NOTICE INVITING TENDER **FOR**

OFFICE INTERIOR FURNISHING, ELECTRICAL, HEATING, VENTILATION & AIR CONDITIONING (HVAC), AND ALLIED CIVIL WORKS at D.No. 42-1-45/1/1, New Investment Building, LIC Annex Building, Thikkana Road, Visakhapatnam-530004

(A Government of India Enterprise)

You focus on exports. We cover the risks.

VISAKHAPATNAM **BRANCH**

ECGC LTD., 1ST FLOOR, SHANKARMATAM ROAD, OPPOSITE SHANKARMATAM TEMPLE, VISAKHAPATNAM-530016

REF: ECGC/VISAKHAPATNAM/TENDER-01/2024-25
DATE: 20/12/2024

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SECTION 1

1. Introduction

1.1. Invitation to Bidders

By way of this Notice Inviting Tender (NIT) document (hereinafter also referred to as 'the Bid Document' or 'the Tender Document'), **ECGC Limited** (hereinafter referred to as ECGC or the Company), a company wholly owned by the Government of India and established in 1957, invites competitive bids from reliable, resourceful, bona fide, and experienced firms/companies/individual contractors (hereinafter referred to as **'the Bidders'**), with experience in similar nature of work for any Government of India Public Sector Companies/PSU Banks/PSU Insurance companies for Office Interior Furnishing, Electrical, Heating Ventilation & Air Conditioning (HVAC), and allied Civil Works, in an office space area of 2800 square feet located at D.No. 42-1-45/1/1, New Investment Building, LIC Annex Building, Thikkana Road, Visakhapatnam-530004.

The "Technical Bid" and " Financial Bid," along with the supporting documents, will be received physically. The authorized representative of the company will open the Financial Bid after the technical evaluation.

The Bidder(s) are advised to carefully study the Tender Document. Submission of Bids will be considered as having been done after a thorough study and examination of the Tender Document, fully understanding its implications and consequences. The Bid Document can be downloaded from the company's website at www.ecgc.in

Please note that all the required information as sought in the Tender document is required to be provided by the bidders. Incomplete or Conditional information may lead to rejection of the Bid. The Company

reserves the right to change the dates mentioned in this Tender Document, which will be communicated to the Bidder(s), and shall be displayed on the Company's website. The information provided by the Bidder(s) in response to this TENDER Document will become the property of ECGC and will not be returned. ECGC reserves the right to amend, rescind or reissue this Tender Document and all subsequent amendments, if any. Amendments or changes shall be displayed on ECGC's website only. All amendments or changes, if any will become integral part of this Document.

1.2. Schedule of events:

Date of Notification	20/12/2024
Bid Document Availability	The Bid Document can be downloaded from website w.e.f 20/12/2024
Earnest Money Deposit	Rs.50,000/- only (Rupees Fifty Thousand only) All bidders must make a DD in favor of ECGC Ltd, Payable at Visakhapatnam. In absence of DD the tenderer will be disqualified.
Estimated Amount put to tender	Rs.1,07,08,993/- only (Rupees One Crore Seven Lakh Eight Thousand Nine Hundred and Ninety Three only)
Pre-bid Queries (if any)	With in one week from the tender issued date through email only
Address for Communication and submission of bid	ECGC Ltd., VISAKHAPATNAM Branch, 1st Floor, Shankarmatam road,

	Opposite Shankarmatam temple, Visakhapatnam-530016
E-mail & Phone no.	visakhapatnam@ecgc.in 0891 2748653
Period of Contract	90 days from the date of issue of work order
Date and time limit for receipt of bids	09/01/2025 5:30 pm
Date & Place of opening of Technical Bid / Pre-qualification Bid	ECGC Ltd., VISAKAHPATNAM Branch, 1st Floor, Shankarmatam road, Opposite Shankarmatam temple, Visakhapatnam-530016
Date of opening of Financial Bid	Within 15 days of opening of Technical Bids. Date will be communicated to Bidder(s) who will qualify in the Technical Bids. The bidders will be informed one day in advance in case the bidders want to be present while the financial bid is opened. Only one person from each bidder can attend such bid opening.
Validity period of Bid	120 days from the last date of submission of Bid
In the event of any of the above-mentioned dates being declared as a holiday the tender will be opened on the next working day at the appointed time.	

Note: Timelines are subject to change at the sole discretion of ECGC Ltd.

SECTION - 2

2. Disclaimer

The information provided in this Tender Document, or any information subsequently provided to Bidder(s) in documentary form by ECGC or on behalf of ECGC, is provided to the Bidder(s) based on the terms and conditions as set out in this Tender Document and all other terms and conditions under which such information is provided.

This Tender Document is not an agreement or an offer; it is simply an invitation by the company to interested parties to submit their bids. This Tender Document aims to provide Bidder(s) with information to assist them in formulating their bids.

This Tender Document may not contain all the information required by each Bidder. Each Bidder is responsible for conducting their own investigations and analysis and verifying the accuracy, reliability, and completeness of the information in this Tender Document. If necessary, Bidders should obtain independent advice at their own cost, if any. ECGC shall incur no liability under any law, statute, rules or regulations as to accuracy, reliability or completeness of this document.

The Company may, at its absolute discretion, but without being under any obligation to do so, update, amend, or supplement the information in this Tender Document. No contractual obligation arises from the Tender process until a formal letter from the duly authorised representative of the Company

communicating the award of the Tender is received by the selected Bidder.

ECGC reserves the right to reject any or all the bids received in response to this document at any stage without assigning any reason whatsoever. The decision of ECGC in this regard shall be final, conclusive, and binding on all the parties.

SECTION - 3

3.Instructions for Bidder(s)

1. General Instructions

1.1. The bidder must treat the document details as privileged, secret, and confidential, regardless of their participation in the bidding process.

1.2. Before placing a bid, bidders are requested to visit the ECGC website and carefully review the Tender Document as well as the General and Special Terms and Conditions of the Contract (TCC) provided therein. If there appears to be any ambiguities or discrepancies in the terms of the Tender Document and the Contract, they should promptly contact ECGC for clarifications.

1.3. The bidders should carefully review the contract terms before bidding to ensure full understanding.

1.4. The details of the work to be carried out and its scope are given in the specifications and Schedule of Quantities of these documents which also indicate a brief description of the Project which is to be executed.

1.5. The Bidder should quote their (own) rates for undertaking the work.

1.6. The Bidders should note that the information, if any, regarding the site and local conditions, as contained in these tender documents has been given merely to assist the Bidders and is not warranted to be complete.

1.7. The Bidders, in their interest, are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders, in respect of the site conditions including but not restricting to the following which may influence or affect the work or cost thereof under the contract:

(a) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work.

(b) Requirement and availability of land and other facilities for his enabling works, stores & workshops etc.

(c) Ground conditions include those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained therefrom.

(d) Source and extent of availability of suitable materials including water etc. and labours (skilled and unskilled) required for work and laws and regulations governing their use and employment;

(e) The type of equipment and facilities needed preliminary for and in the performance of the work and for successful completion of work.

(f) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

1.8. The Bidders should note and bear in mind that ECGC Ltd. shall bear no responsibility for the lack of acquaintance with the site and other conditions or any information relating thereto, on their part. The consequences of the lack of any knowledge as aforesaid on the part of the Bidders shall be at their risk and cost and no charges or claims

whatsoever consequent upon the lack of any information, knowledge or understanding shall be entertained or payable by ECGC Ltd.

1.9. No employee of ECGC Ltd is allowed to work under or as a contractor for two years after he retires from ECGC Ltd services, without the prior approval of the ECGC Ltd. Any bid is liable to be rejected if either the bidder or any of his employees is found at any time to be such a person who had not obtained the permission of the ECGC Ltd as aforesaid before submission of the tender or engagement in the bidder's service.

1.10. Canvassing in connection with Tenders is strictly prohibited and the bids submitted by the Bidders who resort to canvassing shall be liable to be rejected.

1.11. ECGC does not bind itself to accept the lowest of any Bid or any other bid received and shall have the right to reject any Bid without assigning any reason whatsoever. ECGC also reserves the right to re-issue the Tender Document and is not liable for any cost that might have been incurred by any bidder at the stage of bidding.

1.12. No queries or changes in requirements specifications/line items will be entertained in terms of the Bid process, except if such changes are advised or are approved by the Company.

1.13. The Company reserves the right to cancel the NIT or issue corrigendum notices to the NIT due to unavoidable circumstances and no claim in this respect will be entertained whatsoever.

2. Cost of Bidding:

The Bidder shall bear all the Costs associated with the preparation and submission of its Bid, and the Company will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the Bidding process.

ECGC is not liable for any cost that might have been incurred by any Bidder

at the stage of Bidding.

3. Eligibility Criteria:

3.1 The legal status of the Bidder shall be sole proprietor, partnership firm, Limited Liability Partnership or Company. If the bidder is found to have applied severally for this Tender, all his bids will be rejected. Several bids by related parties will also be rejected.

3.2 The Bidder should not have been blacklisted/barred/disqualified by any Govt. Financial Institutions / Banks / Government/Semi-Government departments/ regulator/ statutory body/ judicial or any other authority in India.

3.3 In addition to the above, participants fulfilling the following eligibility criteria will be considered technically qualified:

i. Bidder shall produce credentials in the form of a completion certificate of 1 (one) similar nature of work in Visakhapatnam or Andhra Pradesh of the minimum value of 200 Lakh Rupees put to tender during the last 5 (five) years before the date of issue of this tender notice.

or

ii. Bidder shall produce credentials in the form of a completion certificate of 3 (three) similar nature of work in Visakhapatnam or Andhra Pradesh of the minimum value of 100 Lakh Rupees amount put to tender during the last 5 (Five) years before the date of issue of this tender notice; (Only completed work shall be the criterion).

iii. Valid Electrical license issued by the Govt. of Andhra Pradesh.

Note:

i) Copy of the **Completion certificate and Work order** duly signed by the competent authority about past works shall be submitted with

their bid. In the required certificate it should be clearly stated that the work has been completed to their satisfaction and also that no penal action has been initiated against the executed agency i.e., the tenderer. (Both certificates are mandatory)

ii) Payment Certificates will not be treated as completion certificates. Copy of completion certificate without actual date of completion will not be entertained.

3.4 The audited balance sheet for the previous five financial years must be submitted as per **Annexure- B**. Average annual financial turnover during the last 05 (five) previous financial years with the latest FY ending on 31st March 2024, should be at least 250 Lakh value and as per pre-qualification Performa detailed in **Annexure-A**

3.5 Valid Professional Tax Receipt Challan for the relevant period, Valid PAN issued by the IT Department, Govt. of India, Valid Goods and Services Taxpayer Identification Numbers (GSTIN) under GST Act 2017 as per notification No: - 4374 -F(Y) dated 13.07.2017 & Income Tax Acknowledgement Receipt for Assessment Year 2023-24 to be submitted.

3.6 A declaration (Affidavit) in this respect has to be furnished by the prospective bidders as per the prescribed format vide **Annexure- G** without which the Technical/Pre-qualification Bid shall be treated non-responsive. Time is the essence of the project no excuses will be entertained regarding work, the contractor has to perform the work within schedule otherwise penalties will be imposed.

3.7 The documentary evidence of the Bidder's qualifications to perform the Contract in its Bid will be accepted only if it is established that the same is to the Company's satisfaction.

3.8 Bidder must have an office of a minimum of 5 (Five) years old and

should be functional from Visakhapatnam or Andhra Pradesh where the project is located. Bidder may produce documentary evidence in support of the same. ECGC may disqualify if any of the above requirements is not furnished in proper format. (Shops and Establishment certificates issued by corporation / Local GST).

3.9 GST Turnover certificates are to be submitted.

4. Documents Comprising the Bid:

4.1 Documents comprising the Bid envelope should contain the following completed forms/documents as per the clauses in the Bid and duly signed by the authorised representative of the Bidder and stamped with the official stamp of the Bidder (Board Resolution, if applicable, authorising representative to bid and make commitments on behalf of the Bidder to be attached):

(i) Technical/Pre-qualification Bid Form as per Annexure-A

(ii) Financial/Price Bid as per Annexure-H

(iii) Supporting documents as mentioned in Annexure-B to G.

4.2 The Bid form and the documents attached to it shall not be detached from one another and no alteration or mutilation (other than filling in all the blank spaces) shall be made in any of the forms or documents attached thereto. Any alterations or changes to the entries in the attached documents shall only be made by a separate covering letter otherwise it shall not be entertained for the Bidding process.

5. Language of Bid

The Bid prepared by the Bidder, as well as all correspondence and documents relating to the Bid, exchanged by the Bidder and the Company and supporting documents and printed literature shall be submitted in English.

6. Preparation of Bids

6.1. The bid shall be in A4 size papers, numbered with index and highlighted with technical/Pre-qualification specification details. Bids should be spirally bound or fastened securely before submission. Bids submitted in loose sheets shall be disqualified.

6.2. The Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorised to bind the Bidder to the Contract. The person or persons signing the Bids shall authenticate all pages of the Bids, except for un-amended printed literature.

6.3. All documents submitted in the context of this Tender Document, whether typed, written in indelible ink, or un-amended printed literature, should be legible/readable. Non-compliance to this clause shall result in the Bid being considered non-responsive and shall be rejected at the outset.

6.4. The Bidder, for the purpose of making the Bid, shall complete in all respects, the form(s) annexed to the Tender Document, quote the Rates, with Amount (prices) and furnish the information/ documents, called for therein, and shall sign and put a date on each of the forms/documents in the space provided therein for the purpose. The Bidder shall affix its initial on each page of the Bidding Documents.

6.5. No questions or items in the annexures shall be left blank or unanswered. Where bidders have no details or answers to be provided a ‘No’ or ‘Nil’ or ‘Not Applicable’ statement shall be made as appropriate. Forms with blank columns or unsigned forms will be summarily rejected.

6.6. The Bidder should ensure that there are no cuttings, over-writings, and illegible or undecipherable figures to indicate their Bid. All such Bids may be disqualified on this ground alone. The decision of the Company

shall be final and binding on the Bidder. The Bidder should ensure that unrealistic (lower than workable rates, or excessively high rates), ambiguous or unquantifiable costs/amounts are not included in the Bid, which would disqualify the Bid.

6.7. Tenders containing any condition leading to unknown/indefinite liability, are liable to be summarily rejected.

6.8. The Bid shall contain the address, Tel. No., Fax No. WhatsApp number and e-mail ID, if any, of the Bidder, for the purposes of serving notices required to be given to the Bidder in connection with the Bid.

6.9. The Bid shall be signed by a person or persons duly authorized by the Bidder with signature duly attested. In the case of a body corporate, the Bid shall be signed by the officers duly authorized by the body corporate with its common seal duly affixed.

6.10. The Bidder, at his responsibility, costs and risk should visit the site to check the Drawing of the Tender on Scale Print, ascertain the working conditions and local authority rules/regulations/restrictions if any and other information required for the proper execution of the work and obtain all information that may be necessary for preparing the Bid as mentioned in the Notice Inviting Tender, before submitting the bid with satisfaction. The successful Bidder shall not be entitled to any claim of compensation for difficulties faced or losses incurred on account of any site conditions which existed before the commencement of the work or which in the opinion of the Company might be deemed to have reasonably been inferred to be so existing before commencement of work. Necessary permission, wherever required, is to be taken from the nodal contact person of ECGC – Mr. Chirantan Dutta, Branch Manager.

6.11. The quantities of various items given in the Bill of Quantity (BoQ) are

approximate. The quantities of work may vary at the time of allotment/execution of work. The company reserves the right to omit/delete any item(s) of work from the schedule before the order for purchase of the same has been placed by the Vendor. The schedule of quantities shall be filled in as follows:

(i) The rates column is to be legibly filled in both English figures and English words.

(ii) Amount column to be filled in figures for each item and the amount for each subhead as detailed in the "Schedule of Quantities".

(iii) All corrections are to be initialed.

6.12 The Bidders should note that the tender is strictly on the item rate basis and their attention is drawn to the fact that the rates for every item should be correct workable and self-supporting. If called upon by the Company, a detailed analysis of any or all the rates shall be submitted by the contractor. The Company shall not be bound to recognize the contractor's analysis.

7. Submission of Tender

7.1 Each Bidder can submit only one Bid.

7.2 Bids shall be submitted in two parts i.e. (a) Technical/Pre-qualification Bid and (b) Financial/Price Bid.

a. Envelope No.1 (Technical/Pre-qualification Bid)

The Envelope No.1 shall contain 1) A Technical bid as per **Annexure – A**; 2) Supporting documents for the Technical bid and 3) an Earnest money deposit in the form of Crossed Demand Draft of Rs.50,000/- (Rupees Fifty Thousand Only) in favor of ECGC Ltd. payable at Visakhapatnam, for "Notice inviting Tender for

Office Interior furnishing, electrical, Heating, Ventilation and air conditioning (HVAC) and allied civil work at ECGC Ltd.'s Visakhapatnam office." This envelope shall be superscribed " Envelope No.1 (Technical Bid and Earnest Money) for "Notice inviting Tender for Office Interior furnishing, electrical, Heating, Ventilation and air conditioning (HVAC) and allied civil work at ECGC Ltd.' Visakhapatnam office." The tenders not accompanied by the earnest money deposited by demand draft are liable to be rejected as NON-RESPONSIVE.

b. Envelope No.2 (Financial Bid/Price Bid)

Envelope No.2 shall contain the Financial Bid as per **Annexure - H** on the letterhead of the bidder duly filled in with complete details and description including all data which are to be supplied by Bidders as specified in this Bid. The bidder shall quote their rate for each & every item in the Schedule of Quantities rate column, and arrive at the amount of that item by multiplying the quoted rate with the quantity of the item. The quoted rate should be a whole number. The bids containing fractions, any notes and conditions will be rejected. This envelope shall be super scribed " Envelope No.2 (Financial Bid) for "Notice inviting Tender for Office Interior furnishing, electrical, Heating, Ventilation and air conditioning (HVAC) and allied civil work at ECGC Ltd.' Visakhapatnam office."

7.3 The tenders are to be submitted in one non-window envelope containing technical and financial bids in two separate non-window envelopes each sealed and identified as to envelope number and contents as indicated above. Both envelopes shall be contained in a large envelope super scribed "Notice inviting Tender for Office Interior furnishing, electrical, Heating, Ventilation and air conditioning (HVAC) and allied civil work at ECGC Ltd.'s

Visakhapatnam office.". Bids are liable to be rejected if all Bids (Technical/Pre-qualification Bid and Financial Bid/Price) are not received together and in separate envelopes.

7.4 The outer envelope shall be addressed to the Company at the given address: Branch Manager, ECGC Ltd., VISAKHAPATNAM Branch, 1st Floor, Shankarmatam road, Opposite Shankarmatam temple, Visakhapatnam-530016 up to 5.30 PM. on 09/01/2025. Sealed tenders are to be delivered in person to the Nodal contact person nominated for the purpose or put in a sealed tender box kept in the office before the stipulated time.

7.5 All envelopes should indicate the name and address of the bidder on the cover.

7.6 If the envelopes are not sealed and marked, the company will assume no responsibility for the Bid's misplacement with premature opening.

7.7 Bidder shall apply with self-attested photocopies of all credentials and other relevant documents such as valid certificates, valid Partnership deed (in case of Partnership firm), current Professional Tax deposit Challan/ Professional Tax clearance certificate, PAN card, Trade License from the respective Company, Municipality, Panchayat, etc. for participating in this Tendering process of ECGC Limited

Any Technical/Pre-qualification and Financial Bid not conforming to the above list of documents will be rejected.

7.8 The Technical/Pre-qualification Bid should not contain any price information. Such a bid, if received, will be rejected.

8. Bid Prices

8.1. Prices are to be quoted in Indian Rupees only and the quotation shall be in figures as well as words if there is any discrepancy between the two, the lowest amount will only be accepted.

8.2. Prices quoted by the Bidder shall remain fixed during the Bidder's performance of the Contract and shall not be subject to variation on any account, including exchange rate fluctuations, during the validity period of the contract. GST, Cess etc. levied by Central or State Governments may be charged as per actuals, and are allowed to be varied. A Bid submitted with an adjustable price quotation will be treated as non-responsive and shall be rejected.

8.3. Partial Bids will not be accepted and shall be rejected. Bidder(s) shall have to quote for the entire scope of work.

9. Period of Validity of Bids

9.1. Bids and the rates quoted shall remain valid for a period of 120 days from the last date of submission of Bids. If the Bidder withdraws the Bid, any time after the deadline prescribed for submission of the bid till the period of Bid validity his Earnest Money Deposit shall be forfeited.

9.2. In exceptional circumstances, the Company may solicit the Bidder's consent to an extension of the period of validity of the Bid on the same terms and conditions. The request and the responses thereto shall be made in writing. At this point, a Bidder may refuse the request without risk of exclusion from any future TENDERs or any debarment.

9.3. The Company reserves the right to call for fresh quotes at any time during the validity period of the Bid if considered necessary.

10. ADDITIONAL INFORMATION

10.1. Bidder may include additional information which will be essential for a better understanding of the proposal. This may include diagrams, excerpts from manuals, or other explanatory documentation, which

would clarify and/or substantiate the bid. Any material included here should be specifically referenced elsewhere in the bid.

11. GLOSSARY

11.1. Provide a glossary of all abbreviations, acronyms, and technical terms used to describe the services or products proposed. This glossary should be provided even if these terms are described or defined at their first use or elsewhere in the bid response.

12. Deadline for Submission of Bids

12.1. Bids must be received by the Company at the address specified, no later than the date & time as specified in the “Schedule of Events” in the Invitation to bid.

12.2. In the event of the specified date for submission of Bids being declared a holiday for the Company, the bids will be received up to the appointed time on the next working day.

12.3. The Company may, at its discretion, extend the deadline for submission of Bids by amending the appropriate terms and conditions in the Bid Document, in which case, all rights and obligations of the Company and Bidders previously subject to the deadline will thereafter be subject to the extended deadline, which would also be advised to all the interested Bidders on the Company’s website.

12.4. ECGC is not responsible for non-receipt of bids within the specified date due to any reason including postal delays or holidays.

12.5. Any Bid received after the deadline for submission of Bids prescribed will be rejected. No Bids shall be returned.

13. Modification and Withdrawal of Bids

13.1. The Bidder may modify or withdraw its Bid after the Bid’s submission, provided that written notice of the modification, including substitution

or withdrawal of the Bids, is received by the Company, prior to the deadline prescribed for submission of Bids, the Bidder may do so without any penal action including debarment or exclusion from any future Tenders/contracts/business, provided the Bidder submits its decision to the Company in writing, along with its reasons for the same.

13.2. No Bid shall be modified after the deadline for submission of Bids.

13.3. No Bid shall be withdrawn in the interval between the deadline for submission of Bids and the expiration of the period 120 days from the last date of submission of Bid. Withdrawal of a Bid during this interval shall result in forfeiture of EMD and may further result in penal action including debarment or exclusion from any future Tenders/contracts/business.

13.4. Bidders who wish to be present at the time of the opening of Tender may be present at the Office address as mentioned above on the date and time fixed for opening of the Tender.

14. Preliminary Evaluation

14.1. Bids not confirming to the requirement of the Tender may not be considered by ECGC. However, ECGC reserves the right at any time to waive any of the requirements of the Tender. The Company will examine the Bids to determine whether they are complete, whether the required formats have been furnished, whether the documents have been properly signed and whether the Bids are generally in order. Before the detailed evaluation, the Company will determine the responsiveness of each Bid to the Bid Document. For purposes of these clauses, a responsive Bid is one, which conforms to all the terms and conditions of the Bid Document without any deviations.

14.2 The Company's determination of a Bid's responsiveness will be based on the contents of the Bid itself, without recourse to extrinsic evidence.

14.3. If a Bid is not responsive, it will be rejected by the Company.

ECGC reserves the right to verify the validity of bid information and reject any bid, where the contents are found incorrect whether partially or fully, during the process of Tender or even after the issuance of work order.

14.4. During the scrutiny, if it comes to the notice of the Company that the credential(s) and/or any other paper(s) of any bidder is / are incorrect/ manufactured/ fabricated, that bidder(s) will not be allowed to participate in the tender and that application will be rejected outright. If found necessary, the Company shall verify the credential(s) and/or other document(s) of the Bidders before opening of Financial bid and/or of the lowest Bidder before issuance of the work order. After verification, if it is found that the document(s) submitted by the lowest Bidder is/are either manufactured or false, the work order shall not be issued in favour of the said Bidder.

14.5. During the evaluation of the bids or at any time before or after issuance of the work order, if it comes to the notice of the Company that the credential(s) and/or any other documents(s) of any bidder is/are incorrect/ manufactured/ fabricated, and/or if any bidder has made wilful misrepresentations or fraudulent claims as regards any material fact, such bidder(s) will be made ineligible to participate in the tender process resulting in rejection of the concerned bid or cancellation of the work order, as the case may be. The Company reserves its right to lawfully proceed against such bidders, inter alia, for recovery of damages and/or otherwise.

15. Evaluation of Technical Bids

15.1. Sealed bids shall be opened by the designated Tender opening Committee at the specified time and place.

15.2. Only those Bidders and Bids which conform with the eligibility terms and conditions during the Technical Bid evaluation would be taken up by the Company for further detailed evaluation. The Bids which do not qualify the eligibility criteria and all terms during Technical evaluation will not be taken up for further evaluation.

15.3. The Company reserves the right to evaluate the Bids on technical & eligibility parameters.

15.4. The Technical Evaluation would be first carried out as per the Eligibility Criterion detailed In Clause 3.3 above and relevant Annexures such as A, B, & C.

15.5. During evaluation and comparison of Bids, the Company may, at its discretion ask the Bidders for clarification of their bid. The request for clarification shall be in writing and no change in prices or substance of the Bid shall be sought, offered or permitted. No post-bid clarification at the initiative of the bidder shall be entertained.

16. Evaluation of Financial/Price Bids and Finalization

16.1. The Bidder(s) from the list of earlier shortlisted Bidder(s) shall be deemed eligible for further evaluation and Financial/Price bids for these Bidder(s) shall be opened.

16.2. Company may waive off any minor infirmity or non-conformity or irregularity in a Bid, which does not constitute a material deviation, provided such a waiving does not prejudice or affect the relative ranking of any Bidder. Bidder(s) having any doubt/ queries/ concerns with any clause of this document or selection process shall raise their concern within 7 (Seven) days of the release of the TENDER Document. ECGC will not be liable to accept or provide any explanation towards any doubt/ concerns later on whatever the same

may be.

16.3. An item rate tender containing a percentage below/above will be summarily rejected. However, where a tenderer voluntarily offers a rebate for payment within a stipulated period. This may be considered.

16.4. The queries may be communicated only through the e-mail ID provided, which is visakhapatnam@ecgc.in

16.5. Bidder(s) bidding in the process shall give as a part of the Bidding documents a statement on their letterhead, as per the format provided under **Annexure - E**, that they have no objection to any clause of the Tender Document.

17. Contacting the Company

17.1. The Bidder may submit in writing any tender enquiry on matters where clarifications or additional information is desired as per the dates mentioned in the schedule.

17.2. If considered appropriate, ECGC Ltd reserves the right to issue addendum(s) or amendment(s) to any condition/ specifications/ schedules to all Bidders before the date of submission. Tenders submitted by the Bidders shall be deemed to cover the effect of such addendum(s)/ amendment(s) issued and such addendum(s)/ amendment(s) duly signed by the Bidders shall be submitted along with the tenders.

17.3. No Bidder shall contact the Company on any matter relating to its Bid, from the time of opening of Financial/Price Bid to the time the Work order is issued.

17.4. Any effort by a Bidder to influence the Company in its decisions on Bid evaluation, Bid comparison or contract award may result in the rejection of the Bidder’s Bid and may be barred from any future Tenders/contracts/business with ECGC.

18. Award Criteria

18.1. Only the Bidders who qualify for the technical bid shall be eligible to participate in the financial bid. The bidder who quotes the lowest (L-1) shall be awarded the Contract. ECGC will notify the successful Bidder in writing, by letter or by e-mail, that its Bid has been accepted. The notification of award will constitute the formation of the offer to contract. The selected Bidder should convey acceptance of the award of a contract by returning a duly signed and stamped duplicate copy of the award letter within 10 (ten) working days of receipt of the communication along with a copy of the signed agreement as per Annexure-J.

18.2. In case the selected Bidder fails to accept the award then the Bid will be scrapped and ECGC Ltd. will re-tender the entire bid.

18.3. On acceptance of the tender, the name of the authorised representative(s) of the Bidder who would be responsible for taking instructions from the Company/Architect shall be communicated to the Company/Architect.

18.4. The Bidder shall submit the insurance cover for the work in the form of the **Contractor's All Risk Insurance Policy (CAR)** policy within seven (7) days from the acceptance of the award of the tender letter, from the insurance company approved by IRDA.

18.5. ECGC Ltd. will not be bound to accept the lowest bid and reserves the right to accept or reject any or all the tenders without assigning any reasons whatsoever.

19. Company's Right to Accept Any Bid and to Reject any or All Bids

19.1. Notwithstanding anything mentioned above, the Company reserves the right to accept or reject any or all Bids or to cancel the Bidding

process at any time before contract award, without incurring any liability to the affected Bidder or Bidder(s) or any obligation to inform the affected Bidder or Bidders of the grounds for the Company's action.

19.2. All decisions taken by the Company are binding and final.

20. Earnest Money Deposit (EMD) & Performance Bank Guarantee

20.1. Earnest Money may be deposited through (a.) Demand Draft (DD) issued from any scheduled bank in favour of "ECGC Limited" payable at Visakhapatnam. It should be submitted under sealed cover along with the Bid documents. Bids submitted without EMD are liable to be rejected. However, all Micro and Small Enterprises (as defined in the Micro, Small and Medium Enterprises Development Act 2006) are exempted from depositing EMD amounts. The eligible firms claiming exemption under Micro and Small Enterprises need to submit a certificate of Registration under the Ministry of Micro, Small and Medium Enterprises, GOI.

