 1966 Glazing in building code of practice.
36. I.S.NO 6279 – 1965 Specification for ready mixed paint brushing, matt or egg-shell flat finishing, interior.

37. I.S.NO. 137 – 1965 Specification for ready mixed paint brushing, matt or egg-shell flat finishing, interior to Indian standard colors as required.
38. I.S.NO. 133- 1975 Specification for ready mixed paint brushing, wooden coating, interior it Indian standard colors.
39. I.S. NO 129 – 1950 Specification for enamel interior (a) under coating (b) finishing.
40. I.S.NO. 120- 1950 Specification for ready mixed paint brushing, finishing interior oil glass, for general purposes to Indian standard colors.
41. I.SNO. 533-1973 Specification for gum spirit of turpentine (oil of turpentine.)
42. I.S.NO. 101 – 1964 Methods of test for ready mixed paints and enamel.
43. I.S.NO. 75-1973 Specification for linseed oil, and refined.
44. I.S.NO. 77 – 1973 Specification for linseed oil, and refined.
45. I.S.NO. 124 (part1) – 1976 Specification for ready mixed paint brushing finishing semi- gloss for general purpose.
46. I.S.NO. 5884 – Specification for woolen carpets.
47. I.S.NO. 104- 1979 Specification for ready mixed paint Brushing finishing, zinc chrome primer.
48. I.S. NO 5391 – 1969 Adjustable metal chairs for use of typist and operators in telephone exchanges.
49. I.S.NO. 8756 – 1978 Ball catches for use in wooden almirahs.
50. I.S.NO 3499 – 1976 (part 11) chairs for office purposes metal revolving and tilting.
51. I.S.NO. 5416-1969 General purposes wooden chairs methods of test for.
52. I.S NO. 6185 – 1971 High chairs specification and safety requirements for.
53. I.S.NO> 4116 – 1976 Joints used in wooden furniture code of practice for.
54. I.S.NO 3485 – 1966 Joints used in wooden furniture code of practice for.
55. I.S.NO. 7070- 1973 Shelving racks wooden (adjustable and non-adjustable) type.
56. I.S.NO 4414-1977 table tops (wooden)
57. I.S.NO. 5967-1969 Tables, wooden method of test for.
58. I.S.NO. 3564 –1975 Door closures (hydraulically regulated).
59. I.SNO. 3564 – 1979 Drawer locks, cupboards and box locks.
60. I.S.NO. 7981 – (part1) – 1975 Glossary of terms relating to builder's hardware – part 1 locks.
61. I.S.NO. 204- (part 1 & 11) 1978 Tower bolts ferrous metals and non-ferrous metals.

Note: The various items to be used in the interior decoration work shall be of ISI standards. Whenever the items/ products do not have ISI marks standard, shall be got tested from Laboratory for its quality etc. necessary testing charges shall be borne by the contractor.

NOTE:

The contractor shall use only above-mentioned material or equivalent make to be approved by the Bank/Consultant. All other materials shall confirm to the specifications laid down. The tenderer shall take this into account while tendering rates / prices.

LIST OF APPROVED MAKES OF MATERIAL

MAKE OF MATERIAL-ELECTRICAL WORKS		
1	PVC RIGID CONDUITS & ACCESSORIES:	1.5 MM THICK (MMS) ISI AND FIA APPROVED - PRECISION / VRAJ / NIHIR / BLP /ASTRAL / POLYCAB MAKE. (ONLY WHITE COLOURED PIPES TO BE USED.).
2	L.T. CABLES / FLEXIBALE CABLE :	HAVELLS / R. R. KABLE / FINOLEX / POLYCAB.
3	WIRES (FRLS):	FINOLEX / R. R. KABLE/ LAPP
4	MAIN DISTRIBUTION BOARDS:	MDS LEGRAND (LEXIC) / HAVELLS / SCHNEIDER (EAZY 9) / L&T
5	ELCB / RCCB / MINIATURE CIRCUIT BREAKER:	MDS LEGRAND (LEXIC) / HAVELLS / SCHNEIDER (EAZY 9) / L&T
6	SWITCH GEARS:	MDS LEGRAND (LEXIC) / HAGER / HAVELLS / SCHNEIDER (EAZY 9) / L&T
7	CHANGE OVER SWITCH:	HPL SOCOMAC/ HAVELLS / L & T / HAGER.
8	DOMESTIC FITTINGS:	
	A) ALL SWITCHING MODULAR ACCESSORIES.	LEGRAND ARTEOR OR SCHNEIDER ZENCELO OR HONEYWELL ORNA IN LIGHTING SB & OTHER AREAS OF FOR ALL WORK STATIONS - LEGRAND MYRIS OR SCHNEIDER LIVIA OR HONEYWELL EVO
	B) HOLDERS / CEILING ROSES	ANCHOR OR EQUIVALENT APPROVED MAKE.
	C) ADHESIVE TAPE	BHOR (STEEL GRIP) OR APPROVED.
9	10 - 30 A POLYCARBONATE SOCKET & TOP:	MDS LEGRAND (LEXIC) / HAGER / HAVELLS / SCHNEIDER (EAZY 9) / L&T
10	TELEPHONE JELLY CABLE:	FINOLEX / R. R. KABLE / POLYCAB.
11	TELEPHONE TAG BLOCK:	KRONE MAKE.