20.2. EMD of the unsuccessful bidders will be returned to the latest on or before the 30th day after receipt of acceptance of tender from the successful bidder. The EMD of the successful Bidder shall be refunded after submission of a 3% Performance Bank Guarantee. No interest will be paid on EMD.

20.3. Forfeiture of Earnest Money Deposit: The Earnest Money shall be forfeited –

a. If the Bidder withdraws the Bid after the deadline prescribed for submission of bids.
b. In case of a successful Bidder, if the Bidder fails within the specified time limit to accept the award of the contract.
c. If the successful bidder does not start work within the time specified

in the tender document or refuses to accept the award of the tender.

d. The successful bidder shall furnish a Performance Bank Guarantee of 3% of the value of the contract within 07 days of acceptance of the tender award letter. The Performance Bank Guarantee will be released after successful completion of the project duly certified by the Architect. The Company may terminate the contract in the event the successful bidder fails to furnish the Performance Bank Guarantee for an amount equal to 3% of the value of the contract.

SECTION - 4

4. Terms and Conditions of Contract (TCC)

4.1. As stated in the Draft Service Agreement at Annexure J

****

SECTION – 5

ANNEXURE – A

ELIGIBILITY /TECHNICAL/ PRE-QUALIFICATION BID

Sr No	Description	Details
1	Name of the Company/ Firm/ Individual	
2	Legal Status (eg. Proprietorship, Partnership, Limited Liability Partnership, Company etc.	<Certified copy of the Certificate of Incorporation of Company issued by the Registrar of Companies / Partnership Deed etc. to be attached>
3	Registered Physical Address	
4	Correspondence Address	
5	Business profile of the company/firm (attach a separate write-up or brochure regarding business activities of the company/firm)	

6	Date of incorporation		
7	Board of Directors/ Management/ Promoters/ Partners/ Proprietor	(i)	
		(ii)	
		(iii)	
		(iv)	
		(v)	
8	Contact Person Details (Name, Landline and mobile Number, e-mail id)		
9	E-mail id of the bidder,		
10	PAN of the bidder	<copy required>	
11	TIN of the bidder	<copy required>	
12	GST Registration No.	<copy required>	
13	Work experience in similar nature of work in terms of Clause 3.3 (a) (i) & (ii) of NIT	< Evidences in form or work completion certificates should be provided along with the bid >	

14	Annual turnover for the last five financial years	< IT returns acknowledgments and / or Audited Financial Statements / statements certified by Chartered Accountants to be provided for last five financial years ending on 31.03.2024.
15	Power of Attorney/authorization for signing the bid documents	
16	The Bidder should not have been blacklisted / barred / disqualified by any Govt. Financial Institutions / Banks / Government / Semi-Government departments/ regulator / statutory body/ judicial or any other authority in India.	< A self-declaration by the Bidder on its letter head>

17	The Bidder's Firm should not be owned or controlled by any Director or Employee of ECGC Ltd.	< A self-declaration by the Bidder on its letter head>
18	Projects taken up and completed during last 5 years	Details
19	Any project not completed due to any reason in last 5 years	Details
20	Any penalty imposed for delay or no-completion in past 5 years	Details
21	Status of ongoing/ completed litigation & arbitration related to projects	Details

……

Signature of the authorized Signatory of Company/Firm/ Individual (Company Seal)

Name :

Date: Designation :

Contact No (Mobile) Fax No.:

Email Id

ANNEXURE-B

ANNUAL TURNOVERS FOR THE LAST FIVE FINANCIAL YEARS

Furnish certified copies of the audited balance sheet and profit & loss account (audited) for the last five preceding years-

S. No.	Financial Year	Turnover from renovation and repairing work [Rs in Lakhs]	Turnover from all other sources (Rs in Lakhs)	Remarks
1	2019-20			
2	2020-21			
3	2021-22			
4	2022-23			
5	2023-24			

Note:

1. Please attach certified copies of the latest Income Tax, Audited Balance Sheet and Profit & Loss account statement to support the information furnished, failing which your firms shall be summarily disqualified.
2. Where copies are required to be furnished, the same are to be self-

certified.

3. Please attach the Certificate of financial soundness of your firm issued by the Bank

4. Additional sheets may be used for providing information and the same shall be signed and stamped by the Bidder.

SIGNATURE OF THE BIDDER WITH SEAL

DATE:

ANNEXURE-C

EXPERIENCE PROFILE DETAILS OF SIMILAR WORKS AND ALL WORKS COMPLETED IN THE LAST FIVE YEARS

S. No.	Description of the Work	Name and address of the Tenderer	Contract No. and date	Date of award of work	Stipulated date of completion	Actual date of completion	Value of completed work (in Lakhs)	Penalty if any	Work completion certificate enclosed
1.									
2.									
3.									

NOTE:

i. The contractor must enclose the work completion letter or certificate issued by the competent authority of the tenderer of earlier works. Any other letter such as work order copies, running bill advice, architect's letters etc. shall not be accepted as proof of having completed the works.

ii. Additional sheets may be used for providing information and the same shall be signed and stamped by the Tenderer.

SIGNATURE OF THE BIDDER WITH SEAL AND DATE:

ANNEXURE – D

BANK DETAILS OF THE BIDDER

Sr No	Description	Details
1	Name of the Bank	
2	Address of the Bank	
3	Bank Branch IFSC Code	
4	Bank Account Number	
5	Type of Account	

……

Signature of the authorized Signatory of the Company/Firm/Proprietor (Company Seal)

Name: Designation :

Contact No (Mobile) Email Id

ANNEXURE – E
ACKNOWLEDGEMENT

To,

ECGC Limited,

Visakhapatnam Branch,

1st Floor, Shankarmatam Road, Opposite Shankarmatam temple,

Visakhapatnam-530016

Dear Sir/Madam,

SUBJECT: RESPONSE TO THE NOTICE INVITING TENDER FOR "Office Interior Furnishing, Electrical, Heating Ventilation & Air Conditioning (HVAC), and allied Civil Works, in an office space area of 2800 square feet located at D.No. 42-1-45/1/1, New Investment Building, LIC Annex Building, Thikkana Road, Visakhapatnam-530004.

Having examined the NIT Document including Annexures, the receipt of which is hereby duly acknowledged, we, the undersigned offer to provide services in accordance with the scope of work as stated in the TENDER Document within the cost stated in the Bid.

(1) If our Bid is accepted, we undertake to abide by all terms and conditions of this TENDER.

(2) We certify that we have provided all the information requested by ECGC in the requested format. We also understand that ECGC has the right to reject this Bid if ECGC finds that the required information is not provided or is provided in a different format not suitable for evaluation process for any other reason as it deems fit. ECGC's decision shall be final and binding on us.

(3) We agree that ECGC reserves the right to amend, rescind or reissue this

TENDER Document and all amendments at any time during the tendering.

(4) We agree that we have no objection to any of the clauses and bidding process of this Tender Document.

.....

Signature of the authorized Signatory of the Company/firm/Proprietor (Company Seal)

Name: Designation:

Contact No (Mobile):

Email ID:

ANNEXURE-F

FORMAT FOR LETTER OF AUTHORISATION

(To be submitted on the Bidder's letterhead)

To

ECGC Limited,

Visakhapatnam Branch,

1st Floor, Shankarmatam Road,

Opposite Shankarmatam temple,

Visakhapatnam-530016

Letter of Authorisation for Attending Bid Opening for Tender

Any one of the following persons is hereby authorised to attend the bid opening on _____(date) in the tender for work: **"**Office Interior Furnishing, Electrical, Heating Ventilation & Air Conditioning (HVAC), and allied Civil Works, in an office space area of 2800 square feet located at D.No. 42-1-45/1/1, New Investment Building, LIC Annex Building, Thikkana Road, Visakhapatnam 530004 mentioned on behalf of M/s._____ (Name of the Bidder) in the order of preference given below:

Order of Preference Name Designation Specimen Signature

I

II

(Authorized Signatory of the Bidder)

Date_____

(Company Seal)

1. A maximum of one person can be authorized to attend the bid opening.
2. Permission for entry to the hall where bids are opened may be refused in case authorization as prescribed above is not submitted or for any other exigency.

ANNEXURE G

AFFIDAVIT

(To be furnished in Non – non-judicial stamp paper of appropriate value duly notarized)

1. I,_____the undersigned do certify that all the statements made in the attached documents for the work **"Office Interior Furnishing, Electrical, Heating Ventilation & Air Conditioning (HVAC), and allied Civil Works, in an office space area of 2800 square feet located at D.No. 42-1-45/1/1, New Investment Building, LIC Annex Building, Thikkana Road, Visakhapatnam-530004** are true and correct. In case any information submitted proves to be false or concealed, the application may be rejected and no objection/claim will be raised by the undersigned.

2. The undersigned also hereby certifies that neither our firm/partners nor any of our constituent partners have been debarred to participate in the tender by ECGC LTD. or any other body during the last 5 (five) years before the date of this NIT.

3. The undersigned would authorize and request any Bank, person, Firm or Company to furnish pertinent information as deemed necessary and/or as requested by the company to verify this statement.

4. The undersigned understands that further qualifying information may be requested and agrees to furnish any such information at the request of the Authority.

5. Certified that I have applied in the tender in the capacity of individual / as

a partner of a firm & I have not applied severally for the same tender. I undertake to sign Service Agreement with ECGC Ltd. on behalf of our Company/ Firm if selected as successful bidder and on acceptance of Award Letter as per Draft in Annexure-J attached in the NIT

6. I/ We hereby agree and undertake that we have not directly or through any other person or firm offered, promised or given nor shall we offer, promise or give, to any employee of ECGC involved in the processing and/or approval of our proposal/ offer/ bid/ tender/ contract or to any third person any material or any other benefit which he/she is not legally entitled to, to obtain in exchange advantage of any kind whatsoever, before or during or after the processing and/or approval of our proposal/offer/bid/tender/contract.

_____

Signature of the declarant identified by me

Signature of Advocate

Seal & Signature of Notary

ANNEXURE – H

SPECIFICATIONS

S. NO	DESCRIPTION		PAGE NO
1	PART-A	INTERIOR FURNISHING	
2	PART-B	ELECTRICAL	
3	PART-C	HVAC	

SCHEDULE OF QUANTITIES

S. NO	NAME OF WORK	AMOUNT
1	INTERIOR WORKS	
2	ELECTRICAL WORKS	
3	HVAC WORKS	
4	CIVIL WORKS	
5	PLUMBING WORKS	
6	FURNITURE WORKS	
	GRAND TOTAL	
	GST EXTRA	

Amount in Words:

Signature of the bidders
With the Seal of the Company

Date:

SPECIFICATIONS – PART A

INTERIOR FURNISHING

1. GENERAL DATA

1.1 GENERAL

The work under this tender shall be executed strictly in accordance with constructional and material requirements defined under these specifications. The contractor shall carefully acquaint himself with these specifications to determine his contractual obligations for work. Architect instruction shall be binding over and above the specification described in SOQ, in writing only with CC to the Company.

1.2. DRAWINGS/DIMENSIONS PROCEDURE

Figured dimensions on drawings shall supersede measurements by scale and drawings to a large scale take precedence over those to a smaller scale. Dimensions or directions in the specifications shall be checked on-site. The dimensions where stated do not allow for wastage, laps, joints etc. The levels, measurements and other information concerning the existing site as shown on the drawings are the responsibility of the bidder, who shall verify them for himself and examine the nature of the ground, conduct procedures & coordinate from electrical, HVAC and fire SOQ items.

The procedure for coordination is, to create a mockup sample and all trades workmen shall install items, conduct operational coordination, and physical execution satisfaction in accordance with drawings, or modifications suggested from feedback from the team at work, shall be understood and consented by all trade workmen. The drawing shall be kept permanently displayed at the site, with necessary pictures. Marking levelling and dimensions are permanently marked at the site. Company and Architect representatives have the discretion to observe and witness coordinated teamwork for up to mark work progress and take notes and pictures for

record.

For items which are many in count, or designs that are repeated at multiple sites, one true unit sample is set at the site with a manufacturer test certificate and again tested for workmanship and specification at the site, during the procedure. by the bidder, no test certificate shall be issued by the Employer/architect. Employer and Architect representative have the discretion to observe and witness coordinated teamwork for up-to-mark work progress, take notes and pictures for record

1.3 CO-ORDINATION OF DRAWINGS

Before the commencement of work, the contractor shall correlate all relevant structural, architectural, and service drawings and satisfy himself that the information available therefrom is complete and unambiguous.

Any discrepancy shall be brought to notice for timely rectifications for the architect's response if any, which may take up to 15 days. Communication shall be done in advance, no time extension is available to a contractor in this response time and shall not be entertained as a hindrance.

The contractor shall be responsible for any error/difficulty in execution/damage incurred owing to any discrepancy in the drawings which has been overlooked by him and has not been brought to the notice of the Architect before execution.

1.4B.I.S. CODES OF PRACTICE

Wherever any reference is made in the specifications to any Bureau of Indian Standards (B.I.S.) or Indian Standards (I.S.) Code of practice shall be understood to indicate the latest version of the code of practice in usage at all times of construction. All civil and structural work shall be carried out as per the latest C.P.W.D. specification for material and workmanship unless specified otherwise.

1.5SETTING OUT

The CONTRACTOR shall be responsible for the true and proper setting out of the work to original points, lines, and levels of reference and for the correctness of the levels, dimensions, and alignment of all parts of the work and the provision of all necessary instruments, appliances and labour in connections therewith. If any time during the progress of the work any error appears or arises in the position of levels, dimensions, or alignment of any part of work the contractor on being required to make good shall at his own expense rectify such errors to the satisfaction of the Architect. The checking of any line or level by the Architect shall not in any way relieve the contractor of his responsibilities.

The contractor shall provide all required setting out pillars and one or more permanent benchmarks in some place before the start of the work, from which all important centre lines and levels for excavations will be set. The contractor shall provide all labour and material for setting out at his own cost. The setting out pillars & permanent benchmarks shall consist of masonry pillars with top neatly plastered and horizontal as per the approval of the Architect. Benchmarks shall be well connected with GTS, or any other benchmarks approved by the Architect.

2. P.O.P. (PLASTER OF PARIS)

Plaster of Paris punning (Plaster) is generally applied on an already cement-plastered surface to give it a smooth and even surface.

2.1. PREPARATION OF SURFACE

Projecting burrs of mortar formed during existing cement plaster shall be removed. The surface shall be scrubbed clean with wire brushes. In addition, the plastered surface shall be pockmarked with the painted tool, at a spacing of not more than 4 cm centres and a depth of pocks to be approx. 3mm deep. This is to ensure a proper key for the plaster. This surface shall be cleaned

of all oil and grease marks etc.

2.2. PLASTER OF PARIS

The plaster of Paris shall be of semi-hydrate variety calcium sulphate. Its fineness shall be such that when sieved through a sieve of I.S. sieve designation 3.35 mm or 5 minutes, after drying the residue left on it shall be not more than 1% by weight. It shall not be too quick to set. The initial setting time shall not be less than 17 minutes.

2.3. APPLICATION

The material will be mixed with water to a workable consistency. Plaster of Paris shall be applied directly on the wall plasters in suitable sizes panels and finished to a smooth surface by steel trowels. The plaster shall be applied in such a manner that it fully fills the gaps the thickness over the plastered surface is as specified in the description of the item. The finished surfaces shall be smooth and true to plane, slopes or curves as required.

3. VITRIFIED /GLAZED/CERAMIC TILE AT FLOOR/ DADO

The samples of tiles/ slabs are to be submitted to the Architect for approval. The final decision will be based on the decision of the Architect /engineer or authorized official. For floor tiles, all edges are to be sorted for straight edges before laying. Tiles will be laid after approval from the Architect. Joints for all flooring to run in a straight line and should not exceed 1.5mm for stones and 1mm for tiles and should be filled with laticrete epoxy grouting of approved shade to the full depth. The rate shall include soaking the tiles in water for at least two hours before laying. Curing, and cleaning the surface.

For wall tiles: The tiles shall be uniform in size and colour. The rear face of the tiles shall be grooved and/or recessed to provide an adequate key for the plaster. The tiles shall be laid true and plumb over a cement screed 15mm thick composed of 1 part cement and 3 parts coarse sand. Before laying the tiles, the plaster shall be allowed to harden and then roughened with wire

brushes. The back of the tiles shall be buttered with a coat of grey cement slurry and set in the bedding mortar. The tiles shall be firmly set in the mortar bedding and tamped and corrected to proper plane and lines. The joints shall be tight, regular, and uniform and shall be as fine as possible and finished neat in pigmented horizontally to form a required pattern.

After laying, the tiles shall be thoroughly washed and cleaned to the satisfaction of the Architect.

4. WALL FINISHES

4.1 EXTENT AND INTENT

The contractor shall finish all materials, labor, scaffolding, tools, plant, and incidentals necessary and required for the completion of all plaster and wall finishes. The contractor shall be responsible for taking proper precautions to protect already installed work from damage. Particular care shall be taken to protect windows. Tape shall be used where necessary.

Particular care shall be taken to protect windows. Tape shall be used where necessary.

4.2 GENERAL

Plaster as herein specified shall be applied to all internal surfaces called for. Glazed tile dado, terrazzo dado and other wall finishes are to be provided where indicated on drawings and typical details shall be considered to apply to appropriate adjoining areas where shown on the same drawings or not whether indicated or not. All plaster work and other wall finishes shall be executed by skilled workmen in a workman-like manner and shall be of the best workmanship and in strict accordance with the dimensions on drawings.

4.3 PLASTERWORK

The primary requirements of the plaster work shall be to provide an absolute water-tight enclosure, dense, smooth, and hard and divided of cracks on the

interior and exterior. The contractor shall do all that is necessary to ensure this result. All plastering shall be finished to the true plane without imperfections and square with adjoining work and shall form proper foundations for finishing materials such as paints etc.

Masonry and concrete surfaces to which plaster is to be applied shall be clean, free from efflorescence, damp and sufficiently rough and keyed. Hacking of concrete shall be 100% to ensure proper bond.

Whether directed all joints between concrete frames and masonry in-filling shall be expressed

by a groove cut in the plaster. Said groove shall be 1cm lower than the joint beneath. Where groves are not called for the joints between concrete members and masonry, in-filling shall be covered by a layer of 24 gauge, 12mm size galvanized chicken wire mesh strips 400mm wide or as shown, installed before plastering.

4.4 CHASING

All chasing, installation of conduits, boxes etc. to be completed before any plastering or other wall finish is commenced on a surface. Chasing or cutting of plaster or other finish will not be permitted. Broken corners shall be cut back not less than 150mm on both sides and patched with plaster of Paris as directed. All corners shall be rounder plaster of Paris as directed. All corners shall be rounded to a radius of 8mm or provided with suitable galvanized iron E.P.M. corner beads as directed by the Architect.

4.5 SAMPLES

Samples of each type of plaster and other wall finish shall be prepared for approval by the Architect.

4.6 PREPARATION OF SURFACE

The joints in all walls, both existing and freshly built shall be raked onto a

depth of 15mm, brushed clean with wire brushes dusted and thoroughly washed before starting plaster work. Concrete surfaces shall be completely hacked up to about 6mm depth for the entire surface as approved by the Architect to endure proper key for the plaster.

4.7 INTERNAL PLASTER TO WALLS

Plaster to internal faces of walls shall be 12mm/15mm/20mm thick as called for, consisting of 1 part cement and 4 part clean sand. (Fine and Coarse sand in equal proportions). As approved by the Architect

4.8 MORTAR MIXING

Mortar shall be prepared as specified under brickwork. It shall be made in small quantities only as required and applied within 15 minutes of mixing.

4.9 APPLICATION

Plaster application shall be commenced only after the preparatory work is approved by the Architect. The correct thickness of plaster shall be obtained by laying plaster screed (Gauges) at intervals of 1.50 meters.

Mortar shall be firmly applied, well pressed into the joints, rubbed, and finished as approved by the Architect to give a smooth and even surface.

4.10 CHICKEN MESH ON WALLS

A layer of galvanized chicken mesh (24 gauge, 12mm size) shall be provided at all junctions of members and masonry walls besides other locations as called for, properly stretched, and nailed, ensuring equal thickness of plaster on both sides of the mesh. Chicken mesh shall be provided over the entire surface of hollow blocks wherever plaster over hollow block wall is called for.

Metal corner beads are to be provided where called for on drawings and/or as instructed.

4.11 CURING

Finished plaster shall be kept wet for 10 days after completion. In hot weather, all walls shall be screened with matting kept wet or any other approved means.

4.12 CEILING PLASTER

Ceiling plaster, soffits of stair flight slabs and similar locations where called for shall be 6mm thick and consist of 1 cement and 4 parts clean fine sand.

4.13 PREPARATION OF SURFACE

The surface to be plastered shall be prepared by a close hacking with a pointed chisel as directed, to provide necessary bonding for the plaster. The surface shall be brushed, swept clean and thoroughly wetted before plastering.

4.14 APPLICATION

Mortar shall be applied firmly, pressed to the surface, rubbed, and finished to a smooth and even surface.

4.15 GROOVES

Where called for V Grooves of size as approved shall be formed in the dado and finished neat as directed. The grooves shall be straight, uniform in width and depth and neatly formed.

5. UPVC/ ALUMINIUM WORK

5.1. SHOP DRAWINGS

Contractor shall submit to the Architect for his approval shop drawings within 10 days of confirming opening sizes.

The drawing should be to full scale as possible, showing all items **of work, including:**

Metal thickness Arrangement of components Jointing

Details of site connections Fastening

Flashing Metal finishes Glazing

Weatherstripping Sub framing

Hardware (including preparation) Sealant

Other pertinent information.

5.2 INSPECTION:

All material brought to the site by the contractor for use in the work shall be subjected to inspection and approval by the Architect and shall be required to get necessary tests carried out on material and work from an approved laboratory/test house, the cost of which shall be borne by the Contractor.

5.3 ALUMINUM SECTIONS:

Aluminium sections used for work shall be as per the architect-approved drawing and suitable for use to meet architectural technical, structural, functional, and visual considerations. The aluminium extruded section shall be confirmed to IS designation HE 9WP/HV 9WP alloy, with chemical composition and technical properties as per IS 733 and IS 1285.

5.4 FABRICATION:

All frames shall be square and flat, and the frames be fabricated to a true right angle and shall conform to IS 1948. These shall be fabricated as per the approved shop drawing. Both fixed and operable frames shall be fabricated out of a section which has been machine cut to length and mechanically jointed with hardened nickel, zinc plate steel screws and joining accessories such as cleat, fixture, and machine bolt made of such material as not to cause bimetallic action. For matching with coloured anodized aluminium section all visible screws shall be coloured black by a chemical process. Threads of machine screws used shall conform to the requirements

of IS 4218. It shall withstand 150 Kg/sqm wind pressure without deformation. Required sash bars as per the approved drawing shall have a watertight EPDM gasket to that water does not penetrate through it even though water penetrates the exterior gasket and is properly welded/braced/screwed to the main members.

5.5 ANODIZING:

All aluminium sections shall be anodized as per IS 7088 and electro-coloured to matt bronze finish as per IS 1868 grading as specified in the item schedule. Anodizing to confirm specified grade with a minimum average thickness of 25 microns meter when measured as per IS 6012. The anodized coating shall be properly sealed by steam or in boiling water cold sealing process as per IS 1868/IS 6057. Polyethylene tape protection shall be applied on the anodized section before they are brought to the site. All care shall be taken to ensure surface protection during transportation, storage at the site and installation. The tape protection shall be removed on installation.

5.6 GLAZING:

Glazing shall comprise reflecting bronze or approved shade tinted or heat reflective float glass 6mm thick on the outside and 12 mm thick toughened float glass on the inside, all glass panels shall be retained within aluminium framing by use of exterior grade Ethyl Propylene Di Methylene (EPDM) gasket. No water leakage or penetration shall occur when subjected to continuous steady water shower as per BS 4315 and DIN 18055 withstanding water spray at the rate of 5 gallons per hour sft. of fixed glass area and static pressure of 20% design wind load or 15 PSI whichever is greater. The complete installation shall be free from vibration, wind whistle and noise due to thermal and structural movement and wind pressure. For doors glazing shall be of 12mm thick float glass clear/tinted as specified.

5.7 PRECAUTIONS:

The contractor shall ensure that aluminium curtain walls are not deformed/damaged during subsequent construction. all fittings, hinges framework etc. shall be protected within alkathene sheets, so that these may not be damaged during the execution of work.

5.8 FITTINGS:

The contractor shall fix aluminium doors, windows etc. in the prepared opening. Aluminium door frames, wherever possible, shall be fixed in place before erecting partitions. Where this is not possible, prepared openings shall be left for holdfasts. Breaking of partitions or walls for inserting holdfasts will not be permitted. Where the frames are to be fixed to column/wall faces they shall be fixed with raw bolts/expansion bolts of approved make in an approved manner. Special concrete blocks with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 10 mm size) with 3mm thick M.S. plate 100 x 100mm shall be cast set at suitable places into the jambs of openings. Door and window frames shall be welded to the blocks with spaces in an approved manner.

The contractor shall be responsible for assembling composites, bedding, and pointing with mastic inside and outside at the mullions and transoms, fixing lugs to the frames, placing the doors/windows in their respective opening and bedding with mastic. The contractor shall be responsible for all builder’s work including cutting out and making goods, forming fixing holes for inserting loose lugs, bolts and clips and for stacking of windows, and doors adjacent to the opening for necessary hoisting. The contractor shall be responsible for the doors and windows being set straight, plumb and level and for their satisfactory operation after the fixing is complete.

5.9 MANUFACTURER'S ATTENDANCE

The manufacturer immediately prior to the commencement of glazing shall adjust and set all windows and doors and accept responsibility for satisfactory working of the opening frames. The contractor shall give three days' clear notice to the manufacturer that glazing will commence.

6. PLYWOOD

The plywood to be used shall be grade BWR, i.e., it shall be bounded with BWR (Boiling Water Proof) type synthetic resin adhesive shall be an equal or superior quality that is laid down in IS: 303-1960.

The veneers for all grades shall be either rotary cut or sliced. The Veneers shall be sufficiently smooth to permit even the spread of glue. The thickness of all veneers shall be uniform, within a tolerance of 5%, corresponding veneers on either side of centre one shall be of the same thickness and species. The requirement for the thickness of the face and core veneers shall be as follows:

In a 3-ply board up to 5 mm thick, the combined thickness of the face veneers shall not exceed twice the thickness of the centre ply.

In multiple boards, the thickness of any veneer shall not be more than thrice the thickness of any other veneer.

The sum of the thickness of the veneers in one direction shall be approx. To the sum of the thickness of the veneers at right angles to them and shall not be greater than 1-5 times this sum except for 3-ply as specified in (a).

7. FLUSH DOORS

All flush doors shall be solid core type with well-seasoned block board core. The entire bonding shall be in highly water-resistant type liquid phenol Formaldehyde Synthetic Resin Adhesives of the hot-pressed type. Teak wood 12 mm thick lapping all rounds had to be provided and should be included in the rates. Both the faces shall be commercial hardwood type

ready for lamination or painting.

7.1. ADHESIVES

The adhesive shall be Phenol Formaldehyde Synthetic resin conforming to the B.W.P. (Boiling Waterproof) type specified in IS:848-1974. Only synthetic resin adhesive shall be used for bonding core members to one another, including the core frame, and for lapping, glazing frame, Venetian frame, and other exposed parts where such binding is done.

7.2. NAILS, SPIKES, SCREWS & BOLTS

Nails, spikes, and bolts shall be of the best quality mild steel or length and length and weight approved by the Architect. Nails shall comply with IS:1959 -1960 approved quality samples. Brass-headed nails are to comply with B.S.1210. Wire staplers shall comply with B.S.1494 or equivalent.

7.3. WORKMANSHIP

All carpenter's work shall be done by skilled workmen using proper tools. All joints shall as far as possible, be mortised tenoned and glued with the best quality approved waterproof glue. Where mortise tenon joints are not possible, the joints shall be securely nailed with the longest nails that may be used without splitting the wood. Whenever it is necessary or an adequate joint cannot be formed by nailing, the members shall be lapped or jointed by GI straps or extra wood blocks. All joints shall be done with neatness and as approved and directed by the Architect.

8. PARTITIONS AND CABINET WORK

General: Partitions, cabinets, etc. shall be fabricated and workshop as far as practicable and then brought inside the building ready to set in place. The various members shall be worked in the best manner known to the trade, mortised and tenoned, doweled, blocked, and glued together to avoid the use of nails as far as possible. The details shall be closely followed, moulding cut and mitres accurately made. Free edge of shutters, Shelves, partitions,

sides etc. shall be provided with first-class teakwood edging PVC edge tape as mentioned in individual items, glued and nailed in an approved manner. Shelves, where shown fixed, shall be supported on aluminium or other cleats or in other manner as approved by the Architect. Adjustable shelves shall have brass sockets and pins as detailed on drawings. Drawer bottoms shall be of 6 mm commercial ply unless otherwise mentioned. The drawer front, sides and back shall be as mentioned in the item. The drawers shall slide on a Soft closer telescopic channel as shown in the drawing.

Timber skirting where called for shall be of first-class Burma teakwood, cut to required sizes, planned smooth on visible faces and fixed in position in an approved manner. Cut-outs, openings, etc. shall be provided in the counters and cabinets to accommodate sinks, washbasins, cooking, ranges, pipes, etc. as shown on drawings as required at the site.

8.1. PRESERVATIVE TREATMENT

All woodwork in contract with masonry shall be painted with approved asphalt or anti-termite &fire retardant coating (Viper or equivalent) before placement. Care shall be taken to keep exposed surfaces clear from tat etc. felt shall be used to isolated wood from masonry wherever practicable. All concealed wood etc. shall be treated fully and liberally with solignum before placing in position.

8.2. PAINTING AND POLISHING

All exposed teak faces of partitions, glazing, doors, cabinet work etc. shall be Duco painted polished to approved finish. Door shutters, internal faces of cupboards and cabinets etc. shall be enamel painted/oiled to the approved finish. Drawer bottoms, sides of drawers, etc. shall be carried out as specified under “painting”.

8.3. PROTECTION OF WORK

The contractor shall be responsible for the temporary doors and closing in

opening necessary for the protection of the work during progress. He shall also provide and maintain any other temporary covering required for the protection of finished woodwork that may be damaged during the progress of the work is left unprotected.

9. HARDWARE

9.1. EXTENT AND INTENT

The contract intends that the building as shown shall be completely equipped with the required hardware. Any required item not noted or listed shall be finished in a grade equal to and harmony with the similar item listed.

9.2. GENERAL

All hardware shall be of the best quality of its type and strictly in conformity with the materials and finish described in the schedule of hardware. If called upon to do so, the contractor shall arrange to get hardware specially manufactured to the design, requirements and standards laid down by the Architect.

9.3. SAMPLES

Samples of each different item of hardware including screws or any item of hardware shall be submitted to the Architect for approval.

9.4. QUALITY

All hardware shall be of perfect fit, uniform in finish and free from imperfections that affect serviceability or mar the appearance.

9.5. GUARANTEE

The contractor shall be responsible for the proper working of all hardware, for one year from the date of completion of acceptance of the building.

10. PAINTING

10.1. EXTENT AND INTENT

The contractor shall supply all materials, labour, tools, ladders, scaffolding and other equipment necessary for the completion and protection of all painting work. Painting, as herein specified shall be applied to all surfaces requiring painting throughout the interior and exterior of the building as given in the schedules of finishes or elsewhere. The painting shall be carried out by a specialized sub-contractor, approved by the Architect. Care is to be taken that all surfaces to be painted are thoroughly cleaned and dry.

10.2. MATERIALS

Materials used in the work shall be of manufacture approved by the Architect. Ready-mixed paints, varnishes, Enamels, lacquers, stains, paste fillers, distempers and other materials must be delivered to the job site in the original containers, with the seals unbroken and labels intact. Each container shall give the manufacturer's name, type of paint, and colour of paint and instructions for reducing the thinning shall be done only in accordance with directions. Remove rejected materials immediately from the premises

10.3. COLOR

All colours, as provided in the colour schedule shall be approved by the Architect. The contractor shall mix the manufacturer's colours as per the Architect's requirements and shall prepare painted samples of the colours selected and submit same for approval by the Architect. No work is to proceed until the Architect has given his approval, preferably in writing of colour samples.

10.4. COMMENCEMENT OF WORK

Painting shall not be started until the surfaces to be painted are in a condition

fit to receive the painting and so certified by the Architect.

Painting work shall be taken in hand only after all other contractor's work is completed. The building where painting work is to be commenced shall be thoroughly swept and cleaned up before the commencement of painting. other materials of colours sharp and clean, without overlapping.

10.5. ENAMEL PAINT

Wood or Plastered Surface: Pigmented priming coat followed by one undercoat and two more finishing coats of enamel paint. Paste filler is to be applied after every coat except the final finishing coat and sanded.

Non-Galvanized Steel Surfaces: Coat of zinc chromate's oxide primer after phosphating followed by three or more coats of synthetic enamel paint. Paste filler is to be applied after every coat except the final finishing coat and sanded.

Galvanized Steel Surfaces: Priming coat of galvanized metal primer after washing with galvanized metal cleaner, followed by three or more coats of synthetic enamel paint. Paste filler is to be applied after every coat except a final finishing coat and sanded.

10.6. PLASTIC EMULSION PAINT

Pigmented priming coat (emulsion thinned with water) followed by three or more coats of plastic paint. Paste filler is to be applied after every coat except the final finishing coat and sanded.

11. SPIRIT POLISHING

Polish: Polishing material shall be prepared by dissolving pure shellac, varying in shade from pale orange to lemon yellow, free from direct and other materials, in methylated spirit at the rate of 0.15Kg. shellac to 1 litre of spirit. Suitable pigment to achieve the required shade of polish shall be added as directed by the Architect.

Preparation of Surface: The surface cleaned of all dirt etc. shall be rubbed

down smooth with sandpaper and well dusted. Knots of visible shall be covered with a preparation of red lead and glue size laid on while hot. Holes and indentations shall be given a coat of wood filler made by mixing whiting (ground chalk) in methylated spirit at the rate of 1.5 kg. of whiting to one litre of spirit. The surface shall again be rubbed down perfectly smooth with fine sandpaper and wiped clean.

Application: There or more coats of polish shall be applied over the above surface, to achieve a finish as approved by the Architect. The polish shall be applied with a pad of wooden cloth covered by a fine cloth. The paid moistened with polish shall be rubbed on the wood surface in a series of overlapping movements, applying the material uniformly over the entire area to give an even finish. Subsequent coats shall be applied in similar manner after the previous coat is allowed to dry. The finishing shall be done with fresh price of clean fine cloth, damped with methylated spirit and applied by light rubbing. The finished surface shall have a uniform texture and high gloss.

12. WAX POLISHING

Wax polishing shall be done with the readymade wax polish of approved brands and manufacturers.

Preparation of Surface: The surface to be polished shall have been finished smooth. Knots, cracks and holes on the surface shall be cleaned and filled with wood putty (fine sawdust mixed with bee's wax). The filling when dry shall be rubbed down with a carpenter's file and then the entire surface shall be rubbed down perfectly smooth and wiped clean. In no case shall sandpapers be rubbed across the grains so that even fine marks are not seen on the surface.

Application: The polish shall be applied evenly with a clean, soft pad of cotton cloth on the surface is completely and fully covered. The surface is then

continuously rubbed till the surface is quite dry. A second and third coat shall be applied in the same manner and rubbed continuously until the surface is dry.

The final coat shall then be applied and rubbed until the surface has assumed a uniform gloss and is dry, showing no sign of stickiness. The finished surface shall have a uniform glossy finish as approved by the Architect.

13. FIRE RESISTANT COATINGS ON WOODWORK

13.1. General:

The paints and primers to be used should be as per IS. 12777-1989 and BS:476 Part-7.

13.2. Application:

Primer coat: The wood surface is to be sandpapered with two coats of primer equivalent or Viper FR-880 (A-2) is to be applied on it with a brush with a time interval of 3-4 hours. Finishing coat: Primer-coated wood is to be applied with 2 coats of sealant coating equivalent to Viper FR-944 (fear) or Viper FRS-881 with a brush with a time interval of 4-6 hours.

The finishing coat as aforesaid also be applied directly on the previously painted/polished surfaces without removing the existing paint.

Thinner: Thinning agent if required could be used equivalent to 'Viper' Setter WP-914(2:1 ratio) for primer and setter WP-914(5:1 ratio) for finishing coat paint/polish.

13.3. SPECIAL NOTES

1. All laminate shall be 1.0mm thick. on vertical surfaces & 1.5mm thick. on horizontal surfaces unless otherwise specified.
2. All hardware like multipurpose locks, hinges, handles, magnetic catches

etc. shall be used only after written approval of samples.

3. Rates of all furniture items including three coats of synthetic enamel paint/spirit polish etc. as specified in the SOQ.
4. Each cabinet shall have powder powder-coated handle, Godrej, lock/spring loaded hinges brass ball catches and shutter to be fixed using hinges of approved quality.
5. Wherever not specified all exposed surfaces of partition and other woodwork shall be finished with three coats of synthetic enamel paint/polish in natural shade as applicable. Nothing extra shall be paid for the same.

13.4. SPECIFICATIONS/BRAND NAMES

Materials and finishes approved by the Architect/Employer are listed below: However equivalent materials and finishes of any other specialized firms may be used, in case it is established that the brands specified below are not available in the market and are subject to the approval of the alternative brand by the Architect.

14. UPVC DOOR AND WINDOW

14.1. COMPOSITION:

Un-plasticized PVC (Polyvinyl Chloride) meeting the requirement of ASTM D 1748 / BS 7413/ EN 12608 shall be used. No reworked material is to be used in any profile; whether used internally or externally.

14.2. PROFILE MARKING: The main frame profile shall be permanently marked at approximately 1-meter intervals (or the same as the drawing) with an identifying mark which enables the name of the profile Systems supplier, date of manufacture and extruder to be identified without extraction of the window. The profiles are hollow, multi-chambered and steel-reinforced with an outer wall thickness of 2. 8

mm.

14.3. DURABILITY:

The Systems shall be resistant to chemicals and be fungal and vermin-proof. The profiles must be colourfast, being able to withstand weather and light resistance tests of 4000 hours on xenon and weathering apparatus. COLOUR The system's colour should be uniform and consistent.

14.4. FIRE RESISTANCE:

The uPVC should be classed as self-extinguishing to prevent support or enhancement of accidental fires.

14.5. QUALITY CONTROL:

The extrusion process must be quality-controlled and have the appropriate standards relating to impact strength, technical performance and consistency.

14.6. PROFILE CONSTRUCTION:

The profile depth should be a minimum of 58mm with a nominal wall thickness, internally and externally of 2.8mm. The profile shall have a minimum of two sealed chambers for transoms and mullions and 3 sealed chambers for frames and sashes.

14.7. INTERNAL PROFILE DRAINAGE:

The internal drainage shall be isolated from chambers into which reinforcements can be placed or through which frame fixing pass. Drainage shall be either through the base or to the face, concealed by face drainage caps.

14.8. PRESSURE EQUALIZATION:

Pressure equalization for glazing rebates and frame rebates shall be carried

out in accordance with the recommendation of the profile Systems supplier to ensure efficient drainage in adverse conditions.:

14.9. WINDOW PERFORMANCE:

Windows must meet the requirements with respect to air permeability, water tightness and wind resistance up to 2400 pa.

14.10. STRENGTH AND SAFETY OF MOVING PARTS:

The moving parts of the Windows must have sufficient strength and robustness to withstand accidental Static and Dynamic loads in use, without any permanent deflection or breakage. The overall evaluation will be based on the experience from use and subject to approval by the Design Consultant/ Client.

15. GLAZING BEADS:

Glazing beads shall be of the one-foot snap-in design and shall be extruded U PVC mitred at the corners. All glazing beads shall be with a co-extruded gasket of a multi-fin design to maintain security and weather performance. The gasket material shall be thermo Plastic Elastomer.

15.1. GLAZING GASKETS:

All glazing gaskets as well as weather seals are to be extruded from non-migratory EPDM Glazing gaskets shall be a continuous length. The gasket may be subjected to random testing and shall be obtained from the profile Systems supplier.

15.2. WEATHER SEALS:

Weather seals shall consist of a double sealing System. Seals on the sash and the frame shall be continuous length and for outward opening windows the seal on the sash shall be joined to a 50mm length of pressure relief seal at the bottom of the opening whereas the seal on the frame shall be joined

on the top of opening. Weather seals and pressure relief seals, which shall be obtained from the profile Systems supplier, shall be capable of removal without disturbing the glazing Systems or removal of the frame or sash.

15.3. GLAZING:

All glazing shall be internally beaded. The windows shall be constructed in such a manner that the glazing or deglazing can take place without the removal of the sash or frame.

15.4. WELDED JOINTS:

All corner joints shall be homogeneously fusion heat welded in accordance with the instructions of the profile Systems supplier. The resulting joints shall be finished by the grooving/knifing method. Solvent welded joints shall not be allowed.

16. REINFORCEMENT:

All transoms and mullions shall be fully reinforced, irrespective of size, with corrosion-resistant galvanized steel. All other profiles to be reinforced as per the specification of the profile Systems supplier which shall suit the proposed style application relative to exposure, elevation and height above the ground level. Reinforcing shall be secured by suitable screws in accordance with the instructions of the profile Systems supplier. All galvanized steel reinforcing profiles shall comply with BS 2989 1982 Grade G 275N
/ IS 4759-1996 or equivalent.

17. MECHANICAL JOINTS:

The mechanical jointing of mullions and transoms shall be carried out in strict accordance with the instructions/recommendations of the profile Systems supplier using only approved mechanical coupling components.

17.1. HARDWARE GENERAL:

All hardware shall be manufactured from corrosion-resistant material and be approved by the profile Systems supplier. All ferrous screws, nuts, bolts and other fastening or fixing shall be of a stainless grade or a suitable coated steel recommended for use in the fabrication of UPVC windows. Metal that are in contact with each other shall be compatible to prevent galvanic corrosion of dissimilar metals by electrolytic action. All hardware should ideally be fixed by attachments through the UPVC to the reinforcement; alternatively, it should be fixed in purpose-designed screw ports or at least two thicknesses of UPVC. Hardware with provision for adjustment shall be accessible for adjusting after the window has been installed. Hardware used to open and close the window shall be replaceable without removing the outer frame from the structure.

18. FRICTION HINGES:

Top-hung and side-hung opening-out lights shall have two friction stays per light and be of stainless-steel construction. The size of the friction stay will depend on the size, weight, hanging and exposure of the relevant sashes. This will be determined from the table provided by the hinge manufacturer. All side-hung friction stays incorporate a riser block to allow the sash to be supported in its closed position.

18.1. BUTT HINGES:

Where external butt hinges are used, they must be of the security pin type which does not allow removal of the hinge pin from outside.

18.2. ESPAGNOLETTE HANDLES:

All espagnolette striking plates are to be purpose designed and secured to the outer frame by approved screw fixing. The espagnolette mechanism shall be of multi-locking points depending on size. All ironmongery where possible shall be screwed into frame reinforcing, or fixing screws must penetrate a

minimum of two wall thicknesses or an equivalent screw port, to obtain sufficient purchase.

18.3. Touch Lock: These are handles which lock the sliding windows on pushing the slider.

18.4. Pop-Up handle: The handle is used after approval for Sliding Windows / Doors. The handle gets flushed in the sliding sash. The handle is used along with a Transmission gear / Espagonellete.

18.5. Sliding Handle: This handle is used for Sliding or Inward opening Windows or out opening Doors. The width of the handle is 27 mm. The handle is used along with a Transmission gear / Espagonellete

18.6. Sliding Handle with Lock:

handle is used for Sliding or Inward open Windows or out opening Doors. It has a lock & key built into the handle.

18.7. D Type Handle:

1. **Single Roller:**

The roller is made of Steel using needle bearing in the roller to ensure smooth functioning.

2. **Double Roller:**

use a roller made with Zinc Alloy & copper using a bearing in the roller to ensure smooth functioning & to take heavy loads

18.8. Door Roller:

used Heavy Duty Door Rollers made from copper and Heavy Ball bearings in the centre ensure a very smooth sliding in the windows and doors and also can take heavy loads of Double Glass

18.9. Sliding Gear:

used for Sliding Windows & Doors. When the handle is locked the window is locked at 2 – 3 points depending on the height of the window. This makes the window much more secure & safe. Also, this system ensures that the windows do not bend at the top & bottom.

Open Door & Windows: The following hardware is are used in Openable Doors & windows

18.10. Single Point Lock Handle:

handle is used for Out Open Casement Window. This handle does not require a Transmission gear / Espagonellete.

18.11. Open able Handle:

handle used for the Out Open Casement Window. The width of the handle is 17 mm and the handle is used along with a Transmission gear / Espagonellete

18.12. Open able Handle with Lock:

handle used for the Out Open Casement Window. It has a lock & key built into the handle. The width of the handle is 17 mm and the handle is used along with a Transmission gear / Espagonellete

18.13. Single Side Door Handle:

handle used for Out Openable Casement Doors. The width of the handle is 27 mm and the handle is used along with a Transmission gear / Espagonellete

18.14. Single Side Door with Lock:

handle used for Out Openable Casement Doors. It has a lock & key built into the handle. The width of the handle is 27 mm and the handle is used along with a Transmission gear / Espagonellete

1. **Both Side Door Handle with cylinder:**

handle used for Out Open door. The hands are on both sides of the door. This is used in conjunction with Door transmission gear. There is a provision to use a cylinder in the above handle.

18.15. Both Side Door Handle:

handle used for Out Open door. This is used in conjunction with Door transmission gear.

18.16. Friction Hinges:

used in Out Open Window friction hinges are concealed inside the windows & are not visible. These allow the window to be opened at various angles. The Friction hinges are made of high-quality Stainless-Steel SS 304. The thickness of the friction hinge is 2 & 2.5 mm with a height of 16 mm & backset of 18 mm

18.17. 75 mm Window Hinge:

used for window hinges are used to open the window completely.

18.18. 100 mm Door Hinge:

use for window hinges are used to open the window completely.

18.19. Door Hinges:

use for Open Window & Door. This can be used in windows when Double glass is used. This window hinge can take heavy loads as they are screwed to the frame

18.20. 3D Hinges:

use a heavy-duty hinge for the door. It can be adjusted in 3 ways after being fixed to the door. This hinge can take heavy loads & ensure ease of movement

18.21. 2D Hinges:

use a hinge for the door. It can be adjusted in 2 ways after being fixed to the door.

18.22. Single plate gear:

used in Out Open Window. And locks the window at 2 – 3 points depending on the height of the window. This makes the window much more secure & safe. This system ensures that the windows do not bend at the top & bottom.

18.23. Multi Point Door Gear:

used in Out Open Door and locks the window at 2 – 3 points depending on the height of the window. This makes the window much more secure & safe.

This system ensures that the windows do not bend at the top & bottom.

18.24. Multi Point Gear with Mortice Lock:

used in the Out Open Door. The Door is locked at 5 points therefore making it highly safe & secure. This door gear uses a Cylinder for additional safety

18.25. Cylinder both side keys:

The required Cylinder is made of Complete Brass and is 80mm long

18.26. Double sash door bolt:

used to lock a False Door / Window to the frame in a French Door/ Window

19. FIXING THE FRAME TO THE BUILDING:

The gap between the structural opening and the uPVC frame shall be between 5 to 10mm all around, which should be filled by injectable PU foam after completion of fixing for the best frame and wall bonding, and for sound and thermal insulation and finally applying neutral cure low modules Silicone sealant to make joint waterproof.

Fixing points shall be to all four sides of a frame, spaced 150mm to 250mm from corners and not more than 600mm apart elsewhere. Fixing shall be by direct drilling a 10mm hole through the UPVC frame to the building wall. Each fixing shall penetrate the building structure by no less than 40mm. and ultimate fixing with anti-corrosive plated anchor bolts through these holes.

All heads of all fixing screws shall be covered with appropriate plastic cover caps.

20. HANDING AND TRANSPORT:

door/Windows may be transported either glazed or unglazed. All door/windows or prefabricated units shall be transported and stacked in a

vertical position and properly anchored to prevent movement in transit, door/windows shall be separated from each other by adequate packing pieces during transport.

21. WARRANTY:

The window manufacturer shall issue to the client a certificate of warranty against any manufacturing or installation defect, valid for a minimum of ten years for rectification of the defect.

22. TECHNICAL SPECIFICATIONS

S.NO	TECHNICAL SPECIFICATION	
I	Impact strength down to 400C	No breakage
ii	Notch impact strength	> 30 kJ/m2
iii	Ball impact hardness	100 N/mm2
iv	Tensile strength	> 40 N/mm2
v	E module	> 2500 N/mm2
Vi	Linear Thermal Expansion	Coefficient300C to+500C 0.80 x 10-4 K-1
vii	Thermal Conductivity	0.16W/mK
viii	Specific volume resistance	10 16 Ω cm
ix	Relative Permittivity	3.3 at 50GHz 2.9 at 106 Hz

x	Fire behavior	Self-extinguishing
xi	Weathering stability RAL GZ 716/1	After 8.0GJ/m2 irradiation energy better than authenticity grade 4 of grey scale

23. POP AND FALSE CEILING ITEMS

23.1. Plain Gypsum board False Ceiling

False ceilings make the ceiling level look clean and defined. They are economical and improve the look of the room/area and cover up all the exposed and unpleasant-looking wires, cables and pipes while providing support to lighting arrangement. They absorb sounds and generally have fire-resisting properties.

Being lightweight they are easy & quick to install and have light reflectance, sound absorption, and thermal insulation properties.

23.2. Location:

lobby, office area and service areas. Size: 1800 mm x 1200 mm (sheet size).

23.3. Material:

12.5 mm thick. Gypsum plasterboards, galvanized iron framing, cleats and steel expansion fasteners, and jointing tape.

23.4. GENERAL NOTES FOR FALSE CEILING WORK:

The false ceiling design can be stepped / curved/architectural design etc however only the plane / horizontal surface shall be measured for the purpose of payment. The same shall include gypsum verticals, coves etc. to be provided as per design.

The existing floor-to-slab height on the site shall vary from 3.00 meters. to 3.2 mtr. The ceiling shall be hung from the existing slab through hangers/channels. The rate quoted in the tender shall be applicable for all floor levels/ all floor heights including scaffolding, etc. The rate of false ceiling items also includes 6 mm ply backing for supporting light fixtures in the false ceiling and shall not be charged separately.

All GI steel is to be marked with “GYPSTEEL” which is a standard hologram of Indian gypsum. All boards are to be marked with “GYPSTEEL” which is a standard hologram of Indian gypsum.

23.5. Gypsum False Ceiling:

Plain gypsum board MR/FR grade ceiling: 12 mm thick Plain gypsum MR/FR grade false ceiling Suspension (considering all levels require all fabrication work and fitting from RCC slab to false ceiling level & The rate shall be considered in sqm for all floors and at all heights, offsets whether cove light or fixed gypsum board size up to 100 mm to 1200 mm in the false ceilings including all costs). Work complete as per the manufacturers specification of Saint Gobain or approved make- M/F Suspended Ceiling 1 hour fire rated. Providing and fixing Suspended ceilings using Gypsum or the equivalent of Ultra G.

I. Perimeter Channels of size 0.55mm thick having one flange of 20mm and another flange of 30mm and web 27mm along with the perimeter of the ceiling, screw fixed to brick wall/partitions with the help of nylon sleeves and screws, at min. 600 mm centers. Then suspending G. I. intermediate channel of size 45mm, 0.9mm thick with two flanges of 15mm each from the soffit at 1220mm centers with ceiling angle of width 25mm x 10mm x 0.55mm thick fixed to soffit with G.

I. cleat and steel expansion fasteners. The ceiling section of 0.55mm

thickness having a knurled web of 51.5mm and two flanges of 26mm each with lips of 10.5mm are then fixed to the intermediate channel with the help of a connecting clip and in a direction perpendicular to the intermediate channel at 457mm centres. 12mm gypsum MR/FR grade Board (conforming to IS 2095 part 1 2011) is then screw-fixed to the ceiling section with 25mm drywall screwed at 230mm centres. Screw fixing is done mechanically either with a screwdriver or a drilling machine with a suitable attachment. Finally, the boards are to be jointed and finished to have a flush look which includes filling and finishing the edges of the boards with jointing compound and joint paper tape.

Cutouts For light fittings, grill diffusers shall be made. Necessary cutting / providing openings in the ceiling for AC fixtures, grills, electrical fittings, or other utility services, hatch openings etc. shall be provided by the Contractor and the cost of making such modifications shall be included in the price. No separate charges for cutting/providing openings will be paid. Joints between the two gypsum boards, (Board placed staggered) gypsum board and the wall will have suitable tape and finishes with plaster of Paris to have crack-free joints.

The item includes providing and fixing a trap door of size 600 X 1200 mm as per the approved sample of Ceiling panels comprised of a powder-coated beaded steel frame with gypsum/plywood board door. Each panel features a push-latch closing mechanism with door door-retaining safety cable & hook. Suspenders from the ceiling to support the frame and trap door firmly along with necessary hilti fastener, cleats, screws, angles, packing, etc. complete work. Work complete including all types of tools, tackles, finishing etc. complete as per approved sample & instruction of Architect/ Client/ PMC. sample mock shall be approved by the Architect/ Client.

23.6. Mineral Fiber Ceiling

Mineral fibre ceilings make the ceiling level look clean and defined. They are economical and convenient for servicing the above false ceiling ducting, wiring etc. These ceilings are fire retardant which makes them ideal for fire hazard areas.

Being lightweight they are easy & quick to install, have light reflectance, sound absorption, and thermal insulation properties and are biodegradable. Armstrong Classic Lite H1892M with “Superfine Silhouette” detail.

23.7. Material specifications:

Size: 600 mm x 600 mm and 15 mm thick. Sound absorption (NRC): 0.55 Light reflectance of > 84% (WT) Thermal conductivity k = 0.052 - 0.057 W/M0k Humidity resistance = 99% having fire performance Class O / Class 1 (BS 476). Surface: 3 coats of white paint. Back Side: Sanded & one coat of paint.

23.8. GENERAL NOTES FOR FALSE CEILING WORK

MODULAR CEILING: Providing and fixing modular false ceiling tiles of 600 mm x 600 mm Centre to centre and 13 mm thick square mineral fibre board to be fixed on the framework of Aluminium sections for suspended false ceiling consisting of Aluminium T 2” X 1 1/2” (50 mm X 40 mm) weighing 0.39 kg/m at 60 cms centre to Centre and fixed with 1/2” x 1/2” (15 x 15 mm) flanges weighing 0.19 kg/m suspended on 6 mm dia. mild steel rod weighing 0.22 kg/m, fixed on wall and beams including rounding of the edges with aluminium T of 2” x 1 1/2” (50 mm x 40 mm) weighing 0.39 kg/m etc. (All aluminium sections shall be anodized/powder coated) including all labour, material, lifts etc. complete. Make - Armstrong or equivalent make

23.9. EXTERNAL ACP CLADDING WORK

Along the Front façade walls/columns/underside of chajja projections and

sides as directed by the Architect or as per site conditions.

Size: as mentioned in the drawing.

Material: 4.00 mm thick. External grade Aluminium composite panelling of approved make.

Shade: Equivalent make – Pure white -10 (100) or Silver metallic 500.

23.10. SPECIFICATIONS FOR ACP CLADDING

Providing and fixing of 4.00 mm thick. external grade Aluminium composite panelling of Alu bond /Alco bond or equivalent made with aluminium section framing 37.5mm x 50mm Aluminium sections framework at spacing not exceeding 600mm both ways (horizontal and vertical). Panelling framework to be secured to wall surface/column surface and with necessary provision for trap doors as required etc. complete in all respects as directed by the Architect. Cost shall include expenses towards required hardware, silicon sealant (Dow Corning 789) masking tape scaffolding if required and the same shall not be marked extra.

24. LIST OF APPROVED MAKE:

S.No.	Item	Description
1.	Verified Tiles	Kajaria, Nexion, AGL
2.	Engineers Marble/ Composite Marble	(16 Mm Thick Marble Stone Slab) AGL Or Equivalent.
3.	Ceramic Tiles	Kajaria, Nexion, AGL

4.	Tile Adhesive	Unitile, Pidilite , Fosroc , Eurokart
5.	Cement: Opc 53 Grade	Shall be ordinary Portland cement 53 grade manufactured by JK Cement, A.C.C. Cement by Associated Cement Companies Ltd., Ambuja cement , Ultratech cement.
6.	White Cement	j.K., Birla ,
7.	Reinforcement Steel: Tmt-Fe-500	Tata Tmt, Tata Tiscon, Jindal, Sail, Sail, RATHI tore steel.
8.	Structural Steel	Sail, Tisco, Ispat , Tata
9.	Ready-Mix Concrete	Acc, Ultratech, Ns.
8.	Screws / Nails & other accessories	GKW / Nettleford or equivalent
10.	Water Proofing Compound	Cico, Dr. Fixit, Pidilite, Fosroc.

11.	Polysulphide Sealant	Shall Be Pidiseal By M/S Pidlite Industries Ltd.
12.	Upvc Door/ Window , windows	Fenesta , Aparna, Encraft.
13.	Hinges And Drawer Slide (Heavy duty telescopic channels)	Hettich /Ozone/ Haffle
14.	Locks, Handles	Godrej, Dorset, Harrison
15.	Door Closers, Floor Springs, Hardware for main Glass doors (patch fittings)	Dorma / Euro/ Ozone / Enox / Doorset
16.	Aluminium section for partition	Jindal,Indial , Tata steel
17.	Plain/ Toughened	Saint- Gobain , Indo Asahi , Modi , Trutuf

	Glass	
18.	Mirror	Saint Gobin, Jolly, Modi-Guard
19.	Silicon	G E / Dow corning / Wacer
20.	Window Hardware	Approved By Architect.
21.	Paint , polish	Shall Be of First Quality Manufactured By :(Paints And Primers) Berger Paints, Asian Paints, Dulex Nerolac Paint
22.	POP Punning and putty	Shall Be Gold Size Putty by Gyprock / India Gypsum / Birla , Asian paint
23.	Expansion Bolts For Fixing	Shall Be Dash Fasteners Of Appropriate Size By Hilti Or M/S. Dev Ashish Trades
24.	Wooden laminated flooring	Pergo / Armstrong / Euro
25.	Flush Doors	Green Ply, Merino, Archid, Century,
26.	Laminates, Decorative Laminate	Marino, Sunmica, Greenlam, Archid.