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12	CABLE LUGS:	DOWELL / LOTUS / JAINSON / 3 D.
13	CABLE GLAND SINGLE / DOUBLE COMPRESSION:	HMI / COMET / 3D.
14	AMMETER / VOLTMETER:	L&T / SCHNEIDER /MECO/ AE MAKE.
15	SELECTOR SWITCHES:	L & T SALZER / KAYCEE MAKE.
16	INDICATOR LAMPS:	LED TYPE TEKNIC / PRECIFINE/ BINAY.
17	CONNECTOR STRIPS:	WAGO / ELMEX MAKE.
18	LIGHTING FIXTURES :	WIPRO / PHILIPS / HAVELLS / REGENT
19	EXHAUST FAN (LIGHT DUTY):	KHAITAN / CROMPTON / HAVELLS.
20	CEILING FAN (5 STAR RATED):	ORIENT (PSPO) / CROMPTON (HIGH BREEZE PLUS) / HAVELLS.
21	WALL MOUNTED FAN (5 STAR RATED):	CROMPTON / KHAITAN / HAVELLS.
22	DATA CAT 6 / TELEPHONE CABLE - I / O, PATCHPANEL (ALL NETWORKING ITEMS) UNIT:	D - LINK / DIGI LINK / MOLEX / LEGRAND
23	NETWORK RACK:	D - LINK / VALLRACK / ELIXIR
24	FIBER CABLE :	D - LINK / POLYCAB / FINOLEX
25	CABLE TRAY / RACEWAY / FLOOR JUNCTION BOXES :	LOCALY FABRICATED (SIZE VERYFIDE AS PER TENDER DETAILS ON SITE - CUNSULTANT / ARCHITECT AS PER ENGINEER INCHARGE)
26	LT PANELS :	AD ENTERPRISE / ACTIVE ENGINEER / SHIVSHAKTI ENGINEERS / NEPTUNE / SWATI SWITCHGEAR
		(CPRI CERTIFICATION REQUIRED)
27	FIRE EXTENSIGUSER :	KENTEX / MINIMAX
28	CCTV :	PALCO / BOSCH / DAHUA / HIKVISION / HONNEYWELL

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29	TV LED (COMMERCIAL DISPLAY UNIT AS PER SPECIFICATION) :	SAMSUNG / PANASONIC / LG
30	ACCESS CONTROLE :	HID / MATRIX / ZK
31	DIGITAL PIR SENSOR :	LEGRAND / HONEYWELL /PYROTECH
32	TV CHANNEL RG6/ RJ11 CABLE :	RR / POLYACB / FINOLET / AVOCAB
33	FIRE ALARM SYSTEM :	HONEYWELL / GST / AXIS / SIEMENS
34	PA SYSTEM :	BOSCH / HONEYWELL / AHUJA
35	EARTHING SYSTEM :	GALAXY / ASHLOK / INDELEC / LPI
36	FLOODING SYSTEM :	NOVEC
37	WATER LEACK DETECTION SYSTEM :	AS PER SPECIFICATION APPROVED BY ARCHITECT AS PER ENGINEER IN CHARGE
38	AUDIO CONFERENCE SYSTEM :	AHUJA / BOSCH / HONEYWELL
39	RODDENT SYSTEM:	AS PER SPECIFICATION APPROVED BY ARCHITECT AS PER ENGINEER INCHARGE)
40	UPS SYSTEM:	APC / EATON / VERTIV / NUMERIC
41	POP-UP BOX :	LEGRAND / HONEYWELL

NOTE :-- (ALL MATERIAL TECHNICAL DATA SHEET SUBMIT WITH APPROVE BY ARCHITECT AS PER ENGINEER IN CHARGE)

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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 BEAPPROVED 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

DECLARATION

I/We have inspected the site of works and have made me / us fully acquainted with the local conditions in and around the sites of works. I/We hereby declare that I/We have gone through the conditions laid down in the Notice Inviting Tender, Conditions of Contract, Technical Specifications and understood the same and on the basis of the same I/We quoted our rates in the Schedule of Quantities attached with the tender documents.

I/We shall also uniformly maintain such progress as may be directed by the Employer / Architect to ensure completion of same within the target date as mentioned in the tender document.

Witness:

_____

Signature of Tenderer

Address_____

_____ Date: _____

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