27.	Plywood, Block Board, MDF	Century, Greenlam, Green Ply, Blue apple Marino
28.	Veneer	Green , Duro , Century
29.	Adhesive	Fevicol, Araldite, Anchor
30	Solid Surfaces (Curion)	DUPOINT/HI-MAC/ STARON
31	Automated Rolling Shutter	Gandhi Automation/Toshi Automatic Systems/Akash Rolling Shutter
32.	False ceiling Gypsum Board	India Gypsum / Saint Gobin / Asia
33.	False Ceilings: Grid (As Approved)	Armstrong/ Daikin / Anutone
34.	Acoustical False Ceilings: Mineral fiber board	Armstrong, Hunter Douglas / Peritex
35.	GI Sections	India Gypsum / Saint Gobin / Jindal

36.	Aluminium Skirting	Jindal
37.	Anti-Termite	Thiddan (35 E.C.), Dursban-20tc, Trishul,
38.	Rolling and vertical Blinds	Mac/Vista
39.	Heat Reflective Film and frosted film	Garware
40.	CP Fittings	Jaquar /Hindware/ Kohlar
41.	Sanitary Ware	Hindware / Cera / Parryware
42.	Sanitary Fittings	Jaquar /Hindware
43.	Geyser	Bajaj / Sphere Hot / Crompton /Racold / Havells
44.	Stainless Steel Sink	Nirali, Nilkanth, Orient.
45.	C.I.Pipe / RWP	Bengal Iron Corporation ISI make Rif, Sif, Bis.
46.	G.I. Pipe	Tata, Jindal,Zenith
47.	Cpvc pipe	(Ajay/ Ashirwad/Astral/Supreme)
48.	C.I Brass La Pips	Electro Steel, Kesoram

49.	U.P.V.C Pipe	Astral, Finolex, Prince, Supreme. Supreme Make (Is Type " B' Is 13592 Swr Range
50.	Stone Ware Pipe	Bhaskar, Anand, ISI Marked Of Approved Quality.
51.	Gun Metal Valve (Full Way Check) Gate Valve	Leader, Sant, Zoloto
52.	Rcc Pipe	Isi Marked Of Approved Quality.
53.	Aluminium Composite Sheet	Alucobond, AL Strong, Eurobond.
54.	Shuttering	Shall be Indian Plywood Manufacturing Co. Bombay or Swastik by Sudershan Plywood
55.	Loft Tank	Syntax, Uniplast, Sheetal.
56.	Hardware Fittings	Ecie, Sigma, Everite.
57.	Wood Preservative	Wood Guard Or Approved Eq/Ici.
58.	Furniture hardware	Central Locks Of Godrej/, Heavy Telescopic Channels Should Be Of Hettich approved All Hinges Should Be “Eco Mat Clip-On Hinges” Of Hettich approved.
59.	Hand Drier	Jaquar , Askon

60.	Refrigerator	L.G., Bosch, Whirlpool, Godrej With Ss Finish, Or As per approval
61.	Microwave	LG, Samsung , Make/Range.
62	Auto Sanitizer Dispenser	Puremist / Make/Range
63	Furniture	Godrej
64	Glass	Modi / Saint Gobain
65	PLYWOOD (BWR)	Blue Apple / Century Sainik MR 710 / Green Ecotec Ply
66	Locks	Doorset / Godrej
67	SS Handles	Doorset / Haffele/ Hettich

SPECIFICATIONS – PART B

ELECTRICAL

SCOPE OF WORK:

Before laying of conduits, the Contractor shall prepare a shop drawing, with detailing and coordination from other tradesmen engaged at the site example carpenters for Interior furnishing, HVAC design drawing, for placement and spacing of site physical installations/ items. Conduit/cable tray layout indicating the route of conduit, number and size of conduits, location of junction/ inspection/pull boxes, size and location of switch boxes, point outlet boxes and other details. Location of points/ power supply to the gadgets, and equipment that require power and electrical supply. The drawing shall be explained and understood by every trade man working site, through demonstration, and actual gadget tested by placing to the actual position.

The drawing shall be submitted for records and confirmation about the mutual placement of items. All layout drawings shall be presented to the team, a joint meeting for the understanding of items for installation, to the satisfaction of all personnel working at the site. Layouts shall be placed for comments, to the Consultant. Any modification or suggestions recommended and commented on by the Consultant shall be incorporated into the work.

The drawing shall be displayed on site at a convenient location for everyone in large size, such that the font size on the drawing is 3 mm.

1. CONDUITS:

1.1. FRLS PVC CONDUIT

Conduits shall be heavy gauge rigid PVC of the minimum thickness of 2mm. Conduits shall be ISI marked confirming to IS: 9537 (Part-3)-1983. All

conduit and conduit accessories shall be of PVC. Conduits shall be joined together by vinyl-type cement/solvents. The minimum size of conduit shall be 25mm diameter. The conduit shall be fixed on the ceiling or wall. Exposed visible conduits shall be concealed in the wall, ceiling etc. or hidden inside cabinets, or ceiling conduits shall be fixed on the surface of the wall with clamps at regular intervals as called for elsewhere. For termination of PVC conduits into switch outlet boxes, PVC female adopters shall be used. Wherever conduit run exceeds 10 meters, circular junction boxes shall be provided to facilitate pulling & inspection of wires. Inspection boxes shall be located to have access and replacement of wires in future, in coordination with other installations, to the satisfaction of the Consultant Engineer-in-charge. Conduits shall be bent using suitable-size springs. Long-radius bends shall be provided. Heating shall not be used to bend the conduits. The size of the conduit shall depend upon the number and size of wires to be drawn.

1.2. M.S. conduits:

1.2.1. MATERIAL

Conduits shall be black enamelled mild steel (ISI marked) and be solid drawn or lap welded conduits, stove-enamelled inside and outside with minimum wall thickness of 1.6 mm for conduits up to 25 mm diameter and 2 mm wall thickness for conduits above 25 mm diameter. The accessories used for M.S. conduits shall conform to Indian Standards IS: 3837-1966-(Specification for fittings for Rigid steel conduits with the latest amendments, The conduits shall be delivered to the site in original bundles and each length of conduit shall bear the label of the manufacturer. The number of insulated copper conductor wires that may be drawn in the conduits of various sizes are given below and the conduit fill shall not exceed 40%. The minimum size of conduits shall be 25mm diameter for lighting and outlets and conduit size

shall be increased as per the relevant IS code depending on the number of wires. Wires shall be PVC-insulated copper conductors and ISI marked.

1.2.2. CONDUIT FILL

The maximum number of 650/1100 Volts grade single core PVC insulated copper conductor wires that may be drawn in the conduits of various sizes are given below.

1.2.3. Maximum number of wires used under (M.s.) conduit:

CONDUITS (MM)	**20**	**25**	**32**	**40**	**50**
Size of wire in sq. mm	**(Maximum number of wires use under conduit**				
1.5	5	6	18	-	
2.5	3	4	10		
4	2	4	5	10	
6	-	6	6	8	
10			3	4	
16				3	5
25				2	3
35				1	1

1.3. M.S. CONDUIT CONNECTIONS:

Conduit connections for MS conduits shall be screwed metal to metal

and be painted with one coat of self-etching zinc chromate primer and two coats of enamel paint. The threads and sockets shall be free from grease and oil. Connections between screwed conduit and sheet metal boxes shall be by means of a brass hexagon smooth bore bush, fixed inside the box. Check nuts to be provided on the inside and outside of the box and connected through a coupler to the conduit or as directed by the Consultant. The joints in the conduits shall be free of burrs to avoid damage to the insulation of conductors while pulling them through the conduits. Connections between PVC and MS conduits shall be through a junction box. Direct connection between PVC and MS conduits is not allowed.

1.4. BENDS IN CONDUITS:

Where necessary, bends may be carried out by means of conduit bends and/or circular inspection boxes with adequate and suitable inlet and outlet screwed joints. In case of a recessed system, each junction box shall be provided with a cover properly secured and flushed with the finished wall/ceiling surface, so that the conductors inside the conduit are accessible. No bends shall have a radius less than 2.5 times the outside diameter of the conduit. Use a Special spring for bending the conduit. Heating to soften the conduit for bending is not allowed.

2. FIXING OF CONDUITS

Conduits and junction boxes shall be kept in position with the help of proper holdfasts while the walls, slabs and floor are under construction. 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 of conductors. All threaded joints of conduit pipes shall be treated with an approved preservative compound to secure protection against rust. Conduits shall be arranged to facilitate easy drawing of wires through them. An adequate no. of junction boxes shall be provided.

All conduits shall be installed away from steam and hot water pipes. After the conduits, junction boxes, outlet boxes and switch boxes are installed in position, their openings shall be properly plugged or covered, so that, water, mortar, insects or any other foreign matter does not enter into the conduit system. Where called for, surface conduits shall be fixed by means of spacer bar saddles at intervals not more than 500 mm from both sides of fittings or accessories. The staples or saddles of galvanised mild steel flat, properly treated, shall be secured and fixed by means.

Separate conduits shall be provided for the following system.

i) Lights, Ceiling fans, Exhaust fans & 5A light sockets.

i) Power sockets & A/C outlets

i) Telephone System

ii) Television, Computer & Music system

i) Emergency System.

i) Public Address System

i) Fire Alarm System.

Separate switchboards/outlets shall be provided for the following system.

i) Lights, Ceiling fans, Exhaust fans & 5A light sockets.

i) Power sockets & A/C outlets

i) Telephone System

i) Television, Computer & Music system

i) Emergency System.

ii) Public Address System

i) Fire Alarm system.

Where exposed conduits are suspended from the structure they shall be clamped firmly and rigidly (min 10 kg load fastener to a stable surface, not more than 600 apart) to hangers with design calculations. Hangers

anchored to reinforced concrete appropriate inserts and necessary devices for their fixing shall be provided at the time of fixing. Making holes or openings in the concrete shall be repaired with concrete. Conduits shall be fixed in the chase by means of staples not more than 600 mm apart and the chase filled with cement mortar 1:

4. Cutting of horizontal chases in walls is prohibited. Chases shall be cut using an electric cutter/blade.

3. PROTECTION

To minimize condensation or sweating inside the conduit pipes, all outlets of the conduit system shall be adequately ventilated. All socketed connections shall be made fully watertight by use of proper jointing compound.

4. SWITCH-OUTLET BOXES AND JUNCTION BOXES

All boxes shall conform to Indian Standards IS 5133(Part-1)-1969 (Specification for boxes for enclosure of Electrical accessories) with the latest amendments. All outlet boxes for switches, sockets & other receptacles shall be fabricated from 1.6mm thick

mild steel sheets duly painted with rust-proof paint (zinc passivated) as called for, having smooth external & internal surfaces to true finish.

Junction boxes and outlet boxes in contact with earth or installed in areas exposed to the weather shall be of 2mm thick mild steel and painted. Where called for, outlet boxes for receiving switches, telephone outlets T.V. outlets, power plugs etc. shall be fabricated to prove shape and size to suit the cover plates of approved make for different utilities.

The cover plates shall be of, 2 mm thick, best quality Hylam sheets or ISI grade Urea Formaldehyde Thermosetting insulating material which shall be both mechanically strong and fire retardant. Proper supports shall be

provided in the outlet boxes to fix the cover plates of switches as required. A separate screwed earth terminal shall be provided inside the box for earthing purposes.

All boxes shall have an adequate number of knockout holes of the required diameter for conduit entry. Where called outlet boxes for receiving switches and fan regulators in one box, shall be fabricated to the approved shape and size to accommodate fan regulators and switches to be fixed on grid plates. These boxes shall be covered with Hylam sheets or ISI grade Urea Formaldehyde Thermosetting insulating material which shall be both mechanically strong and fire retardant.

All junction boxes, pull boxes and outlet boxes shall be provided with sheet cover Urea Formaldehyde Thermosetting insulating material. The box cover shall be secured to the box with an adequate number of round-head brass screws of approved make. Outlets exposed to the weather shall be fully weather-tight, complete with rubber gasket covers, and glass where used shall be fully heat resistant for the duty.

The outlet boxes shall be painted with two coats of bit mastic paint before they are fixed in position. All Outlet boxes fixed in concrete/recessed in the wall shall be of a minimum depth of 55mm.

5. INSPECTION BOXES

Rust-proof (Zinc passivated) inspection boxes of 1.6mm thick mild steel sheet and of required size, having smooth external and internal finish shall be provided to permit periodical inspection and to facilitate removal and replacement of wires when required. Inspection boxes shall be mounted flush with the ceiling/wall finished surface and shall be provided with screwed covers of Urea Formaldehyde Thermosetting insulating material sheet cover

secured to the box with brass screws. Adequate holes shall be provided for ventilation in the inspection box covers.

6. TELEPHONE SYSTEM

Conduits, junction boxes, draw boxes, outlet boxes and covers to boxes for the telephone system shall be as described under relevant clauses elsewhere in these specifications. Conduits for the telephone system shall be at least 300 mm away from the electrical conduits. The conduits for telephone wiring shall be of specified size and shall be terminated at outlets as indicated on the drawings. Telephone system conduits shall have 2 mm diameter galvanized steel pull wires installed. Necessary Junction boxes are to be provided for easy drawing of the Telephone wires from each unit to the Telephone Tag Box and from the Tag Box to the open ground.

7. T.V. & COMPUTER SYSTEM

Conduit junction boxes, draw boxes, outlet boxes and covers to boxes for T.V. & Computer system shall be as described under relevant clauses elsewhere in these specifications. Conduits for the T.V. & Computer system shall be at least 300mm away from the electrical conduits.

The conduits for T.V. & Computer wiring shall be of specified size and shall be terminated at outlets as indicated on the drawings. T.V. & Computer system conduits shall have 2mm diameter galvanized steel pull wires installed. Necessary Junction boxes are to be provided for easy drawing of the Television & Computer wires from each unit to the Junction Box and from the Junction Box to the open ground.

On the completion of the work, the Contractor shall submit to the company layout Drawings indicating the complete Electrical Installation as installed. These Drawings shall in particular give the following information.

7.1. Run and size of conduit, location of inspection/outlet boxes etc.

7.2. Number and size of wires in each conduit.

7.3. Location of switches, outlets, all types of DBs, Telephone, Television, Computer, Call Bell & Public Address points, Light sockets, Power sockets, Fire Alarm points, etc.

7.4. Layout and particulars of mains and sub-mains and cable route etc.

7.5. Schematic diagrams for the complete Electrical System.

i. The layout of the Complete Earthing System with the size of Earthing conductors.

ii. Layout and particulars of the Telephone, Public Address, Television, and Computer.

8. CONDUCTORS

PVC insulated multi-storied copper conductor wires of 1100 Volts grade shall be used for three-phase distribution and PVC insulated multi-storied copper conductor wires of 1100 V grade shall also be used for Single phase distribution and shall conform to IS: 694 -1964 with the latest amendments and shall be ISI marked.

8.1. BUNCHING OF WIRES

Wires carrying current shall be so bunched in the conduit that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

8.2. DRAWING OF CONDUCTORS

The drawing and jointing of copper conductor wires shall be executed with due regard to the following precautions while drawing insulated wires into the conduits. Care shall be taken to avoid scratches and kinks which cause breakage of conductors. There shall be no sharp bends.

Insulation shall be shaved off for a length of 15mm at the end of the wire like sharpening of a pencil and it shall not be removed by cutting it square or ringing.

PVC insulated copper conductor wire ends before connection shall be properly soldered (at least 15mm length) with special Cu solder for the copper conductor or shall be properly crimped with copper lugs/sockets as the case may be. Strands of wires shall not be out for connecting to the terminals. All strands of wires shall be soldered at the end before connection. The connecting brass screws shall have flat ends. All looped joints shall be soldered and connected through terminal blocks/connectors.

The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. Conductors having a nominal cross-sectional area exceeding 6 Sq mm shall always be provided with cable sockets. At all bolted terminals, a brass flat washer of a large area and approved steel spring washers shall be used. Brass nuts and bolts shall be used for all connections. Only certified wiremen and cable jointers shall be employed to do jointing work. All wires shall bear the manufacturer's label and the voltage grade at one-meter intervals for the full length of the coil and shall be brought to the site in new and original packages.

The sub-circuit wiring for points shall be carried out in a looping system and no joint shall be allowed in the length of the conductors. No wire shall be drawn into any conduit, until all work of any nature, that may cause wire injury is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Before the wires are drawn into the conduits the conduits shall be thoroughly cleared of moisture, dust, dirt or any other obstruction by Drawing dry cloth through the conduits. The minimum size of PVC insulated stranded copper conductor wire for all sub-

circuit wiring for lights, exhaust fans, ceiling fans and 5A Light socket points shall be 1.5 sq mm. In case of a power circuit, not more than two 15 Amp power outlets shall be grouped in one circuit, and wiring for the first power outlet shall be carried out with PVC insulated minimum 6.0 sq mm copper conductor wires.

Wiring for the second power outlet shall be carried with PVC insulated minimum 4.0 sq mm copper conductor wires. All power outlets shall be connected with a minimum 4.0 sq mm PVC insulated copper conductor wires to the earth terminal of the outlet. Separate circuit shall run with PVC insulated 4.0 sq mm copper conductor wires for water heaters, kitchen equipment, window Air conditioners and similar outlets at locations as shown on drawings.

The minimum size of wire from the final distribution board to the first tapping point in the circuit shall be 2.5 sq mm. PVC insulated stranded copper conductor wires. The circuit shall not have more than a total of 8 points of fans, or 5A Light sockets and Light points and its load shall not exceed 800 watts. No more than two power circuits shall be drawn through the same conduit.

Separate earth wire shall run for each circuit. In case two circuits of the same phase are running in the same conduit then a common earth wire is permissible. The size of earth wire for all the light points, ceiling fans, exhaust fans, light sockets, outlet boxes etc. shall be a minimum of 1.5 sq mm PVC insulated copper conductor wires.

8.3. JOINTS

All joints shall be made at main switches, distribution boards, socket outlets, lighting outlets and switch boxes only. No joints shall be made inside conduits and junction boxes. Conductors shall be continuous from outlet to outlet.

9. MAINS AND SUB-MAINS:

Mains and sub-mains wires were called for shall be of the rated capacity and approved make. Every main and sub-main shall be drawn into an independent adequate size conduit. Adequate size draw boxes shall be provided at convenient locations to facilitate easy drawing of the mains and sub-mains. An independent earth wire of proper rating shall be provided. The earth wires shall run along the entire length of the mains and sub-mains. The earth wires shall be fixed to conduits by means of suitable copper clips at not more than 1000mm distance. Where mains and sub-main cables are connected to switch gears, sufficient extra length of sub-main and main cable shall be provided to facilitate easy connections and maintenance.

10. LOAD BALANCING:

Balancing of circuits in three-phase installation shall be planned before the commencement of wiring, chart prepared and submitted withdrawal.

10.1. COLOUR CODE OF CONDUCTORS:

Colour code shall be maintained for the entire wiring installation; red, yellow, and blue for three phases and “off” circuit black for neutral and green for earth (or bare earth wire)

Telephone Multicore cables shall be of approved make and shall conform to the following specifications.

i) Type of conductor. Electrolytic Annealed Tinned Cu conductor. (ATC)

ii) Diameter of Conductor ..... 0.61 mm dia uniform (minimum size)

iii) Weight of conductor..... 2.52 Kg/Km minimum.

iv) Resistance of conductor at 20 degrees... 60 Ohms/Km,

v) Radial Thickness of PVC insulation... 0.3mm + 0.05mm uniform

vi) Radios Thickness of PVC sheathing .....1.2mm uniform + 0.2mm

vii) The overall diameter of the insulated conductor. 1.2mm uniform

viii) High voltage Test. Able to withstand up to 500 volts D.C. up to 12 hours immersion in water.

11. MOUNTING HEIGHT DETAILS

11.1 - The bottom of the light/fan switchboard shall be 1.0 meters above the finished floor level unless otherwise specified. Enough space for smooth usage, and operations by user.

11.2- All plugs and socket outlets shall be, only Spring female contact sockets, of 5/6 pin type and the appropriate pin of socket shall be connected to the earthing system.

11.3- In case of light and fan circuit only 5 pin 5A, only Spring female contact socket outlets shall be used. 6-pin 15A socket outlets shall be provided only on power circuits. The switch controlling the socket-outlet shall be adjacent to it. 6 pin 15 A, only Spring female contact socket outlets shall be located at the levels as indicated below unless otherwise specified.

a In Kitchen at 300 mm above the kitchen platform or FFL as per the location shown on the drawings.

b In the bathroom at 1800 mm above FFL but Mirror lights shall be above the Mirror of the wash basin.

c In all other rooms at 150 mm above FFL unless otherwise specified.

11.4 All Bracket light fittings, unless otherwise specified shall be at a height of 2.1 meters above the floor level unless otherwise specified for some locations, coordinated with interior drawings.

11.5 Unless otherwise specified, the ceiling fans shall be hung at 2.75 meters above the finished floor level.

11.6 Lamp holders in bathrooms are to be shrouded with insulating materials and fitted with protective shields.

11.7 All live conductors are to be insulated and safeguarded to avoid danger.

12. CABLES:

12.1 GENERAL

MV Cables shall be supplied, laid tested and commissioned in accordance with drawing specifications, relevant Indian Standards specification, Indian Electricity Act and the manufacturer's instructions.

The cable shall be delivered at the site in original drums with the manufacturer’s name written on the drums.

12.2 MATERIAL

MV CABLES: MV Cables shall be PVC insulated aluminium conductor armoured and unarmored cables conforming to IS: 1554 (part I&II)-1976 & IS: 694-1977 (PVC Insulated cables for working voltages up to and including 1100 volts (second revision) with latest amendments. MV cables shall be suitable for underground use and laid in trenches, ducts, cable trays, under roads and paved areas. MV Cables shall be termite resistant and shall be of approved make.

12.3 JOINTS IN CABLES

The contractor shall take care to see that all the cables are apportioned to various locations in such a manner as to ensure no straight joints in the cable run. If the straight joint in the cable is unavoidable due to any specified reasons, prior permission in writing shall be obtained from the consultant before the use of such straight joints in the cable.

12.4 JOINTING BOXES FOR CABLES

Cable jointing boxes shall be of appropriate size, suitable for PVC insulated cables of particular voltage ratings, and shall be manufactured by approved manufacturers.

1. JOINTING OF CABLES

All cable joints shall be made in suitable approved cable joint boxes. Jointing of cables in the joint boxes and the filling in of the compound shall

be done in accordance with the best trade practice, in accordance with the manufacturer's instructions and in an approved manner. All straight Joints shall be done in epoxy mould boxes with TROPOLIC/ M-Seal resin or approved equal. All terminal ends of conductors shall be heavily soldered up to at least 50mm in length.

All cables shall be jointed colour to colour and tested for insulation resistance and continuity before jointing commences. The seals of cables must not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged.

2. FILLING OF EPOXY COMPOUND

Equal quantities of resin and hardener shall be taken and mixed thoroughly by hand until the mixture is free from white patches and has a uniform colour. No water, oil or any other liquid shall be added to the mixture to make it soft as this will affect the properties of the compound. The mixture shall be used within 30- 40 minutes of mixing.

The surface on which the epoxy compound is to be used shall be free from dust, rust, oil, and grease and shall be dry. No disturbance or movement of the joint shall be made till the epoxy compound has completely hardened. A smooth surface can be made by rubbing a damp cloth smoothly on the compound before it sets.

The joints shall be painted after it has completely hardened.

3. CABLES TERMINATION

Cable termination shall be done in the terminal cable box using cable glands and the cable ends sealed with a sealing compound.

4. BONDING OF CABLES

Where a cable enters any piece of apparatus, it shall be connected to the casing by means of an approved type of armoured clamps and gland.

The clamps must grip the armouring firmly to the gland or casing so that in the event of ground movement no undue stress is passed on to the cable conductors. The glands shall be either to the lead sheath by means of a 'Plumbing Joint' as on a cone of approved materials, capable of being compressed into the lead sheath. The gland or cone shall be capable of effecting a good electrical bond between both the armouring and lead of the cable and the casing.

12.5 LAYING OF CABLES

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cable to avoid forming kinks. The drums shall be unrolled and cables run over wooden rollers in trenches at intervals not exceeding 2 meters.

Cables shall be laid at a depth of 750mm depth below ground level in the case of MV Cables. A cushion of sand, not less than 75mm shall be provided both above and below the cable, joint boxes and other accessories. HV and MV cables shall not be laid in the same trench and/or alongside of water main. The cable shall be laid in an excavated trench 80mm layer of sand shall be spread over the cable.

The cable then shall be lifted and placed over the sand bed. The second layer of 80mm sand then be spread over the cable. The relative position of the cables laid in the same trench shall be preserved and the cables shall not cross each other as far as possible.

At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius of bend not less than 12 times the diameter of the cable. A minimum 3 M long loop shall be provided at both sides of every straight joint and

5 Meters at each end of the cable. Distinguishing marks shall be made on the cable ends for identification. Insulation tapes of appropriate voltage and in red, yellow and blue colours shall be wrapped just below the sockets for phase identification. Aluminium Labels etched with the size of the cable shall be provided around the two ends of each cable.

12.6 PROTECTION OF CABLES

The cable shall be protected by placing burnt bricks over the cables 600mm wide on the top layer of sand for the full length of the underground cable. Where more than one cable is running in the same trench, the bricks shall cover all the cables and shall project a minimum of 80mm on either side of the cable.

The cable under road crossings and any surfaces subjected to heavy traffic shall be protected by running them through Hume pipes of suitable size and Heavy-grade quality.

Cables under paved areas (which form part of the building) shall be protected by running them through Stoneware/Hume pipes of 150 mm diameter (minimum size) one meter below road level.

1. CABLES INSIDE BUILDINGS

Cables inside buildings shall be laid either in masonry trenches or carried on through trays or brackets. Where cables run in ducts inside the buildings the cables shall be adequately clamped to angle iron brackets, and secured to the wall, as directed and approved by the Consultant. Where cables are suspended from ceilings, they shall be carried over troughs or trays as directed and approved by the Architect. The supports shall be placed not more than 1.0 meters apart.

All cables passing through walls below paved areas, and concrete shall run through stoneware pipes or Hume pipes of adequate diameter recessed

or exposed as directed. Cables running along walls shall be supported and clamped to saddles, or hangers rigidly anchored at close intervals. Clear space between parallel cables shall be equal to the diameter of the cable but not less than 50mm. Where called for cable trenches shall be filled with fine sand.

The contractor shall ensure that hangers, brackets and other supporting arrangements for cables are placed in the proper position at the time of building the walls, concreting slabs, etc. Cutting holes or openings in concrete may be carried out only with the prior permission of the Architect.

All excavations and backfill fill, including timbering, shoring and pumping required for the installation of the cables, shall be carried out as per the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Backfill for trenches shall be filled in layers not exceeding 150mm. Each layer shall be properly rammed and consolidated before laying the next layer. The Contractor shall restore all surfaces, roadways, sidewalks, curbs, walls or other works cut by the excavation of their original condition to the satisfaction of the consultant.

2. MARKERS AND WARNING PLATES

Approved CI cable markers shall be provided along the route of the cables at every 30meter distance and both ends of road crossing, indicating HV cables and MV cables as applicable. Special CI markers shall be provided at all buried cable joints indicating “Electrical Cable Joints. GI plates engraving the size of the cable and the place it serves shall be tied to the cable at regular intervals of 2 meters for easy identification of the cables.

12.7 TESTING OF CABLES

Before burying the cables, the following tests shall be carried out:

a. Insulation test between phases and phase to earth for each length of cable before and after jointing.

On completion of cable laying work and jointing the following tests shall be conducted in the presence of the Consultants.

a. Insulation Resistance test (Sectional and Overall)
b. Continuity Resistance Test.
c. Sheath Continuity Test.
d. Earth Test.
e. Physical Dimensions Test.

All tests shall be carried out in accordance with relevant Indian Standard Codes of Practice and Indian Electricity Rules. The contractor shall provide the necessary instruments, equipment and labour for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Architect /

13. EARTHING

All the non-current metal parts of the electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switchgear, outlet boxes, distribution boards, light fittings, fans and all other parts made of metal or conductive material shall be bonded together and connected by means of a specified earthing system.

All earthing will conform with the relevant provision of Rules 33 and 61 of the Indian Electricity Rules 1956 and Indian Standard Specifications IS:3043-1987 with the latest amendments.

1. EARTHING CONDUCTORS

All earthing conductors shall be of high-conductivity electrolytic copper of 99.95 % purity and shall be protected against mechanical injury or corrosion.

2.SIZING OF EARTHING CONDUCTORS

The cross-sectional area of the copper earthing conductor shall be the

same as the active conductor for sizes of active copper conductors up to 4.0 sq. mm and shall be half the size of 16 sq mm active copper conductor and above. All fixtures, fans, outlet boxes and junction boxes shall be earthed with 1.5 sq. mm PVC Insulated copper conductor wires. All power sockets and single-phase A/C units shall be earthed with 4.0 PVC Insulated copper conductor wires. All Three-phase Final Distribution Boards shall be earthed with 2 nos 4 mm dia bare copper conductor wires. The sizes of the earth continuity conductors should not be less than half of the largest current-carrying conductors.

The Sub-Distribution Board shall be earthed to 2 nos 600mm x 600mm x 3mm copper plate earthing stations through 25m x 3 mm copper strips.

3. CONNECTION OF EARTHING CONDUCTORS

Main earthing conductors shall be taken from the earth connections at the main switchboards to an earth electrode with which the connection is to be made. Sub-main earthing conductors shall run from the main switchboard to the sub-distribution boards. Final distribution board earthing conductors shall run from sub-distribution boards.

4. PROHIBITED CONNECTIONS

Neutral conductors, sprinkler pipes, or pipes conveying gas, water, or inflammable liquid, structural steelwork, metallic enclosures or cables and conductors, metallic conduits and lightning protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system.

The electrical resistance of metallic enclosures for cables and conductors measured between earth connections at the main switchboard and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate fuse or circuit breakers and shall not exceed 1 ohm.

5. PROTECTION FROM CORROSION

Connections between copper and galvanized equipment shall be made on the vertical face and protected with paint and grease. Galvanized fixing clamps shall not be used for fixing earth conductors. Only copper fixing clamps shall be used for fixing earth conductors. When there is evidence that the soil is aggressive to copper, buried earthing conductors shall be protected by suitable serving and sheathing.

6. EARTHING STATION

Plate Electrode Earthing: Earthing electrode shall consist of a tinned copper plate not less than 300mm x 300mm x 3mm thick as called for in the Schedule. The plate electrode shall be buried as far as practicable below permanent moisture level but, in any case, not less than 4.2 meters below ground level. Wherever possible earth electrodes shall be located as near the water tap, water drain or a down-take pipe as possible.

Earth electrodes shall not be installed in proximity to a metal fence. It shall be kept clear of the building foundations and in no case shall it be nearer than 2 meters from the outer face of the wall.

The earth plate shall be set vertically and surrounded with a 150mm thick layer of charcoal, dust and salt mixture. 20mm GI pipe shall run from the top edge of the plate to the ground level. The top of the pipe shall be provided with a funnel and a mesh for watering the earth through a pipe. The funnel over the GI Pipe shall be housed in a masonry chamber, approximately 300mm x 300mm x 300mm deep. The masonry chamber shall be provided with a cast iron cover resting over a GI frame embedded in masonry. Refer to Sketch for additional details.

Pipe Electrode Earthing: Earthing electrode shall consist of a Pipe specified in BOQ item, Indian Tube Company make or approved equal not less than 40mm dia and 4.5 meters long, (pipe wall thickness as

manufacture) GI Pipe electrode shall be cut tapered at the bottom and provided with holes of 12mm dia drilled at 75mm interval up to 2.5 meters length from the bottom.

The electrode shall be buried vertically in the ground as far as practicable below permanent moisture level with its top not less than 1.25 M below ground level. The electrode shall be in one piece and no joints shall be allowed in the electrode. Wherever possible earth electrodes shall be located near a water tap, water drain or a down-take pipe. Earth electrodes shall not be located in proximity to a metal fence. It shall be kept clear of the building foundations and in no case shall be nearer than 2 meters from the outer face of the wall. Refer to Sketch for additional details.

The pipe earth electrode shall be kept vertically and surrounded with a 150mm thick layer of charcoal dust and salt mixture up to a height of 2.5 meters from the bottom. At the top of the electrode, a funnel with a mesh shall be provided for watering the earth. The main earth conductors shall be connected to the electrode just below the funnel, with proper terminal lugs and check nuts. The funnel over the GI pipe and earth connection is housed in a masonry chamber, approximately 350mm deep. The masonry chamber shall be provided with a cast iron cover resting over a CI frame embedded in masonry.

7. EARTH CONNECTION

All metal-clad switches and other equipment carrying single-phase current shall be connected to the earth by a single connection. All metal-clad switches carrying medium voltage and high voltage shall be connected with the earth by two separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in GI Pipe of adequate size.

Earthing conductors outside the building shall be laid 600mm below the

finished ground level. The overlapping in copper strips at joints where required, shall be a minimum of 75mm. The joints shall be riveted and brazed with copper rivets and greased in an approved manner. Sweated lugs of adequate capacity and size shall be used for all termination of wires above 1 Sq.m size and bare copper wire above 2.0mm dia. Lugs shall be bolted to the equipment body after the metal body is cleaned of paint and other oily substances and properly tinned.

The earth wires entering the Final Distribution Boards shall be terminated with copper sockets crimped to their ends and tightened to the terminal with the help of flat-end brass screws.

8. EARTH RESISTANCE

The earth resistivity of the soil where the earthing stations are located shall be submitted to the Consultant before the earthing work starts and get the approval of the Consultant. If the earth resistance is too high and multiple electrode earthing does/not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, calcium chloride, sodium carbonate, copper sulphate, salt and soft coke or charcoal in suitable proportions as directed by the consultants.

9.RESISTANCE TO EARTH

The resistance of each earth system shall not exceed 1.0 ohm in the case of a Medium Voltage system and 0.5 ohm in the case of a High Voltage system.

14. TESTING.

GENERAL

On completion of the work, the entire installation shall be subject to the following tests:

a) Wiring Continuity Test

a) Insulation Resistance Test

a) Earth Continuity Test

b) Earth Resistivity Test

Besides the above, any other test specified by the local Authority shall also be carried out.

All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the Contractor at his own cost.

14.1. TESTING OF WIRING

All wiring systems shall be tested for continuity of circuits, short circuits and earthing after wiring is complete and before energising. The Test Certificates for the complete wiring shall be submitted in the Format and the Total Electrical Installation shall be approved by the Electrical Inspector.

14.2. INSULATION RESISTANCE TEST

The insulation resistance shall be measured by applying between the earth and the whole system of conductors, or any section thereof with all fuses in place and all switches closed (except in concentric wiring) and all lamps in the position of both poles of the installation, otherwise electrically connected, a direct current pressure of not less than twice the working pressure (provided that it does not exceed 660 volts for medium voltage circuits) be applied. Where the supply is derived from A.C. three three-phase system, the neutral pole of which is connected to the earth, either directly or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

The insulation resistance measured as above shall not be less than 50 divided by the number of points on the circuit provided that the whole installation shall not be required to have an insulation resistance greater than one mega ohm.

The insulation resistance shall not be measured between all conductors connected to one phase conductor of the supply and all the conductors connected to the middle wire or the neutral or to the other phase conductors of the supply. Such a test shall be carried out after removing all metallic connections between the two poles of the installation and in these circumstances, the insulation resistance between conductors of installation shall not be less than that specified above.

The insulation resistance between the case of the work of housing and power appliances, and all live parts of each appliance shall not be less than that specified in the relevant Indian Standard Specifications or where there is no such specification shall not be less than half a mega ohm.

14.3. TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCHES

In a two-wire installation, a test shall be made to verify that all non-linked single pole switches have been fitted in the same conductor throughout, and such conductor shall be labelled or marked for connection to an outer or phase conductor or the non-earthed conductor of the supply. In the three or four-wire installation, a test shall be made to verify that every non-linked single Pole switch is fitted in a conductor to one of the outer or phase conductors of the supply. The entire electrical installation shall be subject to the final acceptance of the Consultant as well as the local authorities.

14.4. EARTH RESISTIVITY TEST

Earth resistivity test shall be carried out in accordance with Indian Standard code of practice for earthing IS: 3043:1987. All tests shall be carried out in the presence of the Architect.

14.5. TEST CERTIFICATES

The Electrical Installation shall be tested as per relevant Indian Standards and a Test Certificate to this effect shall be submitted to the

Company. The Contractor has to get the Total Electrical Installation approved by the Electrical Inspector and the permission to energise the same shall be submitted to the Company.

SAFETY REQUIREMENTS

1. SCOPE

This section covers the requirements of items to be provided in the sub-station for compliance with statutory regulations, safety and operational needs.

2. REQUIREMENTS

Safety provisions shall be generally in conformity with the relevant Indian Standards and I.E. Rules and Regulations. In particular, the following items shall be provided.

(a) Insulation Mats

Insulation Mats conforming to IS: 5424-1969 shall be provided in front of main switchboards and other control equipment as specified.

(a) First Aid Charts and First Aid Box

Charts (one in English, one in Hindi, one in a regional language), displaying methods of giving artificial respiration to a recipient of electrical shock shall be prominently provided at the appropriate place. Standard First Aid Boxes containing materials as prescribed by the St. John Ambulance Brigade or Indian Red Cross should be provided in each sub-station.

(b) Danger Plate

Danger plates shall be provided on HV and MV equipment. MV danger notice plate shall be 200mm x 150mm made of mild steel at least 2mm thick vitreous enamelled white on both sides and with inscriptions in signal red color on the front side as required.

(c) Fire Extinguishers

Portable CO2 conforming to IS: 2878-1976 dry chemical conforming to IS 2171-1976 extinguishers shall be installed in the substation at suitable places as specified.

(d) Fire Buckets

Fire buckets conforming to I: 2546-1974 shall be installed with a suitable stand for storage of water and sand.

(e) Tool Box

standard toolbox containing necessary tools required for operation and maintenance shall be provided in the sub-station.

(f) Caution Board

A necessary number of caution boards such as “Man on Line” “Don’t switch on’ etc. shall be available in the sub-station.

(g) Key Board

A keyboard of the required size shall be provided at a proper place containing the castle key, and all other keys of sub-station and allied areas.

M V PANELS, SUB-DISTRIBUTION BOARDS & FINAL DISTRIBUTION BOARDS

All the M V Panels, Sub-Distribution Boards (SDB) & Final Distribution Boards (FDB) shall be suitable for operation on 3 phases, 4 wire, 415 Volts, 50 cycles, neutral grounded at the transformer and short circuit level not less than 31 MVA at 415 volts.

The MV Panel, SDBs & FDBs shall comply with the latest edition of relevant Indian Standards and Indian Electricity Rules and Regulations. All Panels and Distribution Boards shall be fabricated by the contractor by using specified components as per the specifications given below:

3. CONSTRUCTION FEATURES

The Distribution Boards and Panels shall be metal-enclosed sheet steel cubical, indoor, dead front, and floor mounting type. The distribution boards shall be enclosed, and completely dust and vermin-proof. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dustproof. Panels and Distribution boards shall be preferably arranged in a multitier formation.

All doors and covers shall be fully gasketed with foam rubber and/or rubber strips and shall be lockable. All MS sheet steel used in the construction of distribution boards and Panels shall be 2mm thick and shall be folded and braced as necessary to provide rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

All 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 MV Panels & distribution boards. A base channel of 75mm x 40mm x 5mm thick shall be provided at the bottom. A minimum of 200 mm between the floor of the MV Panel & Distribution board and the lowermost unit shall be provided. The MV Panel & Distribution Boards shall be of adequate size with a provision of 20% spare space to accommodate possible future switchgear in addition to spare feeders.

Knockout holes of appropriate size and number shall be provided in the Distribution Board and Panels in conformity with the location of incoming and outgoing cables. Panels and distribution boards shall be provided with removable sheet steel plates at the top and bottom to drill holes for cable

entry at the site. MV Panel shall be of Extendible type.

The Panels and SDBs shall be suitable for IP 42 protection.

4. CIRCUIT COMPARTMENTS

Each circuit breaker, MCCB and switch fuse unit shall be housed in separate compartments and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with the ACB/MCCB/switch fuse unit in the ‘on’ and ‘off’ position. Safety interlocks shall be provided for air circuit breakers to prevent the breaker from being drawn out when the breaker is in the ‘on’ position.

The door shall not form an integral part of the draw-out position of the ACB. All instruments and indicating lamps shall not be mounted on the ACB compartment door. Sheet steel barriers shall be provided between the tiers in a vertical section. The Knobs for holding the cubicle door in closed position shall be spring operating rotating type and not screwed type.

5. INSTRUMENT ACCOMMODATION

Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contractors control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, bus bar and connections.

6. BUS BARS & BUS BAR CONNECTION

The bus bar and interconnections shall be of electrolytic Copper of 99.9 % purity of rectangular cross sections suitable for full load current for phase bus bars and full rated current for neutral bus bars and shall be extendible on either side. Minimum 200 Amps capacity bus bars shall be provided in the distribution boards.

The bus bars and interconnections shall be insulated with PVC heat-shrinking sleeves and color-coded. The bus bars shall be supported on unbreakable, non-hygroscopic insulated SMC supports at regular intervals to withstand the forces arising from short circuits in the system. All bus bars shall be provided in a separate chamber and properly ventilated. The current density of copper shall be 1.6 Amps per sq.mm cross-sectional area of the Bus bar.

All bus bar connections in Panel and Sub-distribution boards shall be done by drilling holes in bus bars and connecting by cadmium-plated M.S. bolts and nuts. 20% Additional cross section of bus bars shall be provided in all distribution boards to cover up the holes drilled in the bus bars. Spring and flat washers shall be used for tightening the bolts.

Automatically operated safety shutters to screen the live cluster when the breaker is withdrawn from cubicle is to be provided.

All connections between bus bars and switches and between switches and cable alley terminals shall be through solid copper strips of proper size to carry full rated current and insulated with PVC heat shrinking sleeves.

All the M V Panels and SDBs shall be completely factory wired, ready for connection. All the terminals shall have adequate current rating and size to suit individual feeder requirements. Each feeder shall be clearly numbered from left to right to correspond with wiring diagram. All the switches and feeders shall be distinctly marked with a small description of the service installed. Minimum width of busbar Alley shall be 300 mm and that of cable alley shall be 450 mm.

7. TERMINALS

The outgoing terminals and neutral link shall be brought out to a cable

alley suitably located and accessible from the panel front. The current transformer for instruments metering shall be mounted on the terminal blocks. Cable compartments shall be provided for incoming and outgoing cables.

8. WIREWAYS

A horizontal wire way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical sections.

9. CABLE COMPARTMENTS

A cable compartment of adequate size shall be provided in the Sub Distribution Boards for easy termination of all incoming and outgoing cables entering from the bottom or top. Adequate proper supports shall be provided in cable compartments to support cables. All incoming and outgoing switch terminals shall be brought out to terminal blocks in the cable compartment.

1. METERS

All meters shall be housed in a separate compartment and accessible from the front only. Lockable doors shall be provided for the metering compartment. The details of other meters and indicating lamps are as described in each switchboard and neutral selector switch of appropriate range and scale. Wiring for meters shall be colour-coded and labeled with approved plastic ferrules for easy identification. All meters shall be digital.

2. CURRENT TRANSFORMERS

Where ammeters are called for CTs shall be provided for current measuring more than 60 Amps. Each phase shall be provided with a separate current transformer of accuracy class I and suitable V.A. Burden for the operation of associated metering. Current transformers shall be in accordance with IS:2705- 1964 as amended up to date and Cast Resin Type.

3. INDICATING PANEL AND METERING EQUIPMENT

All meters and indicating instruments shall be in accordance with relevant Indian Standards. The meters shall be flush mounted and draw out type. Indicating lamps shall be neon type and of low burden. Indicating lamps shall be backed up with fuses of 5 Amps and toggle switch.

4. MOULDED CASE CIRCUIT BREAKERS (MCCB)

MOULDED CASE CIRCUIT BREAKERS(MCCB): MCCBs shall be in accordance with IS: 2516-1985 & IEC 157-1 with the latest amendments. It shall be enclosed type made of Heat resistant high strength, flame retarding, thermosetting material rated for 500 V, 50 Hz. It shall have three position indicators 'ON', 'OFF' & 'TRIP' at the top, bottom & middle positions. It shall be provided with a shunt trip and an additional 2 Nos. NO & NC contacts. The minimum breaking capacity of MCCBs shall be 20 KA up to 100 AMPS rating 35 KA for MCCBs above 100 AMPS rating up to 200 A and 50KA for MCCBs above 200 A. All MCCB.s shall have a door operating handle (Rotary Operating Handle). The short circuit withstanding capacity shall be ICS Rating and not ICU Rating.

5. EARTHING

Copper earth bars of 25mm x 3mm shall be provided for the MV Panel and SDBs for the full length and connected to the framework of the Panel and SDBs.

Provision shall be made for connection from this earth bar to the main earthing bar on both sides of the Panel and SDBs.

6. PAINTING

All sheet steelwork shall undergo a process of degreasing pickling in acid, cold rinsing, phosphating, passivating and then sprayed with a high corrosion-resistant primer. The primer shall be baked in an oven. The

finishing treatment shall be by application. Two coats of synthetic enamel paint of approved colour and powder were quoted. The seven Tank processes shall be adopted.

15. LABELS

Engraved anodized aluminium labels shall be provided on all incoming and outgoing feeder switches. A circuit diagram showing the control wiring shall be pasted on the inside of the panel door and covered with a transparent laminated plastic sheet. The Label shall indicate the name of the feeder, the specific area it is feeding, the ampere rating and the cable size it is receiving. The Labels shall be provided on the backside of the Panel in case of back access. All the SDBs and Panels shall be subject to tests specified in relevant Indian Standards and a test certificate shall be furnished.

15.1. SHOP DRAWING

Before fabricating the Panels and the SDBs/FDBs the contractor has to submit a shop drawing with the wiring diagram for all the Panels and SDBs/FDBs to the consultant and get approval from the consultant.

15.2. INSPECTION

At all reasonable times during production and prior to shipment of equipment the contractor shall provide and secure for the Consultant/ Company representative every reasonable access and facility at their plant for inspection.

16. TEST CERTIFICATES

Testing of Panels and SDBs shall be carried out at the factory and the site as specified in Indian Standards. The test certificates for the tests carried out at the factory shall be submitted in duplicate.

Miniature circuit breakers shall be quick make and break type and confirm with Indian Standards IS 8828 – 1978 (Specifications for Miniature Air Break Circuit breakers for voltage not exceeding 1000V) The housing of MCBs shall be heat resistant and have a high impact strength. The fault current of MCBs shall not be less than 9000 Amps at 230 volts. The MCBs shall be flush mounted and shall be provided with a trip-free manual operating mechanism with “ON” and “OFF” indications. The MCB contacts shall be silver nickel and silver graphite alloy coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCBs shall be provided with magnetic fluid plunger release for over-current and short-circuit protection. The overload or short circuit devices shall have a common trip bar in the case of DP and TPN Miniature circuit breakers. The MCB shall be tested and certified as per Indian Standards prior to installation.

All final distribution boards shall be provided with MCBs. TPN final distribution boards shall consist of 3 rows of single pole MCBs for each circuit, and each phase shall be connected to the incoming supply through a double pole MCB isolator. Separate neutral bus bars shall be provided for each phase in the case of TPN Distribution Boards. In case Earth Leakage Circuit Breaker (ELCB) has to be provided in Final Distribution Boards then on the incoming side instead of DP MCB Isolator a DP ELCB shall be provided of Current rating same as that of DP MCB Isolator and current sensitivity maximum of 100mA.

The ELCB shall conform to IS: 12640 – 1988 (Residual Current-Operated Circuit Breakers- Specifications) Solid links between the MCB Isolator and backed by HRC fuse/Rewireable fuse and Neutral bus bar shall be provided.

The Neutral shall be looped from one phase to another through DP Isolators.

MCBs shall be provided on the phase or live conductor of each circuit and a neutral bar for the earthed neutral. The individual MCB in each row shall be detachable without disturbing the row of MCBs. Phase separation barriers of 3mm thick Bakelite sheet shall be provided between the back of MCB's fitting 3mm thick Bakelite sheet cover shall be provided for each phase.

There shall be ample space behind the back of MCBs to accommodate all the wiring. All the internal wiring of the final distribution Boards shall be concealed behind a 3mm thick Bakelite sheet. All the distribution boards shall be completely factory wired, ready for connection. All the terminals shall have adequate current rating and size to suit individual feeder requirements. Each circuit shall be numbered from left to right to correspond with the wiring diagram. All the switches and circuits shall be distinctly marked with a small description of the service installed. A four-way 60 A Brass/Copper neutral link shall be provided with terminals suitable to receive 16 sq mm stranded copper wires with end sockets. The final Distribution Boards shall be fabricated as per consultants' design.

17. INTELLIGENT ADDRESSABLE FIRE ALARM SYSTEM

The addressable and intelligent system shall be such that photoelectric /multi-criterion sensors, manual call points, etc., can be identified with point address. The system shall be capable of:

- Setting smoke sensor sensitivity remotely (from the Fire Work Station) to either high sensitivity manually or on a pre-programmed sequence e.g. occupied/unoccupied period. The FAS shall be able to recognize normal and alarm conditions, below-normal sensor values that reveal trouble conditions, and above-normal values that indicate either a pre-alarm condition or the need for maintenance.
- Read out or address an actual space temperature at thermal detector

points. The operator shall also be able to adjust alarm and pre-alarm thresholds and other parameters for the smoke sensors.

- Provide a maintenance/pre-alert alarm capability at smoke sensors to prevent the detectors from indicating a false alarm due to dust, dirt etc.
- Provide alarm verification of individual smoke sensors.
- Provide local numeric point address and LED display of the device and current condition of the point.
- Provide outputs that are addressable. The distributed Intelligent Fire Alarm Control Panel (FACP) shall function as a fully stand-alone panel as well as provide a communication interface to the central station. FACP shall have its microprocessor, software and memory and should be listed under UL864. The memory data for panel configuration and operation shall reside in non-volatile memory (EEPROM). It shall be possible to command test, reset and alarm silence from both the FACP and the central console. FACP switches shall allow authorized personnel to accomplish the following, independent of the central console:
- Initiate a general alarm condition.
- Silence the local audible alarm.
- It shall be possible to acknowledge (Silence the local FACP audible without silencing the alarm indicating devices (hooters).
- Reset all zones (Logical Point Group) / points, after all initiating devices have returned to normal.
- Perform a complete operational test of the microprocessor and memory with a visual indication of each board.
- Test all panel LEDs for proper operation without causing a change in the condition of any zone (Logical Point Group)
- Walk Test FACP shall be backed up with its built-in UPS power and shall

also be connected to central DG Power available in the building.

- Software zones/loops shall be circuited and protected by Fault Isolation Modules such that in the event of a zone/loop short-circuit, not more than twenty (20) devices shall be left non-functional.
- Monitor modules shall be provided to monitor and address contact-type input devices.
- The monitor module shall be supervised by FACP.
- The FACP shall have a Drift Compensation facility to compensate for the environment.
- FACP shall be provided with the following features:
- Charger Rate Control
- Control-by-Time
- Non-Alarm Module Reporting
- Day/Night Sensitivity
- Periodic Detector Test
- Device Blink Control
- Remote Page
- Drift Compensation
- Trouble Reminder
- NFPA 72 Sensitivity Test
- Verification Counters
- System Status Reports
- Walk Test
- Security Monitor Points

- Maintenance Alert
- Alarm Verification
- System Configuration Report
- Printer Interface
- System Point Report
- Event Historical log
- Programmable Automatic Timed and Manual Signal Silence
- Programmable Manual Signal Silence Inhibit Timer
- Control-By-Event with Boolean Logic and Timer Control
- The FACP should truly field programmable.
- The FACP should have a degraded mode of operation.
- Power supply unit of FACP shall have following characters:
- The main power supply shall be 230 VAC±10%, 50 Hz±1% and shall in turn provide all necessary power of the FACP.
- It shall provide a battery charger for 24 hours for standby power using a dual-rate charging technique for fast battery recharge.
- It shall provide a very low-frequency sweep earth fault detection circuit, capable of detecting earth faults on sensitive addressable modules.
- It shall be power-limiting using a Positive Temperature Coefficient (PTC) resistor.
- It shall provide an indication of battery voltage and charging current.

DETECTORS & ADDRESSABLE DEVICES

General features common to all detectors:

- Compatibility: All automatic fire detectors shall be interchangeable without requiring different mounting bases or alterations in the signal panel.
- Sensitivity: On average 30 mgs of burned material per cu.m. (As measured in a 1 cu.m. chamber) shall release an alarm sensitivity which shall be adjustable according to the use of the space.
- Power Consumption: Each detector shall use the minimum of power, for economic circuits, so that it shall have the capacity to connect at least 99 detectors, 50 modules and 20 fault isolator modules in one loop.
- Built-in-response indicator: Each detector shall incorporate an indicator “LED” at the detector which shall blink during normal conditions and light up on actuation of the detector to locate the detector which is operated. The detector shall not be affected by the failure of the response indicator lamp.
- Maintenance: All detectors shall be fitted either with a plug-in system or bayonet-type connections only, from the maintenance and compatibility point of view.
- Construction: The detector shall be vibration and shock-proof. When disassembling for cleaning purposes, its components must not be damaged by static overvoltage.
- Atmospheric and Thermal Disturbance: The detector shall be so designed as to be practically immune to environmental criteria such as air currents, humidity, temperature fluctuations, and pressure and shall not trigger false alarms, due to the above conditions.
- Continuous Operation: An alarm release shall not affect a detector’s functioning. After resetting the alarm, the detector shall resume operation without any readjustment.
- Adaptability to ambient conditions: Detectors shall be designed for

adaptability to humid locations. No performance deterioration shall be acceptable.

- The monitor module shall provide address-setting and shall also store an internal identifying code which the Fire Alarm Control Panel shall use to identify the type of device.
- The control module shall provide address-setting and shall also store an internal identifying code which the control panel shall use to identify the type of device.
- All field hooters should preferably be addressable and software configurable. All Hooters should be able to provide at least a minimum of 3 different tones, which should be user-configurable. The minimum decibel level of each hooter should be 90db. All Hooters should be UL/FM listed. All hooters shall have coupled strobe lights of 110Cd intensity.

EMERGENCY VOICE EVACUATION (EVAC) & TALK BACK FIREMAN PHONE SYSTEM

The FACP shall contain all equipment required for all audio control, telephone system control, signalling and supervisory functions. This includes speaker zone indication, telephone circuit indication and control, digital voice units, microphone and main telephone handset.

Function: The EVAC system equipment shall perform the following functions:

- Operate as a supervised dual-channel emergency voice communication system.
- Operate as a two-way emergency telephone system control centre.
- Audibly and visually annunciate the active or trouble condition of every speaker circuit and telephone circuit.
- Audibly and visually annunciate any trouble condition of tone generators

and digital voice units required for normal operation of the system.

- Provide automatic, digitally recorded voice messages and tones which may be programmed through the microphone.

FIRE ALARM GRAPHICS SOFTWARE (FAS)

- The status of each detector shall be monitored by the FAS.
- Using the FAS, the operator shall be able to adjust the sensitivity of any detector.
- Using the FAS, the operator shall be able to define the entire database for the file system. Fire systems which are not field programmable shall not be accepted.
- The FAS operator shall be able to acknowledge alarms or trouble messages at the FAS.
- It shall be necessary for all alarm or trouble conditions to be acknowledged at the fire system central panel.

8.0 General Note:

1.	All wires shall be FRLS PVC insulated copper conductor. Point wiring rates are inclusive of 3 x2.5 sq mm insulated copper conductor wires for circuit. (from DB to switch board).
2.	Wherever the occupancy sensors and daylight sensors in the closed room and workstations, the wiring from DB to sensor and sensor to switch board shall be included in the point wiring rates.
3.	All sockets to be checked with a Check Plug socket tester for live-neutral reverse, no earth, neutral fault, live earth

	reverse, neutral earth reverse.
4.	The Circuit No. and DB no. label shall be provided on all UPS, RAW sockets and switchboards with label printer.
5.	Colour coding for conduits to be done for different systems. The whole length of conduits to be painted
a	Light & Power Black
b	Emergency Light -Green
c	Data Cable- White
	All circuit & point wiring shall be colour coded & shall have ferruling on both end for circuit identification complete as required etc. Labelling on all the switches and sockets to be done with respect to DB reference, phase and circuit no.
	Earth loop Impedance Test to be performed. RCD test to be done. Cable Insulation Tests to be done.
	The word UPS shall be printed on all UPS sockets.
	The word RAW shall be printed on all RAW sockets.
	Contractor is required to submit samples of all types of switches and sockets to Consultant and Architects representative for approval before ordering the material.
	Cables
1	All cables to be glanded and crimped with suitable sized lugs. All Cable trays to be double earthed. All raceways and

	cable glands to be earthed with brass round earth clips and wires.
2	Earthing ring to be included in all the cable glands.
3	Sub main cables should be labelled at both ends.
4	Joints shall be allowed only at the 2 ends of the cables and not in between.
	Distribution Board & Panels
1	RCCB shall be Si type (Super Immunized) only for UPS DBs. The IP rating of the DB should be IP 43.
2	Provide DB charts in laminated sheets in all Distribution Boards
3	Provide insulated dedicated earth link in all UPS Panels
4	All MCCB's 250 Amps and above shall be Microprocessor based
5	All Light & Power panel, UPS and A.C. Panel incomer MCCB shall have Over current, Earth fault and short circuit protection.
6	All Incomer MCCB's in UPS Panels shall be Microprocessor based
7	The microprocessor based MCCBs shall have
	Over Load (Phase)
I	Current setting Ir (Ir=XIn) OFF 0.4 to 1.0 in steps of 0.1

Ii	Time delay, tr(Inverse) 10 sec at 6/r
Iii	Over Load (Neutral)
Iv	Current setting In (Intrl =XIr) 0.5, 0.75&1.00 Intrl
V	Inverse 10 sec at 6 Intrl/Fixed 200ms
Vi	Short Circuit setting -2- 10
Vii	Instantaneous - 1.5-1
8	All MCB's in UPS Panels shall be D Curve
9	In all Electrical panels protective acrylic sheet to be provided in cable alley and feeders.
10	The meters shall be able to monitor all major power quality parameters Voltage, current, frequency, KVAH, KWH, Power factor and individual, harmonics, ethernet ready - IEC-625-22.
11	The ATS shall be 4 poles with inbuilt manual operating switch. In case the controller of the ATS fails it should be capable of transferring the load while the ATS is in maintenance. The ATS and controller should be same make.
12	Provide On / Off and trip indicating lamp on main incomer & bus coupler only.
13	Panel construction shall be Form 3b for all Panels with MCCB outgoings and Form 2b for all Panels with MCB's outgoings.

14	The Earth fault release/relay and CBCTs shall be same make as OEM Switchgear been used in the Panels. It shall not trip on imbalance of load.
15	The breaking capacity and trip setting of the breakers shall be finalized as per the final design. The report shall be as per ETAP analysis.
16	All MCCB's Breaking Capacity shall be enhanced to 36KA due to cascading
17	All multifunctional meter shall be Schneider make with RS 485 MODBUS RTU half-duplex interface in all the Panels detailed below.

1. Fire extinguishers

This is one of the main and most important types of fire safety gadgets which needs to be positioned at strategic locations. The Fire Extinguisher including all accessories shall be delivered and should be brand new. The contractor should also guarantee that all the components supplied by the contractor are licensed and legally obtained. The fire extinguishers procured must include a comprehensive on-site warranty of -1- year for all types of fire extinguishers except modular automatic fire extinguishers which shall carry a warranty of -3- years from the date of installation and commissioning of the equipment. The Service Provider shall be fully responsible for the manufacturer's warranty with respect to proper design, quality and workmanship of all equipment, accessories, etc., covered by the offer.

The contractor must warrant all equipment, accessories, spare parts etc., against any manufacturing defects during the warranty period. As per the requirement of details, all fire extinguishers with the date of installation and due date of refilling shall be made available on the premises. A demonstration shall be given by the service provider every 3-4 months to the staff with a proper explanation.

Following are the general norms to be followed while positioning the Fire extinguishers at various locations in an office:

In a normal size office of 1200 sq. ft. – 1500 sq. ft. maximum of 6-8 fire extinguishers are to be installed as under:

1. -CO2 gas type 4.5 kgs – Conforming to IS15683.
2. -ABC Powder type / DCP type 4.0 kgs or approved kg – Conforming to IS 15683.

2. <u>Modular type at UPS and Electrical junction 2 /3 kgs or approved</u>

Automatic detection and suppression in one single system, no human intervention is needed for the activation purpose; no power back up needed; easy to install and automatic discharge at set pre-defined temperature. ABC powder automatic fire extinguishers for 24 x 7 protection of unmanned closed areas shall be placed 1 above the UPS and if there is a possibility above the Main Electrical DB. If the size of an office is large suitable fire extinguishers of different types shall be installed as per the recommendations of the Security Officer / Fire Officer / or norms. These directives are suggestive, in case any modifications or additional security requirements etc. are assessed based on the geographical or local situation, concurrence for the same needs to be obtained from the client.

3. BATTERY

Suitable rating ampere Hours 24 Volts DC sealed maintenance free batteries shall be provided for Fire Detection and Alarm System. The battery rating is indicative only. It shall be sized by bidder to cater to all momentary and short-time loads in addition to supplying the continuously rated loads for a duration of 8 hours. However minimum size shall be 65 AH.

4. Battery Charger

Bidder shall furnish the battery charging system complete with all necessary accessories such as transformer, rectifier, switches, fuses, starters, contactors, ammeter, voltmeter, protections and other, devices for trouble-free operation.

5. Construction features

The housing of the battery charger shall be a 2 mm thick CRCA steel sheet cabinet for indoor installation and shall be floor-mounted type. The cabinet shall be folded and braced as necessary to provide rigid support for all components. Louvres shall be provided in the cabinet for ventilation. PVC sheets of 3 mm thick shall be provided on the selves on which the batteries are to be placed.

Input-240 volts AC 50 cycles, single phase with tapings of 0-200-220-240-260 volts on the primary side of the transformer.

Output-DC output shall be 24 volts. DC bridge rectifier shall be of silicon

type, having full wave rectification. Suitable contactor, relay, and reset shall be provided as required.

6. CABLES

All PVC insulated FRLS copper conductor stranded cables shall be 650 volts grade and shall generally conform to IS-1554-1988 and meet the signal cabling requirement of the system manufacturer. Strands of cables shall not be cut to accommodate & connect to the terminals. Terminals shall have sufficient cross-sectional area to take all the strands. Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks. At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturers.

All cables shall be laid with a minimum one-diameter gap and shall be clamped at every meter and shall be tagged for identification with an aluminium tag and clamped properly. Tags shall be provided at both ends and all changes in directions on both sides of wall and floor crossings. All cables shall be identified by embossing on the tag the size of the cable, place of origin and termination. These shall be measured on a linear basis including the fittings required like end termination junction boxes.

18. POINT WIRING

18.1. The rates for all point wiring items shall include :

18.1.1 Conduits, Conduit specials, bushes and other fittings concealed or exposed as called for.

18.1.2 Embedding conduit and allied fittings including the outlet boxes in walls, floors etc., during construction and/or in chases

including cutting chases and making good with cement mortar as necessary in the case of concealed conduit work.

18.1.3. Providing and fixing approved fixing devices, saddles and grouting the same as required for exposed conduits.

18.1.4. Fabrication and Supply of G.I .boxes for switches, ceiling fan hooks, Exhaust fan outlets and lighting fixtures with 1.6 mm thick sheet steel.

18.1.5. Providing and fixing junction boxes with 3mm Hylam or 3mm/5mm thick Perspex sheet cover duly painted from inside to match the colour of the walls. All Junction boxes shall be MS only.

18.1.6. All fixing accessories such as clips, brass screws/brass washers raw plugs etc.

All work & material necessary (including circuit wiring from DB to the first tapping point of each circuit with 2.5 sq. mm wires) in complete wiring of a switch circuit of any length from the distribution board to the **following via the switch:**

a. Ceiling rose.
b. Connector.
c. Back plate.
d. Socket outlet.
e. Lamps Holder.
f. Any other terminal outlet boxes.
g. Ceiling fan and Exhaust fan.
    i. Switch, socket outlet as called for.
    ii. Cable/wire as required up to lamp holder.

18.1.7. All metal boxes and boards are concealed or surface mounted including those required for housing fan regulators.

18.1.8. All accessories necessary to complete wiring as specified.

18.1.9. FRLS PVC Insulated stranded Copper conductor earth wire for fixtures, switch outlet boxes and third pin of 5/15 Amps. Socket to the common earth.

i. Painting all exposed M.S. conduits, outlet boxes and junction boxes.

ii. M.S. conduit for concealed and exposed wiring.

iii. 2 mm dia G.I. pull wires in conduit work, wherever necessary.

iv. The switch plate shall be made of I.S.I. grade Urea Formaldehyde Molding powder. The base of the switches shall be made from high heat-resistant phenol formaldehyde powder. The cost of switches shall include the cost of cover plates, cadmium fixing screws etc. The switches/sockets shall be rocker-operated.

v. Separate Earth wire shall run along with each circuit both for power and light circuits.

vi. Cutting of floor and making good for carrying conduits also.

vii. Numbering of Circuits with ferrules for all circuits at both ends.

viii. Providing 15 Amps capacity Bakelite terminal Blocks for terminating the phase, neutral and earth wire at each fixture location. PVC insulated copper conductor wire ends before connection shall be properly soldered (at least 15 mm length) with special Cu solder for the copper conductor or shall be properly crimped with copper lugs/sockets as the case may be. Strands of wires shall not be out for connecting to the terminals.

All stands of wires shall be soldered at the end before connection. The connecting brass screws shall have flat ends. All looped joints shall be soldered and connected through terminal blocks/connectors.

Provide embossing on the sockets engraving “UPS” and “RAW”

19. CONDUCTING & WIRING FOR TELEPHONE & COMPUTER SYSTEM

The rates for conduit work shall include:

1. All necessary specials and fittings.
2. M. S. inspection, junction and outlet boxes as required.
3. 3/5 mm thick Perspex sheet covers for inspection & junction boxes.
4. All fixing accessories such as clips, nails, brass screws/brass washers, etc.
5. 2 mm dia G.I. pull wires in conduit work, wherever necessary.
6. Providing and fixing approved saddle, hooks and grouting the same as required in the case of all exposed conduit work.
7. Embedding conduit and allied fittings including the outlet boxes in walls, floors etc., during construction and/or in chases including cutting chases and making good with cement mortar as necessary in the case of concealed conduit work.
8. Painting all inspection, junction and outlet boxes.
9. PVC conduit for concealed conduit wiring.
10. Painting of Hylam /Perspex sheet cover from inside to suit the colour of the surrounding wall with two coats of paint.
11. Supply and fabrication of G.I. outlet boxes.
12. The outlet cover plate for Telephone outlets shall be made of I.S.I. grade Urea Formaldehyde Molding powder. The cost of outlets shall include the cost of cover plates, cadmium fixing screws etc. also.
13. Numbering of wires on both ends of the wires for easy identification with PVC ferrules.

20. CABLES, MAINS AND SUB-MAINS

The rates for all items of work shall include:

1. Embedding conduits and allied fittings in walls, floors, etc., during construction and/or in chases including cutting chases and making good as necessary in the case of concealed conduit work.

2. Providing and fixing approved saddles, hangers, trays etc., and grouting the same as required for exposed conduits where called for. Providing dash fasteners for the threaded MS down rods (primer coated) used for hanging the cable \trays.

3. Providing and fixing junction boxes with 5 mm thick ‘Hylam’ sheet covers.

4. Effecting adequate and proper connections at terminations.

5. Ensuring that provision is left in various building components and trenches as the work proceeds, for incorporation of cable supports at a later date.

6. Providing all fixing accessories such as clamping devices, nuts and bolts, screws etc.

7. Clamping to supports where laid in trenches.

8. Excavation of trenches and bringing the trenches to exact level as required.

9. Providing sealing compound, thimble, solder etc., at joints and terminations as called for.

10. Providing proper support for cable terminal boxes as called for.

11. Wherever cables pass through walls, ceilings, paved areas or below roads provide sleeves/ Hume pipes and make good as necessary.

21. DISTRIBUTION BOARDS

a. The supporting rigid steel framework.
b. 1.6 mm thick MS boxes complete with dust-proof and vermin-proof covers and locking arrangements, mounted flush with surfaces.
c. All fixing accessories such as dash fasteners, bolts, nuts, screws, etc. as required.
d. Building into masonry/concrete work including all necessary cutting and grouting with cement mortar 1:2.
e. Effecting adequate and proper connections.
f. Effecting proper bonding to earth.
g. Painting/lettering on switches and distribution boards the location they serve and providing on each board its circuit diagram.
h. Touching up all damaged paint over exposed work with one coat of red oxide primer and two finishing coats of approved synthetic enamel paint.
i. The Main Distribution Board and Final Distribution Boards shall be fabricated by the Contractor with the specified equipment.

k. Provide 6 Amps. SP MCB for Light Points Circuits, 20 Amps. SP MCB for Power Circuits and 32 Amps. SP MCB for 1.5 Ton AC Unit.

22. FIXING OF LIGHTING FIXTURES AND FANS

1. Receiving the fixtures from the Company stores and assembling the same at the site and testing the fixture before fixing.
2. All components that may be required to make the installation complete in all

respects such as:

2.1. A suitable length of the down rod, hanger and connecting wires, were called for.

2.2. Wires for connecting the fixtures to the point through connector blocks.

2.3. All wood and metal blocks to serve as the base of fixtures.

2.4. Bonding with common earth wires.

3. Drilling holes in supports where required.
4. Fixing clamps, GI bolts and nuts, clips, brass screws, dash fasteners and other fixing accessories as required, including leaving necessary provisions for fixing at the time of concreting.
5. Approved enamel painting for hanger rods, clamps and other components and fixing accessories as called for.
6. Testing and commissioning of all fixtures and fans after installation.
7. The lighting fixtures shall be suitable for 230 Volts, single phase 50 cycles A.C. supply system.
8. Incandescent lamps shall be 100 Watts (maximum) and fluorescent lamps shall be 18 watts and 36 watts.
9. Use G.I. suspenders and clamping to the slab with dash fasteners (4 per fitting), including turn buckle arrangements for adjustable heights for hanging. They should be the same suspenders used for hanging the False Ceiling grid ceiling.
10. The contractor is to mark the size of light fittings, speaker and fire alarm components on the false ceiling for the interior contractor to cut holes.

23. **LIST OF APPROVED MAKES:**

1.	M.S. Conduits and accessories	BEC/AKG	Sharma/Steel Craft/ Rama/Disco

2.	FRLS P.V.C. conduits and accessories	BEC (Black) / Polypack/ AKG
3.	FRLS P.V.C. insulated copper conductor wires 1100 volts grade	Polycab/ESC /Havells /Bonton
4.	MCCB, s and Accessories	Schneider/ABB /Legrand
5.	Miniature circuit breakers/ DB	Schneider/ABB /Legrand
6.	Switches, plugs, telephone	Honeywell/Crabtree/Legrand/North West/outlets (Modular Type)
7.	Gang Box & sockets	Make same as make of switch
8.	G.I Pipe	Tata/Jindal
9	Telephone wires	Polycab/ESC /Havells /Bonton
10	PVC insulated Aluminum/copper conductor armored cables of 1100 V/	Polycab/KEI/Havells /Bonton 11000-volt grade
11	PVC insulated flexible copper conduc- tor cables of 1100 V/ 11000-volt grade	Polycab/ESC /Havells /Bonton
12	FRLS PVC insulated Twisted / shielded Copper L.V. Cable	Finolex/Excel / Skytone /Havells / Bonton/KEI

13	Cable Glands Chromium plated Brass heavy-duty glands	double compression, weatherproof with rubber washers and gaskets of Comet make
14	Cable Lugs	Dowells crimping type
15	Light fixtures	Philips /Wipro/ Havells/Divinity
16	Special light fixtures	As per BOQ
17	Day light/Occupancy Sensor	Schneider/Wipro/ Philips/Keselec
18	Indicating Lamps	L & T/Schneider/ seimens
19	Terminal Blocks	Elmex
20	Energy meter	Schneider / L & T / HPL /Socomec/Procom
21	SPD	Mersen/OBO
22	Industrial socket outlet	Legrand / Bals/Clipsal/Hensel/ ABB socket and top
23	Earth Leakage Circuit	Legrand /ABB/ Legrand/ Schneider Breaker
24	Maintenance Free Earthing	Alltec / Teksai /Duval Messien

25	Telephone Tag Block	Krone
26	Cable Tray	KME/ Era Control System
27	Raceway – with sheet steel	KME/ Era Control System
28	Special Cable Tray	OBO Batterman /Applicam Industries
29	Wire Mesh Tray	Legrand – Cablofil
30	Floor Access Box	M.K / Legrand
31	SDB's and Panels	Supretech Control system/EVA/ Era Control System/Application Control
32	Fire Alarm system	Morley/Edwards/Ravel
33	P A System	Bosch
34	CCTV IP Based	Hikvision/ Honeywell
35	Any other items	Sample to be approved by Client/engineer in-charge
36	Fire extinguishers	Safex / Kenex / Bharat / Reliance/NewTech
37	NETWORKIG	Make AMPS / D- Link

The names of manufacturers are mentioned in order of preference. The Contractor shall quote rates for materials of first preference only and that the

Contractor has satisfied himself regarding the availability of the materials and that only materials called for under first preference shall be supplied and installed. In the event that the materials of makes called for are not available and alternative makes are approved (by the consultant) for incorporation in the work, the rates quoted shall be suitably amended based on the price variation between the specified makes and alternative makes on the day the alternative makes are accepted.

SPECIFICATIONS – PART C

HVAC

TECHNICAL SPECIFICATION AIR-CONDITIONING

Part 1:

1. GENERAL DATA

The system design, basis of design, estimated requirements and other relevant data are outlined in this section. The detailed specifications and specific requirements are outlined in the subsequent sections (Bill of Quantity.)

The work under this tender shall be executed strictly in accordance with constructional and material requirements defined under these specifications.

2. SCOPE OF WORK

The scope comprises supply, installation, testing commissioning of air-conditioning by VRV/VRF/MRV system. The system to facilitate the operation & control of individual rooms/cabins. The system shall be able to cater for the partial load which can be as low as 10% of the total load.

The drain point of each unit shall be connected to the common drain point.

The proposed AC system will be microprocessor controlled inclusive of safety factors & gadgets.

The condensing units should be capable of providing cooling within the ambient range of -5 degrees C to 50 degrees C DB & heating in the range of 0 degrees C to 15 degrees DB.

All exposed pipes are to be covered with raceway or heavy-duty flexible pipe for protection. Special precautions are to be taken while installing the drain piping. The contractor shall be responsible for any leakage/seepage due to poor installation of the HVAC drain until the guarantee period. The drain point is to be tested for 24 hours after blocking one end. Drain piping will be plugged at both ends using the appropriate method after completing the drain test to avoid choking due to foreign material.

3. DRAWINGS/DIMENSIONS

Figured dimensions on drawings shall supersede measurements by scale and drawings to a large scale take precedence over these to a smaller scale.

Special dimensions or directions in the specifications shall be checked on-site. Regarding the levels, measurements and other information concerning the existing site, the contractor shall verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever shall be entertained hereafter on account of any errors or omissions in the levels or the description of the ground turned out to be different from what was expected or shown on the drawings.

4. CO-ORDINATION OF DRAWINGS

Before commencement of work, the contractor shall correlate all relevant drawings about,

a) Existing physical civil structure, and proposed modifications in physical shapes sizes and dimensions of building elements/openings, objects on this tender, and spaces required for the HVAC system proposed. Dimensions of site, about beam sizes, beam-bottoms, clear height, window and opening locations, and other civil structures that make space and structure to SITC (Supplying Installation Testing and Commissioning) of HVAC.
b) Site conditions to receive/provide water supply, and drainage of wastewater from HVAC. Intake of fresh air and exit for Air disposal.
c) Existing/ proposed location of the electrical establishment, cable tray, wiring, junction boxes, three-phase and LV routes, and power sources required to SITC (Supplying Installation Testing and Commissioning) of HVAC.
d) Interior furnishing drawing containing details about the false ceiling, furniture, structural, architectural, and service drawings that make space and structure to SITC (Supplying Installation Testing and Commissioning) of HVAC.
e) The contractor shall satisfy himself that the information available therefrom is complete and unambiguous. Shop drawings are coordinated, from all the above installations on the site.
f) The contractor shall prepare shop drawings, such that the scope and

dimensions are correct to the scheme of work in progress. Drawings and dimensions are available to other working persons and teams on this site.

g) The contractor shall mark reference levels/ colour lines, with permanent marker markings such that it is readable for the workman and supervisors in charge at the site, from the HVAC team, also to the supervisor's Electrical, and interior furnishing team supervisors. Readable and reference markings, to the supervisor's form consultant and employer representatives. Marking on walls and columns he is using as benchmark levels for measurement installation of machinery.

h) The contractor shall maintain open format drawings and person at site, to incorporate updates from site working conditions. Shall submit such drawing revisions as Drawing R/A Bill 1, 2, 3 and final.

The list of shop drawings shall be as follows:

Detail plans for each area.

Refrigerant piping routes with sections.

Condenser / Evaporative unit location along with the location of MCB.

Electrical panel and control scheme.

Mounting stand & foundation details. (to be designed by a structural engineer employed by the contractor and approved by the employer).

Any other detailed drawing required for the system. # Drain piping layout with section.

Control cabling detail along with sizes.

Power cable sizes and earthing wire sizes. # Cu pipe support details.

Drain line clamp details.

The contractor shall be responsible for any error/difficulty in execution/damage incurred owing to any discrepancy in the drawings which has been overlooked by him and has not been brought to the notice of the

Project Manager/Architect before execution.

5. B.I.S. CODES OF PRACTICE

Worksite shall be carried out in compliance with procedure, material, and procedure in compliance to standards prescribed by the Bureau of Indian Standards (B.I.S.) or Indian Standards (I.S.) Code of practice, the latest version of the code of practice in usage all the time of construction.

6. INSPECTION:

Routine performance testing of equipment shall be carried out at works in the presence of the representative from employer/consultant-engineer/Architect

7. SUPERVISION

The contractor shall depute their team of engineers for the supervision of installation, testing, commissioning & handling at the site of work.

8. SECURITY

The contractor is responsible for all the equipment, piping, wiring and all related accessories till the time of handing over to the customer.

9. TEST

The contractor will perform summer or monsoon and winter tests and confirm the performance of units as specified in the design data.

10. MAINTENANCE

The contractor will provide sufficient no. of service/ operator team (available 12 hours) along with the service spares during the guarantee (defect) period at the site. Capital project Administration / NIREH will provide the necessary office space for the service team. Any defects, including the drain, arising during the warranty period will be attended to within 24 hours.

11. CIVIL WORKS

Chasing, cutting and semi-finishing with chicken wire mesh of the brickwork or floor for laying the drainpipe and copper pipe to be in contractor scope. Chasing, and cutting will be carried out only by chase cutting machine. Chisel and hammer shall not be allowed.

Part 2: TECHNICAL SPECIFICATION

1. OUTDOOR UNIT

The outdoor unit shall be factory assembled, weatherproof casing, constructed from heavy gauge mild steel panels and coated with a baked enamel finish. The unit should be completely factory wired, tested with all necessary controls tested prior to dispatch conforming to the following specifications.

a. All outdoor units shall consist of inverter scroll compressors.
b. Outdoor units when consisting of more than 1 module (e.g. 22 HP = 10 HP +12 HP), each should have one separate inverter driven compressor.
c. In such cases, the units shall be provided with a duty cycling arrangement for multiple inverter compressors.
d. The outdoor unit shall be modular in design to facilitate installation one after another close to each other. Preference would be given to compact units having smaller footprints.
e. Outdoor units should be rugged with anti-corrosion design and should have strong base plates for easy mounting of the unit. 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.
f. The outdoor unit shall comprise of sub-cooling feature to effectively use the

entire coil surface through the proper circuit/bridge in order to prevent flushing of refrigerant owing to the large length of piping.

g. The condensing unit shall be provided with a state-of-the-art microprocessor-based control panel.

h. The outdoor unit shall be provided with with Aero spiral design fan exhibiting low noise level characteristics complete with an aero fitting grille to facilitate spiral discharge of airflow to effect reduction in pressure losses. The fan should be capable of responding to external static pressure of 5mm.

i. Motor shall be speed controlled to ensure a stable operation for varying ambient, by a factory fitted direct acting head pressure activated variable speed drive for at least
    a. 15 steps to give precise discharge pressure and minimum power consumption of condenser fan motor.

j. The condenser shall be complete with provisions for refrigerant piping connections, shut-off valves and any other standard accessories necessary with the equipment supplied. The condensing unit shall be designed to facilitate fail-safe operation when connected to multiple indoor units. If possible, the system should work on standard operating parameters like discharge pressures of not more than 300 PSI as the ref. Piping will be moving around within a habitable space, protection from any misfortune of any leakage, (leakage is like a bullet on higher pressures). Vendor to comply with all safety codes of high-pressure safety & testing and give 2 sets of special tools to handle such equipment at the site. All brazing should be done by only qualified trained persons who had training on HIGH-PRESSURE brazing, special tools & procedures.

(k) The outdoor unit should be fitted with a low noise level and should not be more

than 67db (A) at normal operation when measured at a 1.5m distance from floor/ground level.

(L) Indoor supplied shall belong to compatible models across the system, from the same generation of technology, from the same manufacturer.

2.0 REFRIGERANT CIRCUIT

The refrigerant circuit shall include liquid and gas shut-off valves and a solenoid valve at the condenser end. The equipment must have inbuilt refrigerant stabilization control for proper refrigerant distribution. All necessary safety devices shall be provided to ensure the safe operation of the system.

3.0 HEAT EXCHANGER

The heat exchanger shall be constructed with copper tubes mechanically bonded to aluminium fins to form a cross-fin coil. The aluminium fins shall be covered by anti-corrosion resin film/paint/treatment. The unit should be with a bye-pass/ e-pass heat exchanger to optimize the path of the heat exchanger and for better efficiency of the condenser.

The unit shall be provided with a necessary number of directly driven low-noise level propeller-type fans arranged for vertical discharge. Each fan shall have a safety guard.

4.0 SAFETY DEVICES

All necessary safety devices shall be provided to ensure safe operation of the system. The following safety devices shall be part of the outdoor unit:
- high-pressure switch, fuse, fan drive overload protector, fusible plug,

crankcase heater, overload relay, and overload protection for the inverter. The outdoor roof-mounted units shall be provided in such a fashion that these do not affect the overall aesthetics and ambience of the building. If required these units shall be suitably camouflaged to give a good aesthetic look. These provisions, however, shall be discussed, if required, at a later date and the prices for the same shall be worked out separately as extra items. Noise levels for outdoor units shall not be more than 67 dB (measured at a point 1 meter in front of the unit at a height of 1.5 meters.

5.0 INDOOR UNITS

All indoor units as specified shall have in general; noise levels less than 46 dB. For critical applications noise levels below these limits may, however, be specified during the design stage.

i.) Each unit shall have an electronic control valve to control refrigerant flow rate response to load variation of the room.

ii.) The address of the indoor unit shall be set automatically in case of individual and group control.

iii.) In the case of the centralized control system, it shall be possible to set the address of individual indoor units through a liquid crystal remote controller.

iv.) 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 a direct driven type, mounted directly on the motor shaft having support from housing.

v.) The cooling coil shall be made out of seamless copper tubes and have continuous aluminium 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 21 kg/sq.m air pressure under water.

vi.) The indoor unit shall have a cleanable type filter fixed to an integrally moulded/moulded plastic frame. The filter shall be slide-in and neatly insertable type. It shall be possible to clean the filters either with compressed air or water.

vii.) Each unit shall have computerized PID control for maintaining the designed room temperature. Each unit shall be provided with a microprocessor thermostat for cooling/ heating.

viii.) Each indoor high-wall unit shall have with corded/ cordless remote controller as a standard features. Corded/ cordless remotes shall have standard features as per the standard design of manufacturers.

ix.) The power supply of each indoor unit shall be provided by the department.

6.0 HIGH WALL INDOOR TYPE UNIT

The unit shall be a high wall-mounted type. The unit shall include pre-filters, a fan section and a DX- coil section. The housing of the unit shall be powder-coated/heat-treated galvanized steel. The body shall be light in weight and shall be able to suspend from four comers. The fan shall be an aerodynamically designed diffuser turbofan type. Unit shall have an external attractive panel for supply and return air.

7.0 CENTRALIZED TYPE REMOTE CONTROLLER:

A multifunctional compact centralized controller shall be provided with the system. These controllers shall be capable of controlling all the indoor

and outdoor units and should be capable of integration with the PC-based building management system of HVAC. It shall be able to control the indoor units with the following functions:

a. Starting/ stopping of Air Conditioners as a zone or group or individual unit.
b. Temperature setting for each indoor unit or zone.
c. Switching between temperature control modes, switching of fan speed and direction of airflow, enabling/disabling individual remote controller operation.
d. Monitoring of operation status such as operation mode and temperature setting of individual indoor units, maintenance information and troubleshooting information.
e. Display of air conditioner operation history.
f. Daily management automation through yearly schedule function with the possibility of various schedules. The controller shall be widescreen user-friendly and can be wired by a non-polar 2-wire transmission cable to a distance of 1 K.M away from the indoor unit. The cables shall be as per prevailing practice adopted by the manufacturers but shall have a minimum rating of 2 core, 1.5 sq. mm shielded cables suitable for outdoor application. A cordless/corded remote having a star and feature as per the standard design of the manufacturer IS acceptable to the Department.

8.0 REFERIGERANT 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 practices 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 joining any copper pipe or fitting, 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 shall be pressure tested using nitrogen at 32 Kg per sq. cm. Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to a minimum vacuum of 700 mm Hg and held for 24 hours. The air-conditioning supplier shall design sizes and erect proper interconnections of the complete refrigerant circuit.

The suction line pipe size and the liquid line pipe sizes shall be selected according to the manufacturer's specified outside diameter. All refrigerant pipe 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.

9.0 DRAIN PIPING

Shall be UPVC.

The IDU shall be connected to the drainpipe made of rigid heavy-duty UPVC, density 10 KG/sq cm min 20 MM diameter. The pipe under the floor should be 20 Kg/sq.cm

The pipe shall be laid on a proper slope for efficient draining of the condensate water.

10. PIPE INSULATION

Refrigerant Pipe Insulation:

The whole of the suction and liquid line including all fitting, valves strainers bodies etc. shall be insulated with a 19 MM respectively thick class ‘o’ Electrometric Nitrile Rubber sleeve, as per BOQ.

The joint shall be properly sealed with R242 adhesive of polychloroprene to ensure proper bonding at the ends.

Insulation of cold lines shall be carried out with Armaflex/K-flex insulation sheets and tubes of appropriate thickness so that condensation does not occur.

Drain Pipe Insulation

The drainpipe carrying condensate water shall be insulated with 6 MM thick Kinifoam.

The joint shall be properly sealed with R242 adhesive of polychloroprene to ensure proper bonding at the ends.

For proper drainage of condensate U-trap shall be provided in the drain piping (wherever required).

All pipe supports shall be of pre-fabricated and pre-painted slotted angle supports properly installed with clamps.

Part 3: TECHNICAL SPECIFICATION AIR DISTRIBUTION SYSTEM)

1.0 Scope

The scope of this section comprises supply fabrication, installation and testing of all sheet metal/aluminium ducts, supply, and installation, testing

and balancing of all grilles, registers and diffusers. All are to be in accordance with these specifications and the general arrangement is shown on the Drawings.

Ductwork shall mean all duct, casing, dampers access doors, joints, vanes, stiffeners, hangers and support etc.

2.0 Duct Materials

RAW MATERIALS

Galvanizing shall be Class VII – light coating of zinc, nominal 180gm/sq. m 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 the employer's site representative shall be subject to approval and tested for thickness and zinc coating at the contractor's expense.

3.0 GAUGES, BRACING BY SIZE OF DUCTS

All ducts shall be fabricated from galvanized steel/aluminium of the following thickness, as indicated in the schedule of quantities & as described in the IS: 655 with the latest.

4.0 RECTANGULAR DUCT:

Dimensions of duct	**Gauge G. I**	**Aluminium**	**Type of joints**	**Type of Bracings**
Up to 600	24	22	G.I flange at 2.5 Centre	Cross Bracing

601 to 750	24	22	25 x 25 x 5 mm angle iron frame with 6 mm dia nuts and bolts.	25 x 25 x 5mm MS angles bracing at 1500 mm from joints.
751 to 1000	22	20	25 x 25 x 5 mm angle iron frame with 6 mm dia nuts and bolts.	25 x 25 x 5 mm MS angles bracing at 1500 mm from joints.
1001 to 1500	22	20	40 x 40 x 5 mm angle iron frame with 8 mm dia nuts and bolts.	40 x40 x 5 mm MS angles bracing at 1500 mm from joints.
1501 to 2250	20	16	50 x 50 x 5 mm angle iron to be cross braced diagonally with 10 mm dia nuts& bolts at 125	40 x40 x 5 mm MS angles bracing at 1200 mm from joints. Or 40 x 40 x 5 mm MS.

			centers.	Angle diagonal bracing.
2250 and above	18	14	50 x 50 x 6 mm angle iron frame with 10 mm dia	50 x50 x 5 mm MS angles bracing at 1200 mm from joints.
			nuts and bolts at 125 mm centre.	Or 50 x 50 x 5 mm MS. Angle diagonal bracing.

Sheet metal ducts shall be fabricated out of galvanized steel sheets conforming to BIS 655, BIS 277, BIS 737 & SMACNA. Sheets used shall be produced by Hot dip process and galvanizing shall be Class VII- Minimum Average Coating 180 gm/sq.m as per

BIS 277: 1992.

5.0 HANGERS FOR DUCT:

Duct Size (mm)	Spacing(M)	Size of MS angle (mm x mm)	Size of rod dia (mm)
Upto 750	2.5	40 x 40X5	10
751 to 1500	2.0	40 x40X 5	12
1501 to 2250	2.0	50 x50X5	15
2251 to above	2.0	50 50X5	15

6.0 FABRICATION:

All ducts shall be fabricated and installed in a workman like manner, generally conforming to IS 655. Round exposed ducts shall be die formed for achieving perfect circle configuration.

a. Ducts so identified on the drawings shall be acoustically lined with thermal insulation as described in the section `Insulation' and as indicated in the schedule of quantities. Duct dimensions shown on drawings are overall sheet metal dimensions inclusive of the acoustic lining, where required and indicated in the schedule of quantities.
b. Ducts shall be straight and smooth on the inside with neatly finished joints. All joints shall be made airtight.
c. All exposed ducts within conditioned spaces shall have slip joints - no flanged joints. The internal ends of slip joints shall be made in the direction of airflow. Exposed ducts, where required or as indicated in the Schedule of quantities, shall be painted with two coats, of enamel paint of approved colour. Ducts

and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint.

d. Changes in the dimensions and shape of ducts shall be gradual. Curved elbows, unless otherwise indicated, shall have a centre line radius equal to one and a half times the width of the duct. Air turns shall be installed in all vanes, arranged to permit the air to make the turn without appreciable turbulence. Suitable vanes shall be provided in duct collars to have uniform/ proper air distribution.

e. 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 sample size to keep the ducts true to shape and to prevent bulking, vibration or breathing.

f. All sheet metal connections, partitions and plenums required to confine the flow of air to and through 18g GI/16-gauge aluminium, thoroughly stiffened with 25mm 25 mm x 5mm angle iron braces and fitted with all necessary doors as required to give access to all parts of the apparatus. Access Doors shall be not less than 45cm x 45cm in size.

7.0 INSTALLATION:

All ducts shall be installed generally as per the drawings and in strict accordance with approved shop drawings to be prepared by the Contractor.

a. 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 the Employer'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

is shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and/or conduits, the ducts shall be transformed, divided or curved to one side, the required area is maintained, all as per the site requirements.

c. 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 Employers site representatives.

d. All ductwork shall be independently supported by the building structure. All horizontal ducts shall be rigidly and securely supported, in an approved manner with trapeze hangers formed of MS rods and angle iron under ducts at not greater than 2-meter centres.

    i. All vertical ductwork shall be supported by structural members on each floor. The air conditioning contractor shall supply and install 50mm cube MS boxes with 10mm dia steel rods passing through the box, all given two coats of red oxide paint, the MS rod tied with reinforcement bar at the point of suspension shall be neatly exposed and opening subsequently filled with plastic compound after duct hangers are installed. If the duct is passing through in such areas where the space between the ceiling slab to false ceiling is more than 1500 mm then duct should be supported by wall-mounted brackets of 40 x 40 x 5 mm angle.

e. Ducting over the furred ceiling shall be supported from the slab above, or from beams, after obtaining approval of the Employer'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

a. no delay to other contractors on the building.

f. Where metal ducts or sleeves terminate in woodwork, tight joints shall be made by means of closely fitted heavy flanged collars. Where ducts pass through brick or masonry openings and wooden framework shall be provided within the opening and crossing ducts provided with heavy flanged collars on each side of the wooden framework, so that duct crossing is made leak-proof.

g. 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 vibrations in the ducts, ducts shall be provided with closely woven, rubber-impregnated double-layer asbestos/canvas or neoprene-coated fibreglass fire-resistant flexible connection. The flexible connections are located close to the unit, in mutually perpendicular directions. The flexible sleeve is at least 10cm long securely bonded and bolted on both sides. The sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation.

h. The air conditioning unit and exhaust fans shall be connected to duct work by inserting at the air inlet and air outlet a double canvass sleeve. Each sleeve shall minimum of 150 mm securely bolted to the duct and the connecting ductwork rigidly held in line with the unit inlet or outlet.

8.0 SPLITTERS AND DAMPERS:

All dampers shall be opposed to blade-type dampers of robust construction and tight fitting. They shall be made of G.S. sheet minimum of 16 gauge thick and shall have brass bushes. The design, method of handling, and control shall be suitable for the location and service required.

Dampers shall be provided with suitable links, levers and quadrants as

required for their proper operation control or setting devices shall be made robust, easily operatable and accessible through suitable access doors in the ducts. Every damper shall have an indicating device clearly showing the damper's position at all times. Handles will be provided with extended arms to account for insulation thickness.

Dampers shall be placed in ducts and 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 system.

9.0 Fire & Smoke Dampers

All supply and return air ducts at AHU room crossings and all floor crossings shall be provided with Motor motor-operated Fire & smoke damper of at least 90 minutes rating as per UL555/1995 tested by CBRI. These shall be of a multi-leaf type and provided with a Spring Return electrical actuator having its thermal trip for ambient air temperature outside the duct and air temperature inside the duct. The actuator shall have Form fit type of mounting, metal enclosure and guaranteed long life span.

Fire damper blades and outer frames shall be of 16G galvanized steel construction fitted with 18 gage 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 galvanized sheet steel. For preventing smoke leakage metallic compression seals will be provided.

The electric actuator shall be energized either upon receiving a signal from the smoke detector installed in the 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 through the electronic temperature sensor.

Each damper shall be provided with its control panel, mounted on the wall and suitable for 240 VAC supply. This control panel shall be suitable for spring return actuator and shall have at least the following features:

Potential free contacts for AHU fan ON/ Off and remote alarm indication.

Accept signal from external smoke/fire detection system for tripping the electrical actuator.

Test and reset facility. Indicating lights/contacts to indicate the following status: Power Supply On Alarm
Damper open and close position

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. The control panel shall be wall-mounted type. It shall be the HVAC Contractor's responsibility to coordinate with the Fire Alarm System Contractor to correctly hook up the Motor Operated Damper to the Fire Detection / Fire Management System. All necessary materials for hooking up shall be supplied and installed by the HVAC Contractor under close coordination with the fire protection system contractor.

The HVAC Contractor shall demonstrate the testing of all Dampers and their control panel after the necessary hook-up with the fire protection/fire management system is carried out by energizing all the smoke detectors with the help of smoke.

HVAC Contractor shall provide Fire retardant cables wherever required for satisfactory operation and control of the Damper.

HVAC Contractor shall strictly follow the instructions of the Damper Supplier or avail his services at the site before carrying out testing at the site.

The fire/smoke damper shall be provided with factory-fitted sleeves; however, access doors shall be provided in the ducts within the AHU room in accordance with the manufacturer's recommendations.

The Contractor shall also furnish to the Company, the necessary additional spare actuators and temperature sensors (a minimum of 5% of the total number installed) at the time of commissioning of the installation.

10.0 FIRE DAMPER:

Whenever a supply/return duct crosses from one fire zone to another, it shall be provided with an approved fire damper of at least a 1½ hour fire rating as per UL555/1995 tested by CBRI. This shall be a curtain-type fire damper.

Fire damper blades shall be one piece folded high strength 16 gage galvanized steel construction. In normal position, these blades shall be gathered and stacked at the frame head providing maximum air passage and preventing passing air currents from creating noise or chatter. The blades shall be held in position through the fusible link of temp 70o 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 them down without the use of springs, weights or other devices subject to failure.

Fire damper sleeves and access doors shall be provided within the duct in accordance with the manufacturer's recommendation.

The contractor shall also furnish to the Employer, the necessary additional fusible links (spares), as recommended by the manufacturer, at the time of commissioning of the installation.

11.0 SUPPLY AND RETURN AIR GRILLES:

Supply and return air grilles shall be M.S. or anodized extruded aluminium construction with individually adjustable bars as shown on drawings and indicated in the schedule of quantities. Supply air grilles shall be generally double deflection type, with removable key-operated volume control dampers. Return air grilles shall be generally double deflection type similar to supply air grilles but without dampers.

All supply and return air grilles behind wooden frames shall be single deflection type with one-way bars only, the supply air grilles being provided with removable key-operated volume control dampers. Mild steel supply and return air grilles shall be factory-coated with rust-resistant primer and shall be finished with two coats of paint as per the client's choice. Aluminium supply and return grilles shall be powder coated and have the colour of the client's choice or extruded aluminium as per the bill of quantities. For fixing of grilles in the walls HVAC Contractor has to provide a 50 mm x 50 mm wooden frame of kail wood.

The frames have to be given a coating of fire-retardant paint. Nothing extra shall be paid on this account.

12.0 SUPPLY AND RETURN AIR DIFFUSERS:

Supply and return air diffusers shall be shown on the drawings and indicated in the schedule of quantities. The supply air diffuser shall be provided with removable key operative volume control dampers. Mild steel diffusers/dampers shall be factory-coated with rust-resistant primer. These shall be finished with two coats of paint as per the Architect's directions.

Aluminium supply and return air diffusers shall be powder coated and have the colour of the client's choice or shall be extruded aluminium.

i. Round or Rectangular Diffusers:

Supply/return air linear diffusers shall be M.S. or Extruded aluminium construction, square, rectangular, or round diffusers with a flush fixed pattern or adjustable flow pattern. Diffusers for different spaces shall be selected in consultation with the Architect/Consultants. Supply air diffusers may be equipped with fixed air distribution

grids, removable key-operated volume control dampers, and anti-smudge rings as per requirements of schedule of quantities.

ii.Linear Supply Air/ Return Air Grilles:

This shall be M.S. or extruded aluminium construction with fixed horizontal bars at 15 dig inclination and flange on both sides. The thickness of fixed bar louvres shall be at least 5.5mm & angle shall be 20mm/30mm inside. The grilles shall be suitable for concealed fixing volume control damper of extruded. Aluminium construction with a black anodized finish shall be provided in SA duct collars.

13.0 LINEAR DIFFUSER:

The liner diffuser shall be extruded aluminium construction multi-slot type with air pattern controlled provided in each slot. Supply air diffusion shall be provided with a volume damper in each slot of the supply air diffuser. A plenum shall be provided for each supply air diffuser.

The Material of the Grilles shall be as follows:

i. All grilles shall be selected in consultation with the Client/Architect/Consultant. Different spaces shall require horizontal or vertical face bars and different widths of margin frames.

ii. All grilles shall have a soft, continuous rubber gasket between the periphery of the registers and the surface on which it has to be mounted. The effective area of the registers shall not be less than 75

per cent.

iii. Grilles shall be an adjustable pattern as each grille bar shall be pivotable to provide a pattern with 0 to 100 deg horizontal arc and up to 30 deg C deflection up or down. Bars shall hold deflection settings under all conditions of eco regional and pressure. Extruded aluminium grilles shall have fixed bars.

iv. Bars longer than 45cm shall be reinforced by set-back vertical members of approved thickness.

The material thickness of grills, diffusers, and damper shall be as follows:

Diffuser	**MS**	**Aluminum**
a) Frame	20-gauge	18 gauge
a) Louvres	20-gauge	18 gauge

Grills:

a) Frame	20-gauge	18 gauge
b) Louvers	26-gauge	24 gauge

V.C. Damper:

a) Frame	20-gauge	18 gauge
b) Louver	26-	24 ga

gauge ug
e

v. Fresh air intake and extract louvres:

All the louvres shall be rain protection type and shall be fabricated from the extruded aluminium section. The louvres shall additionally be provided with heavy-duty expanded metal (aluminium–alloy) bird screed. 50 mm x 75 mm wooden frame made out of kail wood to be provided by HVAC contractor free of cost for fixing of louvres.

vi.Testing & Balancing:

After the installation of the entire air distribution system is completed in all respects, all ducts shall be tested for air leaks before painting the interiors of conditioned spaces air distribution system shall be allowed to run continuously for

48 hours for driving away any dust or foreign material logged within ducts during installation.

Part 4: TECHNICAL SPECIFICATION THERMAL/ACOUSTIC INSULATION:

GENERAL:

The scope of this specification comprises supplying, installing, testing and commissioning insulation on ducts, pumps, chilled water piping, chillers, expansion tank, AHU room and duct lining.

1.0 DUCT INSULATION:

Scope: The Scope of this section comprises the supply and fixing of insulation as specified.

All insulating materials in the form in which it is used and under the condition

anticipated shall not ignite, burn, support combustion or release toxic gases when subject to fire or heat.

All adhesives used to stick insulation shall also be non-flammable.
All materials used for thermal and acoustical insulation shall be resin-bonded fibre glass of density and thickness as specified or indicated on the drawing.

All sun-exposed roofs shall have Phenotherm under deck insulation of the density and thickness specified.

Manufacturers' recommendations for application & safety shall be strictly adhered to.

2.0 Fibre Glass Insulation

Resin bonded, glass wool, pre-laminated with aluminium foil. The thermal conductivity of glass wool shall not exceed 0.024 Kcal/hr. sqm deg C (0.19 BTU in/Hr. Sq. ft deg F at 10 deg C - mean temperature and density shall not be less than 48 kg/m3.

Thickness of Insulation:

Type	Location	Insulation
Supply Duct	Conditioned Space	25 mm
Supply Duct	Unconditioned Space	50 mm
Return Duct	Conditioned Space	25 mm

Return Duct	Unconditioned Space	50 mm

When specified/indicated the insulation shall be applied as follows:

3.0 Duct Insulation Thermal Fibre Glass

a. Clean all duct surfaces thoroughly

b. Install self-adhesive pins spaced along the duct at no greater than 300 mm centres at the bottom of the duct. The pin should be located no less than 75 mm from each edge or corner.

c. Apply a coat of Foster Duct as Adhesive 81-22 on the duct surfaces as per the manufacturer's recommendations.

d. Impale insulation through the pins and ensure insulation is stuck to the adhesive.

e. Fix self-retaining washers onto the pins to hold the insulation. Do not compress insulation more than 3 mm.

f. Bend the pins so as to prevent protrusions or tears.

g. Apply vapour seal pressure-sensitive sealing tape to all joints and protrusions. The sealing tape should be a minimum of 75 mm wide.

h. Provide nylon strapping at 600 mm centres to prevent sag. Strapping is to be applied to the widths of all ducts. Ensure strapping does not tear the aluminium foil.

i. Wrap 24G x ¾" G I chicken wire mesh around the insulation. Prevent any damage or tear to the insulation facing.

4.0 Application: (For exposed duct)

a. Cleaning the surface of ducts with a wire brush to remove dirt, rust etc.
b. Applying a coat of adhesive.
c. Fixing the expanded polystyrene insulation.
d. Cover the insulation with 2 nos. polystyrene 500g and seal the joint with black Japan.
e. Fixing 24 x 3/4" Hexagonal wire netting tied with G.I. wire.
f. Finally apply sand cement plaster in a ratio 1:3 in two layers each 10mm thick.
g. Paint it to the required colour with a brush.

5.0 Nitrile rubber class

Insulation material for ducts shall be close cell elastomeric nitrile rubber class‘O’.

The thermal conductivity of nitrile rubber shall not exceed 0.036 w / m 0 C. Density of the material shall not be less than 0.04 gm / cm3.

6.0 The insulation shall be applied as follows:

Duct Insulation – Thermal

a. Clean all duct surfaces thoroughly to remove grease, dirt etc.
b. The measurement of surface dimension shall have to be taken properly to cut nitrile rubber sheets.
c. The rubber sheets are sized to cut with sufficient allowance in dimension. A single sheet should be cut, so as to provide only one seam at the top of the duct. No small patches shall be allowed.
d. Apply a thin coat of non-flammable adhesive recommended by the manufacturer on ducts and on the insulation material.
e. When the adhesive is tack dry, insulation shall be placed in position with

compression and no stretching of insulation shall be permitted to achieve a good bond.

f. All longitudinal and transverse joints shall be sealed with 3mm thick and 25mm width adhesive Arm flex class ‘O’ tape.

7.0 Acoustical Insulation

Acoustical Insulation for Ducts

All connecting ducts to Package Units / AHUs shall be sound insulated to a distance of 6 m or as specified or as shown on the design.

Acoustical insulation shall be 50 mm thick 32 Kg/cum Fiber Glass Insulation finished with dimensionally stable Black Glass Tissue (BGT) facing & 24 G perforated aluminium sheets as specified or shown on the drawings.

Application:

Clean all internal duct surfaces

Pre-cut the insulation to the size desired, allowing 50 mm excess at downstream joints.

Install self-adhesive pins spaced along the inner face of the duct. The pins should start within 75 mm of upstream transverse edges of the liner and 75 mm from longitudinal joints and should be placed at a maximum of 300 mm on centres around the perimeter of the duct, except that there may be a maximum of 300 mm from a corner break.

Apply a coat of Foster Duct Fas Adhesive 81 - 22 on the duct surfaces as per the manufacturer’s recommendations.

Impale insulation through the pins and ensure insulation is stuck to the adhesive.

Fix self-retaining washers onto the pins. Do not compress insulation more

than 3 mm.

Bend the pins so as to prevent protrusions or tears

It is recommended that all exposed leading edges & joints be coated with Foster Duct fast Adhesive 81 -22.

8.0 Acoustical Insulation for AHU / Package Unit Rooms

Acoustical insulation shall be 50 mm thick 32 Kg/cum Fiber Glass Insulation finished with dimensionally stable Black Glass Tissue (BGT) facing & 24 G perforated aluminium sheets as specified or shown on the drawings.

Application:

Fix 50 mm x 50 mm GI / Al. angle frame at 600 mm centres.

Fix insulation + BGT & finish with 24G perforated aluminium sheets.

9.0 Duct Lining:

Clean the inner surface of the duct which is to be lined with wire brush to remove the dirt. Fixing 25 mm x 25 mm/50 mm GI framework of 22-gauge 600mm distance screwed with the duct and making size as per requirement.

Apply a cold-setting adhesive compound over the frame/duct. The adhesive shall be a nonflammable vapour vapour-proof, odorless type.

Fixing insulation material of specified thickness overlapped with R P Tissue paper over it and then covering the material with 24 gauge perforated aluminium sheet & should have 2-3 mm dia perforation at 3 to 4 mm centre to centre distance with the help of self-tapping screws and shall be neatly finished to give a true surface finish.

Part 5: TECHNICAL SPECIFICATION

1.0 LIST OF APPROVED MAKES/AGENCIES:

The tenderer shall quote his rates based on the price of the brand/make stipulated in the item of works as described in BOQ, specifications and furnished in technical data. The employer reserves the right to select any of the brands indicated in the "List of Approved Makes/Agencies" in case of delay in delivery of the ordered `make of item'. The contractor cannot claim anything extra if the employer changes the make/agencies but is within the list of approved make.

S. No	Description of Item	Approved Makes
1.	**High side Equipment**	
1.1	VRV/VRF/MRV System using compressor of following make only.	MITSUBISHI ELECTRIC / LG / BLUE STAR / DAIKIN
1.2	Y-Joints VRV/ VRF system	MITSUBISHI ELECTRIC / LG / BLUE STAR / DAIKIN
2.	**Fans**	
2.1	Propeller Fan	Carya ire/ Kruger/ Nuair (UK)/ Nicotra
3.	**Cables & Accessories**	
3.1	Control Cables	Sky tone/ Universal/ Delton/Finolex

3.2	XLPE /PVC Insulated Aluminium Conductor Armored Power Cables	Sky tone/havells/ Universal/RPG Asian/INCAB
3.3	Communication Cable	Fusion/ CommScope / Contempt/Finolex
3.4	Cable Gland Double Compression withEarthing Links	Power/Grip well /Baliga Lighting Ltd.
3.5	PVC Insulated Copper Conductor Stranded Flexible Wires	Finolex/ National Cables – NC/ polycab/ Sky toneHavells
3.6	PVC Conduit & Accessories (ISIApproved)	BEC/ Precision/ D Plast/ Polypack
3.7	MS/ GI Conduit (ISI Approved)	BEC/ AKG/ STEEL KRAFT
3.8	Accessories for MS/GI Conduit (ISIApproved)	Sharma Sales Corporation/ Super SalesCorporation
3.9	Bimettalic Cable Lugs	Hax (Brass copper Alloy India Ltd)/ Dowell's(Biller India Pvt. Ltd.)
3.10	Lugs (Tinned Copper)	Dowell

3.11.	Slotted/Tray	Kelp/Fletco/MM Enterprises.
4.	**Ducting & Grilles**	
4.1	Grilles/ Diffusers	Carya ire / Ravi star/ Mapro/ Tristar
4.2	Fire Dampers	Caryaire/ Conaire
4.3	G.I. Sheet Metal Duct	Jindal/National/ Tata
4.4	Fire Dampers motors	Belimo/Siemens
4.5	Self-Adhesive Sealing Gasket for Ducts	Prima Seal/ Air Flow/ Trocellen
4.6	Hessian (Fire treated)	Nav air/ Pyro guard
4.7	Stick Pins	Prima Seal/ Air Flow
4.8	VCD/ Gravity louvers/ Exhaust & fresh air louvers	Cary aire /Ravistar/Mapro/ Tristar
4.9	Overload Relays with built- i n s i n g l e - p h a s e preventer	L&T/ Minlec/Siemens/ Group Schneider (MG) France
5.	**Pipes & Fittings**	
5.1	UPVC pipe for Darin	AKG/Polypack/supreme
5.2	Cu- Pipes	Totaling /Rajco /Mazflow

6.	**Insulation**	
6.1	Expanded Polystyrene (TF Quality) (Pre-moulded pipe section/slab)	Thermolloyd/ Beard Sell/ Styrene Pakagings/ DEBSProducts/ P R Pakaging/ Coolite/ Indian Pakaging Services
6.2	Cross Linked Polyethylene	Trocellen/Supreme
6.3	Glass Wool	Owens Corning/ U.P. Twinga
6.4	Closed Cell Elastomeric Insulation	Armacell/K-flex/A-flex
6.5	Aluminum Tape	Johnson/ Birla 3M
6.6	Acoustic Lining	UP Twiga/ Lloyd Insulation
6.7	Non-Woven Polyster (Mikron)	Mikron
7.	**Electrical Equipment**	
7.1	ElectricalPanel Board/ Motor Control Centre (Power Coated)	Tricolite/ Adlec Systems pvt Ltd./Triton/ System PowerControl
7.2	Electric Motor (TEFC)	Siemens/ Crompton/ Kirloskar/ ABB
7.3	Starters/ Switch gear	Siemens/ L&T/ Group

		Schneider (MG) France
7.4	Miniature Circuit Breaker (MCB)	Siemens/ MDS Legrand/ Hager (L&T)
7.5	Moulded Case Circuit breaker (MCCB)	Siemens/ L&T/ GE Power/ Group Schneider (MG)NS
7.6	Air Circuit Breaker (ACB)	Siemens/ L&T/ GE Power/ Group Schneider (MG)NW
7.7	Earth leakage circuit Breaker (ELCB)	MDS Legrand/ Hager (Larsen & Toubro)
7.8	Push Button Starter	Siemens/ L&T/Group Schneider (MG)
7.9	Auxiliary Relays/ Contactors	Siemens/ L&T/ Group Schneider (MG) France
7.10	Line Type Fuse	Siemens/ L&T/GE
7.11	Timer	Siemens/ L&T/GE
7.12	Terminal Block	Elmax
7.13	Voltmeter/ Ammeter (Digital)	Automatic Electric/ L&T/ Siemens / Enercon
7.14	Indicating Lamps (LED Type)/ Push Button	Siemens/ L&T/ Vashnio
7.15	Single Phase Preventer (Current Base)	L&T/ Minlec

7.16	Electronic Digital Meters (A/V/PF/Hz/KW/KWA) With Led Display	Enercon System Pvt. Ltd/ L&T
7.18	Selector Switches/ Toggle Switch	Siemens/ L&T/ Kaycee
7.19	Change over switch	Siemens/ L&T/ HH Elcon/ HPL-Socomech
7.20	Protection Relay	Alstom/ L&T/ Siemens
7.21	Control Transformer/ Potential Transformers	Precise/ Gilbert & Maxwell/AE
7.22	Current Transformer (Epoxy CastResin)	Precise/ Gilbert & Maxwell/ AE
7.23	Rubber Mats 1199 V, 6 mm thick(ISI approved)	Jyoti
7.24	Weatherproof Boxes (IP55)	Advance/ Adlec/ Milestone
7.25	MS Painted Cable Trays	Ricco/ Slotco/ M. M Enterprises

ANNEXURE – I

SCOPE OF WORK

The scope of work shall be generally as given in the Bill of Quantity, summary of items and as mentioned below:

1. **INTERIOR FURNISHING:**

Dismantling/Removal of existing furnishing, furniture, false ceiling, wooden partitions, panelling, electrical work, door, windows, cabinet, AHU, Ducting etc. And flooring wall and floor, granite, skirting, brickwork, plaster, cut-out patch repair, pvc spout in the balcony, uPvc door, window, sliding, louvres door, partitions, glazed door, flush door, repairing existing door/shutter, panelling, wall paper, Lacquer Glass, paint, p.o.p, false ceiling, plumbing work, piping, sanitary work, geyser, tables and counters, storage cupboards unit, cabinet, overhead storage, mobile compactors storage, locker cabinet, sofa, chairs, company logo, shutter, honeycomb shades, roller blinds, photo frames, artificial plant, grass truffe, outdoor roof cover (awning, green plants (outdoor wall), natural green plants (with pots), anti-birds net, auto sanitizer dispenser, refrigerator, water dispenser, microwave, hot case, rolling shutter, collapsible shutter, dishwasher, induction stove, wall clock, signage, etc.

2. **ELECTRICAL:**

Electrical work including all Low & Medium Voltage, Sub Distribution Panels, Distribution Boards, Raceways and Cable Trays, Cables, Mains & Sub Mains, Earthing, Point Wiring, Telephone, Computer, T.V. System, Lighting/ Fixtures, Addressable Fire Alarm and PA system, fire extinguishers cylinders, Cc Tv, Access Control System, Fire Fighting System, Screen, IP - PBX system, Ups, networking, conducting, etc.

3. HEATING VENTILATION & AIR CONDITIONING (HVAC):

HVAC Work Including Outdoor Unit, Indoor Unit, Cassette Ac – (.8,1,1.3,1.5,2.0) Ton, Hi- Wall Type Indoor, TFA, Y-Joint, Clean Air Filter/Central Controller Refrigerant piping, UVGI Lamp, Air-cooled Split Ac System, MS Stand, Control Cable, Air Distribution, Duct Damper, Grills, Air Diffusers, Thermal Insulation, Louvers, Inline Fans, etc.

The contractor shall maintain open format drawings and person at the site, to incorporate updates from site working conditions. Shall submit such drawing revisions as Drawing R/A Bill 1, 2, 3 and final.

4. CIVIL & BOUGHT OUT ITEMS:

Civil & Bought items are to be executed as per the financial bid.

Annexure J: Draft Service Agreement

(To be submitted by the Successful Bidder after issue of Letter of Award)

This **SERVICE AGREEMENT** ("**Agreement**") is made and entered into on this the [•] day of [•] Two Thousand and Twenty [___/[___]/2024), BY AND BETWEEN:

ECGC Ltd., a Public Sector Enterprise wholly owned by Government of India, having its registered office at ECGC Bhawan, CTS No. 393, 393/1 to 45, M.V. Road, Andheri (East), Mumbai-400069 (hereinafter referred to as the "**Company**", which term shall, unless repugnant to the context or meaning thereof, be deemed to mean and include its successors-in-interest and permitted assigns), of the ONE PART;

AND

SERVICE PROVIDER, a company/ firm/ proprietorship incorporated under the Indian Companies Act, 1956, having its registered office at ' --------- '(hereinafter referred to as the "**Vendor**", which term shall, unless repugnant to the context or meaning thereof, be deemed to mean and include its successors-in-interest and permitted assigns), of the OTHER PART.

Company and the Service Provider shall hereinafter jointly be referred to as "Parties" and individually as a "Party"

WHEREAS:

1. The Company is, *inter alia*, engaged in the business of providing export credit insurance to Indian exporters and banks;
2. The Service Provider is, *inter alia*, involved in the business of providing…….
3. The Company floated NOTICE INVITING TENDER (‘**NIT’**) Document having reference: **ECGC/……..** (hereinafter also referred to as ‘the Bid Document’ or ‘the Tender Document’) (Attached as Annexure – I to this Agreement).
4. The Service Provider has become the successful bidder in the said NIT and the Company has selected the Service Provider to do Office Interior Furnishing, Electrical, Heating Ventilation & Airconditioning(HVAC) and allied Civil Works for Setting Up a New Branch Office of ECGC Limited at …….. and the Service Provider has agreed to provide the services, as they have the required skills and personnel.

NOW THEREFORE, in consideration of the mutual covenants, terms and conditions and understandings set forth in this Agreement, the Parties with the intent to be legally bound hereby agree as follows:

Definitions

In this Section, the following terms shall be interpreted as indicated herein below:

i. “Architect” means the Architect appointed by ECGC Limited for this project.
ii. “The Company” means ECGC Limited.
iii. “Vendor” is the successful Bidder whose financial Bid has been accepted and to whom notification of award has

been given by the Company.

iv. “The Services" means the scope of services which the Vendor is required to provide to the Company under the Contract.

v. “The Contract” means the agreement entered into between ECGC and the Vendor, and signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein;

vi. “The Contract Price” means the price payable to the Vendor under the Contract for the full and proper performance of its contractual obligations;

vii. “The Project” means Office Interior furnishing, Electrical, Heating Ventilation Air Conditioning (HVAC) and allied works at ECGC LTD, 2800 square feet located at D.No. 42-1-45/1/1, New Investment Building, LIC Annexe Building, Thikkana Road, Visakhapatnam-530004.

viii. “The Project Site” means designated locations of the Company as may be specified in the Contract.

ix. “Departmental Schedule” means the (i) Public Works Department Schedule of Rates in Andhra Pradesh; (ii) the Latest edition of the book published for the specification of various works by CPWD.

x. “Drawings” means the graphical representation of the design and execution of the Project, the components, framework, and dimensions prepared by the Architect in consultation with the Vendor within seven (7) days from the date of acceptance of the tender award letter.

xi. “Start date” means the date of start of the work; which

shall be seven (7) days from the date of acceptance of the tender award letter.

xii. “Site Engineer” means the person posted at the site who shall be appointed by the Architect and will work under the orders of the Architects and the Company to inspect the works.

xiii. "The works" shall mean the work or works to be executed or done under this contract.

xiv. "The Schedule of Quantities" (SOQ) shall mean the schedule of quantities as specified and forming part of this Request for Tender.

xv. "Priced Schedule of Quantities" shall mean the schedule of quantities duly priced with the accepted quoted percentage of the contractor.

Terms and Conditions of the Contract are provided hereinafter:

Scope of Work

1. The Scope of Work includes Office Interior Furnishing, Electrical, Heating Ventilation & Air Conditioning (HVAC), and allied Civil Works, in an office space area of 2800 square feet located at D.No. 42-1-45/1/1, New Investment Building, LIC Annex Building, Thikkana Road, Visakhapatnam-530004 as per details given in accordance with the “Specifications” and “Schedule of Quantities” in **Annexure H** and as per the Drawings.

2. The Vendor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described

therein provided that the same can reasonably be inferred therefrom and if the Vendor finds any discrepancies therein, he shall immediately and in writing refer the same to the Company whose decision shall be final and binding.

3. The rates quoted against individual items are inclusive of everything necessary to complete the said items of work within the contemplation of the contract and beyond the unit price. It includes furnishing all materials, labour, tools, equipment, Municipal Fees for water supply, Royalty on road materials (if any), electricity and other charges of Municipalities or statutory local bodies, all statutory and levy/ cess, transportation charges required for carriage and supply of materials, Toll charges, loading and unloading charges, handling charges, overhead charges, taxes applicable, etc. and its management necessary for, and incidental to, the construction and completion of the work. All work, during its progress and upon completion shall conform to the lines, elevations and grades as shown on the drawings furnished by the Architect. Should any detail essential for the efficient completion of the work be omitted from the drawings and specifications it shall be the responsibility of the contractor to inform the Architect and to furnish and install such detail with the Company's concurrence, so that upon completion of the proposed work the same will be acceptable and ready for use. No extra claim in this regard beyond the specified rate as per the work schedule whatsoever in this respect will be entertained.

4. The Vendor shall provide and maintain proper sheds for the proper storage and adequate protection of the materials etc., and other work that may be executed on the site including the tools and materials and remove same on completion. No separate charges shall be paid for traffic control measures, shoring, shuttering, dewatering, curing etc.

and the rates of respective items or works are to be deemed as inclusive of the same.

5. Company may in their absolute discretion issue further drawings and/or written instructions, details, directions and explanations, which are, hereafter collectively, referred to as "the company's instructions" regarding:

a) The variation or modification of the design quality or quantity of works or the addition or omission or substitution of any work. Should the Vendor desire to substitute any materials and workmanship, he/they must obtain the approval of the Company in writing in advance.

b) Any discrepancy in the drawing or between the schedule of quantities and/or drawings and/or specifications.

c) The removal from the site of any defective materials brought thereon by the contractor and the substitution of any other material thereof.

d) The demolition/removal and/or re-execution of any work executed by the contractors.

e) The dismissal from the work of any persons deployed on the Project Site thereupon.

f) The opening up for inspection of any work covered up.

g) The rectification and making good of any defects under clauses hereinafter mentioned and those arising during the maintenance period (Defect Liability period).

No variation shall vitiate the contract.

6. The contractor shall forthwith comply with and duly execute any work comprised in instructions contained herein, provided always that verbal

instructions, directions and explanations given to the Vendor or his representative upon the works by the Company shall if involving a variation be confirmed in writing to the Vendor/s within seven days. No works for which rates are not specifically mentioned in the priced schedule of quantities shall be taken up without prior written permission of the Company.

7. Rates of Extra items: Rates of Extra items shall be determined in the following order of preference whereby only when the first rate is completely ruled out, can the second rate be opted for and so on until the fourth rate which shall be the final rate if none of the preceding rates are found suitable.

   First: - Similar comparable item rate quoted in the SOQ,

   Second: - Similar nearest comparable item rate quoted in the SOQ,

   Third: - Nearest comparable CPWD Schedule or rates/or practices;

   Fourth: - Market rates substantiated by purchase bills/vouchers

8. No Additional/supplementary work/item, other than work/items mentioned in the printed tender be carried out by the contractor without prior approval of the Architect and Company.

9. The responsibility for stacking the serviceable materials (as per the decision of the Company/ Architect) obtained during the dismantling of existing structures/walls/tiles except those for disposing of under salvage value items & property/ materials of ECGC which are required to be handed over to ECGC lies with the Vendor and nothing will be paid on this account. In case of any loss or damage of serviceable materials before handing over the same to ECGC, full value will be recovered from the Vendor’s bill at rates as will be assessed by the Architect.

10. The Vendor shall remove all unserviceable materials/debris obtained during execution at the place as directed. The Vendor shall dress up and clear the work site after completion of work as per the direction of the Architect. The debris shall be disposed of by the Vendor. No extra payment will be made on this account.

11. The under-noted records books at the site of work shall be maintained in addition to normal routine requirements by the contractor

(a) Daily progress record;
(b) Worksite order book;
(c) Instruction by the Company's Officers;
(d) Test registers of other materials/fittings fixtures equipment as stipulated in the tender;
(e) Register of drawings and working details;
(f) Logbook of defects;
(g) Hindrance register giving details of commencement and removal of each hindrance;
(h) Dismantled materials account to register;
(i) Supply and consumption register of scarce / costly materials like laminates special paints white cement, or any material as directed by the Architect or Company;
(j) Specifications C.P.W.D. & I.S.I. as applicable to the contract;
(k) IS 1200 relating to measurements;
(l) Conversion Table IS 786.

These registers are to be signed by the Site Engineer as and when required.

12. The Vendor shall do photography/video photography of the site firstly before the start of the work, secondly mid-way in the execution of different stages of work and lastly after the completion of the work.

13. 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 every kind and leave the whole of the site and the works clean and in a workmanlike condition to the satisfaction of the Employer and Architects.

Drawings and Programme of Work

1. The Vendor in consultation with the Architect shall prepare drawings of the work to be executed. All works shall conform with the drawings and scope of work and consultation with the project architect.
2. On finalizing the drawings, the Vendor shall furnish:
    a. Construction schedule showing all activities of work in detail and the form of a Bar Chart proposed to be completed within the stipulated period duly signed as token of acceptance.
    b. Details of equipment, Machinery and labour to be deployed on the work.
3. All the drawings relating to work given to the contractor together with a copy of the schedule of quantities are to be kept at the site and the Company & Architects shall be given access to such drawings or schedule of quantities whenever necessary. In case any detailed drawings are necessary, the contractor shall prepare such detailed drawings and/or dimensional sketches therefore and have it confirmed by the Company before taking up such work.
4. The contractor shall ask in writing for all clarifications on matters occurring anywhere in drawings, specifications and schedule of quantities or for additional instructions at least 10 days ahead from the time when it is required for implementations so that the Employer may be able to give a decision thereon.
5. Two copies of each of the drawings and one copy of each of the

condition of contract specification tender preamble and bill of quantities will be provided for the use of the Vendor who must satisfy himself as to the accuracy of the said copies in every detail, and make all other copies necessary for the conduct of the work.

6. One copy of each drawing or sketch furnished to the Vendor shall be kept at the Project Site and the Architect or Site Engineer or any person authorised by the Company shall have free access to the drawings and sketches whenever they desire
7. Before the actual commencement of work, the Vendor shall submit a programme of construction of work with methodology clearly showing the required materials, men and equipment.
8. Any ambiguity observed shall be brought to the notice of the Company and be executed after obtaining approval from the Company.

Commencement of Work and Duration

The work will commence on the Start Date, which should be within 10 days from the date of the work order issue. The project, in accordance with the scope of work and drawings, must be finished within 90 days from the work order issue.

Co-operation and safety

1. All work to be carried out by the Vendor shall be in close coordination with the Architect, Site Engineer and the Company. The Vendor shall at all times give access to workers employed by the Architect and officials of the Company or any men employed on the buildings and to provide such parties with proper sufficient and if required special scaffolding, hoists and ladders and provide them with water and lighting and leave or make any holes, grooves etc. in any work were directed by the Company as may be required to enable such workmen to lay or fix pipes, electrical wiring, special fittings etc. The quoted rates

of the tenders shall accordingly include all these above-mentioned contingent works.

2. The work should also be carried out with due regard to the convenience of the common area users and other occupants of the building, if any. All arrangements and programmes of work must be adjusted accordingly. All precautions must be taken for the protection of the public and the safety of any adjacent roads, streets, walls, houses, buildings, and all other erections, matters and things and the Vendor shall take down and remove any or all such scaffolding, etc. as occasion shall be required or when ordered to do so and shall fully reinstate and make good all matters and things distributed during the execution of works to the satisfaction of the Company/Architect. The Vendor must see that all damages to any property which, in the opinion of the Architect are due to the negligence of the contractor are promptly rectified by the Vendor at his own cost and expenses and according to the direction and satisfaction of the Architect.

3. The Vendor shall carefully execute the work without disturbing or damaging underground or overhead service utilities viz. Electricity, Telephones, Gas, Water pipes, Sewers, Lifts, etc. In case disturbances of service utilities are found unavoidable the matter should immediately be brought to the notice of the Architect and necessary precautionary measures as would be directed by the Architect shall be carried out at the cost and expenses of the Vendor. If the service utilities are damaged or disturbed in any way by the Vendor during the execution of the work, the cost of rectification or restoration of damages as would be fixed by the Architect concerned will be recovered from the Vendor.

4. The Vendor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

(a) Have full regard for the safety of all persons and the Works.

(b) provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Architect for the protection of the Works and/or for the safety and convenience of its workers, the public and/or others,

(c) take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation,

(d) ensure that all lights provided by the Vendor shall be screened so as not to interfere with any signal light of the railways or with any traffic or signal lights of any local or other authority.

(e) The vendor should provide a Contractor with All Risks Policy as explained in this Tender document(s).

5. The Vendor shall not fix or place any placards or advertisement of any description or permit the same to be fixed or placed in or upon any boarding, gantry, or building structure other than those approved by the Company.

6. The Vendor shall give due notice to the Company and Architects whenever any work is to be buried in the earth, concrete or in the bodies of walls or 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 be either opened up for measurement at the contractor's expense or no payment may be made for such materials. Should any dispute or differences 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 Employer shall be accepted as correct and binding on the contractor.

7. The Vendor shall afford the Site Engineer every facility and assistance for examining the works and materials for checking and measuring work and materials. The Site Engineer shall have no power to revoke, alter, enlarge or relax any requirements of the contractor or to sanction any day work, additions, alterations, deviations, or omissions or any extra work whatever, except in so far as such authority may be specially conferred in written by the Company.
8. The Site Engineer shall have power to give notice to the contractor or his foreman of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the Company is obtained. The work will from time to time be examined by the Architects, Nodal Officer on behalf of the Company and the Site Engineer. But such examination shall not in any way exonerate the contractor from the obligation to remedy any defects which may be found to exist at any stage of the work or after the same is complete. Subject to the limitations of this clause the Vendor shall take instructions only from the Nodal Officer of the Company. Nodal Officer of the Company is to be kept informed about the progress of the work by the Site Engineer and Architect.

Authorized Representative of Vendor and Vendor's Employees

1. The Vendor shall not assign the agreement or subcontract any portion of the work. The whole of the works included in the contract shall be executed by the Vendor and the Vendor shall not directly or indirectly transfer or assign the contract or any part, share or interest therein nor, shall take a new partner without the prior written consent of the

Company and no sub-contracting shall relieve the contractor from the full and entire responsibility of the contract or active superintendence of the work during their progress. The contractor, may, however, appoint and authorize a representative in respect of one or more of the following purposes only:

a. General day-to-day management of work.
b. To give requisition for Departmental materials, Tools etc., if any, to receive the same and sign hand receipts thereof.
c. To attend measurements when taken by the ECGC's Officers and sign the records of such measurements which will be taken upon acceptance by the Vendor. The selection of the authorized representatives shall be subject to the prior approval of the concerned Architect in writing. Even after first approval, the Architect may issue at any subsequent date, revised directions without any reasons, about such authorized representative and the contractor shall be bound to abide by such directions.

2. The Contractor shall employ a technically qualified and competent workforce with the appropriate skill or ability to perform their job efficiently and who shall be available (by turn) throughout the working hours to receive and comply with instructions of the Employer/Architects.
3. The contractor shall employ local labourers on the work as far as possible. No labourers below the age of sixteen years and who are not Indian Nationals shall be employed on the work.
4. Any labourer supplied by the contractor to be engaged in the work on day work basis either wholly or partly under the direct order or control of the Company or his representative shall be deemed to be a person employed by the contractor.

5. The Vendor shall arrange to provide first aid treatment to the labourers engaged in the works whenever required. He shall within 24 (twenty four) hours of the occurrence of any accident at or about the site or in connection with execution of the works, report such accident to the Company and also to the competent authority where such report is required by law.
6. Dismissal of Vendor's employees: The Vendor shall on the request of the Company immediately dismiss from works any person employed thereon by him who may in the opinion of the employer be unsuitable or incompetent or who may misconduct himself. Such discharges shall not be the basis of a claim for compensation or damages against the Company or any of its officers or employees.

Procurement, Quality, Approval and Rejection of Materials

1. All materials required to complete the execution of the work shall be supplied by the Vendor after procurement from an authorized and approved source. The contractor shall not use modified/redirected old material from other projects.
2. Samples of all materials to be supplied by the Vendor and to be used in the work shall have to be approved by the Architect and checking the quality of such materials shall have to be done by the Architect in consultation with the Company.
3. All materials and workmanship shall be in accordance with the specifications laid down in the Tender and the Architect reserves the right to test, examine and measure the materials/ workmanship directly at the place of manufacture, fabrication or the site of works or any suitable place. The Vendor shall provide such assistance, instrument, machine, labour and materials as the Architect may require for examining, measuring and testing the works and quality,

weight or quantity of materials used and shall supply samples for testing as may be selected and required by the Architect without any extra cost.

4. All the works specified and provided for in the specifications or which may be required to be done in order to perform and complete any part thereof shall be executed in the best and most workman-like manner with materials of the best and approved quality of the respective kinds in accordance with the particulars contained in and implied by the specifications and as represented by the drawings or according to such other additional particulars and instructions as may from time to time be given by the Company as proposed by Architect during the execution of the work, and to its entire satisfaction
5. Should the work be suspended by reason of rain, strike, lockouts or any other cause, the contractor shall take all precautions necessary for the protection of work and at his expense shall make good any damage arising from any of these causes.
6. The Vendor shall cover up and protect from damage, from any cause, all new work and supply all temporary doors, protection to windows, and any other requisite protection for the execution of the work whether by himself or special tradesmen or subcontractor and any damage caused must be made good by the contractor at his expenses.
7. The Company shall during the progress of the work have the power to order in writing from time to time the removal from the work within such reasonable time or times as may be specified in the order of any materials which in the opinion of the Company/Architect are not in accordance with specification or instructions, the substitution or proper re- execution of any work executed with materials or workmanship not

in accordance with the drawings and specifications or instructions. In case the Vendor refuses to comply with the order the Company shall have the power to employ and pay other agencies to carry out the work and all expenses consequent thereon or incidental thereto as certified by the Company shall be borne by the Vendor or may be deducted from any money due to or that may become due to the Vendor. No certificate which may be given by the Architects shall relieve the Vendor from his liability in respect of unsound work or bad materials.

8. Any cement/ equipment/ basic material lying at the Vendor's custody which is found at the time of use to have been damaged shall be rejected and must immediately be removed from the site by the Vendor or disposed of as directed by the Architect at the costs and expenses of the Vendor.

Completion of the Project

1. All the supply and the work must be completed in all respects within the time specified in the Notice Inviting Tender from the date of commencement of the work. Time for completion as specified in the tender shall be deemed to be the essence of the contract.
2. The Vendor shall be responsible for the true and perfect setting out of the work and for the correctness of the position, levels, dimensions and alignments of all parts of the work, if any rectification or adjustment becomes necessary the Vendor shall have to do the same at his own cost according to the direction of the Architect. During the progress of works, if any, error appears or arises with respect of position, level, dimensions or alignment of any part of the work contractor shall at his own cost rectify such defects to the satisfaction of the Architect. Any setting out that may be done or checked by either of them shall not in any way relieve the contractor from their responsibility for correctness

and rectification thereof.

3. For cogent reasons over which the Vendor will have no control and which will slow down the progress, [contractor shall maintain hindrance record, duly signed by the Architect, on the same day of such occurrence/event, and approved by the company extension of time for the period lost may be granted on receipt of application from the Vendor before the expiry date of the contract. No claim whatsoever for idle labour, additional establishment, enhanced cost of materials and labour and hire charges of tools & plants etc. would be entertained under any circumstances. The Vendor should consider the above factor while quoting this rate.
4. The Vendor shall not be entitled to any compensation for any loss due to delays arising out of modification of the drawing, addition & alterations of specifications.

Payments

1. The works will be paid for as "measured work" based on actual work done and not as a "lump sum" contract.
2. Payment shall be made via electronic fund transfer only to the bank account specified, as per the form provided under **Annexure-D**, in the Tender response.
3. All bills shall be submitted by the Vendor in the form prescribed by the Company. Normally one interim bill shall be prepared each month subject to minimum value for interim certificate as stated in these documents. The bills in proper forms 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 bill shall be checked at the site by the Site Engineer and thereafter the Architect shall issue a certificate after due scrutiny of the Vendor's bill which may be further verified by the Company

and the Vendor shall be entitled to payment thereof, within 15 working days honoring/interim certificates named in these documents, as per final verified amount by the Company.

4. 10% of the value of each running bill shall be deducted as Retention Money, till the amount so accumulated equals 10% of the work order. The Retention Money shall be refunded after the Defect Liability Period provided all defects are attended satisfactorily. Such certificate shall only include the value of said material and goods as and from such time as they are reasonably, properly required and not prematurely brought to or placed adjacent to the work.
5. All payments shall be subject to TDS and any other taxes as applicable from time to time and any other amounts as may be deductible/recoverable as per the terms and conditions of the contract.
6. No payment shall be made in advance of the award of the contract. No mobilization Advance and secured Advance will be allowed.
7. It may be noted that ECGC will not pay any amount/expenses/charges/fees/travelling expenses/boarding expenses/lodging expenses/conveyance expenses / out-of-pocket expenses other than the agreed amount as per the purchase order/contract.
8. Any decrease in taxes must be passed on to ECGC/ Company.
9. No adjustment of Price or Price escalation of any kind will be allowed.
10. The final bill will be released on satisfactory completion of the entire work and compliance with all the terms and conditions/obligations mentioned and on proper submission of the bill together with the measurements. Any sum of money due and payable to the Vendor (including any EMD returnable to him) under this contract may be appropriated by the Company and set off against any claim of the Company for the payment of a sum of money arising out of this tender or under any other contract made by the Vendor with the Company.

11. The Vendor shall, upon the request of the Company 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 Vendor shall use materials less than what he is required under the 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 Company shall be final and binding on the contractor as to the amount of materials, the Vendor is required to use for any work under this contract.

Indemnity

1. Vendor shall indemnify, defend and hold harmless the Company from and against any liability, losses, costs and expenses (including reasonable attorney's fees) relating to or arising out of the breach of this Agreement, the negligence or wilful misconduct of Vendor or its employees or agents. No party shall however be liable for any loss or damage arising from reliance on any information or materials supplied by the other party or any third party on behalf of the other party or for any inaccuracy or other defect in any information or materials supplied by the other party or any third party on behalf of the other party. In addition to this, the vendor shall keep the Company saved, harmless and indemnified against claims if any of the workmen or any other person and all costs and expenses as any be incurred by the Company in connection with any claim that may be made by any workman or any other person.
2. The contractor shall pay all fees required to be given or paid under any statute or any regulation or by-law of any local or other statutory authority which may apply to the works and shall keep the ECGC/Company protected against all penalties and liabilities of every kind for breach of such statute regulation or law.

3. The Vendor shall also fully indemnify the Company in respect of any cost, charges or expenses arising out of any claim or proceedings at law and also in respect of any award of compensation of damages arising therefrom.

Liquidated Damages

In case, the completion of the project is delayed due to reasons attributable to the Vendors, the Company shall impose liquidated damages @ 0.5 % (Zero-point five per cent) on the awarded contract value for each week of delay subject to a maximum of 10% (ten per cent) of the awarded contract value.

LIMITATION OF LIABILITY

1. Except for breach of Confidentiality and Infringement of Intellectual property rights under this agreement, each party's total liability for any damages, losses, costs, liabilities arising out of or in connection with this Agreement whether under contract, tort or otherwise shall not exceed an amount equivalent to the total fees paid by the Company to the Vendor under this Agreement. Bidder shall also be required to comply with statutory and regulatory requirements as imposed by various statutes, labour laws, local body rules, state and central Government Body statutes, and any other regulatory requirements applicable on the Service Provider, and shall produce the same for records of ECGC Limited and / or its Auditors and / or its regulator.
2. The aggregate liability of Bidder or ECGC in connection with this Agreement/ service contract, the services provided by bidder for the specific scope of work document, regardless of the form or nature of the action giving rise to such liability (whether in contract, tort or otherwise) and including any or all liability shall be the total bid amount.

Insurance and Defect Liability Period

1. The Vendor is required to take the Contractor's All Risk Insurance Policy (CAR Policy) and Workmen Compensation Policy concerning the work and the workmen within 7 days from the acceptance of the tender award letter with an IRDA approved Insurance Company in the name of the Vendor from the date of commencement of work till the end of Defect Liability Period. The value of the work to be insured would be 125% of the contract value for CAR Policy.
2. The CAR policy should have additional coverage under third-party liabilities. The liabilities should be one lakh rupees per accident. The premium receipt and the policies should be submitted to the Company. The contractor shall fully indemnify the Company against all claims which may be made against the Company by any member of the public or other third party in respect of anything which may arise in respect of the works or in consequence thereof. The contractor shall also fully indemnify the Company against all claims which may be made upon the Company, whether under the Workmen Compensation Act or any Statute in force during the currency of this contract or at common law in respect of any employee of the Vendor or any sub-contractor. The Vendor shall be responsible for anything which may be excluded from the insurance policies above referred to.
3. The defect Liability Period is 12 months from the date of satisfactory completion of the work, as certified by the Architect unless otherwise specified.
4. During Defect Liability Period the Vendor has to rectify all the defects noticed free of charge.
5. In case the Vendor fails to attend to the rectification work within 7 days of reporting the same in writing, the Company will have the liberty to

carry out the said work through any other means at the cost & risk of the Vendor. Such expenditure shall be recovered from the Retention Money or any other amount due to the Vendor in this or any other contract. The Defects Liability Period shall be extended for as long as defects remain to be corrected.

6. While rectifying, the Vendor should ensure that the surroundings are protected against any possible damage. In case of any damage, the same should be made good by the contractor at his cost.

Representation and Warranties

1. Vendor shall be required to comply with statutory and regulatory requirements as imposed by various statutes, and labour laws such as (a) Contract Labour (Regulation Abolition) Act, 1970, (b) Apprentice Act, 1961, (c) Minimum Wages Act, 1948, (d) Employees' Provident Fund and Miscellaneous Provisions Act, 1952; (e) Employees State Insurance Act,1948, (f) Minimum wages according to the rates notified and/or revised by the State Government from time to time under the Minimum Wages Act, 1948; (g) Safety and welfare standards as per the provisions of the Building and other Constructions applicable in Visakhapatnam; etc., local body rules, state and central Government Body statutes, and any other regulatory requirements applicable on the Vendor, and shall produce the same for records of ECGC Limited and/or its Auditors and/or its regulator on demand. If he fails to do so, the Company may at its discretion, take necessary measures over the Vendor and appropriate the amounts against the invoices of the Vendor. The Vendor shall also make himself liable for any pecuniary liabilities arising out on account of any violation of the provision of the said Act(s).

2. Vendor shall be required to obtain valid Registration Certificate & Labour License from respective Regional Labour Offices where construction work by them is proposed to be carried out.
3. The Vendor shall give all notices required by said act, rules, regulations and Byelaws etc. and pay all fees payable to such authorities for the execution of the work involved. The cost, if any, shall be deemed to have been included in his quoted rates, taking into account all liabilities for licenses, fees for footpath encroachment and restorations etc. He shall indemnify the Company against such liabilities and shall defend all actions arising from such claims or liabilities.
4. The Vendor shall employ an “A” grade Licence holder Electrical contractor to complete the electrical work in the scope of the tender.
5. The Vendor shall comply with the Company’s internal guidelines, instructions, manuals, scrutiny lists, procedures, further specifics and requirements (“Guidelines”) in relation to the Services, as may be provided in writing by the Company to the Service Provider. However, in the event there is a conflict between the guidelines and the terms set out in the Tender, the terms set out in the Tender shall prevail.

Termination

1. The Company may terminate all or any part of the Contract at any time during the term without assigning any reason, by giving 15 days prior written notice to the Vendor. In the event of termination, the Company's liability shall be to the extent of the work already rendered by the Vendor and availed by the Company under this Contract. In case the contract is terminated by the Company on account of any breaches committed by the Vendor in breach of its obligations under

the Contract, the company may invoke the PBG given by the Vendor.

2. Any notice correspondence etc. issued to the authorized representative or left at his address, will be deemed to have been issued to the Vendor.

Entire Agreement

It is expressly agreed between the parties that the bid received from the Vendor along with its annexures, Tender Award Letter, Notice for Tender Document, any addendum or corrigendum issued thereafter and the completed Annexures thereto constitutes the Entire Agreement between the Parties.

Confidentiality

The Vendor and/or its personnel shall keep confidential at all times any/all information that is shared by the Company or Architect or has come to their knowledge during the performance of Services under the Contract.

Intellectual Property Law

1. All the manuals, guidelines, documents, drawings etc. provided by the Architect/company shall be treated as existing intellectual property rights of the Architect/Company therein shall continue to vest with the Architect/Company. Any royalties patents or charges for the use of such intellectual property that may be involved in the contract shall be included in the price.
2. As per prevailing government notification, the Contractor will have to submit the receipt of payment of royalty to the Government for use of sand, stone materials, laterite, murram, gravel, earth etc. to the Architect before preparation of bill for payment, when they collect the materials directly from the source. If they collect the materials from the authorized quarry holder or commercial establishment who directly or

indirectly pays the royalty to the Government, a necessary certificate or cash memo for sale in that respect from them shall have to be produced to the Architect failing which necessary deduction from the dues of the contractor may be made as fixed by the Architect in consultation with the Company.

3. The Contractor shall save, protect and indemnify ECGC from and against all claims, demands, suits and proceedings for and/or an account of infringement of any patent rights, design, trade mark of the name of other protected right in respect of any constructional plant, machine, work, materials, thing or process used for or in connection with works or temporary works or any of them.

Relationship between Company and Vendor

The relationship between Company and Vendor is solely that of an independent contractor and the relationship is on a principal-to-principal basis. Nothing in this Agreement shall constitute the Parties as partners, joint ventures, or co-owners, or constitute either Party as the agent, employee or representative of the other, or empower either Party to act for, bind or otherwise create or assume any obligation on behalf of the other, and neither Party shall hold itself out as having authority to do the same.

Waiver

Any modification to the terms and conditions can be made only in writing and signed by the parties hereto. Any failure or delay by the Company to enforce any provision or right available to it under this Agreement shall not be deemed to be a waiver of such provision or right and shall not preclude the Company from exercising the same subsequently.

Survival

The termination of the Contract shall not affect the rights of and or obligations of the Parties which arose prior to the termination.

Force Majeure

1. Notwithstanding the provisions of the Contract, the Vendor shall not be liable for, liquidated damages, or termination for default, if and to the extent, that, the delay in performance, or other failures to perform its obligations under the Contract, is the result of an event of Force Majeure.
2. For purposes of this clause, “Force Majeure” means an event beyond the control of the Vendor not involving the Vendor’s fault or negligence and is not foreseeable. Such events may include but are not restricted to, acts of the Company in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions, and freight embargoes.
3. If a Force Majeure situation arises, the Vendor shall promptly notify the Company in writing of such condition and the cause thereof. Unless otherwise directed by the Company in writing, the Vendor shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

Governing Law and Jurisdiction

The Courts in Visakhapatnam shall alone have jurisdiction for the purposes of adjudication of any dispute of differences whatsoever in respect of or relating to or arising out of or in any way touching the works awarded or the terms and conditions of the Contract.

Labour Records:

The Vendor shall maintain relevant records and fulfill all conditions and requirements in accordance with the following Act and Rules made hereunder.

(a) The Payment of Wages Act.

(b) Employer's Liability Act.

(c) Workmen's Compensation Act.

(d) Contract Labour (Regulation & Abolition) Act, 1970 and Central Rules 1971.

(e) Apprentices Act 1961.

(f) Minimum wages Act 1948.

(g) disputed Act 1947.

(h) Maternity benefit Act 1961.

(i) ESI Act.

(j) Payment of Bonus Act.

(k) Payment of Gratuity Act.

(l) Any other Act are enactment relating there to and rules framed there Under from time to time.

IN WITNESS WHEREOF, the Parties hereto have set and subscribed their respective hands unto this Agreement on the day and date first set out hereinabove.

For and on behalf of	**For and on behalf of**
ECGC Ltd.	**Vendor**
the "Company" aforesaid,	**the "Vendor" aforesaid,**
through its authorized signatory	**through its authorized signatory**
_____	_____
NAME:……	**NAME: …….**
DESIGNATION: ……..	**DESIGNATION: ……..**

WITNESSES:

1. 2.

Annexure K

CODE OF INTEGRITY

DECLARATION

I/We working as in (name of the firm/Company and firm's/Company's address in full be mentioned), hereby solemnly affirm and declare that I have been authorized by the firm/Company to sign the bids. I, hereby declare and certify, on behalf of the firm/Company, that we have accepted all the terms & conditions mentioned in the ……and we shall abide by all the terms & conditions of NIT/Agreement.

I/ We hereby agree and undertake that we have not directly or through any other person or firm offered, promised or given nor shall we offer, promise or give, to any employee of ECGC involved in the processing and/or approval of our proposal/offer/bid/tender/contract or to any third person any material or any other benefit which he/she is not legally entitled to, in order to obtain in exchange advantage of any kind whatsoever, before or during or after the processing and/or approval of our proposal/offer/bid/tender/contract.

I/we further declare that in relation to my/our Bid submitted to ECGC, in response to NIT No. ……,I/we…….hereby undertake that I/we shall abide by the Code of Integrity and make disclosure as to any Conflict of Interest at all times, and understand that any breach of the Code of Integrity will render me/us liable to be removed from the list of registered bidders, and would also subject me/us to other punitive and penal action such as cancellation of contracts, banning, debarring and blacklisting or action in the court of Law, and so on.

Signature of Authorized Signatory of the firm with Seal & Stamp

Date : Place:

Name:

Designation: