National Backward Classes Finance & Development Corporation
5th Floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg,
New Delhi-110016
Tel: +91-11-45854400
E-mail: info@nbcfdc.gov.in

TENDER DOCUMENT

FOR GENERAL CIVIL AND INTERIOR RENOVATION WORKS FOR NBCFDC AT 5TH FLOOR, N.C.U.I. BUILDING 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI-110016

PART 1 TECHNICAL BID

M/s ABRD ARCHITECTS
INTERIOR DESIGNERS
C-22, Golf View Apartments, Saket, New Delhi-110017
CONTACT NO. – 9810137551 (M) 01146542974 (O)
Mail Id:- abrdarchitects@gmail.com

NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION (NBCFDC) 5th Floor, NCUI Building, August Kranti Marg, New Delhi-110016

Name of Work:- General Civil and Interior Renovation Works for NBCFDC at 5th floor, N.C.U.I. Building 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016

Ref No. : NBCFDC/HR&A/RenovationTender/2019 **Dated: 19.08.2019**

INDEX

NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION (NBCFDC)
5TH Floor, NCUI Building, August Kranti Marg, New Delhi-110016

SECTION-I : TENDER SCHEDULE, FEE ETC.

Bids are invited from the bidders/contractors only for General Civil and Interior Renovation works of approximately 1600 Sq.ft. area in NBCFDC, 5th floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016.

No.: NBCFDC/ HR&A /RenovationTender/2019 **Dated: 19/08/2019**

1	Bidding Document No.	**NBCFDC/ HR&A /Renovation Tender/2019**
2.	Date of Issue of NIT	19.08.2019
3.	Tender Document Download Start Date/Time Tender Document Download End date / Time	20.08.2019 17.00 Hrs. 15.09.2019 18.00 Hrs
4	Deadline/last date for Submission of Bid / Bid Due Date & Time	16.09.2019 at 17.00 Hrs.
6	Date, Time for Opening of Technical Bids	17.09.2019 at 11.00 Hrs.
5	Tender Fee / Bid Document Fee [Non refundable] to be deposited Offline	Rs.1000/- Excluding GST
6	EMD (to be deposited off line)	Rs. 120000 /-.
7	Address for communication	GM (HR & Admn.) NBCFDC, 5th Floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016
8	Any clarifications regarding the scope of work	**Engineer-in-charge** **M/s ABRD Architects** **INTERIOR DESIGNERS** **C-22, Golf View Apartments,** **Saket, New Delhi-110017** **Mobile No:9810137551,** **Tel:011-46542974**

Tender document is also available at **www.nbcfdc.gov.in**

Tender Fee and Earnest Money Deposit (EMD) be deposited as Demand Draft in favour of **National Backward Classes Finance and Development Corporation** payable at New Delhi. Tender not accompanied with requisite amount of EMD & Tender Fee not submitted as per instructions contained in the tender documents are liable for the rejection.

NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION (NBCFDC)
5th Floor, NCUI Building, August Kranti Marg, New Delhi-110016

No. NBCFDC/ HR&A /Renovation Tender/2019 **Dated: 19.08.2019**

1. Separate sealed item rate tenders are invited on behalf of NBCFDC and shall be received in the Registered office of NBCFDC, 5th floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016,

Sl. No	Description	Estimated Cost	EMD	Cost of Tender document	Period of Construction
1.	General civil & Interior Renovation works in NBCFDC 5th Floor, NCUI Building, August Kranti Marg, New Delhi-110016. (approximately 1600 Sq. Ft)	Rs.60,00,000/- (Rupees Sixty Lakhs only)	Rs. 1,20,000/- (Rupees One Lakhs Twenty Thousand only) refundable and entry fee.	Rs. 1000/- (Rupees One Thousand only) Non Refundable.	70 days from date of issue of LOI.

2. Tender Documents & Technical Bid

Tender documents consisting of drawings, specifications, schedule of quantities for various items of work to be done and set of conditions of contract to be complied with by the Tenderer whose tender can be obtained from the office of the GM (HR & Admin) NBCFDC on any working day between 9:30 hours to 18:00 hours on payment of amount mentioned in para 1 above or Tender document may be downloaded from the website www.nbcfdc.gov.in. A demand draft of Rs. 1000/- from any commercial bank drawn in favour of "National Backward Classes Finance and Development Corporation," payable at New Delhi shall be submitted along with the bid and it is non-refundable.

3. EMD/Bid Security

Earnest money amounting to Rs. 1,20,000/- (Rupees One Lakhs Twenty Thousand only), is to be deposited with the tender in the form of Bank Draft on Delhi Branch of any Nationalized Bank in favor of "**National Backward Classes Finance & Development Corporation**" payable at New Delhi. The tender which is not accompanied with Earnest Money shall be summarily rejected. The Earnest Money of unsuccessful tenderer (s) shall be refunded to the tenderer if his tender is not accepted but without any interest/Bank commission/Collection charges within 60 (Sixty) days from the date of acceptance/finalization of the tender. The Earnest Money deposited may be converted as initial security deposit in terms of para `4' of section I, in the case of successful tenderer, should he request for the same.

Earnest Money Deposit (EMD) and Tender Fee are exempted for Bidders registered with NSIC coming under the definition of Micro, Small & Medium Enterprises (MSME) and holding valid registration certificate covering the tendered items/services. However, attested copy of valid NSIC Certificate or " Micro, Small & Medium Enterprises Certificate" must be submitted alongwith the tender.

4. Performance Guarantee

The successful bidder will provide Performance Guarantee @5% of the estimated cost of tender either by way of Bank Guarantee issued by a Scheduled Commercial Bank as per format at Annexure-I or on payment of security deposit of equivalent amount by way of a Demand Draft favoring "NBCFDC, New Delhi". The performance guarantee should be submitted within 30 days of issue of the LOI and be valid for a period of four months.

5. **Technical Qualifying Condition**

The details of past experience on similar works etc., list of similar works and value of each work successfully carried out and completed within the Geographical boundary of India as defined below in the last 3 years ending 31.03.2019 as per any of the following:

a) Three Similar Completed works, each costing not less than Rs. 24.00 Lakhs

OR

b) Two Similar Completed works, each costing not less than Rs. 36.00 Lakhs

OR

c) One Similar Completed work costing not less than Rs. 48.00 Lakhs

6. Submission of Tenders

a) Tenders shall be submitted in two (2) sealed cloth lined covers one super scribed as "**Technical & Commercial Bid" and other "Price Bid"**. Both covers shall be put into another sealed cloth lined cover super scribing the name of work, NIT number and name of Tenderer.

b) In case any deviations are intended from Departmental Conditions and Specifications, etc. same shall be put in the technical & commercial bid. The technical & commercial bids shall be first opened on the due date and time of opening. All the technical submittals of the tenderers shall be evaluated, if necessary, similar works executed by the tenderer shall be inspected to ascertain the quality and relevant details of the work. The tenderers, whose offers are found to be technically acceptable, based on the above evaluation, would be informed of the time and date of opening of price bid and the price bid shall be opened accordingly. The earnest money deposit indicated above shall be enclosed in the "Technical & Commercial Bid "cover.

c) If any Bidder withdraws his tender after opening of tender, within the validity period or makes any modifications in the terms & conditions of tender which are not

acceptable to NBCFDC, then NBCFDC shall without prejudice to any/or other right or remedy, shall be at liberty to forfeit the EMD absolutely. Applications for the tender document not accompanied by the following are liable for rejection;

i. Documents in support of experience in execution of similar works as explained above,
ii. Letter of authority in case the application is through authorized person.

d) The application for the tender document shall be submitted well in advance of time and period for issue of the document.
e) NBCFDC reserves the right to reject any application for issue of tender papers without assigning any reason.

f) As said above, tender which shall always be placed in sealed covers super scribed with the name of work (as given in para 1) shall be received by NBCFDC up to **17.00 hrs** on **16.09.2019** and shall be opened on **17.09.2019** at **11:00 hrs** onwards in the presence of the Tenderers or their representatives who intend to be present.

g) The contractors shall quote rates in price bid figures as well as in words and / or amounts tendered by them. The amount for each item shall be worked out and requisite total given. All corrections shall be attested by the dated initials of the tenderer.

7. Evaluation of Technical Bids

i) Tenders not accompanied by the following are liable to be summarily rejected:

a) Tender fee by way of DD/pay order in favour of National Backward classes Finance and Development Corporation payable at New Delhi.
b) EMD in DD/pay order National Backward classes Finance and Development Corporation payable at New Delhi.
c) Proof of technical and organizational competence to execute the work of above nature and magnitude
d) Latest work experience certificate on similar nature of work.
e) Copy of the MSME/NSIC Registration Certificate in cases where the tenderer is seeking expemption of EMD & Tender Fees.

ii) NBCFDC may seek clarifications from the tenders in respect of the documents submitted
iii) The price bids of tenderers whose documents are found fulfilling the technical eligibility criteria will be opened under intimation to the bidders.
iv) The contractor whose tender/s is / are accepted shall required to furnish Performance Guarantee for the due fulfillment of the Contracts as per details in clause 4 above subsequent to which a contract agreement will be signed. The LOI will form a part of the Contract agreement.

8. Evaluation of Price Bids

a) Rates quoted by the Contractor in item rate tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates written in figure or in words which correspond with the amount worked out by the contractor shall be taken as correct. Rates to be quoted in BOQ without GST. GST to be quoted only in summary sheet.
b) If the amount of an item is not worked out by the Contractor or it does not correspond with the rate written either in figures or words, then the rates quoted by the Contractor in words shall be taken as correct.
c) Where the rates quoted by the Contractor for the various items/services in figures and in words tally but the total sum amount is not worked out correctively, the rates quoted by the Contractor for the individual items shall be taken as correct and not the sum amount.
d) It is to be explicitly noted that Canvassing in connection with tender shall result in disqualification of the said tenderer.

9. Award of Tender

a) After scrutiny the lowest responsive bidder will be considered for award of the work.
b) Irrespective of what is written above the acceptance of the tender shall rest with NBCFDC which does not bind itself to accept the lowest or any other tender. No reasons shall be furnished for the acceptance or rejection of any tender.
c) NBCFDC reserves the right to alter the scope/or reduce quantum of work before issue of work order and the Tenderer shall not have any claim what so ever on this account.
d) NBCFDC will issue Letter of Intent (LOI) to the successful bidder in duplicate, who would require to sign one of the copies and return the same to NBCFDC within a week of receipt of same as a token of the unconditional acceptance.

GM (HR & Admin)
National Backward Classes Finance and
Development Corporation 5th Floor, NCUI Building,
3, Siri Institutional Area, August Kranti Marg,
New Delhi-110016

SECTION-II BRIEF TO THE TENDERERS, FORM OF AGREEMENT & GENERAL RULES & DIRECTIONS FOR GUIDANCE OF THE CONTRACTOR.

NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION (NBCFDC)

5th Floor, NCUI Building, August Kranti Marg, New Delhi-110016

Form of Agreement

Item Rate Tender for Works

I/We hereby tender for the execution for NBCFDC for the work specified in the under Written Memorandum within the time/s specified in such Memorandum at the rates specified in the attached schedule of quantities and in all respects with these specifications, design, drawings and instructions in writing referred to in Rules here to and in clause 12 of the General conditions of Contract and with such materials as provided for by and all other respects in accordance with, such conditions so far as applicable.

Memorandum

General description (if several sub-work are included they shall be detailed in a separate list)

a)	Estimated Cost	Rs 60,00,000/- (Rupees Sixty Lakhs only)
b)	Earnest Money	Rs. 1,20,000/- (Rupees One Lakh Twenty Thousand only)
c)	Performance Guarantee/ Security Deposit @5% of Estimated Cost	Rs 3,00,000/-(Rupees Three Lakhs only) (**Refundable after 30 days of successful/satisfactory handing over of renovated space on certification of Architect.**
d)	Time allowed for the work from the date of issue of the work order.	**70 days**

Shall this tender be accepted in whole or in part, I/We hereby agree to abide by and fulfill all the terms and provisions of the said conditions annexed here to and all the terms and provisions contained in document. In the pamphlets named "Instruction to Bidder ", "Preamble to Schedule of Quantities", "Special Conditions" which has been read by me/us and explained to me/ us so far as applicable or in default there of to forfeit and pay to NBCFDC or the successors in Office the sums of money mentioned in the said conditions.

A sum of Rs.**……../- (Rupees……only**) is hereby forwarded by crossed D.D./ Pay Order of a Scheduled Bank as Earnest Money, If I/We fail to commence the work specified in the above Memorandum. I/We agree that NBCFDC shall, without prejudice to any

other right or remedy be at liberty to forfeit the said EMD and the performance guarantee/security deposit.

I/We agree to execute all the works referred to in the tender documents upon the terms and conditions contained or referred therein and to carry out such deviation as may be ordered subject to the condition of clause 1 & 2 herein after referred to as the deviation limit at the rates quoted in the tendered documents and those in excess of that limit at the rates to be determined in accordance with the provision contained in clause 1 & 2 of the tender form.

I/We agree that shall I/We fail to commence the work specified in the above Memorandum an amount equal to amount of the Earnest Money mentioned in the form of invitation of tender shall be absolutely forfeited to NBCFDC and same may at the option of NBCFDC be recovered out of the deposit in so far as the same may extend in terms of the said bond and in the event of the deficiency out of any other money due to me/us or otherwise.

Dated the …….. Day of 2019

Witness

Address

Occupation

Signature of the Contractor with Seal
(To be signed while submission of the Tender)

The above tender for a sum of Rs. …… (Rs……) is hereby accepted by me on behalf of NBCFDC

Dated the …….. day of..... 2019

Signature of contractor

Signature of whom accepted Officer

NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION (NBCFDC)
5TH Floor, NCUI Building, August Kranti Marg, New Delhi-110016

GENERAL RULES AND DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS

1.	All works proposed for execution by contract shall be notified in a form of invitation to tender signed by GM (HR & Admin) or by appropriate competent authority declared by NBCFDC. This form shall state the work to be carried out as well as the date for submitting and opening of tenders and the time allowed for carrying out the work, also the amount of Earnest Money to be deposited with the tender and the amount of Security Deposit to be deposited by the successful tenderer and the percentage if any, to be deducted from the bills (Performance Guarantee).
2.	In the event the tender being submitted by a firm, it must be signed separately by each member there of or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power-of-attorney authorizing him to do so, such power of attorney be produced that the firm is duly registered under the Indian Partnership Act.
3	Receipts for payments made on account of a work when executed by a firm must also be signed by the several partners, except where the Contractors are described in the tender as a firm in which case the receipts must be signed in the name of the firm by one of the partners or by some other person having authority to give effectual receipts for the firm.
4	Any person who submits a tender shall fill up the usual printed form, stating at what rate he is wiling to undertake each item of the work. Tenders, which propose any alteration in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other conditions of any sort, shall be liable for rejection. a) The rate(s) and / or amount (s) must be quoted in decimal coinage.
5	The NBCFDC shall open the tender in the presence of any intending Contractors who may be present at the time and shall enter the amounts of the several tenders in a comparative statement in a suitable form. In the event of a tender being accepted, a receipt for the Earnest Money forwarded therewith shall there upon be given to the Contractor who shall there upon for the purpose of identification, sign copies of the specifications and other document mentioned in Rule 1. In the event of the tender being rejected, the Earnest Money forwarded with such unaccepted tender shall there upon be returned to the Contractor remitting the same.
6	The officer inviting tenders shall have the right to rejecting all or any of the tenders and shall not be bound to accept the lowest tender.
7	The tenderers shall sign a declaration under the Official Secret Act for maintaining secrecy of the tender documents, drawings or any other records connected with the work given to them. The unsuccessful tenderers shall return all the tender documents, drawings, etc., given to them

DECLARATION

I/We hereby declare that I/We shall treat the tender documents, drawings and other records connected with as secret/ confidential documents and shall not communicate the same or use the information in any manner prejudicial to the safety of the country.

Signature of Contractor

No: NBCFDC/ HR&A /RenovationTender/2019 **Dated: 19.08.2019**

ABOUT NBCFDC

National Backward Classes Finance & Development Corporation (NBCFDC) is a Govt. of India Undertaking under the aegis of Ministry of Social Justice and Empowerment**.** NBCFDC was incorporated under Section 25 of the Companies Act 1956 on **1**3th January 1992 (Now under section 8 of the Companies Act 2013) as a Company not for profit with an objective to promote economic and developmental activities for the benefit of Backward Classes and to assist the poorer section of these classes in skill development and self- employment ventures. NBCFDC provides financial assistance through State Channelizing Agencies (SCAs) nominated by the respective State Governments/UTs and Regional Rural Banks, Public Sector Banks. The Corporation supports a wide range of income generating activities to assist the poorer section of these classes in skill development and self-employment ventures.

BRIEF SCOPE OF WORK:

The bid document envisages interior construction and renovation works of office area for **National Backward Classes Finance & Development Corporation (NBCFDC)**, 5th floor, N.C.U.I. Building, 3, Siri Institutional Area August Kranti Marg, New Delhi-110016.

The area of the facility for civil and interior works is approximately 1600 Sq.Ft. Proposed layouts of floor is given along with the tender document. The proposed interior works shall take place on, 5th Floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi -110016.

It is proposed to hand over the site to the contractor/vendor immediately after placement of order as the above said floor is presently not vacant.

The address of the site as follows:

NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION, 5TH FLOOR, N.C.U.I. BUILDING, 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, POST BOX NO. 4617, NEW DELHI-110016

The Bidder is expected to have the understanding and expertise of the following items preferably in an Office building environment.

(i) Supply and erection of various interior fit out for the office area etc. including custom made and modular furniture, internal partitions and finishes.
(ii) Flooring with edge supported said grid system (lay-in tiles)
(iii) Miscellaneous civil jobs.
(iv) False ceiling work including metal & specialized ceiling.
(v) Internal electrification jobs like point wiring, internal Lighting, Distribution boards etc.

Section – III BID QUALIFICATION CRITERIA

Bidder shall meet all the criteria given here under in Clauses 1.0 & 2.0

1.0 FINANCIAL CRITERIA:

1.1 Average Annual Financial Turnover (similar work) of the bidder during the last three years, ending March 2019, shall be at least Rs. 2.5 Crore.

1.2 Net Worth: Net worth of the bidder shall be positive as per the audited financial Statements of Immediate preceding financial year.

2.0 TECHNICAL CRITERIA:

Bidder shall have experience of having successfully carried out and completed (#) similar works within the Geographical boundary of India as defined below in the last 3 years ending 31.03.2019 as per any of the following:

a) Three Similar Completed works, each costing not less than Rs. 24.00 Lakhs

OR

b) Two Similar Completed works, each costing not less than Rs. 36.00 Lakhs

OR

c) One Similar Completed work costing not less than Rs. 48.00 Lakhs

Similar work referred under Technical Criteria (Clause 2.0) shall be as follows: Interior job comprising of custom made or Civil Work, PH Work & Paintings, Ceiling works, Flooring Work, Partition / Wall Covering Works , Furniture Works , Electrical Works, Air-conditioning Works , fire detection ,pa system and audio conferencing system & Data Cable Networking racks & UPS Etc.

The EMD submitted by the bidder shall be forfeited if:

- The bidder withdraws or amends its tender or derogates from the tender in any respect within the period of validity of its tender. Further, if successful tenderer fails to accept the LOI furnish the required performance security within the specified period, EMD shall be forfeited.

- The bidder withdraws his bid after processing but before acceptance of award of contract issued by NBCFDC

- The bidder violates any of the provisions of the terms and conditions of the tender specifications
- Final decision on EMD forfeiture shall rest with the Competent Authority of NBCFDC

3.0 DOCUMENTS REQUIRED IN SUPPORT OF BID EVALUATION CRITERIA (TECHNICAL & FINANCIAL):-

3.1 All bidders are required to qualify for both Technical and Financial criteria of BQC stated above. Bidder shall ensure submission of complete information/documents in the first Instance itself. Evaluation may be completed based on the details so furnished without seeking any subsequent additional information.

3.2 In support of Technical criteria of BQC, bidder shall furnish documentary evidence duly certified / attested by Chartered Engineer and notarized by notary public with legible stamp. These documents include copy of work order including copy of SOR issued by Client; completion certificate and relevant Supporting documents etc. to establish his experience and track record meeting qualification criteria.

3.3 Format for "Details of Financial Capability" shall be furnished by the bidder is to be submitted towards such experience from Bank where accounts are maintained.

General Notes to BQC

3.4.1 Bids from consortium / joint venture shall not be accepted.

3.4.2 Bidder shall not be affiliated with a Firm or Entity, (i) that has provided consulting services related to works to Employer during preparatory stages of works or of the period of which the work form a part, or (ii) that has been hired (or proposed to be hired) by the Employer as Engineer/Consultant for the Contract.

3.4.3 The bidders who are on Holiday / Negative-list of any Government Department / Public Sector as on the due date of Submission of bid or during the process of evaluation of bids, the offers of such bidders shall not be considered for opening / evaluation / award. If the bid documents were inadvertently downloaded from website by such bidders, offers submitted by all such bidders shall not be considered for opening /evaluation / award.

3.4.4 Bidder shall remain single-point responsible for Project management and execution of the work at site.

3.4.5 NBCFDC reserves the right to use in-house information for bidder's qualification.

3.4.6 NBCFDC reserves the right to assess bidder's capability to execute this work by taking into account various aspects such as concurrent commitments and performance during evaluation of bids.

3.5 Methodology for Evaluation and Award of Contract:

1. The Price Bids of only techno-commercially acceptable bidders shall be opened and shall be considered for evaluation of bids.

2 The "Schedule of Rates" quoted for the complete/entire scope of work shall be taken up for Evaluation, i.e. evaluation & comparison of bids and subsequent award for contract shall be on lowest techno commercially acceptable tender basis

3 The evaluation of all techno commercially acceptable bids, to arrive at the lowest evaluated bid shall be carried out as under:

4. In case a bidder does not quote for any SOR item(s), and the total estimated price impact of the unquoted SOR item(s) is more than 10% of the bidder's Total Quoted Price, the bid shall be rejected. If such price impact of unquoted SOR item(s) is 10% or less than that of the bidder's Total Quoted Price and under special circumstances, Owner shall decide to consider the bid. However, for the purpose of comparison, such bidder's unquoted SOR item(s) shall be loaded by price-impact calculated on the basis of the highest of the rates/prices quoted among the remaining bidders and estimated rates/prices. If such bidder happens to be the lowest evaluated bidder, rates/prices of unquoted SOR item(s) shall be considered built-up in the bidder's quoted prices, and no extra cost shall be payable by NBCFDC for such SOR item(s).

5. No uncalled-for lump-sum/percentage or ad hoc reduction/increase in prices offered by a bidder after opening of Price Bids shall be considered.

BRIEF DETAILS OF BIDDING DOCUMENT

1	**Bidding Document No.**	**NBCFDC/HR&A/RenovationTender/2019**
2	**Deadline for Submission of Bid / Bid Due Date & Time**	**16.09.2019 1700 Hours**
3	**Tender Fee / Bid Document Fee [Non refundable]**	**Rs.1000/- excluding GST**
4	**EMD**	**Rs.1,20,000/-**
5	**Performance Guarantee (5% of the Estimated Tendered value)**	**Rs. 3,00,000/- by way of a Bank Guarantee issued by a Scheduled Commercial Bank valid of 120 days or a Security Deposit by way of a Demand Draft issued in favour of "NBCFDC, New Delhi".**
6	**Security Deposit**	**Deducted @ 5% of each bill and returned for defect liability period of 6 months after completion of work.**
6	**Date, Time for Opening of bids**	**17.09.2019 11.00 hours**

TENDER FEES:

Tender document may be downloaded from the website www.nbcfdc.gov.in. Tender Fee of Rs.1000/- (Rupees One Thousand only) may be submitted in the shape of crossed Demand Draft / Banker's Cheque having a validity of three (03) months, duly issued by an any commercial bank drawn in favour of "**National Backward Classes Finance and Development Corporation**", 5th Floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016" payable at New Delhi either in person or through post/courier shall be submitted along with the bid and it is non-refundable.

Tender Fee are exempted for vendors registered under NSIC on coming under the definition of Micro & Small Industries (MSME) and holding valid registration certificate covering the tendered items/services. However, attested copy of valid NSIC Certificate or "Micro & Small Industries Certificate must be submitted alongwith the tender. Offers received without EMD shall be summarily rejected.

This is a ZERO-DEVIATION Bidding Document. Bidder is to ensure compliance of all provisions of the Bidding Document and submit their bid accordingly. Bid with any deviation to the bid conditions shall be liable for rejection. NBCFDC shall appreciate submission of Offer based on the terms and conditions of this Bidding Document to avoid wastage of time and money in seeking clarifications on technical and/or commercial aspects of the Offer.

The bid shall be submitted in two (02) Parts, as follows:

PART I - TECHNICAL BID to be submitted in separate envelope

PART-II : FINANCIAL BID, to be submitted in separate envelope, which shall contain only the prices, without any condition whatsoever.

Bids complete in all respects shall be submitted on or before the bid due date and time. Bids cannot be submitted after the bid due date and time.

Bids shall be valid for three (03) months from the bid due date.

Bids sent through Fax/E-mail/Courier/Post shall not be acceptable. Bidders are advised to quote strictly as per terms and conditions of the Bidding Document and not to stipulate any deviations/exceptions. NBCFDC reserves the right to accept or reject any or all Tenders received at its absolute discretion without assigning any reason whatsoever.

4.0 INSTRUCTIONS TO BIDDERS

4.1 PROJECT DESCRIPTION/SITE INFORMATION

It is proposed to carry out General Civil and Interior Works for the 5th floor for National Backward Classes Finance and Development Corporation, Delhi The address of the site as follows:

5th Floor, NCUI Building, 3 Siri Institutional Area, August Kranti Marg, New Delhi

The area of the Facility for Works is approximately 1600 Sq. ft. The proposed layout of the floor is given along with the tender.
This is an Office building carrying other offices, agencies and incumbents also in occupation.

4.2 SCOPE OF WORK

The brief scope of work comprises of, but not limited to the following:

a) Civil Work, PH Work & Paintings,
b) Ceiling works, Flooring Work,
c) Partition / Wall Covering Works ,
d) Furniture Works ,
e) Electrical Works,
f) Air-conditioning Works ,
g) Data Cable Networking racks Etc.

In case of any clarifications regarding the scope of work, the same shall be obtained from NBCFDC**. Bidder shall submit a detailed work plan incorporating work schedule for different jobs in manner so that the work can be completed as per time schedule mentioned.**

The bidder is advised to visit and examine the site of works and their surrounding and obtain for himself and on his own responsibility all information that may be necessary for preparing of the bid and entering into the contract. The cost of visiting the sites shall be at bidder's own expenses. No extra claim on account of non-familiarity of site conditions shall be entertained during execution of works.
The prospective bidders are requested to thoroughly read and comprehend the various sections of this tender document and visit the sites before quoting for the tender and offer their most competitive rates for the job.

4.3 SITE CONDITION:

The job needs to be carried out in the existing commercial/office building premises. The contractor has to take necessary precaution for the safe transportation of the material. Before quoting for the said job the contractor is required to visit the site and make himself acquainted with the scope of the job and quote accordingly.

The contractor shall arrange all equipment, tools, manpower, power and water required for execution, testing of building materials before and during the jobs & completion of the job. In case Surplus power is available with NBCFDC, the same shall be provided in a single point in panel room and vendor can utilize the same with energy meter and adequate protection devices. The above facility extension to the vendor shall be at the sole discretion of NBCFDC.

All the safety precautions shall be taken while executing jobs at site work including working at height etc. All necessary Personal Protective Equipment such as helmets, shoes shall be arranged by the Contractors as per the directions of Engineer in charge at no extra cost to NBCFDC.

NOTES:

1. **The contractor shall prepare a detailed date wise schedule of work/Bar Chart of the activities as per PO and submit to Engineer-In-Charge, ABRD Architect for approval before commencement of activities.**
2. **The Contractor has to give progress report with photographs every fortnight in hard copy as well as soft copy.**

The contractor shall arrange for all materials, equipment, tools, power and water required for execution & completion of the job.

The bidders are required to go through the tender document thoroughly and carefully and offer their most competitive rates for the job.

5.0 SPLIT-UP OF WORK

Total work shall be awarded to single agency and the scope of work shall not be split.

6.0 SUBMISSION AND OPENING OF BID

The bidder shall refer the part –I/IIB of the instruction to bidders for the submission & opening of bid

7.0 BID CLARIFICATIONS/AMENDMENTS BY NBCFDC

7.1 NBCFDC may issue clarifications/amendments in the form of addendum/ corrigendum during the bidding period and may also issue amendments subsequent to receiving the bids. For the addendum/corrigendum issued during the bidding period, bidders shall confirm the inclusion of addendum/corrigendum in their bid. Bidder shall follow the instructions issued along with addendum/corrigendum.

7.2 Bidders shall examine the Bidding Document thoroughly and submit to NBCFDC any apparent conflict, discrepancy or error within 2 weeks of floating of tender by way of email to info@nbcfdc.gov.in. NBCFDC shall issue appropriate clarifications or amendments, if required. Any failure by Bidder to comply with the aforesaid shall not excuse the Bidder from performing the Services in accordance with the contract if subsequently awarded.

The Addendum/Corrigendum/Other Announcements if any, will be available on NBCFDC website only.

8.0 CONFIDENTIALITY OF DOCUMENTS

Bidder shall treat the Bidding Document and contents therein as private and confidential and shall not use the Bidding Document for any other purposes.

9.0 APPLICABLE LANGUAGE

The bid prepared by the bidder, all correspondences and documents related to this bid shall be written in English language only. For document submitted in any other language, an English translation shall also be submitted, in which case, for the purpose of interpretation of the bid, the English translation shall govern.

10.0 CAUTION AND DISCLAIMER

Transfer of Bid document by the bidder is not permitted.
Bidder shall make his own interpretation of any and all information provided in the Bidding Document. NBCFDC shall not be responsible for the accuracy or completeness of such information and/or interpretation. Although certain information's are provided in the Bidding Document, however, bidder shall be responsible for obtaining and verifying all necessary data and information as required by him. NBCFDC reserves the right to accept or reject any/all tender in whole or in part without assigning any reason whatsoever. NBCFDC shall not be bound to accept the lowest tender and reserves the right to accept any or more tenders in part. Decision of NBCFDC in this regard shall be final.

11.0 RECEIPT OF BID

Bids received late i.e. after due date and time, due to any reason (s) whatsoever shall be rejected. Late and rejected bid and representative of such bidders shall not be allowed to attend the bid opening. Unopened bids shall be returned to the Bidder.

12.0 DEVIATIONS TO TENDER REQUIREMENTS

In case Bidders wish to stipulate any deviation to Bidding Document requirements other than those stated above, they shall indicate the same as per the Performa enclosed in the Bidding Document. Bidder shall note that clarification/queries/deviations mentioned elsewhere in the offer shall not be given any cognizance. However, NBCFDC reserves their right to reject bids containing deviations to any of the Bidding Document stipulations.

13.0. UNSOLICITED POST BID MODIFICATION

Bidders are advised to quote strictly as per terms and conditions of the Bidding Document and after submission of offer not to stipulate any deviation / exceptions. Once, quoted the bidders shall not make any subsequent price changes, whether resulting or arising out of any technical / commercial clarifications sought/allowed on any deviations or exceptions mentioned in the bid unless discussed and agreed by NBCFDC in writing.

14.0. COMPLETE SCOPE OF WORK

The complete scope of work has been defined in the bidding document. Only those bidders who take complete responsibility for the complete scope of work as contained in the bidding document shall be considered for qualifying.

15.0. REBATE

No suo-moto reduction in prices quoted by bidder shall be permitted after opening of the bid. If any bidder unilaterally reduces the prices quoted by him in his bid after opening of bids, the bid (s) of such bidder(s) shall be liable to be rejected. Such reduction shall not be considered for comparison of prices but shall be binding on the bidder in case he happens to be a successful bidder for award of work.

16.0. CONTRACT AGREEMENT

Purchase Order (PO) shall be prepared after award of works. Successful bidder shall be intimated regarding award of works through Fax/Letter of Intent. Until the final PO documents are prepared and executed, this Bidding Document together with the annexed General civil & interior renovation works Delhi documents, modification, deletions agreed upon by the NBCFDC and Bidder's acceptance thereof shall constitute a binding contract between the successful bidder and the NBCFDC based on terms contained in the aforesaid documents and the finally

submitted and accepted prices. In case the successful bidder wishes to sign a contract document then he or she may clearly specify in the cover letter of his un-priced bid that he or she intends to enter in to contract with NBCFDC. No clause/ terms in contract document shall be in contradiction to PO/tender terms or accepted deviations. Such contract shall be executed after issuance of PO and all cost towards execution of the contract shall be to the bidders account. All documents of the PO including tender document shall become a part of the contract and the date of LOI/PO (whichever is earlier) shall be considered as the date of commencement of job

16.1 The Contract document/PO shall consist of the following:

a) Original Bidding Document along with its enclosures issued
b) Addendum/Corrigendum to Bidding Document issued, if any.
c) Fax/Letter of Intent
d) The detailed Letter of Award/Acceptance along with Statement of Agreed Variations (if any) and enclosures attached therewith.

16.2 The Contractor shall not be entitled to any compensation for any loss suffered by him on account of delays, in commencing or executing the work, whatever the cause of delays may be, including delays arising out of modifications to the work entrusted to him or in any sub-contract connected therewith or delays in awarding contracts for other trades of the project or in commencement of completion of such works or in procuring Government controlled or other building materials or in obtaining water and power connections for execution of work or for any claim in respect thereof. The Employer does not accept liability for any sum besides the tender amount, subject to such variations as are provided for herein.

17 Liquidated Damages

17.1 Liquidated Damages time is essence of contract and the total completion period stipulated is 70 days from the date of issue of LOI.

17.2 Liquidated damages equal to 0.5% of the price of any portion of services/goods undelivered as assessed by Engineer Incharge, per week shall be levied subject to maximum of 10% of the total value.

17.3 For delays beyond this period, NBCFDC may resort to getting the work done by alternate means at the risk and cost of the contractor and also to other positive measures including but not limited to black listing of the contractor.

17.4 The Contractor may request NBCFDC for waiving off liquidated damages citing valid reasons based on merits of which, the latter may at its sole discretion to waive off part or whole of the same.

18.0 TAX

The rates quoted by the contractor shall be deemed to be exclusive of the GST that the contractor shall have to pay for the performance of this contract. However, GST alone shall be reimbursed on submission of documentary evidence in original.

19.0 Work to be executed in accordance with Specifications, Drawings, Orders, Etc.,

The contractor shall execute the whole and every part of the work in the most substantial and workman like manner, and both as regards materials and otherwise in every respect in strict accordance with the specifications in the tender document. The Contractor shall also conform exactly fully and faithfully to the designs, drawings and instructions in writing in respect of the work assigned by the Engineer-In-Charge. The work in general shall conform to specification in tender document.

In case of any work for which there is no specification or in the specifications forming part of tender documents or in case there is any variation, such work shall be carried out in all respects in accordance with the instructions to be issued by the Engineer-In-Charge

20.0 Additions / Alterations / Substitutions in Specifications, Design & Drawings

The Engineer-In-Charge shall have power to make any alterations in, omissions from, additions to, or substitutions for, the original specifications, drawings, design, and instructions that may appear to him to be necessary or advisable during the progress of the works and the Contractor shall carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-In-Charge, and such alterations, omissions, additions, or substitutions shall not invalidate the contract and any altered, additional or substituted work which the Contractor may be directed to do in the manner above as part of the work, shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main work.

For items existing in the contract but where quantities have increased beyond the variation limits, the rate payable for quantity in excess of the quantity in the contract plus permissible variation shall be determined in the following order.

(1) Rates and prices in contract if reasonable [The reasonableness shall be verified by Engineer-In-Charge (EIC) and his certificate in this regard is final and binding].

(2) (i) Contractor within 15 days of the occurrence of variation in quantities beyond permissible limits, shall claim revision of rates supported by proper analysis for the work in excess of the permissible limit provided that if the rates so claimed are in excess of the rates specified in contract, the EIC shall within one month of receipt of claim supported by analysis, after giving consideration to the analysis of rates submitted by the contractor, determine the rates on the basis of prevailing market rates and pay the contractor accordingly.

(ii) The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down and Engineer-In-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of receipt of the notice, revise the rates for the work in question having regard to the market rates.

21.0 Arbitration

NBCFDC and selected Bidder shall make every effort to resolve amicably, by direct negotiation, any disagreement or dispute arising between them under or in connection with the work order. If any dispute shall arise between parties on aspects not covered by this agreement, or the construction or operation thereof, or the rights, duties or liabilities under these except as to any matters the decision of which is specially provided for by the special conditions, such dispute shall be referred to arbitrator, to be appointed by MD, NBCFDC, New Delhi and the award of the arbitration, as the case may be, shall be final and binding on both the parties. Such arbitration shall be governed in all respect by the provision of the Arbitration and Conciliation Act, 1996 or later and the rules there under and any statutory modification or re-enactment, thereof. The arbitration proceedings shall be held in New Delhi only, wherein appropriate Appellate Authority shall also be the Hon'ble High Court of Delhi at New Delhi

22.0 Applicable Law and Jurisdiction of Court

The contract with the selected bidder shall be governed in accordance with the Laws of India and shall be subject to the exclusive jurisdiction of Courts at Delhi (with the exclusion of all other Courts)

DRAFT FORWARDING LETTER

FROM:

M/s. _____
_____
_____

To;
The General Manager (HR & Admin),
National Backward Classes Finance & Development Corporation 5th Floor, N.C.U.I. Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi- 110016

Dear Sir/s,

Re: CONSTRUCTION OF GENERAL CIVIL AND INTERIOR RENOVATION WORKS OF NATIONAL BACKWARD CLASSES FINANCE & DEVELOPMENT CORPORATION, DELHI

Dear Sir.

With reference to the tender invited by you. I/We hereby offer to perform, provide, execute and complete the works in Conformity with the Conditions of Contract, Drawings and Specifications for the respective Items of Schedule of Quantities attached hereto.

1. I/We have satisfied myself/ourselves as to the location and prevailing conditions of the site, and have read carefully the tender booklets containing Articles of Agreement, Conditions of Contract, Specifications, General and Special Conditions, Technical Specifications, Drawings etc. and I/we understand that the works are to be completed within 70 days from the date of issue of Letter of intent/Order and fully understand that the time shall be the essence of the contract.

2. I/We enclose a demand draft for an amount of Rs.----------/- (Rupees --- ---------- only) as conditions of contract , drawn on ---------- Bank, payable at Delhi in favour of **NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION**, as Earnest Money and fully understand that this amount shall not bear any interest.

3. I / We agree to keep the offer open for 90 days from the date of opening of the tender.

4. Shall this tender be accepted in whole or in part, I/We hereby agree to abide by and fulfill all the terms and conditions annexed hereto. If I/we fail to commence the work specified in tender documents, I/we agree that my/our earnest money shall stand forfeited absolutely to the Employer otherwise the said Earnest Money shall be retained by the Employer towards Security Deposit (retention money). I/we also agree to the balance security money being deducted from my/our bills in accordance

with the conditions of contract.

5. All the terms and conditions contained in the Notice Inviting Tenders, General and Special Conditions of Contract. Specifications for execution of work and additional conditions and the Agreement etc. constituting the tender documents have been fully read by me/us and explained to me/us and I/we hereby accept the same and sign hereunder in token of their acceptance.

6. We are further enclosing herewith the following documents, if already not submitted along with offer for pre-qualification.

(a) **Partnership Deed, Articles of Association & Power of Attorney**. We agree that no change shall be made in these documents without prior approval of EMPLOYER.

(b) **Tender documents** duly signed along with detailed program me and targets of completion of each time of work.

(c) **Details of deployment of manpower, machinery, plant and equipment**. Total list of plant and machinery in possession of the firm and the list of plant and machinery shall be exclusively deployed on this work.

(d) **Balance sheet and profit & loss account** for last three financial years.

(e) **Latest Bank solvency certificate** from a nationalized bank/ Scheduled Bank.

(f) **Proof of registration**.

(g) **Name of agencies with valid license** to carry out electrical works.

(h) Demand Draft No. ---------- dt.---------- drawn on----------
for Rs ----------only.

Name of Proprietor /Partners/Directors of the firm ----------

Yours faithfully,

Date: _____ Name & Signature of Tenderer(s) Office-stamp & Seal of the tenderer(s).

Witness: _____

_____

Address:

Occupation: _____ M/s _____

_____

DECLARATION

(To be submitted along with Technical bid Part-1)

M/s_____hereby declare/clarify that we have not been banned or delisted by any Government or quasi Government agencies or Public Sector Undertakings.

Stamp & Signature of the Bidder

NOTE: If a bidder has been banned by any Government or Quasi Government agencies or PSU's, this fact must be clearly stated with details. If this declaration is not given along with the unpriced bid, the tender shall be rejected as non-responsive

CONTACT PARTICULARS

NAME OF PERSON	
TELEPHONE OF OFFICE	
TELEPHONE OF RESIDENCE	
MOBILE NO	
E-MAIL ID	

Annexure-I

FORMAT FOR PERFORMANCE GUARANTEE

WHEREAS National Backward Classes Finance & Development Corporation (Buyer) have invited Tenders vide Tender No..... Dt. ..... for purchase of ..... AND WHEREAS the said tender document requires that any eligible successful tenderer (seller) wishing to supply the equipment / machinery, etc. in response thereto shall establish an irrevocable Performance Guarantee Bond in favour of "**National Backward Classes Finance & Development Corporation, New Delhi**" in the form of Bank Guarantee for Rs ..... (**5% (Five percent) of the purchase value**) and valid till **one year or upto warranty period whichever is later** from the date of issue of Performance Guarantee Bond may be submitted within 30 (Thirty) days from the date of Acceptance as a successful bidder.

NOW THIS BANK HEREBY GUARANTEES that in the event of the said tenderer (seller) failing to abide by any of the conditions referred in tender document / purchase order / performance of the equipment / machinery, etc. this Bank shall pay to National Backward Classes Finance & Development Corporation, New Delhi on demand and without protest or demur Rs ..... (Rupees.....).

This Bank further agrees that the decision of National Backward Classes Finance & Development Corporation, New Delhi (Buyer) as to whether the said Tenderer (Seller) has committed a breach of any of the conditions referred in tender document / purchase order shall be final and binding.

We, ... (name of the Bank & branch) hereby further agree that the Guarantee herein contained shall not be affected by any change in the constitution of the Tenderer (Seller) and/ or National Backward Classes Finance & Development Corporation, New Delhi (Buyer).

Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed Rs. ..... (Indian Rupees ..... only).
2. This Bank Guarantee shall be valid up to .....(date) and
3. We are liable to pay the guaranteed amount or any part thereof under this bank guarantee only and only if NBCFDC serve upon us a written claim or demand on or before .....(date).

This Bank further agrees that the claims if any, against this Bank Guarantee shall be enforceable at our branch office at ..... situated at ..... (Address of local branch).

Yours truly,

Signature and seal of the guarantor: Name of Bank:

Address:

Date:

Instruction to Bank: Bank should note that on expiry of Bond Period, the Original Bond will not be returned to the Bank. Bank is requested to take appropriate necessary action on or after expiry of bond period.

FORM A

TECHNICAL BID OF INTERIOR RENOVATION WORK FOR NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION 5th FLOOR, NCUI BUILDING 3, SIRI INSITITUTIONAL AREA AUGUST KRANTI MARG, NEW DELHI

1	Description of the Company / Firm (Proprietary / Partnership etc.)	
2	Name of the Company / Firm	
3	Permanent Address :	
4	Telephone No., Fax No., Mobile No.	
5	E-mail Address :	
6	Year of Establishment:	
7	Number of years of experience in the field (if different from above)	
8	Name & Address of Partner/s (Please state changes, if any, in partnership since the inception)	
9	Name & Address of the Banker (RTGS/NEFT details)	
10	Has the applicant or any of his partner or previous firm been blacklisted or removed/ demoted etc. (Kindly answer Yes or No. lf Yes, then upload the relevant details in other document section)	
11	Details about firm's structure. (Mention names, addresses, positions etc. of all key persons in the organization)	
12	Bio-data of Partners	
13	Details of the technical staff with their qualification & experience (attach proof)	
14	Details of Registration / Government. Agencies / PWD / Other PSUs	

15	Details about any litigation / Arbitration proceedings taken up with present / previous clients / departments or any Government bodies	
16	Balance sheet/ Profit & loss statements for the last 5 years (to be attached herewith)	
17	Valid income Tax Clearance Certificate (to be attached)	
18	PAN No. (attach proof)	
19	GST No. (attach proof)	
20	Certificates of works completed with value from previous clients. (Certificates shall be of works that are successfully completed in last 3 years)(Three similar works each of 40% of the estimated cost of project OR Two similar works each of 60% of the estimated cost of project OR One similar works each of 80% of the estimated cost of project.) (attach proof)	
21	Any other additional information relevant to the evaluation of their prequalification	
22	List of other Empanelment PSU / Private	
23	Upload the relevant details if blacklisted	

DETAILS OF PREVIOUS CONTRACTS

Period of Contract From To	Name and Address of the Organisation with reference letters	Name of the Contact person & Phone No.	Value of Contract and other details	Remarks

DETAILS OF CURRENT CONTRACTS

Period of Contract From To	Name and Address of the Organisation with reference letters	Name of the Contact person & Phone No.	Value of Contract and other details	Remarks

Place

Date SIGNATURE OF THE TENDERER

FORM - B

ORGANISATIONAL STRUCTURE

1	Name & Address of the applicant with Telephone No./Fax No./ Email ID	
2	Address of local office (in Delhi/India)	
3	Year of Establishment	
4	Legal status of the applicant (attach copies of original document defining the legal status)	
	a) A proprietary firm	
	b) A firm in partnership	
	c) A limited company or Corporation / Joint venture / Consortia	
5	Names of Directors & other executives with designation to be concerned with this work	
6	Designation of individuals authorized to act for the organization.	
7	Has the bidder, or any constituent partner in case of partnership firm / limited company/ Joint venture, ever been convicted by the court of law ? if so, give details.	

8	Details of Fabrication unit a. Address b. Area of the unit c. Personnel d. Tools and Equipment e. Details of Testing Laboratory	
9	Any other information considered necessary but not included above.	

Place

Date

SIGNATURE OF THE TENDERER

FORM - C

PERFORMANCE REPORT OF WORKS

1	Name of work/Project & Location	
2	Agreement No.	
3	Estimated Cost	
4	Tendered Cost	
5	Date of start	
6	Date of completion	
	i. Stipulated date of completion	
	ii. Actual date of completion	
7a	**Whether case of levy of compensation for delay has been decided or not**	Yes / No
7b	***If decided*, amount of compensation levied for delayed completion, if any**	
8	Performance Report	
	i. Quality of work	**Outstanding**/Very Good/Good /Poor
	ii. Financial soundness	**Outstanding**/Very Good/Good /Poor
	iii. Technical Proficiency	**Outstanding**/Very Good/Good /Poor
	iv. Resourcefulness	**Outstanding**/Very Good/Good /Poor
	v. General Approach & Behavior	**Outstanding**/Very Good/Good /Poor

Signature & Seal of
Executive engineer or equivalent

Form – D

FINANCIAL INFORMATION

I. Financial Analysis – Details to be furnished duly supported by figures in balance sheet/profit and loss account for the last Five years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (copies to be attached).

Particulars	**Financial Year**				
	14-15	15-16	16-17	17-18	18-19
i. Gross Annual turnover on similar works (In Lakhs)					
ii. Profit / Loss					
iii. Certified by					

I. Financial arrangements for carrying out the proposed work.

II. The following certificates are enclosed:

(a) Current Income Tax clearance Certificate / Profit & Loss account

(b) Solvency Certificate: Tenderer must produce original solvency certificate for Rs.60.00 Lakhs on cost of project as estimated by the tenderer which ever higher from any scheduled commercial Bank not older than six months (06) from the date of opening of bid.

Signature of Chartered Accountant with seal

FORM-E

MAJOR WORKS OF SIMILAR CLASS COMPLETED DURING THE LAST 5 YEARS, ENDING 31st March 2019

Sl. No.	Name of the work/project and location	Name of the Client	Cost of work in Lakhs	Date of start	Period of Completion	Actual Date of Completion	Name and address/telephone number of officer to whom reference may be made	Final value of the project	Reasons for the variation delay if any	Whether carried out as prime Contractors
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

Credential issued by the Clients shall be enclosed.
Photographs and details of major works executed may be enclosed.
Work should have been executed by the firm under the name in which they are submitting the applications.

ANNEXURE- II

REFERENCE TO GENERAL CONDITIONS OF CONTRACT

1.	Accepting Authority	**National Backward Classes Finance & Development Corporation**
2.	Percentage addition to cover profit and over heads of contractor in rate analysis while working out Market Rates.	15%
3.	Earnest Money	Rs. 1,20,000/- (Rupees One Lakh Twenty Thousand only)
4.	Security Deposit	Shall be deducted @ 5% of each bill and withheld for defect liability periodl.
5.	**Time allowed for execution of work as per below schedule.**	**70 Days**
a)	Mobilization Period	01 Week from issue of LOI
b)	Placement of order for furniture	15 Days from issue of LOI
c)	Renovation of Toilet 1	03 Weeks from issue of LOI
d)	Handover of office space by NBCFDC	03 Weeks from issue of LOI
e)	Receipt of Furniture at Site	07 Weeks from issue of LOI
f)	Completion of all work and handover to NBCFDC	70 Days from issue of LOI
6.	Defects Liability period	06 months after the date of virtual completion and handover of premises to NBCFDC. However, warranty period of brought items to remain valid as per supplier terms for which relevant invoices to be submitted to NBCFDC by Contractor.
7.	Payment Terms *	
a)	Mobilization Advance	50% of Part B (Furniture) of Quoted Amount against submission of performance guarantee/security deposit alongwith evidence of placing order.
b)	Interim Running Account Bills. (to be raised in a phased manner).*	Minimum Rs. 15,00,000/- (Rs. Fifteen Lakhs only) exclusive of tax. subject to cumulative not exceeding 80% of Part `A'
c)	Final Payment *	20% of Part `A' & 50% Part `B' on completion of work and handover of premises + deduction if any.
d)	GST reimbursements	On submission of proof of deposit of GST.
9.	Escalation	NIL
10.	Court of Jurisdiction	Delhi

*All Payments will be made after certification by Architect/Engineer incharge.

SECTION IV: TECHNICAL SPECIFICAION

TECHNICAL SPECIFICATION INTERIOR WORKS

1. GENERAL
2. FLOORING
3. TIMBER
4. WOOD WORKS
5. FALSE CEILING
6. GLASS AND GLAZING
7. FINISHING
8. LIST OF CODES
9. LIST OF APPROVED MAKES – INTERIOR WORKS

1.0 GENERAL

- All flooring shall be laid to the best practice known to the trade.
- For any item if the specification are not indicated in the document / further detailed specification are wanting, relevant detailed specifications of CPWD shall have to be followed with the approval of the Engineer-in-Charge/ Officer-in-Charge
- The approved decisions of Head I&C on the above will be forwarded to the Head-Architect for further necessary action in the matter.
- Use and waste of all temporary fillets, side forms, templates, moulds, straight edges etc.
- Clearing and watering the surface immediately before laying the floor.
- Sufficient extra tiles (not less than 5%) shall be cast / ordered to ensure an adequate supply of matched floor tiles. The contractor shall furnish for approval by the Project Manager, samples of each type of floor finish.
- Cutting, Rubbing and Tinoxide (mirror) polishing. Rounding of corners, edges, and junctions of floor with skirting or dado.
- Necessary cutting for Electrical switch boxes, sinks, mixers, taps, gratings/floor trap jail etc and all other Electrical and Plumbing fixtures as deemed necessary by Project Manager.
- Providing and applying silicon sealant between the joints of floor & dado, around bath tub, kitchen sink, wash basin etc.
- Forming rounded recess in the floor where called for.
- Providing grooves chamfering, moulding, noising edge polishing etc where shown in the drawing.
- Particular care shall be exercised to ensure that all flooring skirting and dado are perfectly matched for colour and finish.
- Work in narrow widths, bands, architraves, curved surfaces, set backs, offsets, (any geometric pattern) pattern and design at all heights and locations, unless otherwise mentioned.
- Curing protecting and cleaning all surface as specified.
- Leaving or chasing recess for skirting to match with plaster surface, bends, steps etc. on wall / concrete and making them good after finishing of the wall.
- Payment shall be made only for the finished dimension actually measured at site of work.
- Matching grains / veins for different finishing items.

- Protection (in required manner) & precaution to avoid any damage of flooring, dado, risers, treads etc. any damage shall be repaired at contractors expenses.

- Cost of pre polishing (Tinoxide) / mirror wherever pre polished stones are specified.

- No work shall be started until the concealed piping drains etc. are laid by other agencies. Prior to commencing any finishing surface, levels and the slopes to drains shall be got approved, in writing by the Project Manager. Further to do so may result in demolishing the finished surface and redoing the work all at contractor's expenses.

- Laying floors to removed slope in any size and shape of panels, pattern & design of panels the strips shall not be paid separately.

- Fixing of clamp shall be with fastener (as approved by Project Manager) in case of RCC and in Brick work pocket (100mmX75mm) shall be made and filled by non-shrinkage compound (as approved by Project Manager). The size and design of the cramp and fastener shall be to suite site requirement and shall be approved by the Project Manager.

- Work shall be carried out at any elevations all heights, levels, leads and lifts.

- Use of all scaffolding cradles, dust seats and other coverings for fittings, furniture, floors etc. (for all heights and locations)

- Painting and polishing on stone /wood/ structural steel prior to handling over.

- Cladding in toilets to be as per the pattern shown in drawings. To facilitate the work and its accuracy providing tile module and marking of location coordinates, for electrical and plumbing fixtures in each toilet.

- The flooring stone / tile shall be taken continuously over the floor traps and cleanout plugs the location of which shall be clearly marked / engraved on the floor. The cut outs shall be made for fixing jail after completion the floor polish.

- Compliance with requirements of technical specification.

2.0 FLOORING

2.1 Tiles

All tiles shall be minimum 8mm thick of approved manufacturer as stated in the schedule of quantities. Only first quality tiles of approved color shall be used. No cracked or warped tiles shall be used in the work. All tiles shall be required to be set in cement mortar. Prior to setting the tiles the contractor shall at his own cost, clear the whole surface and thoroughly saturate it with water. A layer of 12 to 20 mm average thick cement mortar shall then be applied to the surface and the tiles laid firmly over a layer of clear cement slurry. The tiles shall be set in perfect line, level and true plumb line. The joints of tiles shall have white, coloured cement filling/tile grout. After the setting operation is completed, the contractor shall carefully remove all cement and dribbling and cure the tiled surface for at least seven days with water.

2.2 Tile Dado

Tile dado where called for in the drawings, shall minimum 6mm thick tiles of approved manufacture. The tiles shall be for from cracks, twists, uneven edges cracking and such other defects. The rear face of tiles grooved and / or recessed to provide an adequately key for the plaster. A layer of 12mm thick rough base plaster shall be done with cement mortar 1:3 (1 cement:3 coarse sand) the tiles shall be finally set true plumb with rich cement slurry over a 6mm average cement filling / tile grout. After laying the tiles shall be thoroughly washed and cleaned to the satisfaction of the Project Manager.

2.3 MARBLE FLOORING

2.3.1 Marble / Granite Stone

- Marble / Granite shall be the best Indian Marble / Granite to be approved by the Project Manager and a sample piece should be kept in the office of the Project Manager. The quality shall be uniform and it shall be hard and free from any discolorations, cracks, flaws, veins of foreign materials or any other defects. When marble/Granite of different colour and kinds associated, care shall be taken to see that they are of equal hardness so as to wear evenly. The marble/Granite slabs shall be machine cut true to the shape and size and machine mirror polished. Care shall be taken to cut the slabs so as to provide a pattern as indicated. Marble/Granite stone slabs for wall lining and dadoes shall be machine mirror polished edges. The wall shall be lined with the marble/Granite in courses as indicated and grain of the marble/Granite shall be arranged in pattern as per detailed drawings. The marble/Granite shall be bedded in adequate thickness of cement mortar, backing covering the full area of the marble. The wall surface shall cleaned from all dirt, mortar droppings etc. before applying the base plaster. Joints between slabs shall be hair fine and filled with coloured cement to match the marble / Granite. The marble/Granite lining and dadoes shall be finally polished by Carborundum stone, buffing with polishing felt and cleaned with diluted oxalic acid wash. Marble shall be hard, sound, dense and homogeneous in texture with crystalline texture as far as possible. It shall generally be uniform in colour and free from stains, cracks, decay, and weathering.

2.3.2 Approval of Sample

- Before starting the work the contractor shall get samples of Marble approved by the Engineer-in-Charge. Approved samples shall be kept in the custody of the Engineer-in-Charge and the marble supplied and used on the work shall conform to samples with regard to soundness, colour, veins, and general texture.

2.3.3 Dressing of Marble:

- Every stone shall be cut to the required size and shape, fine chisel dressed on all side to full depth so that a straight edge laid along the side of the stone shall be fully in contact with it. The sides and top surface of slabs shall be machine rubbed or table rubbed with coarse sand before paving. All angles and edges of the marble slabs shall be true, square and free from chipping and the surface shall be true and plain.

- The thickness of the slab shall be as specified in the item.

2.3.4 Mortar

- The slabs shall be laid over a bedding of cement mortar 1:6 (1 cement 6 clean coarse sand) of average thickness 25 mm to 30 mm to make up an overall thickness as called for.

2.3.5 Laying

- The RCC slabs or sub-grade concrete over which the slabs are to be laid shall be cleaned, wetted and mopped. The cement mortar shall be spread over a small area to an average thickness of 25 to 30 mm. The slab, washed clean, shall be laid on the mortar pressed, tapped, with a wooden mallet, and brought to required level. It shall then be removed and laid aside. The top of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar is then allowed to harden and cement slurry of paste like consistency shall be spread over the same at the rate of 1 bag per 10 sqm area. The edges of the slab already laid shall be buttered with slurry of cement and pigment to match the shade of slabs. The slab to be laid shall then be placed back in possible, pressed and properly bedded in level with adjoining slab with as fine a joint as possible. Other slabs are also laid in similar manner to correct levels with fine joints. The surplus slurry on the surface shall be cleaned off. Slabs which are fixed in the floor adjoining the well shall enter under the skirting or dado as finish shall be finished neatly as directed. The flooring shall be cured for minimum seven days. Due care shall be taken to match the grains of slabs which shall be selected judiciously having uniform pattern of veins / streaks or as directed by the Engineer-in-Charge.

- The Raj Nagar shall be laid in pattern as shown in the drawings. In the areas where the marble slabs are to be laid in pattern with Jaisalmer yellow 1 Udaipur Green / Kota Stone / Italian Marble the thickness of the tube different varieties of stones shall match to give a level floor. Jaisalmer yellow / Udaipur Green l Kota Stone / Italian Marble, will be cut in required sizes in strips / trims / bands / accents and laid in pattern as drawing.

2.3.6 Polishing and Finishing.

- White marble / Jaisalmer yellow / Udaipur Green / Italian Marble / Kota Stone shall be pro-polished with machine and shall have a same finish as that of pre-polished granite. The joints shall be finished with white cement slurry with matching pigments. After the floor is laid and set the floor shall be mopped with a soft cloth by machine.

2.3.7 Measurement

- Marble / Granite stone flooring shall be measured in sqm.

2.3.8 Rate

- The rate shall include the cost of all materials and labour involved in all the operations described above.

2.4 DADO / LINING AND SKIRTING

- The stone slabs shall be as specified above for flooring unless otherwise mentioned. The stone slab shall be in approved lengths to match the flooring. The exposed edged of stone slabs such as in dado / lining and skirting jams, soffits, sills etc. shall be machine cut and polished smooth.

2.4.1 Mortar Backing

- All joints in the face work shall be raked out to a depth equal to not less than the width of the joints or as directed by the Project Manager. Concrete surface shall be properly hacked. All dirt, soft oil, or any other material that might interfere with satisfactory bond shall be removed. The surface shall be cleaned and scrubbed with fresh water and kept wet for 6 hours prior to applying backing mortar. The dado / lining or skirting work shall be commenced unless the preparatory work is passed by the Project Manager. The proportion of mortar for backing shall be 1:3 cement mortar. Sand in mortar bedding shall be from approved surface, and shall conform to IS: 1542 - 1960 as applicable to internal wall and ceiling plastering and external wall plastering. The thickness of mortar backing shall not be less than 1/2" and not more than1/4".

2.4.2 Fixing Dado / Lining or Skirting Stone Slabs.

- Dado / lining or skirting shall be done only after fixing stone slabs on the floor. The stone slabs shall be thoroughly wetted in water before being used for dado / lining or skirting work. The stone slabs shall be fixed when the backing mortar is still, plastic and before it gets stiff. All the stone slabs shall be covered with an additional layer of neat cement paste and stones shall then be pressed in mortar and gently tapped the wall wooden mallet. The fixing shall be done from the bottom of wall upwards without any hollows in the beds of joints. Each stone slab shall be fixed as close as possible to the adjoining stone slab. The stone slab shall be jointed inneat cement slurry to match the colour of the stones. The joints shall not exceed 1.5 mm in width and they shall be uniform. While fixing the stone slabs in dado I lining or in skirting work, care shall be taken to see that the joints in the adjoining flooring below matches with the joints in the dado / lining or in skirting as the case may be, or shall be staggered as directed. When specified brass cramps and pins etc. of approved size shall also be used for fixing dado / lining.

2.4.3 Polishing: When stone slabs are completely set, polishing shall be done by hand with approved type of polishing stone. A smooth and even polished surface shall be obtained to match the finished surface of the flooring.

2.4.4 Curing: The dado / lining or skirting shall be kept wet for 14 days.

2.4.5 Rates to include

- Apart form others factors mentioned elsewhere in this contract, the rate for the item of dado / lining or skirting shall include for the following :
- Backing mortar.
- Providing and fixing stone slab with exposed edges machine cut including all specials and finishing the edges with plaster.

- Providing and fixing brass cramps and pins etc. for dado / lining where specified.
- Joints of the stone slabs filled with coloured cement slurry to match the stone slabs.
- Curing
- Chiseling, polishing and cleaning the dado / lining and skirting.
- All labour, material, use of tools and equipment for carrying out the items as specified above.

2.4.6 Mode of Measurement

- Dado/lining shall be measured in sqm as provided.

3.0 TIMBER

The moisture content of the timber during manufacture, delivery to site, storage, site working, assembly, installation shall be 10 to 12 percent.
Timber shall be Burma Teak Wood/ Ivory Coast Teak Wood / Champ Wood, / Red mirinti, soft or hardwood and shall be suitable for the purpose for which it is intended. It shall be seasoned or Kiln dried, absolutely free from worm holes, large loose or dead Knots or other defects which would effect strength or usability and shall be flat, straight non-splitting and dressed on all sides. It shall be matched for colours and graining.
Burma Teak Wood/ Ivory Coast Teak Wood / Champ Wood / Red mirinti wherever specified in the drawings / schedule of quantities, it is 1st quality Light Grained of reasonably straight grains, light vein free of Knots and sap.

Fixing:-
The carpentry timber shall be fixed with nails, spikes, bolts screws, hangers, stirrups, anchors, ties or any other accessories which are suitable to develop the full strength of the member to which they are attached, as directed.
Carpentry timber where fixed to solid masonry or concrete shall be secured with expansion bolts or other positive methods of mechanical fastening. MS hold fast grouted in CC block shall be used to hold the door frames.

Timber - Treatment
All timber shall be protected with an organic solvent water repellent wood preservative to give a highly efficient protection against termite, spider, worm, all insects and fungus and rot attach and shall, where exposed, enhance the appearance of the timber. Colour of the product shall be such as to bring out the natural colour of the respective timbers. Fire retardant paint to timber shall be applied as per the recommendations of manufacturer and shall comply with the requirement of ISI / B.S. code and local fire requirements.

3.1 Plywood

Ply board formed of three of more layers of veneer cemented or glued together usually with the grain of adjacent veneers running at right angles to each other. It shall be bonded with BWR Type synthetic resin adhesive.

The veneers for all grades shall be either rotary cut or sliced. The veneer shall be sufficiently smooth to permit even spread of glue. The thickness of all veneers shall be uniform, within

a tolerance of ±5%, corresponding veneers on either side of the center, one shall be of the same thickness of face and core veneers shall be as follows:

a) In 3-ply boards unto 5mm thick the combined thickness of the face veneers shall not exceed twice the thickness of center ply.

b) In a multiply board, the thickness of any veneer shall not be more than thrice the thickness of any other veneer.

c) The sum of the thickness of the veneers of one direction shall approximate to the sum of the thickness of the veneers at right angles to them and not be greater then 1.5 time this sum except for 3-ply as specified in (a).

The thickness of plywood boards shall be specification as under:

Board	**Thickness**
7-Ply 12mm	
	15mm
	15mm
9-Ply 12mm	
	15mm
	16mm
	19mm
11-Ply 19mm	
	22mm
	25mm

3.2 Marine Plywood

Marine plywood shall be as per IS: 710.

3.3 Flush Doors

All flush door shall be solid core as specified. It shall conform to the relevant specifications to IS: 2202 and shall be obtained from ISI approved manufacturers. The finished thickness of the shutter shall be as mentioned in the items. Face veneers shall be of the pattern and colour approved by the Architects and an approved sample shall be deposited with the Architects for reference. The solid core shall be wood laminates prepared from battens of well seasoned and treated good quality wood having straight grains.

3.4 Block Board

Block board is a board having core or strips of wood, each not exceeding 25mm in width, laid separately or glued or otherwise joint to form a slab which is glued between two or more outer veneers with the direction of the grain of the core block running at right angles to that of the adjacent veneers. Block board shall be of grade I exterior grade; which shall have been bonded BWR (Boiling water resistant) type synthetic resin adhesive. Block board – commercial type shall have its faces have commercial veneers.

3.5 MDF (Medium density fiber Board)

For interior works MDF of approved make / manufacturer shall be of only EXTERIOR GRADE as per IS: 12406-1988. It is to be contained that MDF shall be invariably used in place of Ply / Boards. So specified in the specifications of either same thickness or of higher thickness. Wherever feasible the minimum thickness of MDF to be used shall be 8mm wood screw shall be used for MDF and only fully threaded parallel shank screw shall be used after drilling pilot holes. Veneering/lamination to the MDF surface shall be done by exterior grade adhesive only. Poly urethane primers shall be used for sealing the edges and painting the rear side. For specifications of various applications the MANUFACTURER USERS MANUAL shall be followed.

4.0 WOOD WORK

Unless otherwise specified, all timber shall be of the approved quantity, well seasoned free from large or loose knots, cracks or other defects. Timber shall be treated with approved wood preservation before use.

Joinery shall be carried out strictly in accordance with drawings, where joints are not specifically indicated recognized forms of joints shall be used. Joinery shall conform to IS standards. Panels shall be rendered flame retardant and to conform to local fire regulations. The contractor shall submit samples of all materials including samples of veneer for approval. All materials pre-fabricated, delivered and assembled shall in accordance with the approved sample.

These shall confirm to drawings in all details. No unsightly nail marks and screw heads shall be permitted. Plywood grains shall be matched to give a uniform and pleasing appearance. Partitions shall be checked for rigidity of fixing, alignment and plumb and shall be as per relevant item. All peripheral & loose ends of boards shall be covered with 6mm thick T.W. lipping.

The contractor shall be responsible for protecting all items of wood work done by him. The contractor shall replace at his own expense any damaged work caused through lack of adequate protection or care in installation or handling.

The contractor shall be responsible for protecting all items of wood work done by him. The contractor shall replace at his own expense any damaged work caused through lack of adequate protection or care in installation or handling.

Adhesives:-

The adhesives used for all wood work and MDF shall be FEVICOL or approved equivalent of appropriate grade. Manufacturer's recommendations shall be followed for adhesive other than above required for any specified / specialized work.

5.0 FALSE CEILING

5.01 Gypsum Board False Ceiling

5.01.01 Products

A Manufacturer: Indian Gypsum Ltd. or approved equivalent, for gypsum board and all accessories, suspension systems, finishing coats etc.

5.01.02 Gypsum Board

A General: Provide gypsum board of types indicated in maximum lengths available to minimize end to end joints.

B. Thickness: Gypsum board in thickness indicated, in 12.5mm thickness to comply with ASTMC 840 for application system and support spacing indicated.

5.01.03 Trim Accessories

A **Corner bead and Edge Trim for Interior Installation:** G.I. corner beads, edge trim and control joints which comply with ASTM C 1047 to be provided as per requirement and drawings.

5.01.04 Gypsum Board Joint treatment Materials

A General: Materials complying with ASTM C 475, ASTM C 840 and recommendations of manufacturer or both gypsum board and joint treatment materials for the application indicated.

B Joint Tape: Paper reinforcing tape.

C Setting Type Joint Compounds: Factory – Pre-packaged, job-mixed, chemical hardening powder products formulated for uses indicated.

5.01.05 Execution

5.01.06 Installation of G.I. Steel Framing

a. Hangers to be secured to structural support by connecting directly to structure where possible, otherwise to be connected to cast-in concrete inserts or other anchorage devices fasteners as required.

b. Hangers are not to be connected or suspended from steel framing from ducts, pipes or conduits.

c. To keep hangers and braces 50mm clear of ducts, pipes and conduits.

d. To install suspended steel framing components in size and at spacing indicated but not less than that required by referenced steel framing installation standard.

e. Installation Tolerances: To install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within 3mm in 4M as measured both lengthwise on each member and transversely between parallel members.

f. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
g. Grid Suspension System: Perimeter wall track or angle not to touch where grid suspension system meets vertical surfaces, suspended from structure above. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track. Wall track to be free moving from vertical wall surfaces.

h. For exterior soffits to provide cross-bracing and additional framing indicated or required to resist wind uplift.

i. For isolated ceilings to hold perimeter 12mm away from adjacent partitions to prevent flanking. The openings are to be sealed with compressible weather strip type edge seal to allow vertical movement.

5.01.07 Application and finishing of Gypsum Board, General

a. Gypsum Board Application and Finishing Standard: shall be to comply with ASTM C 840.

b. To install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.

c. To locate exposed end-butt joints as far from centre of walls and ceilings as possible, and stagger not less than 600mm in alternate courses of board.

d. To install ceiling boards across taming in the manner which minimize the number of end-butt joints, and which avoids end joints central area of each ceiling. Stagger end joints at least 600mm.

e. To attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

5.02 TECHZONE FALSE CEILING

ACOUSTICAL CEILING TILE OF SIZE 600x1200 - Providing and fixing of Techzone Suspended ceiling system with sand textured mineral fiber tiles 16mm thick with 15mm exposed grid system (NRC 0.5)

5.02.1 SCOPE

This specification covers the design, supply of material. Manufacture and installation of DUNE RH 99 of approved for fire rating and sound absorption from NVLAP & EXOVA a third party certified company respectively.

5.02.2 GENERAL

The Contractor shall furnish all materials, labour, operations, equipment's ,tools & scaffolding and incidents necessary and required for the completion of all metal working connection with Sand Texture Mineral Fiber Tile, as called in the drawings, specifications and bill of quantities which is applicable to the items of work concerned. The supply and installation of additional fastenings, accessory features and other items not specifically mentioned but which are necessary to make a complete functioning installation shall form a part of this contract. All work shall be free from defects, impairing strength, durability and appearance and shall be of the best quality for purposes specified made with structural properties to withstand safety strains, stresses to which they shall be subjected to. All fittings shall be of high quality and as specified and as per approval. The contractor shall strictly follow, at all stages of work, the stipulation contained in the Indian Standard Safety Code or its Equivalent and the provision of the safety code and the provision of the safety code and the provision of the safety rules as specified in the General Conditions of the for ensuring safety of men and material.

The Techzone ceiling system has a ceiling module of 1200x1350 and the on centre spacing between two adjacent technical zones is 1350 mm. The Techzone orientation is such that the main runners run parallel to the technical zone and hence making this layout compatible with continuous lighting fixtures or Air diffusers. Field panel is of size 600x1200x16mm. The 150mm wide technical zone formed is where the technical elements like lighting fixtures & air diffusers would be installed. Where there are no technical elements the technical zone would be covered by using mineral fiber tile Technical Panels of size 1200mm x150mm in conjunction with a special 150mm long cross tee. The ceiling panels should have Humidity Resistance (RH) of 99, NRC 0.5, Light Reflectance ≥85%, Thermal Conductivity k = 0.052 - 0.057 w/m K, Colour White, Fire Performance UK Class 0 / Class 1 (BS 476 pt - 6 &7), suitable for Green Building application, with Recycled content of 32%. The panels shall be laid on 15 mm wide T - section flanges with 38mm web height, colour white having rotary stitching on all T sections i.e. the Main Runner & 1200 mm Cross Tees with a web height of 38mm. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of minimum 100 KGs and need to be installed with suspension system.

5.02.3 INSTALLATION

Technical zones to be formed by using 2 main runners which run parallel to each other at a distance of 150mm and thus forming a Technical zone of 150mm. The centre on spacing between two adjacent technical zones to be 1350mm. Thus we get a module of 1200x1350mm where 1350 is the on centre spacing between the adjacent technical zones. To lay the field panel of size 600x1200mm, flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre. The technical zone where there are no technical elements can be covered using the technical panels of size 1200mm x 150mm. These technical panels to be laid in the technical zone using a special 150mm long cross tee interlocked at every 1200mm in the technical zone. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centres. Installation to be carried out by Trained Installation team & Installation should be carried out as per Manufacturer's recommended procedure.

5.02.4 SUSPENSION SYSTEM

Accessories consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanised steel of size 26 x 26 x 25 x 1.2mm with a Galvanised Thickness of 80gsm, A pre Straightened

Hanger wire of dia – 2.5 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanised spring steel for 2.5 mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

5.03. MINERAL FIBRE TILES FALSE CEILING

The mineral fiber tiles / rockwool shall be procured from an approved manufacturer as per the list of Approved makes.

The tiles and the suspension system shall be as specified in the item nomenclature. The Contractor shall prepare the shop drawings for the False Ceiling based on actual measurements at site and based on the architectural drawings, clearly indicating the typical panel as well as edge panel on all sides with details to adjust the minor variations in orthogonally. Also, junction details with different types of false ceiling materials shall be prepared and submitted for the approval of the Engineer-in-Charge before execution.

The installation shall be got done through a Reputed Interior Contractor who shall be engaged by the Contractor. The details of earlier works executed by the Interior Contractor shall be submitted to the Engineer-in-Charge in advance. If required, those works shall be inspected to assess the Quality of workmanship. The false ceiling shall be perfectly level after installation. The Contractor shall then prepare the mock-up at site for approval of material and quality of workmanship by the Engineer-in-Charge. Only after the approval of Mock-up, the Contractor shall start the mass work.

The mineral fiber tiles shall be of size 600x600mm or 1200x600mm as required as per the architectural drawings and as per the site requirements and shall be the texture and physical & other characteristics as specified in BOQ. The tiles shall have sound absorption, sound attenuation, humidity resistance, impact resistance and fire resistance as specified as per the manufacturer's specifications. The thickness of the tiles shall not be less than 15mm. The tiles shall have light reflectance, thermal conductivity, Relative Humidity and sound absorption (Noise Reduction Co-efficient) with sound attenuation as per the item description. The weight shall not be less than 3.5 kg per sqm without grid. The contractor shall obtain and submit to the SAU the manufacturer's certificate for compliance of the mineral fiber tiles & the suspension system as per the manufacturer's specifications and also copy of the manufacturer's test report for the record.

The tiles shall be made of non -combustible bio-soluble wool and shall have finely granulated surface texture with virtually invisible micro-perforations as specified & as required for its performance. It shall meet the various performance parameters like aesthetics, acoustics (sound absorption), hygiene, humidity resistance, impact resistance, fire resistance, durability etc.

The tiles shall have precisely machined edges including edge treatment required for the installation depending on the type of suspension system grid and manufacture as approved by the Engineer-in-Charge and as per the architectural drawings. The openings of required size for light fittings, fire detection devices, sprinklers, AC diffusers etc. shall be suitably made in the tiles by cutting in an approved and workmanlike manner. For the purpose of

measurement, no deduction shall be made in the area of false ceiling on this account. Also, nothing extra shall be payable on this account. The end tiles shall be cut to the required size in a workmanlike manner as per the site requirement. Nothing extra shall be payable on account of any wastage in the material and /or account of providing grid at closer spacing than 600mm c/c.

These tiles shall be fixed on to coordinated suspension ceiling system with supporting grids system that fully integrates with the ceiling tiles. It shall be ensured that the suspension system shall be suitable to take all the incidental and dead loads and other authorized loads efficiently and shall not sag. The permissible sag shall be as per the British Standards BS 8290 - 1991. The Contractor shall provide a guarantee for 10 years against sag on account of defective material and / or workmanship.

The contractor shall ensure that the grid system is designed and installed to carry all incidental loads and no other unauthorized load shall be transferred to this system. The luminaries, air grills / diffusers, signages etc. shall be as far as possible independently supported to avoid any over loading of the ceiling system which may result in excessive deflection or twisting of grids. Any strengthening of grid system by providing additional hangers, fasteners, runners, cross tees etc. or providing additional bracing may be carried out as required for any specific locations or for specific purpose for which nothing extra shall be payable. Perimeter trims / edge profiles of required size and shape, powder/coil coated to required colour and shade, shall be installed at the suspension grid perimeter to completely enclose the ceiling and shall be properly secured to the walls at not more than 450 mm centre to centre using stainless steel screws and PVC sleeves. It shall be neatly jointed at all external and internal angles and over lap sections in a workman like manner with mitred joints.

The ceiling should be set out such that the perimeter boards or tiles are in excess of half a module so that the edge panels on both the sides are of equal sizes as far as possible. The tiles shall be cut to required size and shape with rebates as specified using hand tools or mechanically operated tools in a workman like manner but with all precautions as per the manufacturer's specifications regarding generation of dust and ventilation.

The entire installation shall have minimum half an hour fire rating and integrity as specified as per BS 476

The contractor shall ensure that the material is procured and delivered at installation site without any damage. Adequate care shall be taken before installation as well as afterwards till handing over the building for occupation. It shall be protected from rains, excessive humidity, chemical fumes, vibrations, dust etc. The contractor shall ensure careful handling and storage and prevent any rough handling, rolling of cartons or dropping cartons to prevent any edge damage or breakage. Any tile with edge damaged or crack etc. shall not be allowed to be used in the work and shall be replaced by the contractor at his own cost. Similarly, adequate care shall be taken by the contractor while placing or removing and handling the tiles so as not to cause any damage. Also, the contractor shall direct his interior contractors to take adequate precautions to prevent

the tiles from any dirt, fingerprints, any other marks / splashes etc. The ceiling shall not be wet cleaned. Abrasive cleaners shall not be used to clean the marks.

The rate for the item of false ceiling includes cost of all inputs of labour, materials, wastage if any, T & P, scaffolding, staging or any other temporary enabling structure / services etc. and all other incidental charges including making necessary cut outs for AC diffusers, Light fittings, grills, Fire detection, alarm, sprinklers devices and fittings etc. No deduction in the area shall be made for openings nor anything extra shall be payable for making the openings. Also nothing extra shall be payable on account of any wastage in materials. Also nothing extra shall be payable on account of any strengthening of the supporting suspension system for the false ceiling, around the openings in the false ceiling by using additional hangers, fasteners, runners, cross tees, etc.. However, for the purpose of payment only the actual area of the false ceiling shall be measured in sq.m.

The Tile & Grid system used together of all sizes should carry a 15 year warranty

6.0 GLASS AND GLAZING

6.1 Extent and Intent

- The contractor shall furnish all materials, labour, tools, appliances, equipment and incidentals required to complete the installation of all glass and related items.

6.2 General

- All glass shall be of the type, quality and substance specified. All glass shall be first class in every respect shall confirm to IS : 1761-1960. The glass shall be reasonably free from blisters, stains scratches and bubbles so as not to disturb the visibility through the glass.

6.3 Glass Sizes

- The contractor shall cut glass sizes by field measurements or dimensionally approved shop drawings. The responsibility for correct glass sizes shall rest with the contractor. No cracked, chipped or disfigured glass shall be accepted.

6.4 Glass Breakage

- The contractor shall replace all broken, damaged and disfigured glass caused in executing the work or by faulty installation, before acceptance of the building, without cost to the owner:

6.5 Materials

- Glass for all glazing work shall be float glass as called for in the drawings and schedules. Glass for windows shall be of specified thickness and as approved by the Architect.

6.6 Tinted / Toughened Glass

- The tinting / toughening of the glass, where called for shall be carried out to the best standards available.

6.7 Glazing Compound

- Glazing putty for setting glass shall be of approved quality (Shalimar or approved equivalent) able for use of metal / wooden windows and confirming to 1S: 420-19123. Setting shall be done with best quality EPDM gaskets.

6.8 Preparation of frames and glass

- Before installation the contractor shall ensure that :
- All glazing rebates are square, plumb and true in plane, clear, dry and dust free;
- All frame adjustments are made prior to glazing;
- All glass edges, are clear cut to exact sizes, allowing expansion tolerance as recommended by the glass manufacturer;
- All sashes shall be glazed in the closed position and shall not be opened until the compound is set:
- All materials are used in strict accordance with the manufacturer's instructions.
- Glass shall not be forced into place;

6.9 Installation

- The glass shall be set on neoprene or EPDM glazing blocks on all sides (at least two per side) as directed. Glass shall be bedded back and face glazed and so installed as to achieve a completely water tight and rattle-free installation. The obscure glass where called for shall be set with smooth surface outside.

6.10 Completion

- Upon the completion of the work all glass shall be thoroughly cleaned, paint or other marks removed. Any cracked, scratched, chipped or other defective glass shall be removed and replaced without cost to owner. Any loose glass shall be set to the satisfaction of the Architect.

6.11 Rate

- Rate for glazing shall be measured under relevant item of door / windows shutter as covered in the respective items.

7.0 FINISHING

This specification covers painting, white washing, polishing, wall painting of interior surfaces of masonry, concrete, plastering, plaster of paris, false ceiling structural and other miscellaneous steel items, as shown on drawings or as directed by the Engineer-in-charge.

If surface to be finished cannot be put in suitable condition for painting by customary preparatory methods, the contractor shall notify the Engineer-in-charge in writing or assume responsibility for and rectify and unsatisfactory finishing that results.

Before commencing painting, finishing, the contractor shall obtain the approval of the Engineer-in-charge in writing regarding the scheduling of work to minimize damage, disfiguration or staining by other trades. He shall also undertake normal precautions to prevent damage, disfiguration or staining to work of other trades or other installations.

8.0 P.O.P PUNNING.

8.1.1 General

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

8.1.2 Preparation of surface

- Projection 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 pock marked with pointed tool, at spacing of not more than 4 centres and depth of pocks to be approx. 3 mm deep. This is to ensure a proper key for the plaster. The surface shall be cleaned of all oil and grease marks etc.

8.1.3 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 IS sieve designation 3.35mm for 5 minutes, after drying the residue left on it shall be not more than 1% by weight. It shall not be too quick setting. Initial setting time shall not be less than 13 minutes.

8.1.4 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 steels 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 surface shall be smooth and true to plane, slopes or curves as required.

8.2 PAINTING WORK

- The contractor shall supply all materials, labour, tools, labours, scaffolding and other equipment 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 schedule of finishes or elsewhere. The painting shall

be carried out by a specialist sub-contractor, approved by the Architect. Care is to be taken that all surfaces to be painted are thoroughly cleaned and dry.

8.2.1 Storage

- Storage of materials to be used on the job shall be only in a single, place approved by the Architect. Such storage place, shall not be located within any of the buildings included in the contract.

8.2.2 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, colour of paint and instructions for reducing. Thinning shall be done only in accordance with directions. Remove rejected materials immediately from the premises.

8.2.3 Colour

- All colours, as provided in the colour schedule, shall be approved by the Architect. The contractor shall mix manufacturer's colours as per 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 the colour samples.

8.2.4 Commencement of work

- Painting shall not be started until the surfaces to be painted are in a condition fit receiving painting and so certified by the Architect.

- Painting work shall be taken in hand only after all other contractor's work is completed. Building where painting work is to be commenced shall be thoroughly swept and cleaned up before commencement of painting.

8.2.5 Scaffolding

- Only double scaffolding having two sets of vertical supports shall be provided for all painting work. The supports shall be tied together with horizontal pieces over which the scaffolding planks shall be fixed.

- All the vertical and horizontal members of the scaffolding shall be placed sufficiently away from the surfaces to be painted to ensure proper and uninterrupted application.

8.2.6 Workmanship

- The workmanship shall be of the very best, all materials evenly spread and smoothly flowed using good quality tools, brushes, etc., as required. Only skilled painters shall be employed.

A properly qualified foreman shall be constantly on the job whilst the work is proceeding. All surfaces to be painted shall be cleaned free of all loose dirt and dust before painting is started. All work where a coat of paint or primer has been applied must be inspected and approved before application of the succeeding specified coat. Each undercoat shall be distinct shade of the approved colour. The painted surface shall present uniform appearance and glossy finish, from steaks, blisters etc.

- Before painting, remove hardware, accessories, plates and similar items or provide suitable protection to all such items. Upon completion of each space, replace all fixtures removed. Remove doors if necessary to paint bottom edge. Use only skilled mechanics for the removal and replacement of above items.

8.2.7 Concealed Surfaces

- All interior and exterior trim, door frames, doors, shelving, cabinet work shall be thoroughly and carefully back painted as all surfaces and edges which will be concealed when installed. Such surface shall be clean, dry, sanded and properly prepared to receive the paint. Tops, bottom and edges of doors shall be finished same as the rest of the door.

8.2.8 Protect and Clean

- Contractor shall protect not only his own work at all times, but shall also protect all adjacent work and materials by suitable covering during progress of his work. Upon completion of his work, he shall remove all paint and varnish spots from floors, glass and other, surfaces. Any defaced surfaces shall be cleaned and the original finish restored. He shall remove from the premises all rubbish and accumulated material and shall leave the work in clean, orderly and acceptable conditions.

8.2.9 Preparation of surfaces

- **Wood:** Sand paper to smooth even surface and then dust off and wipe clean, touch up all knots and pit pockets with shellac on interior wood and shall be covered with a preparation of red lead and glass laid on while hot on exterior work. After priming coat has been applied thoroughly fill all nail holes, irregularities and cracks. Use plaster wood filler for stained or natural finish and putty glazier putty or wood for painted work.

- **Plaster Work**: Fill all holes, cracks and abrasions with plaster of Paris, properly prepared and applied and smoothed off to match adjoining surfaces. Do not use sand paper on plaster surface. Plaster shall be allowed to dry for at least 12 (twelve) weeks before the application of paint.

- **Steel and Iron**: All surfaces shall be washed with mineral spirits to remove any dirt or grease before applying paint. Where rust or scale is present, it shall be wire brushed and sand papered clean. All cleaned surfaces shall be given one coat of approved phosphate before prime coat in accordance with the manufacturer's instructions. Shop coats of paint that have become marred shall be cleaned off, wire brushed, and spot primed over the affected areas.

- **Galvanize Metal**: Galvanised metal, when new, shall be thoroughly cleaned with naphtha and treated with a mordane solution prepared by mixing 38 gms of copper acetate in a litre of soft water or 39 gms, 13 gmslach of copper nitrate ammonium chloride in a litre of soft water, prepared in a wooden container and applied with a brush. Allow to dry thoroughly and brush off before applying paint.

8.2.10 Application

- The paint shall be continuously stirred in the container so that its consistency is kept uniform through out.

- The painting shall be laid on evenly and smoothly by means of crossing and laying off, the latter in the direction of the grain of wood. The crossing and laying off consists of covering the area with paint, brushing the surface hard for the first time and then brushing alternatively in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process no brush marks shall be left after the laying -off is finished. The full process of crossing and laying off will constitute one coat.

- Where so stipulated, the painting shall be carried out using spray machines suited for the nature and location of the work to be carried out. Only skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner. Spraying shall be carried out only in dry conditions. No exterior painting shall be done in damp foggy or rainy weather. Surface to be painted shall be clean, dry, smooth, and adequately protected from dampness. Each coat shall be applied in sufficient quantity to obtain complete coverage, shall be well brushed and evenly worked out over the entire surface and into all comers, angles and crevices allowed to thoroughly dry. Second coat shall be of suitable shade to match final colour, and shall be approved by the Architect before final coat is started. Allow at least 48 hours drying time between coats for interior and 7 days for exterior work, and if in the judgment of the Architect more time is required it shall be allowed. Finished surfaces shall be protected from dampness and dust until completely dry. Finished work shall be uniform, of approved colour, smooth and free from runs, sags, defective brushing and clogging. Make edges of paints adjoining other materials of colours sharp and clean, without overlapping.

- In order to achieve a superior finished surface, putty paste fillers shall be used on all surfaces to be painted, to fill pores, dents, etc. The putty/paste fillers shall be of approved quality and manufacture and shall be applied to the surface with a knife or other sharp edged tools after the priming coat as well as after each undercoat. The surface, after filling with putty/Pasteur filler, shall be rubbed down with fine sand paper and dusted off before the application of the subsequent coat.

- Paste wood filler when set shall be wiped across the grains of the wood and then with the grain to secure a clean surface. Surface to be stained shall be covered with a uniform coat of stain wiped off if required.

- **Finish:** The painted surfaces shall present uniform appearance and semi-gloss finish free from strakes, blisters etc.

8.3 TYPES OF PAINT FINISHES

8.3.1 Enamel Paint

- Wood or Plastered surfaces: Pigmented priming coat followed by one undercoat and two more finished coats of enamel paint. Paste filler to be applied after every coat excepting the final finishing coat and sanded.
- Non-Galvanized Steel Surfaces: Coat of zinc chromate oxide primer after phosphate followed by the three or more coats of synthetic enamel paint. Paste filler to be applied after coat excepting final finishing coat and sanded.
- Galvanized Steel Surfaces : Priming coat of galvanised metal primer after washing with galvanized metal cleaner, followed by three by three or more coats of synthetic enamel paint. Paste filler to be applied after every coat excepting final finishing coat and sanded.

8.3.2 Plastic Emulsion Paint

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

8.3.3 Oil Bound Distemper

- Pigmented primer (cement primer) coat followed by three of more finishing coats of oil bound distemper. Paste filler to be applied after every coat excepting the final finishing coat and sanded.

8.3.4 Textured paint

- The textured finish to external surfaces of walls as per manufacturer's specification and approved by the Project Manager including scaffolding etc. complete.

8.3.5 Polishing New Surface

(a) Preparation of surface

The surface shall be cleaned. All unevenness shall be rubbed down smooth with sand paper and well dusted. Knots if visible shall be covered with a preparation of red lead and glue size laid on while hot. Holes and indentations on the surface shall be stopped with glazier's putty. The surface shall then be given a coat of wood filler made by mixing whiting (ground chalk) in methylated spirit at the rate of 1.5kg of whiting per litre of spirit. The surface shall again be rubbed down perfectly smooth with glass paper and wiped clean.

(b) Application

The number of coats of polish to be applied to achieve the desired shade / finish. A pad of woolen cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with the polish and rubbed hard on the wood, in a series of overlapping circles applying the mixture sparingly but uniformly over the entire area to given an even

level surface. A trace of linseed oil on the face of the pad facilitates this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cotton cloth slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

8.3.6 Melamine Polish

Timber works shall be finished by the application of two coats and catalyzed clear lacquer (melamine) wherever it is indicated in the drawing/specified. The finish shall be a stain semi-gloss finish and shall be carried out as follows:-

The base shall be sand papered to the desired finish and coated with a colour tings to give it shade. This shade shall be sealed with a coat of spirit finish.

After the base, first coat of melamine shall be applied evenly by spray to give as even coat to the veneer surface.

After the first coat has fully dried, the surface shall be rubbed down in the direction of the veneer grain with very fine glass paper and left completely smooth and clean before the second coat is applied.

When the second coat of melamine is fully dry, the surface shall be rubbed down in the direction of veneer grain with very wire dipped in a petroleum based wax to give lubrication.

Twenty four hours after completion of this process the melamined veneer surface shall be finished by burnishing a soft cloth to an approved finish.

8.3.7 WAX POLISHING

- Wax polishing shall be done with ready made wax polish of approved brand and manufacture.

- **Preparation of Surface:** The surface to be polished shall have been finished smooth. Knots, crakes and holes on the surface shall be cleaned and filled with wood putty (fine saw dust mixed with bees wax). The fillings 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 sand papers 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 in such a way that 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 continuous 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.

LIST OF THE IS CODES

Following are some of the Indian standard relevant to Interior works:

INDIAN STANDARD	SUBJECT
4082-1967	Recommendation on staking & storage of contraction material at site.
1121-1974	Methods for determination of compressive, transverse and shear strengths of natural building stones.
1122-1974	Method for determination of specific gravity and porosity of natural building stone.
1125-1974	Method of test for water absorption of natural building stone.
1126-1974	Method of test for durability of natural building stone.
1130-1969	Marble (blocks, slabs and tiles)
287-1973	Recommendation for maximum permissible moisture content of timber used for deferent purposes Plywood for general purpose
451-1972	Technical supply condition for wood screws
452-1973	Double acting spring hinges
723-1972	Steel counter sunk head wire nails
848	Synthetic resin adhesive for plywood (Phonetic & amino plastic)
1003	Timber paneled and glazed shutters
1003(pt. I)	Door Shutters
1003(pt. II)	Window and ventilators shutters
1141	Code of practice for seasoning of timber
1200	Method of measurement of building and Civil Engineering works
1200 (pt. XI)	Glazing
1200 (pt. XI)	Wood work and joinery
1328	Veneered decorative plywood
1659	Block boards
1761	Transparent sheet glass for glazing and Framing purpose Floor door stoppers
1911	Schedule of unit weight of building material
2191 (pt. II)	ply wood face panels
2202 (pt. I)	Wooden flush door shutters (Solid core type) plywood face panels for wooden flush door shutters
2202 (pt. II)	Particle board face panels for wooden flush door shutters
3087	Wood particle board (medium density) for general purpose
3564	Door closer (Hydraulic regulate)
4042	Timber door, window and ventilator Frames
4022	Varnish, gold size
1122	Method for determination of specific Gravity and porosity of natural building Stones
1123	Method of test for water absorption of natural building stone

1197	Marble (block, slabs and tiles)
1200(Pt. XI)	Method of measurement of paving and Floor finishes 1443 Code of practice for laying and finishing of cement concrete flooring
1661	Code of practice for application of cement and cement
5389	Code of practice for laying of hard wood –parquet and wood block floors
75	Linseed oil, raw refined
102	Ready mixed paint, brushing, red, lead, non-setting, and priming
103	Ready mixed paint, brushing, white lead, for priming and general purposes
104	specification for ready mixed paint, brushing , zinc chrome , priming
133	Enamel, interior (a) under coating (b) finishing colure as required
137	Ready mixed paint , brushing , matt or egg shell flat, finishing , interior, to Indian standard colour, as required
208	Creosote and anthracene oil for use as wood preservatives
335	varnish, finishing interior
338	varnish, under coating exterior , natural resin
339	varnish, under coating exterior synthetic resin
340	varnish, mixing
348	French polish
427	Distemper, dry ,colour as required
428	Distemper , oil emulsion , colour as required
524	Varnish, finishing , interior, synthetic
525	Varnish , finishing , exterior and general purpose
533	Gum spirit of turpentine (oil of turpentine)
1200 (Pt. XII)	Method of measurements of plastering and pointing
1200 (Pt. XIII)	Method of measurements of white washing colour washing, distempering
1200 (Pt. XV)	Method of measurements of painting
5411(Pt. I)	Plastic emulsion paint for interior use
6278	Code of practice for white washing &colour washing
1200 (Pt. XVIII)	Method of measurements of demolition and dismantling
3696 (Pt. I)	Safety code of scaffolds
3696 (Pt. II)	Safety code for ladders
7293	Working with construction machinery safety code for distemper, oil Emulsion colour as required
427	Distemper , oil emulsion , colour as required
1477 (Pt. I&II)	code of practice for painting of ferrous material in buildings
157	Ready mixed paint, brushing , acid and alkali resistant lead free for general purpose to Indian standard colors no.446 red oxide , no.537 Bingal red , no.632 dared admiralty grey and black and other colors as required

162	Ready mixed paint, brushing, fire-resisting silicate type for use one wood color as required
2932	Enamel, exterior (a) under coating (b) finishing
5807 (Pt. I& II)	Method of test for clear finishing for wooden furniture
2338	code of practice for finishing of wood and wood based material (part-I)
710	Marine ply wood
1761	Transparent sheet glass for glazing and framing purpose
3548	code of practice for glazing in buildings
2441	code of practice for fixing ceiling coverings
4130	Safety code for demolition of buildings
7293	Safety code for working with construction machinery
12823:1990	Pre-laminated wood particle board

NOTE:

Only latest editions as on date of bid opening of above referred codes shall be followed

One copy each of the code mentioned above shall be kept at site for ready Reference of engineer –in –charge.

LIST OF APPROVED MAKES - INTERIOR WORKS

	NOTE :
1.	The Contractor shall obtain prior approval from the Engineer-in charge before placing order for any specific material or engaging any of the specialized agencies. The Contractor shall make a detailed submittal with catalogues and highlighted proposed specifications, as well as full details of the works executed by the specialized agency, as specified.
2.	Wherever applicable, the Engineer-in-charge may approve any material equivalent to that specified in the tender subject to proof being offered by the Contractor for equivalence to his satisfaction.
3.	Unless otherwise specified, the brand/make of the material as specified in the nomenclature, in the particular specifications and in the list of approved materials attached in the tender, shall be used in the work

In case of non availability of the brand specified in the contract the Contractor shall be allowed to use alternate equivalent brand of the material subject to submission of documentary evidence of non-availability of the specified brand. The necessary cost adjustments on account of above change shall be made for the material.

A. MATERIALS

SL.NO	**MATERIALS**	**APPROVED MAKE**
1.	Ceramic Tiles	Kajaria / H &R. Johnson / Nitco / Somany
2.	Vitrified Tiles	H & R Johnson / Kajaria / Nitco / Rak Ceramics / Restile
3.	Glass Mosaic Tiles	Palladio Glass Ltd. / Colorato-Paveit Ceramics / Occan
4.	Polymer Modified Cementitious Grout	Bal Endura / Webber / Laticrete / Latypoxy / Ardex
5.	Commercial Board	Green / Duro / Merino / Century / Legend
6.	Commercial Plywood	Green / Duro / Merino / Century / Legend
7.	BWP Plywood	Green / Duro / Merino / Century / Legend
8.	Natural Wood Veneers	Sonear / Green Ply / Truwood / Mayur / Archid / Legend
9.	Water Based Melamine Polish	Asian Paints / Pidilite Industries / ICI Dulux
10.	Anti-Static High Pressure Laminate	Formica / Greenlam / Decolam / Merino
11.	Stainless Steel &Glass Railing System	Dorma / Q Railing / Sadev
12.	Dash Fasteners	Hilti / Fischer / Bosch / Cannon
13.	All Types Of Glass	AIS / St. Gobain / Modiguard / Pilkington

14.	Epoxy Primer and Paints	ICI / Nerolac / Asian Paints
15.	Drywall Systems	St.Gobain Gyproc / USG Boral / India Gypsum
16.	Laminated Floor	Kronotex / PERGO / Xylos
17.	All Hardware	Dorma / Hafele / Geze
18.	Stud Anchors Chemicals & Mechanical Anchors	Hilti / Fischer / Bosch / Cannon
19.	Anchor Fasteners	Hilti / Fischer / Bosch / Cannon
20.	Tile and Stone Adhesive	Laticrete / Ferrouscrete / Bal Endura
21.	Lacquered Glass,	Saint Gobain / Glaverbel / Modiguard
22.	Weather Silicon Sealant	Wacker / Dow Corning / Mccoy / Soudal
23.	Stainless Steel Door Handles, Locks	Dorma / Hafele / Geze
24.	Mineral Fibre False Ceiling	Armstrong / USG Boral / Decosonic /AMF
24.	Gypsum Ceiling	Saint Gobain Gyprock / USG Boral / India Gypsum
25.	Moisture Resistant Gypboard	St. Gobain Gyproc / USG Boral / IndiaGypsum
26.	Toilet Cubicles	Merino / Trespa / Century
27.	PVC Doors And Windows	Veka / Kommerling / Deceuninck
28.	Carpet Flooring	Interface / Modulas
29.	Aluminium and Glass Partitioning system	Dorma Kaba / BENE / JEB
30.	Office Furniture	HNI/Steelcase/Hayworth

TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORK

1 INTERNAL WIRING

2 SWITCHES, RECEPTACLES (MODULAR)

3 1.1 kV GRADE CABLES AND CABLE TRAYS

4 CABLING FOR VOICE SYSTEM

5 CABLING FOR DATA SYSTEM

6 LIST OF APPROVED MAKES FOR ELECTRICAL WORK

INTERNAL WIRING

A. INTERNAL WIRING

The internal wiring shall be as per latest CPWD norms.

1. System of Wiring

The system of wiring shall consist of PVC insulated copper stranded conductor flexible FRLS wires in metallic conduits in exposed and FRLS PVC conduit shall be used in concealed above false ceiling or as called for.

2. General

Prior to laying and fixing of conduits, the contractor shall mark the conduit route, carefully examine the working drawings prepared by him and approved by the Consultant indicating the layout, satisfy himself about the non interference in the route, sufficiency of number and sizes of conduits, location of junction boxes, sizes and location of switch boxes and other relevant details. Any discrepancy found shall be brought to the notice of the Owner's site representative. Any modifications suggested by the contractor should get written approval before the actual laying of conduits is commenced.

In laying of conduits it is important that not more than two right angle bends are provided for each circuit without a pull box. No junction box shall be provided in the entire length of conduit run for drawing of wires. Only switch outlets, lighting fixture outlets, equipment power outlets and socket outlets shall be considered for drawing of wires.

3. Metal Conduits & Accessories

3.1 Conduits

Conduits and Accessories shall conform to latest edition of Indian Standards IS-9537 part 1 &2. 16/14 (16 gauge upto 32 & 14 gauge above 32 mm) gauge screwed GI or MS conduits as specified on BOQ shall be used. Joints between conduits and accessories shall be securely made by standard accessories, as per IS-2667, IS-3837 and IS-5133 to ensure earth continuity. All conduit accessories shall be threaded type only.

Only approved make of conduits and accessories shall be used.

Conduits shall be delivered to the site of construction in original bundles and each length of conduit shall bear the label of the manufacturer.

3.2 JOINTS

All jointing shall be subject to the approval of the Owner's site representative. The threads and sockets shall be free from grease and oil. End termination of conduit on GI boxes shall be by means of hexagon check nuts & spring washer on both sides of the conduit. The joints in conduits shall be free of burrs to avoid damage to insulation of conductors while pulling them through the conduits.

3.3 FLEXIBLE CONDUITS

Flexible conduits shall be made of heavy gauge MS strip galvanized after making the spiral. Both edges of the strip shall have interlocking to avoid opening up. Flexible conduit shall be heat resistant, lead coated steel, water leak, fire and rust proof. The flexible conduit shall be heat resistant on continuous temperature up to 150 deg. C and intermittent temperature up to 200 deg. C. The flexible conduit shall be corrosion resistant as per IS-3480 & BS-731.

4. PVC Conduit and Accessories

PVC Conduit
Conduits and accessories shall conform to latest edition of IS-9537 part 3 and shall be heavy duty wall thickness of 2.0 mm rigid tubes which are unscrewed without coupling and with plain ends. All conduits used shall not be less than 20 mm diameter.

PVC Conduit Accessories
Accessories used for conduit shall be of an approved make complying to relevant IS code.

All accessories used shall be of standard white or black colour, identical to conduit used.

Plain conduits shall be jointed by slip type of couplers with manufacturer's standard sealing cement.

All conduit entries to outlet boxes, trunking and switchgear are to be made with adaptors female thread and screwed male bushes.

PVC-switch and socket boxes with round knockouts are to be used. The colour of these boxes and the conduits shall be the same.

Standard PVC circular junction boxes are to be used with conduits for intersection, Tee-junction, angle-junction and terminal. For the drawing-in of cables, standard circular through boxes shall be used.

Samples of accessories shall be submitted for approval prior to installation.

All jointing of PVC conduits shall be by means of adhesive jointing. Adequate expansion joints shall be allowed to take up the expansion of PVC conduits.

Please follow CPWD norms for the following heads

a. Bends in Conduit
b. Fixing of Conduits
c. Switch outlets and Junction Boxes
d. Inspection Boxes

5. Fish Wire

To facilitate subsequent drawing of wires in the conduit, GI fish wires of 2.0 mm (14 SWG) shall be provided along with the laying of recessed conduit.

6. Conductors

All PVC insulated copper conductor flexible FRLS wires shall conform in all respects to Standards as listed under sub-head Regulations and Standards and shall be IS approved and ISI marked.

7. Bunching of Wires

8. Drawing Conductors

The drawing and jointing of PVC insulated copper conductor wires shall be executed with due regard to the following precautions. While drawing wires through conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends. Wire reel stands to be used for pulling of wires to avoid kinks. Care shall be exercised while drawing the wires from reels, by taking appropriate measures to ensure that wires are not spread on ground, causing dust and dirt accumulation on the new wires. Maximum permissible numbers of 1100 volt grade FRLS insulated wires that may be drawn into metallic Conduits are given below:

Size of wires Nominal Cross	**Maximum number of wires within conduit size(mm)**				
section Area (Sq. mm.)	**20**	**25**	**32**	**40**	**50**
1.5	5	10	14	--	--
2.5	5	8	12	--	--
4	3	7	10	--	--
6	2	5	8	--	--
10	--	3	5	6	--
16	--	2	3	6	6

Maximum permissible number of 1100 volt grade PVC insulated wires that may be drawn into rigid non metallic conduits are given below:

Size of wires Nominal Cross	**Maximum number of wires within conduit size(mm)**				
section Area (Sq. mm.)	**20**	**25**	**32**	**40**	**50**
1.5	7	12	16	--	--
2.5	5	10	14	--	--
4	4	8	12	--	--
6	3	6	8	--	--
10	--	4	5	6	--
16	--	3	3	6	6

Insulation shall be removed by insulation stripper only. Strands of wires shall not be cut / reduced for convenience in connecting into terminals. The terminals shall have sufficient cross sectional area to take all strands and it's connecting brass screws shall have flats ends. All looped joints shall be connected through terminal block / connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. All light points shall be terminated through a connector.

Conductors having nominal cross sectional areas exceeding 10 sq.mm shall always be provided with cable sockets. At all bolted terminals brass flat washer of large area and approved steel spring washer shall be used. Brass nuts and bolts shall be used for all connections.

Only licensed wiremen (Before doing the work or before appointing him on site contractor has to submit his wiring license to Owner) and cable jointers shall be employed to do jointing work. Before entrusting cable jointing work to any technician, or before appointing Cable Jointers or Wiremen on Site, Contractor has to submit such Technicians' / Wireman's / Cable Jointer's licensee to Owner.

All wires and cables shall be embossed with the manufacturer's label with ISI mark and shall be brought to site in original packing. For all internal wiring, FRLS PVC insulated wires of 1100 volts grade shall be used.

The sub-circuit wiring for point shall be carried out in loop system and no joints shall be allowed in the length of the conductors. No wire shall be drawn into any conduit until all work of conduit installation of any nature that may cause injury to wire is completed. Care shall be taken while pulling out the wires so that no damage occurs to conduits/wire itself, the conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction. The minimum size of PVC insulated copper conductor wires for all sub-circuit wiring for light points shall be minimum 1.5 sq.mm copper (as specified in BOQ). Separate neutral to be pulled for each circuit.

9. Joints

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

10. Mains and Sub-Mains

Mains and sub-mains cable or wires where called for shall be of the rated capacity and approved make. Every main and sub main wires shall be drawn into an independent adequate size of conduit. Earthing shall be in conformity with relevant IS codes and calculations shall be submitted for verification. An independent earth wire of the proper rating shall be provided for every single phase sub-main. For every 3 -phase sub-main, 2 Nos. earth wires of proper rating shall be provided along with the sub-main. The earth wires shall be drawn along with circuit wires through conduit. Where mains and sub-mains cables are connected to switchgear, sufficient extra lengths of cable shall be provided to facilitate easy connections and maintenance. Where ever necessary, powder-coated 1.6 mm thick

sheet steel covering (also called trunking) shall be provided to cover the group of conduits and cables entering and exiting the Wall mounted/Floor mounted Sub DBs, DBs, and FDBs, so that the Installation looks neat .The colour of such sheet steel covering (trunking) shall be matching with the colour of the SDBs, DBs and FDBs

11. Load Balancing

Balancing of circuits in three phase installation shall be as planned by the contractor and shall be checked by the consultant / PMC before the commencement of wiring and shall be strictly adhered to.

12. Colour Code of Conductors

Colour code shall be maintained as indicated by the Consultant for the entire wiring installations. Red, yellow, blue shall be for three phases, black for neutral and green with yellow band shall be for earthing.

SWITCHES, RECEPTACLES (MODULAR)

1.1. Switches

All switches shall be enclosed type flush mounted suitable for 240 volts AC. All switches shall be fixed inside the switch boxes on adjustable flat MS strips / plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires. Switch controlling the light point shall be connected to the phase wire of the circuit and load on each switch shall be restricted to maximum **800 watts & maximum 1500 watts per circuit**. All wiring accessories shall be BIS approved. Perfect alignment shall be maintained while fixing of the back boxes.

1.2 Wall Socket Outlet

Wall socket outlets shall be of the three pin. The switch controlling the socket outlet shall be on the phase wire of the circuit and not more than two socket outlets of 16 amps shall be connected on one circuit. An earth wire shall be provided along with the circuit wires and shall be connected to earthing screw inside the box. The earth terminal of the socket shall be connected to the earth terminal provided inside the box. All sockets shall be shuttered type.

a. Every socket outlet shall be controlled by an individual switch unless mentioned otherwise.

b. The switch controlling the socket outlet shall be on the `Live' side of the line.

c. 6 amps and 16 amps socket outlet shall normally be fixed at any convenient height above the floor level as desired by the Architect. The switch for 6 and 16 amps, socket outlet shall be kept along with the socket outlet. However, in special case, if desired by the Architect the 6 amp. socket outlet can be placed at the normal switch level.

   16 amps socket outlet in the kitchen of the residential or commercial buildings shall be fixed at any convenient height above working platform or as specified in drawings / schedule of equipments.

   In a room containing a fixed bath or shower, there shall be no socket outlet and there shall be no provision for connecting a portable appliance. Any stationary appliance connected permanently in the bath room shall be controlled by an isolator switch or circuit breaker having outlets at such location where water / moisture does not effect.

d. Where socket outlets are placed at lower level, they shall be enclosed in a suitable metallic box with the system of wiring adopted or shutter type sockets shall be provided as specified.

e. In an earthed system of supply, a socket outlet and plug shall be of three pin type, the third terminal shall be connected to earth.

f. Conductors connecting electrical appliance with socket outlet shall be flexible twin cord with an earthing cord which shall be secured by connecting between the earth terminal of plug and the metallic body of the electrical appliance.

g. Where use of shutter type of interlocking type of socket is required for any special installation, the items should be separately and specifically listed in the Schedule of Quantities of that particular work.

1.1 kV GRADE CABLES AND CABLE TRAYS

1. MEDIUM AND LOW PRESSURE:

Cables should be steel armoured XLPE insulated PVC sheathed with fire retardant compound Aluminium conductor conforming to the quality as specified in the schedule of work. All cables, accessories and other materials should conform to IS Specification. The jointing work should be carried out by a competent authorised cable jointer.

2. LAYING OF CABLES:

All cables shall be laid as per C.P.W.D GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS (PART-II EXTERNAL) - 2005 with all up to date amendments.

3. TESTING THE CABLES:

All cables shall be tested as per C.P.W.D GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS (PART-II EXTERNAL) - 2005 with all up to date amendments.

1. CABLE TRAYS

Cable Trays shall be Hot dip Galvanized and factory fabricated out of G.I. channels, angle iron, tee, bends, sections, flats and perforated sheet for different loads and number and size of cables as given below :

Cable trays shall be galvanized as per Specification given elsewhere.

Ladder Type (Hot dip galvanized)

1000 mm wide

Runners 20 x 100 x 20 x 3 mm

Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/C

Suspenders 2 Nos. 40 x 40 x 5 mm GI angle 1500 mm C/C with base support of 40x 40 x 5mm GI angle.

750 mm wide

Runners 20 x 75 x 20 x 2.5 mm

Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C

Suspenders 2 Nos. 32 x 32 x 5 mm GI angle 1800 mm C/C with base support of 40x 40 x 5mm GI angle.

600 mm wide

Runners 20 x 75 x 20 x 2.5 mm

Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C

Suspenders 2 Nos. 32 x 32 x 5 mm GI angle 1800 mm C/C with base Support of 40x 40 x 5mm GI angle.

450 mm wide

Runners 20 x 75 x 20 x 2.5 mm

Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/C

Suspenders 2 Nos. 25 x 25 x 4 mm GI angle 1800 mm C/C with base support of 40x 40 x 5mm GI angle.

Supply and fixing of perforated type cable trays of the following sizes of pre-galvanized iron.

a) 600 mm width x 50 mm depth x 2 mm thick
b) 450 mm width x 50 mm depth x 2 mm thick
c) 350 mm width x 50 mm depth x 2 mm thick
d) 300 mm width x 50 mm depth x 1.6 mm thick
e) 250 mm width x 50 mm depth x 1.6 mm thick
f) 150 mm width x 50 mm depth x 1.6 mm thick

Note: Suitable length of 10 mm dia GI rod suspenders at 1800 mm interval shall be included in the item for perforated type cable tray.
Specification for Hot Dip Galvanizing Process for Mild Steel Used For Earthing, Cable Trays Or Junction Boxes For Electrical Installation.

4.1 General Requirements

Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS:209-1992.

Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.

The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.
Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing.
The thickness of galvanizing shall be 610 gm / Sq. mtr. (87 Microns) in line with IS: 4759

All finished cable trays and accessories shall be free from sharp tees, corners, burrs and unevenness.

4.2 Cable Trays - Installation Notes

Cable trays shall be installed generally at the elevations shown in respective cable tray layout drawings. If any major modifications in the drawings are envisaged in the field, these should be carried out after getting approval from design office.

Before laying the trays, contractor shall submit the shop drawing & take the approval from client / consultant.

It shall be the responsibility of the electrical contractor to mark up all the field modifications on the latest issues of the drawings and return two copies of all such "as constructed" drawings to client / consultant's design office.
The type and size of tray to be used shall be as mentioned in the individual layout drawings.
Cable trays shall be welded to the mounting/carrier structures. Trays shall be supported with suitable angle / hitech rod supports.

Each continuous laid out length of cable tray shall be earthed at minimum two places by GI flats of minimum size 25x6 mm (unless otherwise noted) to the purchaser's earthing system. The distance between earthing points shall not exceed 10 meters.

The following shall be checked before laying the cables on trays.

a) Check for proper identification nos. Of the trays.
b) Check for continuity of cable trays over the entire route.
c) Check that all sharp corners, burrs and waste materials have been removed from the tray.
d) Obtain clearances from piping contractor / engineer that no piping will be taken in the way of cable trays.
e) Check for earth continuity & earth connection of cable trays.
f) Cable tray installation work shall comply with all currently applicable statutes, regulations and safety codes in the locality/country where the installation is to be carried out.

5. Steel Wire Rope Hangers& Supports:

Wire Hangers shall be used to suspend all static Electrical services.

Wire Hangers should consist of a pre-formed wire rope sling with a range of end fixings to fit various substrates and service fixings, these include a ferruled loop, permanently fixed threaded M6 (or M8, M10) stud, permanently fixed nipple end with toggle, at one end or

hook or eyelet, cladding hook, barrel, wedge anchor, eyebolt anchor or any other end fixture type or size as per manufacturers recommendation and design. The end fixings and the wire must be of the same manufacturer with several options available. The system should be secured and tensioned with a Hanger self-locking grip at the other end. Once the grip is locked for safety purpose unlocking should only be done by using a separate setting key and should not be an integral part of the self-locking grip. Only wire and/or supports supplied and/or approved, shall be used with the system.

a. Wire Hangers should have been independently tested by Lloyds Register. APAVE, TUV, CSA, Chiltern International fire, ADCAS, Intertek, ECA, and SMACNA, approved by CSA and comply with the requirements of DW/144 and BSRIA – wire Rope Suspension systems. Wire rope should be manufactured to BSEN 12385: 2002

b. The contractor shall select the correct specification of wire hanger to use for supporting each particular service from table 1 below. Each size is designated with a maximum safe working load limit (which incorporates a 5:1 safety factor).

The correct specification of wire Hanger required is determined using the following formula.

Weight per meter of object suspended (kg) X distance between suspension points (m) = weight loading per Hanger suspension point (kg).

Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the recommendations give in the manufacturer's handbook.

The contractor shall select the correct length of wire rope required to support the service. Lengths from 1-10m lengths. Specials can be made, check with manufacturer. No in–line joints should be made in the rope.

Table 1

Wire (Gripple) Hanger Safe Working Loads		
size	**minimum breaking load of Wire Rope**	**working load limit (kg/lbs)**
No. 1	80kg/176 lbs	0-10 kg / 0-22 lbs
No. 2	260kg/572 lbs	10-45 kg / 23-100 lbs
No. 3	580kg/1276 lbs	45-90 kg / 101-200 lbs
No. 4	1500kg/3300 lbs	90-225 kg / 210-495 lbs
No. 5	2160kg/4752 lbs	225-325 kg / 496-715 lbs
No. 6	2500kg/5500 lbs	325-500 kg / 715-1100 lbs

The standard range of Hanger Kits should contain galvanized high tensile steel wire rope or stainless steel wire rope as per the application, the minimum specification is as above and should be manufactured to BS 302 (1987), BSEN12385. **Comply with manufacturer's load ratings and recommended installation procedures.**Note the testing is done to the minimum breaking load of the wire thus giving a minimum safety factor of 5: 1.

4.1 **Supports can be provided for: Busbar, Cable Ladder, Cable Tray, Cable Basket, Channel, Trunking, Light Rafts, Luminaires, Secondary Supports, Safety Lines, High Bay/Low Bay Lights, Electrical Cables, CCTV and Catenary Supports:** Y-Fit solution shall be used to a maximum width of 500mm Cable Tray. For Tray over 500mm cradle support method or independent supports must be taken as appropriate based on load. Any other solution can be used based on manufacturer's recommendation on site conditions after prior approval.

4.2 **Catenary Supports**: Refer to manufacturer's recommendations on Catenary supports with C-clip, special care should be taken with tensioning of the wire and angles at which the installation of services are made**.**

4.3 Stainless Steel Supports should be available for food, chemical and High Corrosion areas near coastlines.

Refer to manufacturers catalogue and installation guide for further technical information. **Comply with manufacturer's load ratings and recommended installation procedures.**

All supporting system to be provided by same manufacturer.

CABLING FOR VOICE SYSTEM

1. Scope

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to supply, and to install a complete cabling infrastructure supporting voice and video. The intent of this section is to provide pertinent information to allow the vendor to bid the labor, supervision, tooling, materials, and miscellaneous installation hardware and consumables to install a complete system. However, it is the responsibility of the vendor to propose any, and, all items required for a complete system whether or not it is identified in the specification, drawings and bill of materials attached to this specification.

2. Applicable Documents:

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below (or the latest revisions) has bearing on the desired cabling infrastructure are incorporated into this specification by reference:

This Technical Specification and Associated Drawings

ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001

ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998

ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993

ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

3. Backbone Wiring

The function of the backbone wiring shall be to provide interconnections between telecommunications closets, equipment rooms and entrance facilities in the telecommunications wiring system. The backbone wiring shall consist of the transmission media, intermediate and main cross connects, and mechanical terminations for interconnection of telecommunications closets, equipment rooms and entrance facilities. The backbone wiring shall include transmission media in the building.

The backbone wiring shall use the star topology wherein each telecommunications closet shall be wired to a main cross connect / patch panel or an intermediate cross connect then to a main cross-connects / patch panel. There shall be no more than two hierarchical levels of cross connects / patch panel in the backbone wiring. Interconnections between any two telecommunications closet shall pass through three or fewer cross-connects / patch panel.

Bridged taps shall not be permitted as part of the backbone wiring.
One of the following types of cables shall be used for backbone wiring as defined in schedule of quantities.
100-ohm UTP multiplier backbone cable.
62.5 / 12.5 um optical fiber cable.
The contractor has to assure that cross talk coupling between individual, unshielded twisted-pairs shall not affect the transmission performance of multi-pair cables.

4. Horizontal Wiring

The horizontal wiring shall be the portion of the tele communications wiring system that will extend from the work area telecommunications outlet to the telecommunications closet. The horizontal wiring shall include the telecommunications outlet in the work area, mechanical termination for the horizontal cables, and cross-connections located in the telecommunications closet.
The horizontal wiring shall be capable of handling the following minimum services.
Voice telecommunications.
Premises switching equipment.
The horizontal wiring shall be a star topology with each work area telecommunications outlet connected to a telecommunications closet. Horizontal wiring shall preferably contain no more than one transition point between different forms of the same cable type.
Bridged taps shall not be permitted as part of the horizontal wiring.
The maximum horizontal distance shall be limited to 90 meters (295 ft) independent of media type i.e. the cable length from the mechanical terminating of the media in the telecommunications closet to the telecommunications outlet in the work area shall be limited to this distance. This horizontal distance includes cabling required from the telecommunications outlet to the work station. Horizontal cable shall be limited to one of the following types as listed out in the schedule of quantities.

- Four-pair 100-ohm unshielded twisted pair (UP) cables.
- 62.5/125 um optical fiber cable.

5. Grounding Considerations

a) Grounding system shall be an integral part of the telecommunications wiring system. In addition to helping protect personnel and equipment from hazardous voltages, the grounding system shall reduce the effect of electromagnetic interference ((EMI) to and from the telecommunications wiring system.
b) Grounding shall meet the NEC requirements and practices or local authorities or codes whichever impose a more stringent requirement.
c) The following shall be considered for the grounding system.
d) Installation conforms with proper practices and requirements.
e) Each telecommunications closet shall have an appropriate grounding access.
f) Grounding shall be available for cross-connect frames, patch panel racks, telephone and data equipment and equipment required for maintenance and testing.

6. Backbone Wiring Distances

Telecommunications Closet to Main Cross-Connect

a) The maximum backbone distance between the main cross-connect patch panel and the mechanical termination in the telecommunications closet shall be as follows:

b) For 62.5 / 125 ohms optical Fiber cable the distance between Telecommunication closet and main cross connect / patch panel shall not exceed 2000 mts.

c) For 100 ohm UTP cable, maximum distance between telecommunication closet and main cross connect / panel shall be 800 mts.

d) Telecommunications equipment which connect directly to main or intermediate cross-connects / patch panel shall done via cables of 30 m or less.

7. Telecommunications Closet

A telecommunications closet shall be defined as an area within the building set aside for the exclusive purpose of housing equipment associated with the telecommunications wiring system. There shall be no upper limit on the number of telecommunications closets which may be provided within the building. The telecommunication closet shall have following three possible configurations.

a) Horizontal Backbone Connection: The telecommunications closet shall contain the mechanical terminations for a portion of the horizontal wiring system and a portion for the backbone wiring system. In such a case the telecom closet shall provide facilities (space, power, grounding etc.) for the passive (cross-connect) / patch panel or active devices or both used to interconnect the two system.

b) Backbone Wiring System Interconnection: The telecommunications closet may contain the intermediate cross-connect / patch panel or main cross connect / patch panel for different portions of the backbone wiring system. In this usage, the telecommunications closet shall provide facilities for the passive or active devices or both used to interconnect two or more portions or the backbone wiring system.

c) Entrance Facilities: A telecommunications closet may be used to contain the demarcation point or an interbuilding entrance facility. In this usage, the telecommunications closet shall provide facilities for the active and / or passive devised required to interconnect the demarcation point or interbuilding entrance facility or both to the telecommunication wiring system.

d) The design of the telecommunications closet shall be as per the requirements of EIA/TIA-569.

8. Equipment Room

The equipment room shall be defined as an area within the building where telecommunications systems shall be housed along with the mechanical termination of one or more portions of the telecommunications wiring system. Equipment room shall be considered to be distinct from telecommunications closets because of the nature or complexity of the equipment they contain. Any or all of the functions of a telecommunications closet shall be alternatively provided by an equipment room.

9. Cable Specifications

UTP Cabling System

A. Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum Category 6 Cabling system

a. Networks Supported	10 / 100 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE 802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet
b. Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs
c. Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel

B. Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2

a. Material:	
b. Conductors	23 AWG solid bare copper or better
c. Insulation	Polyethylene
d. Jacket	Flame Retardant PVC
e. Pair Separator	Cross-member fluted Spline.
f. Approvals	UL Listed
	ETL verified to TIA / EIA Cat 6
g. Operating temperature	-20 Deg. C to +60 Deg. C
h. Frequency tested up to	Minimum 600 MHz
i. Packing	Box of 305 meters
j. Delay Skew	45ns MAX.
k. Impedance	100 Ohms + / - 15 ohms, 1 to 600 MHz.
a. Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

CABLING FOR DATA SYSTEM

1. Scope

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to supply, and to install a complete cabling infrastructure supporting data and video. The intent of this section is to provide pertinent information to allow the vendor to bid the labor, supervision, tooling, materials, and miscellaneous mounting hardware and consumables to install a complete system. However, it is the responsibility of the vendor to propose any, and, all items required for a complete system whether or not it is identified in the specification, drawings and bill of materials attached to this specification.

2. Applicable Documents

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The list of documents below (or the latest revisions) has bearing on the desired cabling infrastructure are incorporated into this specification by reference:

This Technical Specification and Associated Drawings

ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001

ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998

ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993

ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

3. Cabling System and Component Specifications

3.1 UTP Cabling System

Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum Category 6 Cabling system	
Networks Supported	10 / 100 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE 802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet
Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs
Performance characteristics to be provided along with bid.	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel.
Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2	
Material:	
Conductors	23 AWG solid bare copper or better

Insulation	Polyethylene
Jacket	Flame Retardant PVC
Pair Separator	Cross-member fluted Spline.
Approvals	UL Listed
	ETL verified to TIA / EIA Cat 6
Operating temperature	-20 Deg. C to +60 Deg. C
Frequency tested up to	Minimum 600 MHz
Packing	Box of 305 meters
Delay Skew	45ns MAX.
Impedance	100 Ohms + / - 15 ohms, 1 to 600 MHz.
Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

Coaxial Cables

As a medium of transmission coaxial cables used in high efficiency efficient, satellite guidance systems, microwave transmission and LAN. It is manufactured as per BR (UR series), American Military Standard MIL –C17 (RG – Series).

Technical Data		
S.No.	**Type**	**Description**
1	Size	RG-59, RG-6, RG-11
2	Inner Conductor	Solid Copper
3	Insulation	Gas Injected Physical Foamed Polyethylene
4	Flooding Compound	Jelly
5	Outer Conductor	Bounded Polyaluminium Tape, Braided with Aluminum Wire
6	Outer Jacket	UV Resistant Black PVC Jacket
7	Marking	Progressive Sequential Length Marking on Every Meter

Electrical Parameters				
S.No.	**Type**	**RG-11 Foam**	**RG-6 Foam**	**RG-59 Foam**
1	Inner Conductor-Max. Resistance (Phm/km) @20 degree C	0.84	2.13	3.55
2	Inner Conductor-Loop Resistance (Phm/km) @20 degree C	1.66	2.78	4.64
3	Nom. Capacitance (pF/mttr)	53	53	53
4	Nom. Impedance (Phm)	75	75	75
5	Nom. Velocity Ratio (%)	85	85	85
6	Nom. Attenuation @25 degree (db/100m)			
	At 55 Mhz	2.82	1.95	6.73

	At 83 Mhz	3.87	6.2	8.04
	At 187 Mhz	5.74	9.15	11.81
	At 211 Mhz	6.23	9.5	12.47
	At 250 Mhz	6.72	10.5	13.45
	At 300 Mhz	7.38	11.5	14.6
	At 350 Mhz	7.94	12.45	15.71
	At 400 Mhz	8.53	13.3	16.73
	At 450 Mhz	9.02	14.35	17.72
	At 500 Mhz	9.51	14.95	18.7
	At 550 Mhz	9.92	15.7	19.52
7	Structural Return Loss (db/100m)			
	From 30 to 300 Mhz	>26	>28	>30
	From 300 to 550 Mhz	>24	>22	>24
	Bending Radius, min (mm)	75	65	65

Electrical Parameters				
S.No.	**Description**	**RG-11 Foam**	**RG-6 Foam**	**RG-59 Foam**
1	Inner Conductor	Solid Bare Copper	Solid Bare Copper	Solid Bare Copper
2	Nom. Diameter (mm)	1.63	1.02	0.8
3	Dielectric	Foam PE	Foam PE	Foam PE
4	Nom. Diameter (mm)	7.11	4.57	3.55
5	Outer Conductor-First	Bonded PolyAL Tape	Bonded PolyAL Tape	Bonded PolyAL Tape
6	Outer Conductor-Second	Alloy Braid	Alloy Braid	Alloy Braid
7	Nom. Covergage(%)	60	60	60
8	Jacket	PVC(Black)	PVC(Black)	PVC(Black)
9	Nom. Diameter (mm)	10	7	6.2

LIST OF APPROVED MAKES FOR ELECTRICAL WORK

Sr. No.	Material/ Equipment	Vendor
1.	Contactors	1. L&T 2. ABB 3. Siemens 4. Schneider 5. Legrand
2.	MCCB/MCB/RCCB/DB/SPD	1. Schneider 2. ABB 3. Siemens
3.	PVC insulated XLPE aluminium/Copper conductor armoured cables 1100V grade	1. Finolex 2. Polycab 3. Havells 4. KEI 5. Skytone
4.	Termination Cable Lugs & Glands	1. Commet 2. Dowell
5.	Cable Trays	1. OBO 2. KME 3. Indeana 4. Aditya Steel 5. RMCON
6.	PVC Conduit (FRLS) & Accessories(ISI Approved)	1. AKG 2. BEC 3. VPL 4. Panasonic
7.	GI Pipes (ISI Approved)	1. Jindal (Hissar) 2. Tata 3. ABL Apollo
8.	Control Cable (ISI Approved)	1. Finolex 2. Skytone 3. Batra Henley 4. Polycab
9.	Copper Conductor PVC Insulated Wires/ Stranded Flexible Wires (FRLS)	1. Finolex 2. Skytone 3. Batra Henley 4. Polycab
10.	Modular Switches, Socket Outlets And Wiring Accessories With Moulded Cover Plate.	1. Legrand 2. ABB 3. Schneider

11.	Metal Clad Plug & Socket (Industrial)	1. Siemens 2. Schneider 3. Crompton 4. Legrand 5. Neptune
12.	Telephone Wires/ Telephone Cables	1. Finolex 2. Skytone 3. Batra Henley 4. Polycab
13.	Telephone Outlet	1. Legrand 2. Crabtree
14.	Light Fixtures (General)	1. Philips 2. Trilux 3. Disano
15.	Multi Detector/Smoke Detector	1. Notifier 2. Edward 3. Cooper
16.	Speaker	1. Notifier 2. Edward 3. Cooper

TECHNICAL SPECIFICATION FOR HVAC WORK

INTRODUCTION

1. Contractor's Scope of Work

The scope of work proposed under this contract includes supply, installation, testing and commissioning of the complete HVAC system as elaborated in design drawings, detailed specifications and bill of quantities.

The scope shall cover Supply and Installation of Variable Refrigerant Flow (VRF) system with indoor & fresh air units, comprising of single / multiple Outdoor & Indoor units as required. The system also includes copper refrigerant piping, condensate drain piping, Inline fans etc. Dedicated smoke evacuation & compensation fans for office spaces during emergency.

Scope of work shall also include supply, fabrication and installation of GSS factory fabricated ductwork, grilles/diffusers and insulation as required.

Routine testing, pressure testing of fabricated components, balancing and Commissioning of the entire HVAC system and performance testing as per system requirement shall also be covered in the scope .

The Contractor shall be responsible to complete the entire work under scope in all respect in line with the contract documents and with the directions of and to the satisfaction of the Architects/Consultants and Owners.

The Contractor shall furnish all labour, materials and equipment (except those to be supplied by the Owners, if any) as listed under bill of quantities and specified otherwise, transportation and incidental necessary for supply, installation, testing and commissioning of complete HVAC system.

The scope shall also cover supply and installation of materials, equipment, appliances and incidental work not specifically mentioned herein or noted on the drawings or documents as being furnished or installed, but which are necessary and customary to make a complete installation. Supply of such material / equipment and execution shall be carried out in accordance with the most latest IS codes and IS specifications. In the event of non availability of relevant IS codes/specifications, good engineering practices shall be adopted.

2. Items to be provided by other agencies

The following activities associated with the said contract shall be carried out by other agencies under direct supervision of the AC contractor:

i. Civil Works:

All associated civil works listed below shall be carried out by civil / interior contractor

a. Foundation for VRF Outdoor Units / Fresh air units including PCC / RCC blocks as required or as mentioned in the BOQ.

b. False ceiling work.

c. Providing aluminum channel trough in the false ceiling for fixing of diffusers and GI frame work in walls/partitions for fixing of grilles.

d. Providing opening in walls / slabs for crossing of ducts/piping and making them good & finished.

ii. Plumbing Works:

All associated plumbing works listed below shall be carried out by plumbing contractor.

a. Providing floor trap for termination of condensate drain piping associated with VRF indoor units to be carried out by the AC contractor.

iii. Electrical Works:

All associated electrical works listed below shall be carried out by electrical contractor:

a. Providing 415 + 10 % volts, 50 Hz, 3 phase stabilized power supply at control panel of each VRF Outdoor unit/Indoor Unit/Fresh Air Treatment Unit to be installed on terrace or other suitable place in the form of power cabling and necessary earthing.

b. Providing 220 + 6 % volts, 50 Hz, 1 phase power point near each VRF Cassette / Hi-wall indoor unit, propeller fan & inline fans for exhaust as shown in the design drawings.

SYSTEM DESIGN

1. Introduction:

An air-conditioning system using Variable Refrigerant Flow System for Office spaces within the Premises of NBCFDC is being designed for summer/monsoon cooling and winter heating as well.

2. Basis of Design:

The various parameters influencing the air conditioning system design have been furnished below.

i. Orientation.
The building orientation is as envisaged in architectural/interior plans.

ii. Outside design conditions.
The outside design conditions for **NEW DELHI** have been given here under:

Climate	**Dry bulb Temperature**	**Wet bulb Temperature**
Summer	110 deg F (43.3 deg C)db	75 deg F (23.9 deg C)db
Monsoon	95 deg F (35 deg C)db	83 deg F (28.3 deg C)db
Winter	45 deg F (7.2 deg C)db	41 deg F (5 deg C)db

iii. Inside design conditions. : Within ASHRAE Bandwidth
Summer / Monsoon

Temperature	73.4±2 deg F(23 ± 1 deg C)
Relative Humidity	Not to exceed 70 % during monsoon

Winter

Temperature	68±2 deg F(20 ± 1 deg C)
Relative Humidity	In the region of 35 – 60 %

iv. Fresh Air Replenishment: Inline with ASHRAE 62.1-2013 recommendations

v. External Building Fabric detail:

The following details as regard to heat gain from external building fabric have been considered which are subject to further confirmation from Architects / Clients:

i. **For Single Glass** :

Solar Factor: 0.56
Overall Heat Transfer Co-efficient ("U" Value): 1.13 BTUs/Hr Sft F

ii. **For Walls** (230mm Brick Wall) :

Overall Heat Transfer Co-efficient ("U" Value): 0.32 BTUs/Hr Sft F (1.82 Watt/SqM K).

iii. For Roof Exposed to Sun insulated with 16mm thick Aluminum faced closed cell Elastomeric insulation material in the form of under deck insulation. :

Overall Heat Transfer Co-efficient ("U" Value): 0.16 BTUs/Hr Sft F (0.9 Watt/SqM K).

vi. Relevant International Codes and Standards:

Apart from the specific equipment standards and specifications, the following broad certifying agency/standards will be considered while designing the system:

a. ASHRAE- American Society for Heating, Refrigerating and Air-conditioning Engineers – ASHRAE1992 Edition.
b. SMACNA – Sheet Metal and Air Conditioning Contractors National Association.
c. UL- Underwriter's Laboratory, USA.
d. ANSI - American National Standards Institute
e. NEMA - National Electrical Manufacturers Association
f. ETL - Electrical Testing Laboratories
g. NEC- National Electrical Code
h. NFC- National Fire Code
i. ISO- International Standards Organization

vii. Design Data:

Floor	Floor Area (Sft)	Height (ft)	Occupancy (Persons)	Lighting Load (Watts/sft)	Equipment Load (Kw)	Hours of operation
FIFTH FLOOR						
Office Spaces	1600	11.5	35	1.25	5	10-12

The design data is prepared based on following assumptions:

01. The design data considered above is subject to further confirmation.

02. Equipment load for office spaces have been arrived at considering 100 watts per work station needs confirmation.

4. **Heat Loads and Equipment Selection**

Based on the interior plans and above design data the heat loads for the various spaces to be air conditioned have been worked out and heat load results along with equipment selection are given hereunder:

Floor	Floor Area	Heat Loads		De-humidified Air Quantity	Fresh Air Qty.	Equipment selection
	(Sft)	Summer	Monsoon	(Cfm)	(Cfm)	(indoor units)
FIFTH FLOOR						
Office Spaces	1600	12	9	6000	325	2 x 3000 Cfm /7.5 TR each Ceiling mounted double skin Air Handling indoor units. 1 x 635 Cfm /3.9 TR Treated Fresh Air Unit being proposed.

Assumptions:

01. All exposed peripheral glazings and windows considered as single glass.
02. Venetian blinds on glazing were considered for calculations.
03. Floors below shall be simultaneously air conditioned.
04. Exposed roof shall be insulated with Aluminum faced 16mm thick closed cell elastomeric insulation of Class 'O' fire properties.

5.0 **Maximum Demand & High Side Equipment Selection for VRF System**

Maximum Demand & high side equipment selection have been furnished below:

Combination 1: Circuit 1 & 2

S. No.	Description	Refrigeration Load based on selection of indoor units.
i.	Capacity of low side equipment with deration factor	15TR
ii.	Diversity factor	Nil
iii.	Demand	15 TR
iv.	Proposed capacity of outdoor unit	2 x 10 HP outdoor VRF units in 2 independent circuits.

Combination 2 : Circuit 3 – FOR FRESH AIR

S. No.	Description	Refrigeration Load based on selection of indoor units.
i.	Load on account of Fresh Air	3.9 TR
ii.	Diversity factor	**Nil**
iii.	Demand	3.9 TR
iv.	Proposed capacity of outdoor units	1 x 6 HP outdoor VRF unit

6.0 **System Designing**

The system will comprise of 3 Nos VRF outdoor units of 2 units of 10 HP for recirculation & 1 unit of 6 HP for fresh air , Indoor units shall 2 Nos of 3000 Cfm/7.5 TR each shall be installed within the false ceiling spaces in line with interior requirement. The outdoor units & Fresh air unit shall be installed on Terrace at suitable location earmarked for services and as indicated in design drawings with minimum refrigerant piping between indoor & outdoor units.

The air distribution system would comprise of GSS supply air ducting with thermal insulation. Cool and dehumidified air from the indoor units shall be carried to various locations through acoustically lined and thermally insulated supply air exposed ducts in rectangular shape. Supply air ductwork shall be exposed below true ceiling spaces & the same shall distribute dehumidified cool air thru aluminium diffusers & grilles as per interior layouts. The return air shall be picked up through return air grilles/diffusers and brought back upto indoor units through the same suspended ceiling spaces and alley provided for return air as per design drawings. Closed cell elastomeric insulation possessing class 'O' fire properties shall be used for ductwork and refrigerant piping.

Condensate drain piping associated with indoor units shall be carefully carried out to ensure **leak proof disposal of condensate water.**

7.0. **Noise Level**

Noise level in conditioned spaces due to all air conditioning equipment shall not exceed 52 dB at 125 Hz when measured at any point in occupied spaces less than 1500 mm above finish floor level and not closer than 1500 mm from any supply air register or 600 mm from any return air grille without operation of any other equipment.

CONDITIONS OF THE CONTRACT

1. Engineering Responsibility of the system

The responsibility of system design, manufacturing, erection, working and safety will solely be responsibility of the Contractor for the parameters as mentioned in the tender documents prepared by the consulting engineers.

The system after commissioning shall be handed over to the Owners and thereafter they will monitor the performance for standard designed parameters for 30 days continuously. In case during this period the performance is not found satisfactory and rectification/ replacement, design improvement or any other change is felt necessary, will be made by the Contractor at no extra cost to the Owner. Though these improvements can only be done after getting the approval from the Owners / Architects.

2. Liability to Govt. Regulations

The Contractor shall be responsible and shall abide by all the government rules and regulations pertaining to erection, testing and commissioning of complete HVAC system at site. Any compensation towards damage / loss of property / material / equipment or to any person working at site shall be borne by the Contractor as per standard terms of contract.

3. Store

A lockable storage space shall be provided by the Clients but safe custody shall be the responsibility of the contractor till the installation is taken over.

4. Certificate of Inspection

The contractor shall obtain and deliver to the owner, a certificate of final inspection by the local authorities concerned, if required at site. The inspection fee shall be reimbursed as per actual on the production of receipt in original.

Further the Owners / Architects shall have full powers to order the materials or work to be tested by an independent agency at the Contractors expense in order to prove its fault & in-adequacy.

5. Design Drawings

The drawings prepared by the Consultants are indicative only of the general arrangement of the entire installation. The Contractor shall follow these drawings and specifications in preparation of his shop drawings and subsequent installation. He shall check the drawings of other trades to verify space for his installation. The Contractor shall examine all relevant

architectural, structural, plumbing, electrical and other services layout drawings before preparing the shop drawings for this installation, and report to the Architects/Consultants any discrepancy and obtain clarifications. Any changes found necessary for co-ordination and installation of this work with other services and trades shall be made with prior approval of the Architects / Consultants and Owner without any additional cost to the Owner.

6. **Site visit & Shop Drawings**

The contractor shall visit the site and shall satisfy himself as to condition under which work is to be performed. No claim for consequences of ignorance at the later date shall be entertained. He should also check and ascertain the location of existing structure or equipment or any other situation which may affect the work.

The contractor shall submit five sets of shop drawings for air distribution system layout, Electrical panels & Equipment Layout drawings for approval of the Owners / Architects. Contractor shall also submit technical submittals for all major items including VRF System, DX AHU, TFA, copper & drain piping, fans, valves, GS sheet, grilles, diffusers, fire dampers, insulation material, electrical components etc. for the approval of the Owners / Architects.

Five sets of detailed shop drawings of all equipment and materials including plant room, ducting, piping, ventilation system, electrical work associated with the HVAC system required to complete the project as per specifications and as required by the Architect / Consultant. These drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all equipment, also the details of all related items of work by other Contractors. Each item of equipment proposed shall be a standard catalogue product of an established manufacturer as per specifications.

If the Architect / Consultants makes any amendment in the above drawings, the contractor shall supply two fresh sets of drawings with the amendments duly incorporated, along with the drawings on which corrections were made. After final approval has been obtained from the Architect/Consultant, the Contractor shall submit a further six sets of shop drawings for the exclusive use of and retention by the Architect/Consultant. No material or equipment may be delivered or installed at the job site until the contractor has in his possession, the approved shop drawings for the particular material or equipment.

The shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow Architects/ Consultants ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved CPM charts.

Samples, drawings, specifications, catalogues, pamphlets and other documents submitted for approval shall be in quadruplicate, each item in each set shall be properly labeled, indicating the specific service for which material or equipment is to be used, giving reference to the governing section and clause number of Specifications clearly identifying in ink the items and the operating characteristics. Data of a general nature shall not be accepted.

Approval rendered on shop drawings shall not be considered as a guarantee of measurements of building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail nor does it any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract.

Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required thereof, shall be prepared by the Contractor at his own cost and approved by the Architect/Consultant.

Where the work of the Contractor has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make satisfactory adjustments. If so directed by the Architect/Consultant, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the Owner.

Within Five days of approval of all the relevant shop drawings, the Contractor shall submit to the Architect / Consultant four copies of comprehensive itemized price list of recommended imported and local spare parts and tools covering all equipment and materials in this contract. The Owner shall make arrangements to procure these spare parts and tools.

7. Material & Workmanship

All material used in work shall be of the best quality, obtainable and of approved list of manufacturers and shall conform to latest Indian Standard specifications unless otherwise stated.

8. Erection and Supervision

The Contractor shall depute engineers from time to time of commencement of installation work to inspect all relevant foundation/fabrication and other necessary facilities to make improved action if felt necessary. However, a qualified experienced engineer to be deputed at site beginning from commencement of HVAC activities at site & till handing over of the project.

9. Testing and Commissioning

On completion, the installation shall be tested for conformity with the stipulated performance specifications. Any defect, shortcoming detected in the system/material/workmanship shall be rectified by the Contractor to the entire satisfaction of the Consultants without any extra cost to the Owner. The installation shall be tested again after the removal of the defects and shall be commissioned only after approval by

competent inspecting authority or the Consultants and the Owner. All tests shall be carried out in the presence of the Consultants and Owner's representative.

Testing and commissioning shall include furnishing all labour, materials, instruments etc. and incidentals necessary for complete testing of each component as per the specifications and manufacturer's recommendations.

Maintenance Services for the complete HVAC installation shall be provided during the defects liability period of one year.

10. Training of Owner's representative

Upon completion of work and conclusion of all tests, the Contractor shall furnish necessary skilled labour and helpers for operating the entire installation for a period of thirty working days of minimum twelve hours each, to enable the Owner's representative to get acquainted with the operation of the system. During this period, the Contractor shall train the Owner's representatives in the operation, adjustments and maintenance of equipment installed.

11. Completion Certificate

On successful completion of the installation, a Certificate in the approved format shall be furnished by the Contractor. The Contractor shall be responsible for getting the entire installation duly approved by the Electrical Inspector or concerned authority, if any, and shall bear all the expenses in connection with the same.

12. Correction of Work before Final Payment

The Consultants/Owner shall conduct a final inspection just before the virtual completion of the work and prepare a final list of materials, equipment and item of work which fail to conform to the contract specifications. The Contractor shall promptly replace or re-execute such items in accordance with the contract and shall bear all expenses of making good all work and the cost of all work of the Contractor destroyed or damaged by such replacement or removal.

If the Contractor fails to remove and replace above rejected materials, equipment/ or workmanship within a reasonable time, fixed by written notice, the Owner may employ and pay other persons to amend and make good such defects at the expense of the Contractor. All expenses incurred by the Owner in rectifying the defects including all damages, loss and expense consequent on the defects shall be recoverable from any amount due or which may become due to the Contractor.

13. Virtual Completion

The work shall be considered virtually complete only upon fulfillment of the procedure laid down in the preceding clause and when the Consultants/Architects and the Owner has certified in writing that the work has been virtually completed. The defect liability period shall commence from the date of such certificate.

14. Clearance of Site

The Contractor shall have to remove all dirt and other unwanted materials from site of work, before handing over HVAC installation to the Owner. The work shall not be treated as complete in all respects unless these requirements are fulfilled by him. In the event of the Contractor failing to do so, the Consultants and the Owner shall have the right to get the site cleared at the Contractor's expenses.

15. Mechanical Maintenance:

a. Scope:

The Contractor shall provide the necessary skills and labour to assure the proper operation of the complete installation by the Owner's staff and to provide all required current and preventive maintenance for all equipment and controls under this contract, for the defects liability period of 12 months from the date of acceptance.

b. Operation:

The Contractor shall receive calls for any and all problems experienced in the operation of the equipment under this contract and shall take steps to immediately correct any deficiencies that may exist.

c. Maintenance:

The Contractor shall provide monthly inspection of all equipment and record the findings on a check list hereinafter specified.

d. Check List:

The Contractor shall provide to Owner / Consultant four copies of a comprehensive maintenance check list and shall post a copy of it in the plant room. The check list shall be a list of each piece of equipment in this contract, and shall provide a space for each of the next fifty two weeks to record the maintenance provided to and status of various equipment. Each month at the time of inspection, the Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, and that all necessary maintenance has been performed.

e. Repairs:

All equipment that require repairing shall be immediately serviced and repaired. Since the period of Mechanical Maintenance runs for one year concurrently with the Defects Liability Period all parts and labours shall be furnished at no extra cost to the Owner.

f. Control System:

Once each month the Contractor shall check all controls in various areas to ensure that these are functioning as designed. This shall apply to all temperature and humidity sensors, controllers, fire dampers, time-delay relays, flow switches, high and low pressure cutouts and motorized valves etc.

g. Emergency Services:

When emergency service is required beyond regular working hours to maintain the system in operation, the Contractor shall furnish service on the basis of prior arrangements with the Owner.

16. After Sales Services:

The HVAC Contractor shall ensure adequate and prompt after sales service in the form of maintenance personnel and spares as and when required with a view to minimizing the breakdown period. Particular attention shall be given to ensure that all spares are easily available during the normal life of the installation.

17. Records

Contractor shell keep complete and daily records as per standard system of all the materials, labour, drawings, work done at site and the Architect / owner can Inspect all / any records whenever he desires.

18. Samples & Technical Submittals

Samples, make or brand of all the materials must be got approved by the Architect/ Consultants / Owner in writing before they are brought to the site. Nothing extra shall be paid for presenting samples of any item as desired by Owner / Architect / Consultants.

Technical submittals of all the major items or as desired by the Architects/Consultants incorporating complete technical details in line with the tender specifications & catalogue prior to procurement of equipment/material shall be submitted for the approval.

19. Labour laws

The contractor is bound by the prevailing labour laws, which are applicable, and the owner will have no responsibility in this matter.

20. Law governing

The contract shall be interpreted and have effect in accordance with the laws of India and no suit or other proceedings relating to this contract shall be filed by the contractor in any court of competent jurisdiction in which the area of the site lying.

21. Rates for items of works

The rates entered in the accepted schedule of rates of the contract are intended to provide for works duly and properly completed in accordance with the General and Special conditions of contract and the specification and drawings together with such enlargements, extensions, diminutions, reductions, alterations, or additions as may be ordered without prejudice to the generally thereof and shall be deemed to include and cover superintendence and labour. Supply, including full freight of material, stores, patterns, profiles, moulds, fittings, centerings, scaffoldings, shoring, props, timber, machinery, derricks, tackle, ropes, pegs, posts, tools, etc. and all apparatus and plant required on the works, except such materials as may be specified in the contract to be supplied to the contractor by the Owner, the erections, maintenance and removal of all temporary works and buildings, all prevention of or compensation for trespass, all barriers and arrangements for the safety of the public or of employees during the execution of works, all sanitary and medical arrangements for labour camps as may be prescribed by the Architect, the setting of all work and of the construction, repair and upkeep of all center lines, bench marks and level pegs thereon, site clearance, all fees, duties, royalties, rent and compensation to owners for surface damage or taxes and impositions payable to local authorities in respect of land, structures and all materials supplied for the works, or other duties or expenses for which the contractor may become liable or may be put to under any provision of law for the purpose of or in connection with the execution of the contract, and all such other incidental charges or contingencies as may have been specially provided for in the specifications. The quoted rates for all items of works in the schedule shall also include the following:

Working in / under water, liquid mud, foul conditions, etc. and shall also include bailing or pumping out of water from the excavations / foundations or any other place of construction site and the excavated area/works executed below ground level shall be kept free from such water, till the completion of work, including all suspension period and days whatsoever.

Execution of works at all heights, levels and depths in all shapes, sizes and sections and in congested area including all lead and lifts etc. unless otherwise specified in the given schedule of quantities.

Scattered works, leaving openings, toothings, holes, curing, scaffolding, finishing of edges of switch boxes, function boxes and other similar works, as required and directed by the Architect.

The list of items / accessories, which are necessary to complete a particular item and not specifically mentioned is deemed to have included in the quoted rates of the item and nothing extra shall be paid on such things.

22. Compliance to regulations and byelaws:

The contractor shall conform to the provisions of any statutes relating to the works and regulations and bye-laws of any local authority and of any water and lighting companies or undertakings with whose system the work is proposed to be connected and shall before making any variations from the drawings or the specifications that may be necessitated by so conforming, give to the Architect notice specifying the variations proposed to be made and the reasons for making the variations and shall not carry out such variation until he has received instructions from the Architect in respect thereof. The Contractor shall be bound to give all notices required by statutes, regulations or bye-laws as aforesaid and to pay all fees and taxes payable to any Authority in respect thereof.

23. Assignment or sub-letting of Contract:

The Contractor shall not assign or sublet the contract or any part thereof or allow any person to become interested therein in any manner. Any breach of this condition shall entitle the owner to rescind the contract.

24. Indemnity by Contractor:

The Contractor shall indemnify and save harmless the OWNER AND ARCHITECTS from and against all actions, suits, proceedings, losses, costs, damages, charges, claims and demands of every nature and description brought or recovered against the OWNER AND ARCHITECTS by reason of any act or omission of the contractor, his agents or employees, in the execution of the works or in the guarding of the same. All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of the OWNER/ARCHITECTS without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

25. Insurance

The contractor has to obtain an "All Risk Erection & comprehensive cover" causing all liabilities for the contract amount beneficiary to Owners. This insurance shall remain valid till satisfactory completion of Defect Liability period.

26. Insurance for works:

The contractor at the time of signing the contract or before commencing the execution of the work, without limiting his obligations and responsibilities shall insure the works at his own cost and keep them insured until the virtual completion of the contract against all acts of God including Fire, Theft, Riots, War, Floods, etc. with Nationalised Insurance Agency in the joint names of the Employer and contractor (the name of the former being placed first in the policy) for the full amount of the contract. Such policy shall cover the property of the Employer and fees for assessing the claim and in connection with his services generally therein and shall not cover any property of the Contractor or of any sub-contractor of Employee.

The contractor shall deposit the policy and receipt for the premiums with the employer within twenty one (21) days from the date of signing the contract/commencement of execution of work or unless otherwise instructed by the Employer. In default of the contractor insuring as provided above, the Employer on his behalf may so insure and may deduct the premiums paid from any moneys due or which may become due to the contractor. The contractor shall, as soon as any claim under the policy in settled or the work reinstated by the Insurance Office should elect to do so, proceed with all due diligence with the completion of the works in the same manner as though the misfortune/accident had not occurred and in all respects under the same conditions of contract. The contractor in case of rebuilding or reinstatement after accident, shall be entitled to such extension as the Employer deems fit.

27. Insurance in respect of damages to persons and property:

i) The contractor shall be responsible for all injury to persons, animals or things and for all structural and decorative damage to property which may arise from the operation or neglect of himself or of any approved sub-contractor's or Employee's, whether such injury or damage arise from carelessness, accident or any other cause whatsoever in any way connected with the carrying out of this contract. The clause should be held to include any damage to buildings, whether immediately adjacent or otherwise, and any damage to roads, streets, footpaths, bridges and works forming the subject of this contract by frost or other inclemency of the weather. The contractor shall indemnify the Employer and hold him harmless in respect of all and any expenses arising from any such injury or damage to persons or property as aforesaid and also respect of any claims made in respect of injury or damage under any Acts of Government or otherwise and also in respect of any award of compensation of damages consequent upon such claims.

ii) The contractor shall reinstate all damages of every sort mentioned in this clause, so as to deliver up the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

iii) The contractor shall indemnify the Employer against all claims which may be made against the Employer by any member of the employer or by any member of the public or other third party in respect of works in consequence thereof and shall at his own expense arrange to effect and maintain, until the virtual completion of the contract, with any Nationalised Insurance Agency in the joint names of the Employer and the contractor against such risks and deposit such policy or policies with the Employer from time to time during the currency of this contract. The contractor shall similarly indemnify the Employer whether under the Workman's Compensation Act or any other statute in force during the currency of the contract. The contractor shall similarly indemnify the employer against all claims which may be made upon the employer whether under the Workman's Compensation Act or any other stature in force during the currency of this contract or at common law in respect of any employee of the contractor or any sub-contractor and shall at his own expenses effect and maintain with an approved office a policy of insurance in the joint names of the Employer and the contractor against such risks and deposit such policy or policies with the employer from time to time during the currency of the contract. The contractor shall be responsible for any thing which may be excluded from the Insurance Policy above referred to out of and incidental to the negligent or defective carrying out of this contract. He shall also indemnify the Employer in respect of any costs, charges or expenses arising out of any claim or proceedings and also in respect of any award of or compensation of damages arising there from.

iv) The Employer shall be at liberty and is empowered to deduct the amount of any damage, compensation costs, charges and expenses arising or accruing from or in respect of any such claim or damage from any sum or sums due to or become due the contractor including the Security Deposit.

v) If the contractor fails to comply with the terms of these conditions, the employer may insure the works and may deduct the amount of the premiums paid from any moneys that may be or become payable to the contractor or may at the option, not release running payment to the contractor until the contractor shall have complied with the terms of this condition.

vi) Such insurance, whether effected by the Employer or the contractor will not limit or bar the liability and obligation of the contractor to deliver the works to the Employer completed in all respects according to the contract. In case o loss or damage due to any of the aforesaid causes, the moneys payable under any such insurance shall be received and retained by the Employer until the works are finally completed and such moneys shall be credited to the contractor in final settlement of accounts.

28. Right of Owner to determine contract:

The Owner shall be entitled to determine and terminate the contract at any time should, in the Owner's opinion, the cessation of work becomes necessary owing to paucity of funds or from any other cause, whatsoever, in which case the value of approved materials at site and of work done to date by the contractor will be paid for in full at the rate specified in the contract. Notice in writing from the Owner of such determination and the reason therefore shall be conclusive evidence thereof.

29. Payment on determination of contract:

Should the contract be determined , the contractor shall have no claim to any payment of compensation or otherwise howsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not derive in consequence of determination of the contract. The Architect's decision on the necessity and propriety of such expenditure shall be final and conclusive.

30. Determination of contract owing to default of contractor:

If the contractor should

i) Become bankrupt or insolvent or
ii) Make an arrangement with or assignment in favour of his creditors, or agree to carry out the contract under a committee of inspection of his creditors, or
iii) Being a company or corporation, go into liquidation (other than a voluntary liquidation for the purpose of amalgamation or reconstruction)
iv) Have an execution levied on his goods or property on the works, or
v) Assign the contract or any part thereof otherwise than as provided in relevant clause of these conditions, or
vi) Abandon the contract or
vii) Persistently disregard the instructions of the Architect and/or Owner, or contravene any provision of the contract, or
viii) Fail to adhere to the agreed programme of work by a margin of 10% of the stipulated period, or
ix) Fail to remove materials from the site or to pull down and replace work after receiving from the Architect notice to the effect that the said materials or works have been condemned or rejected or
x) Fail to take steps to employ competent or additional staff and labour as required, or
xi) Fail to afford the Owner or Architect or their representative proper facilities for inspecting the work or any part thereof as required.

31. Procedure of determination of contract:

Then and in any of the said cases, the Architect on behalf of the Owner may serve the contractor with a notice in writing to that effect and if the contractor does not within seven days after the delivery to him of such notice proceed to make good his default in so far as the same is capable of being made good and carry on the work or comply with such

directions as aforesaid to the entire satisfaction of the Architect, he shall be entitled after having 48 hours notice in writing from owner (to rescind the contract as a whole or in part or parts as may be specified in such notice) and adopt either or both of the following courses:-

To carry out the whole or part of the work from which the contractor has been removed by the employment of the required labour and materials, the costs of which shall include lead, lift, fright, supervision and all incidental charges.

To measure up the whole or part of the work from which the contractor has been removed and to get it completed by another contractor in the manner and method in which such work is completed, shall be at the entire discretion of the Architect whose decision shall be final.

And in both the cases (a) & (b) mentioned above, Owner shall be entitled (i) to forfeit the whole or such portion of the security deposit as it may consider fit; and (ii) to recover from the contractor the cost of carrying out the work in excess of the sum which would have been payable according to the certificate of the Architect to the contractor if the works had been carried out by the contractor under the terms of the contract, such certificate being final and binding upon the contractor. Provided, however, that such recovery shall be made only when the cost incurred in excess is more than the security deposit proposed to be forfeited and shall be limited to the amount by which the cost incurred in excess exceeds the security deposit proposed to be forfeited. The amounts thus to be forfeited or recovered may be deducted from any moneys then due or which at any time thereafter may become due to the contractor by the Owner under this or any other contract or otherwise.

32. Right of Owner after rescission of contract owing to default of Contractor:

In the event of any or several of the courses, referred to in sub-clauses above being adopted.

The contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any commitments or made any advances on account of or with a view to the execution of the work or the performance of the contract and contractor shall not be entitled to recover or be paid any sum for any work thereto or actually performed under the contract unless and until the Architect shall have certified the performance of such work and the value payable in respect thereof and the contractor shall only be entitled to be paid the value so certified.

The Owner shall not be liable to pay contractor, any money on account of the contract until the expiry of the period of maintenance and thereafter until the costs of completion and maintenance damages for delay in completion (if any) and all other expenses incurred by the Owner have been ascertained and the amount there of certified by the Architect. The contractor shall then be entitled to receive only such sum of sums (if any) as the Architect may certify would have been due to him upon due completion by him after deducting the said amount, but if such amount shall exceed the sum which would have been payable to the contractor, then the contractor shall on demand pay to the Owner the amount of such excess and it shall be deemed, debit due by the contractor to Owner and shall be recoverable accordingly.

33. Work not carried out or fulfilled by the contractor

If any work or conditions of the contract is not carried out or fulfilled by the contractor in due time, then a fixed amount, which is supposed to be spent on that particular work will be deducted from the running bills of the contractor as per Architect's estimate and decision of the Architect shall be final and binding on the contractor.

34. Arbitration:

All questions, disputes or differences, claims, right, matter or thing whatsoever in any way arising out of or relating to this contract or the conditions thereof otherwise concerning the works or the execution or failure to execute the same, whether arising during the progress of the work or after the completion or abandonment or breach of the contract shall be referred to the sole Arbitrator, duly appointed by the **Owner** whose award shall be final and binding upon both the parties.

Subject as aforesaid, the provisions of the Arbitration and conciliation Act' 1996, or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceeding under this clause. It is a term of the contract that the party invoking arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

35. Contradiction between BOQ, Specifications and Drawings :

In the event of conflicts between BOQ, Specifications and Drawings, the BOQ shall take precedence over the specifications and drawings. Keeping the general intent of the scope of work under said contract, the Architects / Consultants would interpret the requirements of the design intent & contract and their decision shall be final and acceptable to all concerns including the contractors.

36. Owner reserve the right to relax or modify any condition listed in conditions of the contract in overall interest of the work.

37. All tools, plant and machinery provided by the contractor shall, when brought to the site, be deemed to be exclusively intended for construction and completion of this work and the contractor shall not remove the same or any part thereof without the consent of the Architect / Owner.

38. The rates quoted by the contractor shall be all inclusive keeping in mind the specifications, additional and special conditions in view and nothing extra shall be payable whatsoever.

39. Unless otherwise provided in the schedule of quantities the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building. Nothing extra shall be payable to him on this account.

40. The equipment erected, commissioned at site should be suitable for maximum temperature of 48 degree C.

41. The electrical installation shall be carried out in accordance with Indian electricity rules, relevant Indian standard such as IS 732, IS 3043 and the requirements stipulated by local statutory body such as electrical inspectors for such installations. It is to be clearly understood that the final responsibility for sufficiency, adequacy, and conformity to the performance of the HVAC system shall be with the Contractor.
42. The equipment and materials to be supplied shall conform to the requirements of the relevant IS standards.
43. The work shall be executed strictly as per the specifications drawn and Approved for Construction Shop Drawings" and to the entire satisfaction of the Owners/Architects.
44. Completion Drawings & Documents - After completion of the work, the contractor shall furnish four sets of completion documents complete with "As Built Drawings".
45. The contractor shall ensure good conduct of the workman at the site of work.

TECHNICAL SPECIFICATIONS

A. EQUIPMENT

1. VARIABLE REFRIGERANT FLOW SYSTEM

Scope

The scope shall be supply, installation, testing and commissioning of air cooled variable refrigerant Flow (VRF) system conforming to these specifications and meeting all design parameters as mentioned in the " Bill of Quantities" and drawings. Variable Refrigerant Flow System shall be a standard product, however all these specifications shall fully comply. The outdoor unit should be capable to perform at outside ambient temperature of **52 deg C.**

Type

Unit shall be VRF type consisting of outdoor units and multiple indoor units, each suitable to facilitate cooling during summer & monsoon as per the requirements.

It shall be possible to connect minimum 5-10 indoor units on one refrigerant circuit. The indoor units on any circuit can be of different type and also controlled individually.

Compressor installed in outdoor units shall be equipped 100% inverter compressor for higher reliability, improved life, better backup and duty cycling purpose. The system shall be capable of changing the rotating speed of inverter compressor by inverter controller to follow variations in cooling and heating load.

Outdoor unit shall be suitable for mix match connection of all type of indoor units.

The refrigerant piping between indoor units and outdoor unit shall be possible to extend up to 150M with maximum 35M level difference without any oil traps.

Both indoor units and outdoor unit shall be factory assembled, tested and filled with first charge of refrigerant gas before delivering at site.

Units shall be factory finished with paint as per manufacturer's standard. However, shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirit, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the finish over the adjoining shop painted surfaces.

Capacity

The refrigeration capacity of VRF outdoor and indoor units shall be as mentioned in the "Bill of Quantities" and as reflected on the drawings.

Outdoor Unit

The unit shall be heat pump type with automatic changeover in different seasons.

The outdoor unit shall be a factory assembled unit housed in a sturdy weather proof casing constructed from rust-proofed heavy gauge mild steel panels coated with a baked enamel finish. The unit should be completely factory wired, tested with all necessary controls.

All outdoor units shall have minimum two scroll compressors and be able to operate even in case of breakdown of one compressor. The outdoor units above 18 HP shall have compulsorily at least 2 separate inverter compressors so that the operation is not disrupted with failure of any inverter compressor and if one inverter compressor malfunctions, other continues to provide emergency operation smoothly till repair is affected.

The unit shall be provided with duty cycling arrangement for multiple inverter compressors to facilitate sequenced operation of the machine for better stability and prolonged life.

The outdoor unit shall be modular in design and should be allowed for side by side installation. The unit shall be provided with its own microprocessors control panel.

The outdoor unit should have anti-corrosion paint free steel plate for easy mounting of unit.

The machine must have sub cool feature to use coil surface more effectively thru proper circuit/bridge so that it prevents the flushing of refrigerant from long piping due to this effect thereby achieving energy savings.

The outdoor unit should be fitted with low noise, aero spiral design fan with grill for spiral discharge airflow to reduce pressure loss and should be fitted with DC fan motor for better efficiency. The noise level shall not be more than 60dB (A) at normal operation measured horizontally 1M away and 1.5M above ground. For Residential application or wherever night operation is required the unit shall be suitable to operate on nighttime quiet operation mode having minimum three step of operation sound level i.e. 55dB to 45dB. Wherever required or as shown on the drawings the unit shall be selected for high external static pressure (ESP) not less than 78Pa (8mm WG) to meet long exhaust duct connection requirement.

The outdoor unit shall be designed to operate safely when connected to multiple fan coil units.

The unit shall be suitable to operate on environment friendly R 410A refrigerant.

The outdoor units shall be provided with necessary thermo- guard weather protection to avoid any kind of leakage in refrigerant piping. The protection once applied shall be applicable for a period of 2 years.

Compressor

The compressor shall be highly efficient, high COP scroll type and capable of inverter control. The inverter compressor shall change the speed in accordance to the variation in cooling or heating load requirement.

All outdoor unit shall have multi-steps of capacity control to meet load fluctuation and indoor unit individual control. All parts compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed.

Oil heater shall be provided in the compressor casing.

Inverter compressor shall preferably by Reluctance DC inverter compressor for higher efficiency and improved reliability.

Heat Exchanger

The heat exchanger shall be constructed with copper tubes mechanically bonded to aluminum fins to form a cross fin coil. The aluminum fins shall be covered by anti-corrosion resin film. The unit should be with e-pass heat exchanger to optimize the path of heat exchanger and for better efficiency of condenser. The unit shall be provided with necessary number of direct driven low noise level propeller type fans arranged for vertical discharge. Each fan shall have a safety guard.

Refrigerant Circuit

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

Safety Devices

VRF system shall be provided with all safety devices as required and to ensure safe operation of the system, but not restricted to the following:

a. High pressure switch.
b. Low pressure switch.
c. Fuse.
d. Fan drive overload protector.
e. Fusible plug

f. Overload relay.

g. Overload protection for inverter.

h. Fan motor safety thermostat

Oil Recovery System

Each unit shall be equipped, with an oil recovery system to ensure stable operation with long refrigerant piping.
The system must be provided with oil balancing circuit to avoid poor lubrication.
Anti-corrosion Treatment

Outdoor units should be designed with anti-corrosion specifications as detailed below for use in area, which are subject to salt damage and atmospheric pollution as specified in the BOQ.

The portion of machines like side panel, outer panel, bottom frame, which are exposed to corrosive atmosphere, should be of alloyed hot-dip zinc coated steel plate, coated with corrosion protection powder polyester resin coating on both inner and outer surfaces in thickness of 64 micron or more.

Finned coil protection net should have coating of resin coating containing ultraviolet ray absorbent. Fan and its fan protective net should be with weather resistant polypropylene resin.

The copper pipe – aluminium fins shall be special acrylic resin coated and internal supports, frame, control box shall also be hot-dip zinc coated steel plate and with rust preventive powder coating of 64 micron or more on inner and outer surfaces.

All screws and bolts used in outdoor unit shall be provided with SUS410, Zinc-nickel alloy plating, zinc chrome acid film treatment and rust inhibitor coating.

Indoor Units

This section deals with supply, installation, testing, commissioning of various type of indoor units confirming to general specification and suitable for the duty selected. The type capacity and size of indoor units shall be as specified in detail Bill of Quantities.
Indoor unit shall be either ceiling mounted cassette type, or ceiling mounted ductable type or floor standing type or wall mounted type or other as specified in BOQ. Each unit shall have electronic control valve to control refrigerant flow rate respond to load variations of the rooms.
The indoor units shall have following features:

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

b. In case of centralized control, it shall be set by liquid crystal remote controller.

c. The fan shall be dual suction, aerodynamically designed turbo, multi blade type, statically & dynamically balanced to ensure low noise and vibration free operation of the system. The fan shall be direct driven type, mounted directly on motor shaft having supported from housing.

d. The cooling coil shall be made out of seamless copper tubes and have continues 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 expended for minimum thermal contact resistance with fins. Each coils shall be factory tested at 21kg/sqm air pressure under water.

e. Unit shall have cleanable type filter fixed to an integrally moulded plastic frame. The filter shall slide away type and neatly inserted.

f. Each indoor unit shall have computerized PID control for maintaining design room temperature. Each unit shall be provided with microprocessor thermostat for cooling and heating.

g. Each unit shall be with wired LCD type remote controller. The remote controller shall memorize the latest malfunction code for easy maintenance. The controller shall have self diagnostic features for easy and quick maintenance and service. The controller shall be able to change fan speed and angle of swing flap individually as per requirement.

The indoor units shall generally be of following type:

Ceiling Mounted Ductable Type Unit

Each Indoor unit shall be ceiling mounted ducted type, as specified in scope of work. It shall have electronic control valve to control refrigerant flow rate in response to load variations of the room. The fan shall be of the dual suction multi blade type and statically and dynamically balanced to ensure low noise and vibration free operation. The unit shall have high static fan for Ductable arrangement.

Ceiling Mounted Cassette Type Unit (Multi Flow/ Round Flow Type)

The unit shall be ceiling mounted type. The unit shall include pre-filter, fan section and DX-coil section. The housing of the unit shall be powder coated galvanized steel. The body shall be light in weight and shall be able to suspend from four corners. The fan shall be aerodynamically designed diffuser turbo fan type. Noise level should not be more then 35 dB at low speed.

Unit shall have an external attractive panel for supply and return air. Unit shall have four way supply air grilles on sides and return air grille in center.
Each unit shall have high lift drain pump, fresh air intake provision (if specified) Low gas detection system and very low operating sound.

All the indoor units regardless of their difference in capacity should have same decorative panel size for harmonious aesthetic point of view. It should have provision of connecting branch ducts.

Ceiling Suspended Type

Unit shall be suitable for ceiling suspended arrangement below false ceiling. The units include pre filter, fan section & DX-coil section. The housing of unit shall be light weight powder coated galvanized steel.

High Wall Mounted Units

The unit shall be wall mounted type. The unit includes pre filter, fan section & DX-coil section. The housing of unit shall be light weight powder coated galvanized steel.

Unit shall have an attractive external casing for supply and return air.

Floor Standing Type

Unit shall be suitable for floor standing arrangement. The units include pre filter, fan section & DX-coil section. The housing of unit shall be light weight powder coated galvanized steel.
Centralized Type Remote Controller

(Optional, if specified in BOQ)
A multifunctional compact centralized controller shall be provided with the system.
The controller must be necessarily a graphic Controller type to act as an advanced air-conditioning management system to give complete control of VRF air-conditioning Equipment, It should have case of use for the user and must have a user friendly colored touch screen, icon display and color LCD display.

a. It shall be able to control up to 64 groups of indoor units with the following functions

b. Starting/stopping of Air-conditioners as a zone or group or individual unit.

c. Temperature settling for each indoor unit or zone.

d. Switching between temperature control modes, switching of fan speed and direction of airflow, enabling/disabling of individual remote controller operation.

e. Monitoring of operation status such as operation mode & temperature setting of individual indoor units, maintenance information, trouble shooting information.

f. Display of air conditioner operation history.

g. Daily management automation through yearly schedule function with possibility of various schedules.

h. The controller shall have wide screen user friendly color LCD (Liquid Crystal Display) and can be wired by a non polar 2 wire transmission cable to a distance of 1KM away from indoor unit.

2. AIR HANDLING UNITS (AHUs)

Scope

The scope shall be supply, installation, testing and commissioning of double skin air handling units, conforming to these specifications and meeting all design parameters as mentioned in the " Bill of Quantities", appendices and drawings.

The air handling units shall be draw-thru type comprising of various sections such as mixing box, filter section, coil section, fan section etc., as mentioned in the "Bill of Quantities". The Air handling units shall be factory tested for rated efficiency.

Material of Construction & Design

The housing shall be so constructed that it can be delivered at site in total/SKD conditions depending upon the requirement.

Inner panels shall be constructed out of 24 gauge (0.63mm) plain galvanized sheet and outer panels shall also be made out of 24 gauge (0.63mm) pre painted galvanized steel sheet. Width of each panel shall not exceed 750mm. Insulation shall be injected polyurethane foam in between the double skin panels of thickness as mentioned in the BOQ. These panels shall be bolted from inside on to the frame work with soft rubber gasket in between to make the joints air tight.

AHU framework shall be made out of extruded aluminium hollow sections filled with preformed insulation section. Frame work for each section shall be bolted together with soft rubber gasket in between to make the joints air tight. Frames shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. Suitable doors with pressure die cast aluminium hinges and latches shall be provided for access to various panels for maintenance. The entire housing shall be mounted on steel channel frame work.

Drain Pan

Drain pan shall be made out of 18 gauge stainless steel with necessary slope to facilitate rapid removal of condensate water. Drain pan shall be insulated with closed cell elastomeric insulation of thickness as required. Necessary supports will be provided to slide the coil in the drain pan. Outlet shall be provided from the drain pan in a manner that access panel can be opened without disconnecting the drain pipe connection.

Centrifugal Fan & Motor

The AHU fan section shall house the DIDW backward/forward curved centrifugal fan/s as specified in BOQ. The fan shall be floor standing double inlet double width type. The wheel and housing shall be fabricated from heavy gauge galvanized steel having thickness not less than 14gauge. The fan impeller shall be mounted on a solid shaft supported to housing with angle iron frame and pillow block heavy duty ball bearings. The fan shall be selected for speed not exceeding 1000 RPM. The impeller and fan shaft shall be statically and dynamically balanced. The fan outlet velocity shall generally not be more than 2000 FPM or as mentioned in the BOQ. Fan housing with motor shall be mounted on a common steel base mounted inside the air handling housing on anti-vibration spring mounts or rubber mounts. The fan outlet shall be connected to casing with the help of fire retardant canvass constructed out of imported fabrics. Centrifugal fans shall conform the detailed specifications of fans elaborated in the preceding clause.

Fans shall be driven by an electric motor as specified in the schedule of quantities. Motor ratings are only tentative and where a fan requires a higher capacity motor, the contractor shall clearly point out the requirement and make his offer accordingly. Motor ratings shall be at least 10% over limit load plus transmission losses.

Fan motors shall be suitable for operation on 415 +10% volts, 50 cycles, 3 phase, AC power supply and shall be EFF-1, TEFC squirrel cage induction type totally enclosed fan cooled with IP-55 protection. Motors shall be especially designed for quiet operation and motor speed shall not exceed 1440 RPM. Drive to fan shall be provided through belt-drive arrangement. Belts shall be of the oil-resistant type.

Cooling Coils- DX

Coil section shall house the DX coils wall thickness not less than 0.5mm with aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Material of construction of header associated with cooling coil shall be copper. Face and surface areas shall be such as to ensure rated capacity from each unit and such that air velocity across each coil shall not exceed 500 FPM. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21Kg/Sqcm air pressure under water. Tubes shall be hydraulically/ mechanically expanded for minimum thermal contact resistance with fins. Fin spacing shall be 11 to 13 fins per inch (4 to 5 fins per cm.)

Cooling /Heating Coils - chilled / hot water Based

Coil section shall house the chilled/hot water coils having 12.5 mm to 16 mm dia tubes of wall thickness not less than 0.5mm with aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Material of construction of header associated with cooling coil shall be copper. Face and surface areas shall be such as to ensure rated capacity from each unit and such that air velocity across each coil shall not exceed 500 FPM. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21Kg/Sqcm air pressure under water. Tubes shall be hydraulically/ mechanically expanded for minimum thermal contact resistance with fins. Fin spacing shall be 11 to 13 fins per inch (4 to 5 fins per cm.)

Pre -Filters Section with Filters

Filter section shall house the washable synthetic type air filters having anodized aluminium frame. The media shall be supported with HDP mesh on one side and aluminium mesh on other side. Filter face velocity shall not exceed 400 FPM. Filters shall fit so as to prevent by-pass. Holding frames shall be provided for installing a number of filter cells in banks. These cells shall be held within the frames by sliding the cells between guiding channels. Pre filters shall conform the detailed specifications as elaborated in the preceding clause under sub head “Filters”.

Performance Data

Air handling units shall be selected for the lowest operating noise level. Technical submittal of air handling units shall be prepared for Consultants approval prior to procurement as mentioned under Special Conditions. Fan performance rating and power consumption characteristics shall be submitted and verified at the time of testing and commissioning of the entire installation.

Testing

Cooling/heating capacity of various air handling unit models shall be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Air flow measurements shall be carried out by an anemometer and temperature measurements by accurately calibrated thermometers. Computed results shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

3. FRESH AIR TREATMENT UNITS (FATUS)

Scope

The scope shall be supply, installation, testing and commissioning of double skin construction fresh air treatment units, conforming to these specifications and meeting all design parameters as mentioned in the " Bill of Quantities", appendices and drawings.

The Fresh air treatment units shall be draw-thru type comprising of various sections such as mixing box, filter section, coil section, fan section, air washer section etc., as mentioned in the "Bill of Quantities". The Air handling units shall be factory tested for rated efficiency.

Material of Construction & Design

The housing shall be so constructed that it can be delivered at site in total/SKD conditions depending upon the requirement.

Inner panels shall be constructed out of 24 gauge (0.63mm) plain galvanized sheet and outer panels shall also be made out of 24 gauge (0.63mm) pre painted galvanized steel sheet. Width of each panel shall not exceed 750mm. Insulation shall be injected polyurethane foam in between the double skin panels of thickness as mentioned in the BOQ. These panels shall be bolted from inside on to the frame work with soft rubber gasket in between to make the joints air tight.

FATU framework shall be made out of extruded aluminium hollow sections filled with preformed insulation section. Frame work for each section shall be bolted together with soft rubber gasket in between to make the joints air tight. Frames shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. Suitable doors with pressure die cast aluminium hinges and latches shall be provided for access to various panels for maintenance. The entire housing shall be mounted on steel channel frame work.

Drain Pan

Drain pan shall be made out of 18 gauge stainless steel with necessary slope to facilitate rapid removal of condensate water. Drain pan shall be insulated with closed cell elastomeric insulation of thickness as required. Necessary supports will be provided to slide the coil in the drain pan. Outlet shall be provided from the drain pan in a manner that access panel can be opened without disconnecting the drain pipe connection.

Centrifugal Fan & Motor

The FATU fan section shall house the DIDW backward/forward curved centrifugal fan/s as specified in BOQ. The fan shall be floor standing double inlet double width type. The wheel and housing shall be fabricated from heavy gauge galvanized steel having thickness not less than 14gauge. The fan impeller shall be mounted on a solid shaft supported to housing with angle iron frame and pillow block heavy duty ball bearings. The fan shall be selected for speed not exceeding 1000 RPM. The impeller and fan shaft shall be statically and dynamically balanced. The fan outlet velocity shall generally not be more than 2000 FPM or as mentioned in the BOQ. Fan housing with motor shall be mounted on a common steel base mounted inside the air handling housing on anti-vibration spring mounts or rubber mounts. The fan outlet shall be connected to casing with the help of fire retardant canvass constructed out of imported fabrics. Centrifugal fans shall conform the detailed specifications of fans elaborated in the preceding clause.

Fans shall be driven by an electric motor as specified in the schedule of quantities. Motor ratings are only tentative and where a fan requires a higher capacity motor, the contractor shall clearly point out the requirement and make his offer accordingly. Motor ratings shall be at least 10% over limit load plus transmission losses.

Fan motors shall be suitable for operation on 415 +10% volts, 50 cycles, 3 phase, AC power supply and shall be EFF-1, TEFC squirrel cage induction type totally enclosed fan cooled with IP-55 protection. Motors shall be especially designed for quiet operation and motor speed shall not exceed 1440 RPM. Drive to fan shall be provided through belt-drive arrangement. Belts shall be of the oil-resistant type.

Cooling Coils- DX with Thermo-gaurd protection

Coil section shall house the DX coils wall thickness not less than 0.5mm with aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Material of construction of header associated with cooling coil shall be copper. Face and surface areas shall be such as to ensure rated capacity from each unit and such that air velocity across each coil shall not exceed 500 FPM. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21Kg/Sqcm air pressure under water. Tubes shall be hydraulically/ mechanically expanded for minimum thermal contact resistance with fins. Fin spacing shall be 11 to 13 fins per inch (4 to 5 fins per cm.)

Cooling /Heating Coils - chilled/hot water Based

Coil section shall house the chilled/hot water coils having 12.5 mm to 16 mm dia tubes of wall thickness not less than 0.5mm with aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Material of construction of header associated with cooling coil shall be copper. Face and surface areas shall be such as to ensure rated capacity from each unit and such that air velocity across each coil shall not exceed 500 FPM. The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory tested at 21Kg/Sqcm air pressure under water. Tubes shall be hydraulically/ mechanically expanded for minimum thermal contact resistance with fins. Fin spacing shall be 11 to 13 fins per inch (4 to 5 fins per cm.)

Filters

Filter section shall house the washable synthetic type air filters having anodized aluminium frame. The media shall be supported with HDP mesh on one side and aluminium mesh on other side. Filter face velocity shall not exceed 400 FPM. Filters shall fit so as to prevent by-pass. Holding frames shall be provided for installing a number of filter cells in banks. These cells shall be held within the frames by sliding the cells between guiding channels. Pre filters shall conform the detailed specifications as elaborated in the preceding clause under sub head "Filters". The Unit shall be provided with MERV-14 & carbon filter as well.

Performance Data

FATUs shall be selected for the lowest operating noise level. Technical submittal of air handling units shall be prepared for Consultants approval prior to procurement as mentioned under Special Conditions. Fan performance rating and power consumption characteristics shall be submitted and verified at the time of testing and commissioning of the entire installation.

Testing

Cooling/heating capacity of various FATUs models shall be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Air flow measurements shall be carried out by an anemometer and temperature measurements by accurately calibrated thermometers. Computed results shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

4. FILTERS

4.1 Viscous Metallic Filters

Viscous metal filter shall be all metal, washable type. The filter media shall be composed of layers of crimped GI wire mesh. The velocity over face of filter shall not exceed 90 MPM. and pressure drop shall not exceed 5mm for 50mm thick filter. The filter shall be of GI and suitable for mounting as required at site.

4.2 Synthetic Fibre Filters

Synthetic fibre filter shall be cleanable in light weight aluminium framed with non-woven synthetic fibre replaceable media. The filter shall have an efficiency of 90% down to 10 microns when tested as per BS: 2831 standard. It shall be suitable for operation under 100% Relative Humidity & 120 degree C temperature conditions. The velocity over the face of filter shall not exceed 105 MPM and the pressure drop across the filter shall not exceed 2.5mm WG for 25mm thick filter. The filter frame shall be of aluminium and shall be suitable for mounting in air handling unit as required at site.

5. AIR CURTAINS

Air curtains shall be vertical down throw type and shall comprise of twin centrifugal blowers, statically and dynamically balanced, designed for noiseless and continuous operation, motor etc. Necessary documents establishing Dynamic balancing carried out at factory shall be provided with the consignment. The enclosure shall be factory

fabricated out of 18 gauge aluminium/CRCA sheet duly powder coated. The outlet shall be carefully designed to create laminar draft providing an invisible air curtain at critical junction isolating clean and semi-clean areas or as required.

B. VENTILATION FANS

1. CENTRIFUGAL FANS

a. Centrifugal fans shall be of approved make DIDW or SISW of specified arrangement complete with inspection door, squirrel-cage induction motor, V belt drive, belt guard and vibration isolators etc. Type, direction of discharge / rotation, and motor position shall be as per the Approved for Construction shop drawings.

b. Fans, Aerofoil, forward or backward curved, SISW or DIDW shall be licensed to bear the AMCA Air and Sound Certified Ratings Seal. The test standard used shall be ANSI/AMCA 210-85, ANSI/ASHRAE Standard 51-1985 "Laboratory Method of Testing Fans for Rating" and AMCA 300 "Reverberant Room Method for Sound Testing of fans".

c. All fans shall be dynamically trim-balanced to ISO1940 and AMCA 204/3 - G2.5 quality grade after assembly. A computer printout with vibration spectrum analysis shall be attached to the fans.

d. All fans shall be oven-baked with polyester coating for minimum thickness of 60 microns unless the housing scroll and side frame is constructed from galvanized steel sheet (GSS) .Fan should be of G.S.S. , the Steel sheet should be JFE Galvazinc (Base metal cold rolled), JIS G3302, SGCC with Z22 (minimum coating weight on both sides @ 220 g/m2) zinc coating & Zero Spangle, skin passed, chromated and dry.

e. Fans housing shall be of an appropriate thickness to prevent vibration and drumming and in no case the housing shall be constructed less than 14 Gauge sheet steel and all parts shall be bonderized and then coated with primer finish of approved colour. The fan scroll shall be attached to the side plate by means of continuous lock seam or welded scam. 18 gauge galvanized wire mesh inlet guards of 5 cm sieves shall be provided on both inlets. Housing shall be provided with standard cleanout and door with quick locking tension handles and neoprene gasket. Rotation arrow shall be clearly marked on the housing.

The wheel and inlet cone shall be aerodynamically designed and constructed to prov maximum performance and efficiency as published by the manufacturer.

f. Fans must be physically capable of operating safely at every point of rating at or below the "minimum performance" limit for that class as defined in AMCA standard 99-2408-69 "Performance Class of Operating Limits for Centrifugal Fans".

g. Shafts sizes shall be carefully calculated and designed such that the maximum operating speed (RPM) shall not exceed 75% of the first critical speed. For any application that is not a standard product from catalogue of the fan manufacturer detailed calculation of critical speed characteristic shall be submitted for approval.

h. Shafts shall be constructed out of carbon steel (C45) machined and polished to tolerance of standard ISO 286-2 - grade g6. Protective coat of anti-rusting shall be applied to all bare surfaces of the shafts at the factory.

i. Bearings shall be of self-alignment (concentric) type with adaptor sleeve bearing. Bearings of eccentric locking collar with grub screw type are not acceptable. Bearing shall be maintenance free with permanently lubricated sealed ball bearing type. Bearing life shall be at least 75,000 hours based on basic rating life, L10 of ISO 281 standard. Calculation sheet of Bearing Life shall be submitted for approval.

j. Motor installed shall be of a minimum 130% of the fan power absorbed (Brake horsepower) and shall have sufficient torque available for starting and continuous operation. Motor shall be suitable for 415 ± 10% volts, 50 Hz, 3 phase power supply.

k. Belts and pulleys shall be sized for a minimum 150% of the installed motor horsepower. The belt speed shall not exceed 30m/s. The pulley shall be of Taper Lock SPZ, SPA, SPB or SPC type. Conventional type of pulley is not acceptable. Both fan and motor pulley shall be balanced to the quality grade G.2.5.

l. Fan outlet velocity shall not exceed 2000 FPM (10.16 MPS) and maximum fan speed shall be 1000 RPM. Fan wheel and housing shall be statically and dynamically balanced. Necessary documents establishing Dynamic balancing carried out at factory shall be provided with the consignment.

m. Computer printout on fan performance rating corresponding to the AMCA licensed data, with corrected rating for altitude and temperature, fan operating speed, bearing life, etc. shall be submitted for approval.

n. For Air washer Application, fans should be provided with coat of Pure polyester powder coating. Fans should have Inspection door & Drain plug.

2. **Inline Fans :**

The inline fans shall be used for exhaust air or for fresh air supply as shown on the drawings having following constructional features:

a. The casing shall be constructed out of hot rolled heavy gauge GSS metal epoxy coated embodied with required inspection doors.

b. Fan shall be direct driven SISW forward or backward curved centrifugal type. Material of construction for impeller shall GSS. Fan wheel shall be statically and dynamically balanced.

c. The bearing shall be completely maintenance free and can be used in any mounting position, at maximum indicated temperature.

c. Motor shall be total enclosed external rotor type and suitable for operation on 415±10% volts, 3phase or 220±6% volts, 1 phase, 50Hz AC power supply.

d. Single phase inline fans shall be provided with factory fitted speed regulators and three phase inline fans shall be provided with GI dampers.

f. All the fans shall be tested for performance and the following test results shall be furnished:

i. Air flow rate in C.F.M.
ii. Static pressure at the fan supply end.

C. PIPING

1. General:

a. The scope under this section covers supply, laying, erection, testing and commissioning of pipes, pipe fittings and associated valves conforming to these specifications and the general arrangements shown on the drawings.

b. All piping including pipe fittings and valves shall follow the relevant Indian Standards/manufacturer's recommendations.

2. Refrigerant Piping:

All refrigerant piping for the VRF air conditioning system shall be constructed out of hard drawn copper refrigerant pipes with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good engineering practice within the air-conditioning industry, and shall be inclusive of charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits.

All joints in copper piping shall be sweet joints using low temperature brazing and or silver solder. Before jointing any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while constructing the joints. Subsequently, it shall bee thoroughly blown out using nitrogen.

The Refnet Joints (Y-joints) and Refnet Headers shall be made from copper and would be imported, factory fabricated and pre-insulated.

After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at pressure of 35Kg/Sq. Cm and 10 Kg/Sq.Cm (low side). Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to minimum vacuum of 700mm Hg and held for 24 hours.

The air-conditioning system supplier shall verify the refrigerant piping design conceived and brought to the notice of Consultants if any discrepancy is found.

The OD & wall thickness of copper refrigerant piping shall be as follows:

Outside Pipe Dia (mm)	**Wall thickness (mm)**
54.1	1.5
41.3	1.3
34.9	1.3
28.6	1.2
25.4	1.2
22.2	1.2
19.1	1.0

Outside Pipe Dia (mm)	Wall thickness (mm)
15.9	1.0
12.7	0.8
9.5	0.8
6.4	0.8

The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturers specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

The whole of the liquid and suction refrigerant lines including all fittings, valves and strainer bodies, etc. shall be insulated with 19mm thick closed cell elastomeric insulation material.

The joints shall be properly sealed with synthetic glue to ensure proper bonding of the ends.

3. **Drain Piping:**

a. All pipes to be used for drain, condensate drain and fittings shall be galvanized steel class 'B' (medium class) confirming to relevant IS & BIS Codes.

b. All jointing in the pipe system shall be by screwed and / or by screwed flanges using 3mm 3 ply rubber insertion gaskets. Pipe threads and flanges shall be as per relevant BIS Codes.

c. All pipes supports shall be mild steel, thoroughly cleaned and given one primary coat of red oxide paint before being installed.

d. Fittings shall be galvanized steel "medium class" malleable casting of pressure rating suitable for the piping system. Flanges shall be of approved make. Supply of flanges shall include bolts, nuts, and gaskets as required. Sufficient number of flanges and unions shall be provided for future cleaning and servicing of piping. Tee-off connection shall be through equal or reducing Tees. All equipment and valve connections or connections to any other mating pipes shall be through flanges required for the mating connections.

c. All condensate drain piping shall be insulated with closed cell elastomeric insulation material of thickness as mentioned in "Schedule of Quantities".

4. **Insulation**

Drain Pipes shall be insulated as required or as shown on the approved drawings and in line with specifications stipulated in section 'INSULATION'.

D. AIR DISTRIBUTION

1. General:

a. The scope under this section covers supply, fabrication, installation and testing of all GS sheet metal ducts and supply, installation, testing and balancing of grilles, diffusers conforming to these specifications and the general arrangements shown on the tender drawings.

b. Duct work shall mean all ducts, dampers, access doors, joints, stiffeners, supports and hangers.

2. Duct Work Fabricated at Site as per BIS Standards

2.1 Duct Material and Fabrication

Material used for ducts shall be galvanized steel sheets class VIII conforming to IS:277-1962 (revised) or aluminium sheets conforming to IS:737-1955 as specified in the Bill of Quantities. All ducts shall be fabricated and installed in a workman like manner, generally conforming to IS: 655-1963 (Revised) with amendment- I (1971 edition). Fabrication of ducts shall be through well conditioned Triplex lock former or multiple lock formers, conforming to relevant BIS Codes. Round exposed ducts shall be die formed for achieving perfect circle configuration.

Thickness of the sheet shall be as given hereunder:

Size of Duct	**Sheet thickness**	
	GSS	**Aluminium**
Up to 750 mm	24 Gauge (0.63mm)	22 Gauge (0.80mm)
751 mm to 1500mm	22 Gauge (0.80mm)	20 Gauge (1.00mm)
1501 mm to 2250mm	20 Gauge (1.00mm)	18 Gauge (1.25mm)
2251 mm and above	18 Gauge (1.25mm)	16 Gauge (1.6mm
All Round Ducts	20 Gauge (1.00mm)	

Joints and bracing of ductwork shall generally be as per IS Specifications. However, minimum size of accessories involved shall be as given hereunder:

Size of Duct	**Joint Type**	**Bracing**
Up to 750 mm	G.I. Flange	--
751 mm to 1000 mm	25 mm x 25 mm x 3 mm angle iron frame with 8 mm dia nuts and bolts.	25 mm x 25 mm x 3 mm angle iron frame at 1000 mm centre

1001 mm to 1500 mm	40 mm x 40 mm x 5 mm angle iron frame with 8 mm dia nuts and bolts.	40 mm x 40 mm x3 mm angle iron frame at 1000 mm centre
1501 mm to 2250 mm	50 mm x 50 mm x 5 mm angle iron frame with 12 mm dia nuts and bolts. at 125 mm centre.	40 mm x 40 mm x 3mm angle iron frame at 1200 mm centre (diagonally cross braced)
2251 mm and above	50 mm x 50 mm x 6 mm angle iron frame with 12 mm dia nuts and bolts. at 125 mm centre.	40 mm x 40 mm x 3 mm angle iron frame at 1200 mm centre (diagonally cross braced)

2.1.2 GI sheets shall be produced using hot deep galvanization process and minimum acceptable coating of zinc shall be 120gm/SqM. Sample of GI sheet along with test certificate to be submitted for approval prior to supply of GI sheets.

2.1.3 GI sheets shall be checked for hardness/flexibility and water marks prior to dispatch. Zinc coating if found peeled –off or duct work with water marks after fabrication shall be rejected.

2.1.4 Ducts shall be straight and smooth on the inside with neatly finished joints. All joints shall be made air tight.

2.1.5 All exposed ducts within conditioned spaces shall have only slip joints and no flanged joints. The internal ends of slip joints shall be made in the direction of air flow.

2.1.6 Change in dimensions and shape of ducts shall be gradual. Curved elbows, unless otherwise approved, shall have a centre line radius equal to one and half times the width of the duct. Air turns shall be installed in all abrupt elbows and shall consist of curved metal blades or vanes, arranged to permit the air to make the turns without appreciable turbulence.

2.1.7 GI splitter dampers complete with brass metal lever shall be installed at each bifurcation / trifurcation point of duct for proper flow of air quantity in each duct.

2.1.8 Ductwork shall be fabricated strictly in accordance with the “Approved for Construction” Shop drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees or angles of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

2.1.9 All sheet metal connections, partitions and plenums required to confine the flow of air to and through the filters and fans, shall be constructed out of 18 gauge galvanized steel sheet, thoroughly stiffened with angle iron braces mentioned above and fitted with all

necessary doors as required by the Consultants, to give access to all parts of the apparatus. Doors shall not be less than 45cm x 45cm in size. All hardware fittings such as thunder bolts, hinges, handles etc. shall be in extruded aluminium construction.

2.2 Installation of Ductwork

2.2.1 During construction, the contractor shall temporarily close the duct openings with sheet metal covers to prevent debris and any foreign material entering ducts and to maintain opening straight and square.

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

2.2.3. 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. This work shall meet with the approval of the Architects/Owners in all its parts and details.

2.2.4. All ducts shall be supported from the ceiling /slab using 9mm to 12mm dia MS rods depending upon the size of the duct unless & until mentioned otherwise in the BOQ. MS angle iron of size not less than 40mmx40mmx5mm or more if duct size is large enough shall be used at the bottom. The MS rods shall be anchored to RCC slab using suitable metallic expansion fasteners.

2.2.5 All necessary allowances and provisions shall be made by the contractor for beams, pipes or other obstructions in the buildings, whether or not the same are shown on the drawings. Where it becomes 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 being maintained as approved or directed by the Architects/Consulting Engineer.

2.2.6 If a duct cannot be run as shown on the drawing, the contractor shall install the duct between the required points by any path available, subject to the approval of the Architect/ Consultant.

2.2.7 All duct work shall be independently supported from building elements or as required by the Architect/ Consultant. All horizontal ducts shall be rigidly and securely supported, in an approved manner, within hangers formed of MS rods and angle iron under ducts not greater than 2 M centers. All vertical duct work shall be supported by structural members at each floor.

2.2.8 Ducting on top of the ceiling shall be supported from the slab above, or from beams with the help of adequate strength dash fasteners, after obtaining approval of the Architect/ Consultant. In no case shall a duct be supported from the ceiling hangers or be permitted to rest on a hung ceiling.

2.2.9 All metal work in dead or closed down spaces shall be erected in time to occasion no delay to other contractors in the building.

2.2.10 All air turns of 45 degrees or more shall include curved metal blades or vanes so as to permit the air to make the abrupt turns without an appreciable turbulence. Turning vanes shall be securely fastened to prevent noise or vibration. All supply air collars shall be provided with GI vanes properly secured using rivets.

2.2.11 All ducts shall be totally free from vibration under all conditions of operations. Whenever duct work is connected to fans, that may cause vibrations in the duct, ducts shall be provided with two flexible connections located close to the unit in mutually perpendicular directions. Flexible connection shall be constructed of fire resistant flexible double canvas sleeves at least 150mm long, secured properly and bolted at both ends. Sleeve shall be made smooth and the connecting duct work rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation.

2.2.12 The two mating flanges of the ducts being joined with each other shall be made air tight by providing 4mm thick rubber gasket fixed on both mating flanges by means of good quality adhesive. Rubber strip shall also be provided between bottom surface of duct and angle iron at each duct support to avoid metal to metal contact.

2.2.13 All duct supports including MS rods, cleats and angle iron shall be primer coated and thereafter, painted with black enamel paint.

2.3 Round Ductwork

Spiral/round ductwork wherever required shall meet following parameters :

a. Conform to BIS round ductwork requirements.

b. Round Ducts shall be constructed out of galvanized sheet steel as per relevant BIS standards.

c. Upto 1200mm dia ducts spiral lock seam shall be provided.

d. Ducts more than 1200 mm diameter shall be provided with welded longitudinal or spiral seam.

e. Lap or snap lock seams are not permitted for round ductwork of any size.

f. Provide beaded sleeve or flanged and gasketed joints for ducts.

g. Provide all welded long radius elbows.

h. Provide conical tees, all welded.

i. Butt tees or butt taps are not permitted.

All round ducts, 750 mm and larger, shall be supported with two hangers at each support point in an approved manner.

3. Duct Work Fabricated in Factory as per SMACNA Standards

3.1 Duct Material and Fabrication

Material used for ducts shall be galvanized steel sheets class VIII, light coating of zinc, nominal 120gm/SqM surface area conforming to IS:277-1962 (revised) or aluminium sheets conforming to IS:737-1955 as specified in the Bill of Quantities. GI sheet shall be of Lock Forming Quality prime material along with mill test certificates. In addition, if deemed necessary, samples of raw material, selected at random by Client's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense.

3.2. Recommended Thickness and Type of Joints

All ducts shall be fabricated using galvanized steel/aluminum sheet with thickness as mentioned hereunder:

3.2.1 For Ducts with External Static Pressure (SP) upto 250 Pa (25mm) :

GSS Rectangular Ducts	**Pressure 250 Pa (25mm)**		
	Duct Section Length 1.2 m (4 ft)		
Maximum Duct Size	**Gauge as per BOQ**	**Joint Type**	**Bracing Spacing**
1–750 mm	26 or 24	**"4 Bolt Transverse Duct Connector-E (TDC) with built in sealant" as per BOQ.**	Nil
751 – 899 mm	24	4 Bolt Transverse Duct Connector-E (TDC) with built in sealant	Nil
900 – 1200 mm	24 or 22	4 Bolt TDC –E	Nil
1201 – 1500 mm	22	4 Bolt TDC-H	Nil
1501 – 1800 mm	22 or 20	4 Bolt TDC-H	Nil
1801 – 2100 mm	20	4 Bolt TDC-J	Nil
2101 – 2700 mm	18	4 Bolt TDC-J	Nil

3.2.2 For Ducts with External Static Pressure (SP) upto 500 Pa (50mm) :

GSS Rectangular Ducts	**External Pressure 500 Pa (50mm)**
	Duct Section Length 1.2 m (4 ft)

Maximum Duct Size	Gauge	Joint Type	Bracing Spacing
1–600 mm	24	**"4 Bolt Transverse Duct Connector-E (TDC) with built in sealant" as per BOQ.**	Nil
601-700 mm	24	4 Bolt Transverse Duct Connector-E (TDC) with built in sealant	Nil
701-900 mm	24 or 22	4 Bolt TDC-E	Nil
901-1200 mm	22 or 20	4 Bolt TDC-H	Nil
1201-1300 mm	20	4 Bolt TDC-J	Nil
1301-1500 mm	18	4 Bolt TDC-J	Nil
1501-1800 mm	18	4 Bolt TDC-J	Nil
1801-2100 mm	18	4 Bolt TDC-J	Nil
2101-2250 mm	18	4 Bolt TDC-J	Nil
2251-2400 mm	18	4 Bolt TDC-J	Nil
2401-2700 mm	18	4 Bolt TDC-J	600 *

'C'-cleat; 'S'-S cleat; 'SS'-Standing S cleat; 'AI' -Angle Iron in mm
* Distance of reinforcement/bracing from each joint. Bracing material to be same as of material used for joining of duct sections.

For Aluminium ducts material shall be one commercial gauge higher with 22 gauge as minimum.

3.3 Fabrication Standards and Equipment

All duct construction and installation shall be in accordance with SMACNA standards. In addition ducts shall be factory fabricated utilizing the following machines to provide the requisite quality of ducts.

3.3.1 Coil (Sheet metal in Roll Form) lines to facilitate location of longitudinal seams at corners/folded edges only, for required duct rigidity and leakage free characteristics. No longitudinal seams permitted along any face side of the duct.

3.3.2 All ducts, transformation pieces and fittings to be made on CNC profile cutter for requisite accuracy of dimensions, location and dimensions of notches at the folding lines.

3.3.3 All edges to be machine treated using lock formers, flangers and rollers for turning up edges.

3.4 Duct Construction

All ducts shall be fabricated and installed in workmanlike manner, conforming to relevant SMACNA codes.

a) Ducts so identified on the Drawings shall be acoustically lined and insulated from outside as described in the section "Insulation" and as indicated in schedule of Quantities. Duct dimensions shown on drawings, are overall sheet metal dimensions inclusive of the acoustic lining where required and indicated in Schedule of quantities. The fabricated duct dimensions should be as per approved drawings and care should be taken to ensure that all connecting sections are dimensionally matched to avoid any gaps.

b) Ducts shall be straight and smooth on the inside with longitudinal seams shall be airtight and at corners only which shall be either Pittsburgh or snap button as per SMACNA practice, to ensure air tightness.

c) All concealed ducts up to 750mm width within conditioned spaces shall have slip and drive (C & S/SS) joints. The internal ends of slip joints shall be in the direction of airflow. Care should be taken to ensure that S/SS Cleats are mounted on the longer side of the duct and Cleats on the shorter side. Ducts and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint.

d) Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7). Air-turns (vanes) shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

e) Ducts shall be fabricated as per details shown on Approved for Construction Shop Drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees, or angles, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

f) All sheet metal connection, partitions and plenums, required to confine the flow of air to and through the filters and fans, shall be constructed of 18 gauge GSS / 16gauge aluminum, thoroughly stiffened with 25mm x 25mm x 3mm galvanized steel angle braces and fitted with all necessary inspection doors as required, to give access to all parts of the apparatus. Access doors shall be not less than 450mm x 450mm in size.

g) Plenums shall be shop/factory fabricated panel type and assembled at site. Fixing of galvanized angle flanges on duct pieces shall be with rivets heads inside i.e. towards GS sheet and riveting shall be done from outside.

h) Self adhesive Neoprene rubber / UV resistant PVC foam lining 5mm nominal thickness instead of felt, shall be used between duct flanges and between duct supports in all ducting installation

3.5 Duct Installation

All ducts shall be installed generally as per tender Drawings, and in strict accordance with approved shop drawings to be prepared by the Contractor. The contractor shall also carry out the feasibility study at site, coordination with other services and interior drawings before fabrication of duct at the factory. Any fabricated duct rejected due to these reasons shall not be paid and only final measured and installed duct shall be certified for payment.

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 Architects/Consultants/Client's site representative in all its parts and details.

b. All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the Drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and conduits, the ducts shall be transformed, divided or curved to one side (the required area being maintained) all as per the site requirements.

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 Client's site representative. Fabrication of duct shall be commenced only after verifying the feasibility at site.

d. All duct work shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with trapeze hangers formed of fully threaded galvanized steel rods and galvanized steel angle/channel under ducts at no greater than 2 meter centre. All vertical duct work shall be supported by structural members on each floor slab. Galvanised steel cleat with a hole for passing the hanger rods shall be welded to the plates. Trapeze hanger formed of galvanized steel rods and angles/ channels shall be hung through these cleats. Duct support shall be through dash /anchor fastener driven into the concrete slab by electrically operated gun. Hanger rods shall then hang through the cleats. Size of supports shall be as given hereunder:

Larger Size of Duct	"C" channel size	Fully threaded GI Vertical Rod size	Maximum spacing between supports
Up to 600mm	40mmx40mmx18gauge	8mm	2000mm

601mm to 1200mm	40mmx40mmx16gauge	10mm	2000mm
1201mm to 1800mm	50mmx50mmx5mm MS angle iron duly painted	12mm	2000mm
1801mm & above	65mmx65mmx6mm MS angle iron duly painted	12mm	2000mm

e. Ducting over false ceiling shall be supported from the slab above, or from beams, after obtaining approval of Client's site representative/Architects. In no case shall any duct be supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other Contractor's work in the building. All supports of ducts shall be taken from structural slab/wall by means of fastener.

f. Where ducts pass through brick or masonry openings, it shall be provided with 25 mm thick TF quality expanded polystyrene around the duct and totally covered with mortar for complete sealing. Contractor shall ensure that contact between metal duct and mortar is avoided.

g. All ducts shall be totally free from vibration under all conditions of operation. Whenever duct work is connected to fans, air handling units or blower coil units that may cause vibration in the ducts, ducts shall be provided with a fire resistant double flexible connection, located at the unit discharge. Flexible connections shall be constructed of fire retarding flexible heavy canvas sleeve at least 100mm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting duct work rigidly held by independent supports on both sides of the flexible connection. The flexible connection shall be suitable for pressure at the point of installation.

h. In case of grid type false ceiling, the entire diffuser assembly with plenum shall be independently hung from the ceiling through adjustable GI wires and the same shall be connected to the main duct through a flexible round duct.

i. Duct shall not rest on false ceiling and shall be in level from bottom. Taper pieces shall taper from top.

j. Suitable arrangement shall be provided in duct for fixing of duct smoke sensor (supplied by other vendor).

k. Toilet exhaust duct shall be provided with goose necking as shown in design drawings and exhaust shall continue operation in case of fire.

Duct Support with Steel Wire Rope Hangers

Wire Hangers with following specifications shall be used to suspend static HVAC Air Distribution services as required.

Wire Hangers should consist of a pre-formed wire rope sling with a range of end fixings to fit various substrates and service fixings, these include a ferruled loop, permanently fixed threaded M6 (or M8, M10) stud, permanently fixed nipple end with toggle, at one end or hook or eyelet, cladding hook, barrel, wedge anchor, eyebolt anchor or any other end fixture type or size as per manufacturers recommendation and design. The end fixings and the wire must be of the same manufacturer with several options available. The system should be secured and tensioned with a Hanger self-locking grip at the other end. Once the grip is locked for safety purpose unlocking should only be done by using a separate setting key and should not be an integral part of the self-locking grip. Only wire and/or supports supplied and/or approved, shall be used with the system.

c. Wire Hangers should have been independently tested by Lloyds Register. APAVE, TUV, UL,CSA, Chiltern International fire, ADCAS, Intertek, ECA, and SMACNA, approved by ULC and CSA and comply with the requirements of DW/144 and BSRIA – wire Rope Suspension systems. Wire rope should be manufactured to BSEN 12385: 2002

d. The contractor shall select the correct specification of wire hanger to use for supporting each particular service from table 1 below. Each size is designated with a maximum safe working load limit (which incorporates a 5:1 safety factor).

The correct specification of wire hanger required is determined using the following formula.

Weight per meter of object suspended (kg) x Distance between suspension points (m) = weight loading per Hanger suspension point (kg).

Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the manufacturer's recommendations.

The contractor shall select the correct length of wire rope required to support the service. Lengths from 1-10m lengths. Specials can be made, check with manufacturer. No in–line joints should be made in the rope.

Wire (Gripple) Hanger Safe Working Loads		
size	**minimum breaking load of Wire Rope**	**working load limit (kg/lbs)**
No. 1	80kg/176 lbs	0-10 kg / 0-22 lbs
No. 2	260kg/572 lbs	10-45 kg / 23-100 lbs
No. 3	580kg/1276 lbs	45-90 kg / 101-200 lbs
No. 4	1500kg/3300 lbs	90-225 kg / 210-495 lbs
No. 5	2160kg/4752 lbs	225-325 kg / 496-715 lbs
No. 6	2500kg/5500 lbs	325-500 kg / 715-1100 lbs

The standard range of Hanger Kits should contain galvanized high tensile steel wire rope or stainless steel wire rope as per the application, the minimum specification is as above and should be manufactured to BS 302 (1987), BSEN12385. Comply with manufacturer's load ratings and recommended installation procedures. It should be noted that the testing has been done to the minimum breaking load of the wire giving a minimum safety factor of 5: 1.

Ducting Supports:

a. All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with hangers formed of galvanized steel wire ropes and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel wire hangers under ducts, rigid supports may be provided at certain interval if need be**.** The spacing between supports should be not greater than 2 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates or Toggle end wire fixing left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the wire rope hanger shall be welded to the plates. Trapeze hanger formed of galvanized steel wire rope using Gripple shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Wire rope supports shall hang through the cleats or wire rope threaded studs can be screwed into the anchor fasteners. In case of non availability of RCC slab Hanger wires shall then hang around the structural support without use of fastner.

b. All horizontal ducts shall be adequately secured and supported. In an approved manner, with trapeze Hangers formed of galvanized steel wire rope in a cradle support method under ducts at no greater than 1800mm centre, for 1801mm-above appropriate size angle along with neoprene pad in between the duct & MS angle should be used with prior approval. All vertical duct work shall be supported by structural members on each floor slab. Duct support shall be through dash / anchor fastener driven into the concrete slab by electrically operated gun. Hanger wires shall then hang around the ducting. Rigid supports shall be used in conjunction with wire rope hangers to assist with alignment of services where recommended for by the manufacturer. Rigid support must also be used in conjunction with wire rope hangers with duct work at each change of direction or connection. Support ducting in accordance with Schedule I at the end of this Section. Any

other Gripple solution can be used based on manufacturer's recommendation on site conditions after prior approval. In cases of Spiral ducting the wire can be wrapped directly around the ducting without the need for a spiral ducting clamp for sizes above 1100 a cradle support should be provided refer to manufacturer's recommendations.

c. Ducting over furred ceiling shall be supported from the slab above or from beams after obtaining approval of Construction manager/consultant. In no case shall any duct be supported from false ceiling Hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other Contractor's work in the building. All supports of pipe shall be taken from structural slab/wall by means of fastener.

Catenary Supports: Refer to manufacturer's recommendations on Catenary supports with C clip, special care should be taken with tensioning of the wire and angles at which the installation of services are made.

Stainless Steel Supports should be used for food, chemical and High Corroding environments like areas near coastlines.

Installation should comply with manufacturer's load ratings and recommended installation procedures.

Schedule I: Duct Hanger Schedule

For ducts with external SP upto 250 Pa

Maximum Duct Size (mm)	Gauge	Gripple Hanger No.
1 - 750	26	2
751-1000	26	2
1001-1200	24	3
1201 - 1500	24	3
1501 - 1800	22	4
1801-2100	20	4
2101-2700	18	4

For ducts with external SP upto 500 Pa

Maximum Duct Size (mm)	Gauge	Gripple Hanger No.
1–600 mm	26	2
601-750 mm	26	2
751-1000 mm	24	3

1001-1200 mm	22	4
1201-1300 mm	20	4
1301-1500 mm	18	4
1501-1800 mm	18	4
1801-2100 mm	18	4
2101-2250 mm	18	4
2251-2400 mm	18	4
2401-2700 mm	18	4

Note: All supports are considered at not more 2000 mm interval.

4. **Flat Oval Ductwork**

4.1 Flat oval duct shall be provided where shown and as shown on the tender drawings.

4.2 Minimum duct wall thickness shall be as indicated in below:

Flat oval duct gauge positive pressure to 10 in.wg.

Major Dimension Duct Width (inch)	Longitudinal Seam	SpiralSeam	Fitting Gauge
TO 24	20	24	20
30	20	22	20
36	20	22	20
42	18	22	18
48	18	22	18
54	18	20	18
60	18	20	18
60	16	20	16
71 and UP	16	18	16

Flat oval duct gauge positive pressure to 2500 Pa.

Major Dimension Duct Width (mm)	Longitudinal Seam (mm)	SpiralSeam (mm)	Fitting Gauge (mm)
TO 600	1.00	0.70	1.00
750	1.00	0.85	1.00
900	1.00	0.85	1.00

1000	1.31	0.85	1.31
1200	1.31	0.85	1.31
1300	1.31	1.00	1.31
1500	1.31	1.00	1.31
1650	1.61	1.00	1.61
1775 and UP	1.61	1.31	1.61

4.3 Reinforcement for flat sides of oval duct shall be of the same size and spacing interval as specified for rectangular duct or shall be provided to limit wall deflection to 3/4 (19mm) and reinforcement deflection to 1/4 (6.4 mm)

4.4 Unless otherwise specified, joints and seams shall be similar to those indicated for round duct.

4.5 Fittings shall conform to the thickness schedules in Table 3-15, shall conform to the seam, joint, and connection arrangements permitted for round duct, and shall be reinforced to conform to 2.4.3.

4.6 The duct construction shall be capable of withstanding a pressure 50 percent greater than that of the assigned pressure class without structural failure or permanent deformation.

4.7 Duct wall deflection at atmospheric pressure, with reinforcements and connections in place, shall not exceed 1/4 in. (6.4 mm) on widths of 36 in. (914 mm) or less or 1/2 in (13 mm) on greater widths. Refer Criteria in Chapter 11 of SMACNA Standards 2005 Third Edition.

4.8 Supports shall conform to those permitted for rectangular duct, with the overall dimensions taken as references.

4.9 Documentation & Measurement of ducting

All ducts fabricated and installed should be accompanied and supported by following documentation:

a. For each drawing, all supply of ductwork must be accompanied by computer generated detailed bill of materials indicating all relevant duct sizes, dimensions and quantities. In addition, summary sheets are also to be provided showing duct area by gauge and duct size range as applicable.

b. Measurement sheet covering each fabricated duct piece showing dimensions and external surface area along with summary of external surface area of duct gauge-wise.

c. All duct pieces to have a part number, which should correspond to the serial number, assigned to it in the measurement sheet. The above system will ensure speedy and proper site measurement, verification and approvals.

4.10 Testing

After duct installation, total duct work (Air conditioning and Mechanical Ventilation Ducts for Kitchen and toilet exhaust) carried out under this scope of works should be tested for leakage. The procedure for leak testing should be followed as per SMACNA -" HVAC Air Duct Leakage test manual" (First Edition-1985)

4.11 Ductwork Leakage Tests

4.11.1 General

This section of the specification describes the ductwork leakage testing procedure.

All ductwork shall be pressure tested for leakage, smoke test is not acceptable.

The Sub-contractor shall provide the necessary test equipment and skilled labour to carry out the tests satisfactorily.

Tests shall be witnessed and certified by the Consultant or his representative. Prior to witness of final tests, the sub-contractor shall carry out preliminary tests to ensure the test results are within specified limits.

All ductwork shall be tested for leakage without duct insulation or duct enclosure at the joints.

Accuracy of the test apparatus shall be within:

(i) ± 5% of the indicated flow rate or 0.4 l/s, whichever is greater, and
(ii) 5% of the indicated static pressure in duct under test.

The test apparatus shall have a calibration certificate, chart or graph dated not earlier than one year before the test for which it is used.

4. **Air Terminals**

4.1 Dampers

4.1.1 Opposed blade type louver dampers with quadrant and thumb screw lock shall be used at supply air collars for balancing of air distribution system and box type volume control dampers having lever operation shall be used at the outlet of air conditioning equipment or as shown on the approved shop drawings.

4.1.2. All dampers shall be multi blade type of robust construction of galvanized steel unless and until specified otherwise in the Bill of Quantities and tightly fitted. The design, method of handling, and control shall be suitable for the location and service required.

4.1.3 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 operable and accessible through suitable access doors in the ducts. Every damper shall have an indicating device clearly showing the damper position at all times.

4.1.4 Dampers shall be placed in ducts and at each supply air collar, whether or not indicated on the drawings, for the proper volume control and balancing of the system.

4.1.5 Automatic and manual volume control opposed blade dampers shall be complete with frames and bronze bearings as per drawings. Dampers and frames shall be constructed out of 1.6mm steel sheets and blades shall not be over 225mm wide. The dampers for fresh air inlet shall additionally be provided with fly mesh screen, on the outside, of 0.8mm thickness with fine mesh.

4.1.6 Wherever required for system balancing, a volume balancing opposed blade damper with quadrant and thumb screw lock shall be provided.

4.1.7 After completion of the duct work, dampers are to be adjusted and set to deliver air flow as specified on the drawings.

4.2 Double Louvered Grilles

4.2.1 The supply air grilles shall be fabricated from extruded aluminium sections. The supply air grilles shall have double adjustable louvers i.e. front horizontal and rear vertical louvers, both adjustable. The louvers shall be suitable to hold deflection settings under all conditions of velocity and pressure. The grilles shall be provided with outer frame. The louvers shall be pivoted in Nylon bushes for smooth operation for return air grilles similar to supply air as described above will be provided but with out volume control damper. The grilles shall be painted as per approved powder coated shade.

4.2.2 Volume control dampers in extruded aluminium construction shall be factory fitted for supply air grilles.

4.2.3 Longer grilles having size more than 45cm shall have intermediate supports for the horizontal louvers. The sample of grille shall have to be got approved by the consultants before delivery.

4.3 Linear Grilles

4.3.1 The linear supply cum return air grilles shall be fabricated from extruded aluminium sections. Flanges shall be of minimum 1.3 mm thick extruded aluminium suitable to hold the louvers tightly in fixed position.

4.3.2 Louvers shall be minimum 3mm thick throughout of extruded aluminium construction with 15 degree deflection unless and until specified otherwise. Grilles shall be provided with removable/fixed internal core as mentioned in the BOQ. The sample of grille shall have to be got approved by the consultants before delivery.

4.3.3 All sections of grills shall be powder coated for color and shade as approved by the Architects to match interior finishes.

4.3.4 Linear grilles at each supply air outlet shall be provided with volume control dampers as mentioned above and accounted for in BOQ separately. The linear grilles shall be fixed in to a plenum chamber having GI spacers with concealed screws. End pieces or corner pieces shall be provided as required.

4.4 Diffusers

4.4.1 Square ceiling diffuser shall be anti-smudge ring type fabricated out of extruded aluminium sections. The four directional air flow diffuser shall consist of outer ring fixed to duct collar with concealed screws. Foam gasket shall be provided between outer ring and suspended ceiling. The central core shall be clip fixed to the outer ring.

4.4.2 Opposed blade volume control damper in extruded aluminium construction shall be fixed to the neck of diffuser. The damper shall be adjusted after removing the central core.

4.4.3 All sections of diffusers shall be powder coated for color and shade as approved by the Architects to match interior finishes. The sample of diffuser shall have to be got approved by the consultants before delivery.

4.5 Multislot Linear Diffuser

Linear ceiling diffuser shall be multislot type. The diffuser shall be fabricated out of extruded aluminium sections. Each slot shall be 19mm wide. Each slot shall be equipped with air flow direction control louver mechanically fixed. Integral sliding type hit & miss type volume control damper in extruded aluminium construction shall be provided for each slot for fine control of air flow in supply air portion only. The damper shall be fabricated out of anodized extruded aluminium sections.

Other sections of ceiling diffuser shall be powder coated in colour & shade approved by the Consultants/Architects.

The linear diffuser shall be fixed in to a plenum chamber with concealed screws. Side end pieces or corner pieces shall be provided if required.

4.6 Air Transfer Grille

4.6.1 Air transfer grilles shall be in extruded aluminium construction. The grilles shall be complete with single /double frame suitable to be fixed on the door panel from both sides. The central core shall be no-see-thru type.

4.6.2 The grilles shall be anodized or powder coated in colour and shade as approved by the Architects. The grilles shall be provided with insect screen.

4.6.3 The ATGs shall be provided at the door of pantry and toilets as shown in the approved drawings. The sample of grille shall have to be got approved by the consultants before delivery.

5. Painting

5.1 All grilles and diffusers shall be powder coated at factory prior to delivery at site of approved color and shade.

5.2 All ducts immediately behind the grilles/diffusers etc. to be applied with two coats of black paint in matt finish.

6. Fire cum Smoke Dampers

Bare Dampers

a. All supply and return air ducts/ return air spaces at AHU room crossings and at all floor crossings shall be provided with approved make motorized fire and smoke dampers of at least 90 minutes fire rating as certified by CBRI Roorkee, India as per clause 10 of UL:555-1995. These dampers shall be multi-leaf type –Ruskin.

b. Fire damper blades and outer frame shall be formed out of 1.6mm (16G) galvanized steel sheet of length as mentioned in the approved for construction shops drawings tilted as AHU Room Blow Up. 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 16 gauge galvanized sheet steal. For preventing smoke leakage, metallic compression side seals shall be provided. Dual side leakage shall be provided for better structural stability. The construction of the fire damper shall allow maximum free area to reduce pressure drop and noise in the air passage, in normal position damper blade shall be held in open position with the help of a 220 V operated electric actuators thereby providing maximum air pressure without creating any noise or chatter.

c. For wall mounted fire dampers retaining MS angles duly painted with black enamel paint shall be supplied and installed by HVAC Contactor as per established installation procedure. Whereas the fire damper is also used for Smoke management (Smoke and fire damper) the same shall be as per UL-555 S-Class-II.

d. Every motorized fire damper/ Smoke and fire damper shall be tested in the factory and will be certified by the manufacturer in form of the test certificate.

e. Fire dampers shall also be supplied with spring locked fusible link rated for 72^0C (UL stamped) to close fire damper in event of rise in duct temperature.

f. For fire dampers/ smoke fire dampers of size higher than one approved by certifying agency the damper shall be supplied in multiple units of size not exceeding the tested damper by CBRI. All the multiple units shall be housed in a common factory fitted sleeve.

g. The fire dampers shall be mounted in fire rated wall with a duct sleeve 400mm/ 500mm long depending upon the wall thickness. The sleeve shall be factory fitted on fire damper. The joints at sleeve end shall be slip on type. Minimum thickness of galvanized sheet shall be 18 gauge.

h. The damper shall be installed in accordance with the installation method recommended by the manufacturer.

Actuators

The actuator shall be maintenance free coupled spring return type suitable to work on 24V electric supply. The torque rating of the actuator shall exceed at least by 15% over torque required to open/ close the damper. The selection of actuator size shall be the responsibility of the manufacturer of the fire damper. Spring return time shall be 20 seconds or less at ambient temperature. Other features of the damper actuator shall be as under:

a. Actuator shall have tamper proof housing with IP-54 protection rating.

b. Actuator shall have mechanical integrity of at least one hour at 900^{o}C.

c. Actuator shall have minimum 600000 safe position at rated torque. It shall be capable to withstand temperature of 75^{o}C for 24 Hrs.

d. Actuator shall have electronic over load or digital sensing circuit to prevent damage to actuator.

e. Should be capable of changing direction of rotation by changing mounting orientation .

f. Actuator shall have manual over ride facility.

Damper actuator shall be such that it should close the damper in the event of power failure automatically and open in the same manner in case of power being restored.

Control Panels

The control panel shall be supplied by damper manufacturer fitted on damper compatible with damper actuators. The control panel shall have at least following features:

a. Power on lamps with 230 V/ 24 V Transformer.
b. Damper close and open indication.
c. Reset push button.
d. Push button for manual running of actuator for periodic inspection.
e. Auxiliary contacts 24V/ 230V.
f. Contact points to receive signal from smoke detector/ fire alarm panel.
g. Additional terminal shall be provided to have signal (audio or visual) in central control room.

In addition the Control panel shall have following features as well:

- Potential free contacts for AHU fan/Pkg Unit 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.

The control panel shall receive 230V A/C supply and interconnecting wiring between control panel and actuator shall be carried out using fire proof cables.

The Contactor shall ensure that all electrical connections are suitably terminated. The HVAC Contractor shall also check continuity of electrical circuit as recommended by the manufacture. Fire damper inspection door will be provided in AC duct to facilitate access to the system.

7. Flexible Ducts

The scope of this section comprise supply, installation testing and commissioning of flexible ducting conforming to these specifications and in accordance with requirements of drawings and schedule of quantities.

Wherever specified, uninsulated flexible duct shall be made of double lamination of metalized aluminium film permanently bonded to a coated spring steel wire helix. Duct shall be in tear and puncture resistant construction.

Wherever insulated flexible ducts are specified, inner & outer core for the same should be made of aluminium permanently bonded to a coated spring steel wire helix. Fiberglass insulation of minimum 24Kg/m^3 density, 25mm thickness shall be sandwitched in between inner & outer core.

Care must be taken to install all the flexible duct in fully extended position and bends made with adequate radius as per manufacturer recommended practices.

8. **Testing and Balancing**

8.1 After completion of the installation of the complete air distribution system, all ducts shall be tested for air leaks.

8.2 Before painting the interiors, air distribution system shall be allowed to run continuously for 48 hours for driving away any dust or foreign material lodged within ducts during installation.

8.3 The entire air distribution system shall be balanced using approved anemometer. Air quantities at the fan discharge and at various outlets shall be identical to, or less than 5 percent in excess of, those specified and quoted. Leakage in each air distribution system shall be within 3 percent so that supply air volume at each fan shall be identical to , or no greater than 3 percent in excess of, the total air quantity measured at all supply outlets served by the fan. Branch duct adjustments shall be made by volume or splitter dampers. Dampers shall be permanently marked after air balance is complete so that these can be restored to their correct position if disturbed at any time. Complete air balance report shall

be submitted to the Consulting Engineer for scrutiny and approval, and six copies of the approved report shall be provided with completion documents.

E. INSULATION

1. Scope

The scope of this section comprises of supply and application of insulation conforming to these Specifications and as shown on the drawings & BOQ.

2. Duct Insulation (External)

Material

Insulation material shall be closed cell elastomeric material (nitrile rubber) having fire retardant Class "O" properties. Density of insulation material shall range between 0.04-0.07 gm/Cucm. Thermal conductivity (K value) at 40 C mean temperature and Service temperature limit shall be 0.039 W/M.K and –40C to 105C respectively. Water vapour permeability shall not be less than 7000 Kg/Pa/s.m. Water absorption shall not be more than 1.5% by weight. Insulation material shall have excellent ozone resistance properties. Excellent Thermal Stability. Insulation material shall be tested for the said properties in accordance with the relevant international codes including BS 874 Part 2 1986, DIN 52612(K Value), DIN 52615 (Water vapour permeability), BS 476 Part6 & Part7 (Flammability).

Application

Duct insulation shall be applied as follows:

a. External surface of the ducts to be cleaned vigorously to remove dirt and any other foreign material from the surface of the ducts.

b. Apply Low VOC adhesive on the surface of ducts.

c. Wrap closed cell insulation material having thickness as mentioned in BOQ butting all joints. All joints to be sealed with adhesive.

3. Acoustic Lining of Ducts

3.1 Material

Acoustic insulation material shall generally possess the properties mentioned above, however, insulation material shall be processed Nitrile Rubber Foam having fire retardant Class "O" properties. Density of insulation material shall range between 140-180 Kg/CuM. The insulation material shall conform to the international codes including BS 476 Part6 & Part7 (Flammability).

3.2 Application

Acoustical lining of duct wherever specified shall be applied as under:

a. Internal surface of the ducts to be cleaned vigorously to remove dirt and any other foreign material from the surface of the ducts

b. Apply Low VOC adhesive on the surface of ducts.

c. Cut foamed sheets into required sizes using sharp knives. Apply adhesive on the foam and stick it to the duct surface.

Note: Specifications shall be applicable as specified in the BOQ

4. **Exposed Ducts Thermal Insulation**

Material

Insulation material shall be closed cell elastomeric material (nitrile rubber) having fire retardant Class "O". Density of insulation material shall range between 0.04-0.07 gm/Cucm. Thermal conductivity (K value) at 40 C mean temperature and Service temperature limit shall be 0.039 W/M.K and –40C to 105C respectively. Water vapour permeability shall not be less than 7000 Kg/Pa/s.m. Water absorption shall not be more than 1.5% by weight. Insulation material shall have excellent ozone resistance properties. Excellent Thermal Stability. Insulation material shall be tested for the said properties in accordance with the relevant international codes including BS 874 Part 2 1986, DIN 52612(K Value), DIN 52615 (Water vapour permeability), BS 476 Part6 & Part7 (Flammability).

Application

Duct insulation shall be applied as follows:

a. External surface of the ducts to be cleaned vigorously to remove dirt and any other foreign material from the surface of the ducts.

b. Apply Low VOC adhesive SR-998 on the surface of ducts.

c. Wrap closed cell insulation material having thickness as mentioned in BOQ butting all joints. All joints to be sealed with adhesive.

d. Cover the insulation with necessary glass cloth & ultraviolet (UV) paint towards protection from atmospheric abuse.

5. **Underdeck Thermal Insulation for Exposed Roof**
Material

Insulation material shall be closed cell elastomeric material (nitrile rubber) having fire retardant Class "O" properties. Density of insulation material shall range between 0.04-0.07 gm/Cucm. Thermal conductivity (K value) at 40 C mean temperature and Service temperature limit shall be 0.039 W/M.K and –40C to 105C respectively. Water vapour

permeability shall not be less than 7000 Kg/Pa/s.m. Water absorption shall not be more than 1.5% by weight. Insulation material shall have excellent ozone resistance properties. Excellent Thermal Stability Insulation material shall be tested for the said properties in accordance with the relevant international codes including BS 874 Part 2 1986, DIN 52612(K Value), DIN 52615 (Water vapour permeability), BS 476 Part6 & Part7 (Flammability).

Application

Following procedure towards application of closed cell elastomeric insulation material having properties as mentioned above for roof exposed to sun shall be adopted :

a. The underside of the roof slab surface to be thoroughly cleaned with wire brush and rendered free from bitumen or any time or any other coating that exists.

b. Basic surface preparation using sand paper.

c. Adhesive LOW VOC to be applied thereafter, preferably in the evening and be left for overnight.

d. Finally next morning 16mm thick CSE insulation to be applied using adhesive with longitudinal and cross sectional joints glued properly and left open to facilitate inspection. Thereafter, CSE adhesive based tapes shall be applied on such longitudinal and transverse joints.

F. ELECTRICAL WORK

1. Scope

In general, the contractor shall supply, store, erect, test and commission all the equipment required for Electrical Installation. The contractor shall furnish all the materials, labour, tools and equipment for the electrical work, as shown in the accompanying drawings and in the bill of quantities and specifications hereinafter described.

2. Definitions

The following abbreviations used in the bill of quantities specifications and drawings represents:

ISS	-	Indian Standard specification.
IER	-	Indian Electricity Rules, 1956.
BS	-	British Standard (where specifically called for)
BSCP	-	British Standard Code of Practice (if called for).
HRC	-	High Rupturing Capacity
GI	-	Galvanised Iron
MS	-	Mild Steel
CI	-	Cast Iron
APLSTS	-	Aluminium conductor, paper insulated lead sheathed, Double steel tape armoured and serving.
PVC	-	Polyvinyl Chloride.
XLPE	-	Cross Linked Polyethylene.
HT	-	High Tension.
LT	-	Low Tension.
A-Amp	-	Ampere.
KV	-	Kilo Volts.
PT	-	Potential Transformers.
CT	-	Current Transformers.
OCB	-	Oil circuit Breakers
VCB	-	Vacuum Circuit Breaker
ACB	-	Air Circuit Breakers
SFU	-	Switch fuse Unit
COS	-	Change Over Switch
CFS	-	Combination Fuse Switch
MCCB	-	Moulded Case Circuit Breaker.
MCB	-	Miniature Circuit Breaker
IC	-	Iron Clad
ICTPN	-	Iron Clad Triple Pole and Neutral
ICDP	-	Iron Clad Double Pole
DB	-	Distribution Board
KVA	-	Kilo Volts Ampere.
KVAR	-	Kilo Volts Ampere - Reactive.
NC	-	Normally Close
NO	-	Normally open

SWG - Standard Wire Gauge.

3. REGULATION & STANDARDS

The installation shall conform in all respects to Indian standard Code of Practice for Electrical Wiring Installation I.S. - 732 and 'National Electrical Code'. It shall be in conformity with the current I.E Rules and Regulations and requirements of the local Electric Supply Authority in-so-far as these become applicable to the installation. Wherever this specification calls for a higher standard of materials and/or workmanship then those required by any of the above regulations, this specifications shall take precedence over the said regulations and standards.

In general, the materials, equipments and workmanship not covered by the above, shall conform to the following Indian Standards (Latest Edition) unless otherwise called for:

a. **SWITCHGEAR**

- Requirements of A.C. Circuit Breakers. : IS 2516 (Part I) Sec.1,2 & 3 (Part-II)

- Switches and Switch Isolators above 1000V
- But Not Exceeding 1.1 KV : IS 4710

- Markings & arrangements for switchgear
- bus-bars, main connection & auxiliary wiring : IS 375

- Specification for normal duty air break switches & composites unit for air break switches and fuses for voltage not exceeding 1000 Volts. : IS 4064

- Heavy duty air-break switches and composite units of air-break switches and fuses for voltages not exceeding 1000 Volts. : IS 4047

- Specification for miniature circuit breakers. : IS 8828

- Specification for enclosed distribution, fuse boards and cut-outs for voltage not exceeding 1000 Volts : IS 2675

- Installation and maintenance of switchgear. : IS 3072 (Part I)

- HRC cartridge fuse links 650 Volts. : IS 2208

b. **CABLE & MISCELLANEOUS ITEMS**

- Specification for paper insulated and lead sheathed cables : IS 692

- Code of Practice for installation and maintenance of paper insulated power cables (upto and including 33 KV) : IS 1255

- Specification for PVC insulated (Heavy Duty) electric cables Part-I for Voltage upto 1100 Volts. : IS 1554

- Specification for PVC insulated cables (for voltage upto 1100 V) (Part-II) with Aluminium conductors. : IS 694 (Part-II)

- Specification for rigid steel conduit for electrical wiring. : IS 9537

- Specifications for rigid non metallic conduits for electrical installations. : IS 9537

- Specifications for accessories for rigid steel conduits for Electrical wiring. : IS 3837

- Box for the enclosure of electrical accessories steel and C.I. Boxes. : IS 5133 (Part I)

- 3Pin plugs and sockets outlets : IS 1293

- Adhesive insulating tapes for Electrical purposes (Part- I & II) : IS 2448

- Propeller type AG Ventilating fans : IS 2312

- Code of Practices for earthing. : IS 3043

- Glossary of terms for electrical cable and conductors. : IS 1885

- Code of Practice for buildings (General) Electrical installation : IS 1646
- Current Transformers : IS 2705 (Part-I to III)

- Voltage Transformer : IS 3156 (Part-I to III)

- Shunt capacitors for Power system : IS 2834
- Direct acting electrical indicating instruments : IS 1246

- Factory assembled switchgear : IS 8623
- Rating for Cable : IS 3961 (Part -II)

- Earthing : IS 3843

3. **INSPECTION & APPROVAL OF THE WORK BY LOCAL AUTHORITY**

On completion of this work, the contractor shall obtain and deliver to the owners the certificates of inspection and approval by electrical inspectorate of Local Administration. The fees paid for inspection will be reimbursed on production of challan/receipt. The contractor shall include in his rates all charges necessary for getting electrical installation approved which includes Sub-station, LT distribution, etc. by the Chief Electrical Inspector to the state government or/ and from any other authority required for this job.

5. INSPECTION OF MATERIALS

The Architect/ owners shall have access to the manufacturer's premises for inspection of any items of the tender for which contractor has made arrangement with manufacturer/ suppliers. All such inspection shall not need any prior intimation by the owners or architects.

6. WORKING DRAWINGS & SHOP DRAWINGS

The contractor shall prepare and submit to the Architects/ owners for approval detailed working drawings & shop drawings of all MCC/panels ,cable layout, earthing etc.

7. AS BUILT DRAWINGS

At the completion of the work and before issuance of certificate of virtual completion, the contractor shall submit to the Architect/ employers layout drawings drawn on tracing film and approved scale indicating the complete wiring as installed.

8. ENGINEER/ SUPERVISOR

The contractor shall employ a competent, licence, qualified full time electrical engineer / supervisor to direct the work of electrical installations in accordance with the drawings and specifications. The engineer / supervisor shall be available at all times at the site to receive instructions from the Architect/employers in any day to day activities throughout the duration of the contract. The engineer & supervisor shall correlate the progress of the work in conjunction with all the relevant requirements of the supply authority. The skilled workers employed for the work should have requisite qualifications and should possess competency certificate from the Electrical Inspectorate of Local Administration.

9. APPLICATION FOR ELECTRIC SUPPLY/ LIASON

The Contractor shall be responsible for filing and follow up application for electric supply to the project. The contractor shall carry out all the liason work required for obtaining electric supply at site commencing from filing of application. This liason shall be deemed to be a part of the contract.

GENERAL SPECIFICATION FOR: MEDIUM VOLTAGE POWER CONTROL CENTRE AND SWITCH BOARD PANELS:

1.1 GENERAL:

Medium voltage power control centres (generally termed as switch board panels) shall be in sheet steel clad cubicle pattern, free floor standing type, totally enclosed, compartmentalized design. This specification shall cover the following types of panels :

a) Air circuit breaker panels - Drawout type with single or double tier arrangement as per design shown on the drawings.

b) Panels with one or more Air circuit breakers with Draw-out arrangement and switch-fuse units/moulded case circuit breaker of non-drawout design.

c) Panels with switch- fuse unit/moulded case circuit breaker of non- drawout type. However, the switch-fuse units can have drawout fuse-carriage if a particular make of switch-fuse is used.

The panels shall generally be of extensible type with provision for bus extension on or both sides as desired at the time of approved of shop drawings.

1.2 CODE/STANDARDS :

The panels shall generally conform to the requirements of following codes/ specifications:

a) IS-8623
b) IS-4237
c) IS-2147
d) IS-3072
e) IS-375
f) IS-1248 & 2419
g) IS-5082
h) IS-2705
i) IS-722
j) IS-4064
k) IS-2208
l) IS-6875
m) IS-6005

The equipment shall conform to Indian Electricity Rules as amended upto-date.

The supplier shall examine the provision of these codes and confirm or indicate his comments.

1.3 CONSTRUCTION:

Power control centres / switch board panels shall of free standing type, with sheet steel enclosure having following features:

a) The panel shall be constructed of sheet steel of minimum 1.6mm thickness. The internal frames shall be made of structural steel angles or made up sections (as per standard design of the manufacturer) specifications of which shall be submitted along with offers.

b) The panel shall be compartmentalised to accommodate one feeder n each compartment. The main bus bar chamber shall be provided at the top of panel or bottom of the panel as required. The compartments shall be arranged in section with metallic/ phenolic barrier in between.

A vertical cable alley of at least 200mm width shall be provided to serve one/ two vertical section of feeders. Cable alley shall have hinged door/ doors with rubber gaskets. Suitable cable clamping arrangement with slotted steel members shall be provided in the cable alley. Similarly, vertical bus bar shall be housed in-between two feeder compartments in a separate bus chambers. The opening between bus chamber and feeder compartments shall be properly covered with Bakelite/ Hylam sheets of 3mm minimum thickness. The vertical bus chamber shall be provided with removable bolted covers on the front and back side. All the interconnecting links to the feeders shall be shrouded so as to avoid accidental contact, by means of phenolic barriers.

c) Each compartment shall have its own hinged door with concealed hinges. The doors shall have heavy duty rubber gasket fixed on the inner side of the door. The door shall have interlocking facility with the feeder unit.

d) The Panel shall have punched openings for mounting meters, lamps, push buttons, relays, etc.

e) The dimensions of feeder compartments, bus chambers and cable alleys shall be as shown on the relevant drawings. However, the following minimum dimensions shall be strictly adhered to :

i. ACB compartment : Drawout -600mm wide x 1000mm deep x 900mm high.

ii. SWITCH FUSE UNITS/MOULDED CASE CIRCUIT BRACKER (NON-DRAWOUT TYPE) :

Up to 63A/ 100A	:	300mm wide x 225mm high x 400mm deep
250A	:	400mm wide x 400mm high x 400mm deep
400A to 630A	:	400mm wide x 500mm high x 400mm wide. (or vice- versa).

iii. BUS CHAMBER:

Main bus (Horizontal)	:	400mm high x 300mm deep
Vertical bus (Feeder bus)	:	300mm wide x 400mm deep

iv. Cable alley : Min. 200mm wide.

These dimensions are furnished as a guide and the clearances required in between each live bus/ link and between bus/ links to the earth (panel wall/ sheet) shall be as per relevant Indian Standard Code of practice. However, minimum clearance between neutral bus and earth shall not be less than 25mm. The panel supplier shall furnish detailed sectional drawings and also arrange to get the panel inspection done at intermediate stages of

fabrication to avoid fault defective febrication of the panels (however, the compliance of these specifications shall entirely be the suppliers' responsibility).

1.4 BUS BARS :

a) The bus bars shall be suitable for 3 phase, 4 wire, 415 volts 50 Hz AC supply. The bus bars shall be made of high conductivity aluminium. The bus bars shall have uniform cross-section throughout the length. The bus bars shall be designed for carrying rated-current continuosly. The bus bars and links shall be designed for a maximum temperature of $75^{O}C$. The max. current density of bus bars shall be as follows:

i. Copper : 1.86 Ampere/ Sq.mm. of cross section area.
ii. Aluminium : 1.28 Ampere/ Sq.mm. of cross section area.

It may be noted that these ratings are the upper limit to which the bus could be stressed. Suitable derating factors shall be applied to arrive at the correct cross section of bus bars.

b. Bus bars shall be supported on suitable non hygroscopic, non combustible, material such as DMC/ SMC at sufficiently close intervals to prevent bus bar sag. All bus bar joints shall be provided with high tensile steel bolts (electro plated with suitable metal such as Nickel/ Cadmium), spring washer and nuts so as to ensure good contact. Alternatively, electroplated/ tinned brass bolts shall be used. The joints shall be formed with fish-plates on either side of bus bar to provide adequate contact area. Bus supports shall be provided on either side of joints (max. unsupported distance from the joint 400mm)

c. Power shall be distributed to feeders in dual section by a set of vertical bus bars (Phases+neutral). Individual module shall be connected to the vertical bus bars through sleeved connections.

d. Bus bars shall be insulated with PVC sleeves (heat shrink type) with colour coding (Red/ Blue/ Yellow/ Black).

e. The bus bars and their supports shall be able to withstand thermal and dynamic stresses due to the system short-circuits. The supplier shall furnish calculations alongwith his drawing establishing the adequacy of bus bars both for continuous duty and short -circuit rating. Short circuit withstand capacity shall be for one second. Calculations for spacing of supporting of supports shall also be furnished.

1.5 EARTHING:

The panels shall be provided with a copper earth bus running throughout the width of the switchboard. Suitable earthing eyes / bolts shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

1.6 MOUNTINGS:

Panels incorporating switch fuse units shall have suitable compartments of standard width. Each compartment shall incorporate a heavy duty load break switch fuse and HRC fuses. Suitable cable termination arrangement shall be provided for switch fuse/ fuse-switch unit feeders. Equipment shall be provided with proper fastening arrangements to ensure vibration free operation. Proper designation as given on the respective drawings, shall be provided for every equipment.

Circuit breakers shall be mounted such that they are accessible from the front of the panel. More than two circuit breakers shall not be incorporated in a vertical section. The breakers compartment shall be divided into two parts, one for the breaker and the other for incorporating associated control gear. The necessary instrumentation shall be provided on the door of the compartment.

1.7 INTERLOCKING

The panels shall be provided with the following interlocking arrangements :

a. The door of the feeder compartments is so interlocked with the switch drive or handle that the door can be opened only if the switch is in “OFF” position. De-interlocking arrangement shall also be provided for inspection.

b. It shall not be possible for the breakers to be withdrawn when in “ON” position.

c. It shall not be possible for the breakers to be switched “ON” unless it is either in fully inserted position or for testing purposes it in fully isolated position.

d. The breaker shall be capable of being racked into “testing”, “isolated” and maintenance position and kept in any of these positions.

e. A safety catch to ensure that the movement of the breaker as it is withdrawn, is checked before it is completely out of the cubicle shall be provided.

1.8 PROTECTION AND INSTRUMENTATION:

Protection and instrumentation shall be as per standard specification.

1.9 WIRING

All the interconnections between the incoming, bus and the outgoings of 100A and above rating shall be done by insulated links/ strips of suitable sizes. Switch fuses and equipment below 100A rating shall be wired with PVC insulated copper conductors. The wiring for instrumentation protection and control equipment shall be carried out with PVC insulated flexible copper conductors.

The Power interconnections shall be carried out by means of bolted connections with washers. The wiring shall be terminated by using crimping sockets. Wring shall be laid out neatly in bunches which are fastened to the steel members of the panel. All the potential

circuits shall be protected by fuses mounted near the tap-off point from the main connections.

1.10 TERMINALS:

All the control, instrumentation and protection wiring shall be provided with printed PVC ferrules at both ends. For terminating control cables on to the equipment in the panels, suitable terminals blocks shall be provided. The terminal shall also be numbered for easy identification and maintenance.

1.11 SURFACE TREATMENT

All sheet metal accessories and components of power, control centres and switchboard panels shall be thoroughly cleaned, degreased, derusted and phosphatised before redoxide primer is applied. The panel shall be stove enameled to the required final finish. The interior surfaces of the panel shall also be painted to required shade. The supplier shall indicate in his offer, if there is any deviation from the treatment specified above.

1.12 ENCLOSURES

The panel enclosure shall be dust and vermin proof and shall be suitable for indoor installation. Enclosure design shall be in accordance with the requirements of IP 54 as per IS-2147-1962. The supplier shall confirm whether this requirement is met and a type test certificate furnished. If type test certificate for IP-54 is not available, the same shall be brought out clearly in his offer.

1.13 NAME PLATE

The panel as well as the feeders compartment doors shall be provided with name plates giving the switchboard/ feeder descriptions as indicated on the drawings.

1.14 TESTING

The power control centres shall be tested at factory after assembling of all components and completion of all interconnections and wiring. Tests shall be conducted in accordance with the requirements relevant IS Codes/ specifications.

a. INSULATION TEST

i. Insulation of the main circuit, that is, the insulation resistance of each pole to the earth and that between the poles shall be measured.

ii. Insulation resistance to earth of all secondary wiring should be tested with 1000V megger.

Insulation test shall be carried out both before and after high voltage test.

b. HIGH VOLTAGE TEST :

A high voltage test with 2.5KV one minute shall be applied between the poles and earth. Test shall be carried out on each pole in turn with the remaining poles earthed. All units racked in position and the breakers closed. Original test certificate shall be submitted along with panel.

1.15 STORING, ERECTION AND COMMISSIONING

a. STORING

The panels shall be stored in a well ventilated, dry places. Suitable polythene covers shall be provided for necessary protection against moisture.

b. ERECTION

Switchboards shall be installed on suitable foundation. Foundation shall be as per the dimensions supplied by the panel manufacturer. The foundation shall be flat and level. Suitable grouting holes shall be provided in the foundation. The switch boards shall be properly aligned and bolt000ed to the foundation by at least four bolts. Cable shall terminated on the bottom plate or top plate as the case may be, by using brass compression glands. The individual cables shall then be lead through the panel to the required feeder compartments for necessary terminations. The cables shall be clamped to the supporting arrangement. The switch board earth bus shall be connected to the local earth grid.

c. PRECOMMISSIONING TESTS :

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of engineer-in-charge.

i. All main and auxiliary bus bar connections shall be checked and tightened

ii. All wiring terminations and bus bar joints shall be checked and tightened.

iii. Wiring shall be checked to ensure that it is according to the drawing.

iv. All wiring shall be tested for insulation resistance by a 1000V megger.

v. Phase sequence/ rotation shall be estimated.

vi. vi. Suitable injection tests shall be applied to all the measuring insuring instruments to establish the correctness and accuracy of calibration and working order.

vii. All relays and protective devices shall be tested for correctness of settings and operation by introducing a current generator and an ammeter in the circuit.

SPECIFICATION FOR: MOULDED CASE CIRCUIT BREAKERS

1.1 GENERAL:

Moulded case circuit breakers or fuse free breaker shall be incorporated in the switch board wherever specified. MCCBS shall conform to BS : 3871 Part II or JIS-C-8370 in all respects. MCCBS shall be suitable either for single phase 230V or three phase 415volts.

1.2 CONSTRUCTION:

The MCCB and case shall be made of high strength heat resistant and flame retardant thermo-setting insulating material. Operating handle shall be quick make/quick break, trip-free type. The operating handle shall have suitable “ON”, “OFF” and “TRIPPED” indicators. Three phase MCCBS shall have a common operating handle for simultaneous operation and tripping of all the three phase. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole actuates three poles to open simultaneously. Thermal magnetic/tripping device shall have IDMT characteristics for sustained over loads and short circuits. Contact tips shall be made of suitable are resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances.

1.3 ACCESSORIES:

MCCBS shall be provided with the following accessories, if specified in schedule of quantities:

i. Under voltage release
ii. Shunt release
iii. Alarm Trip alarm
iv. Auxiliary contacts.

1.4 INTERLOCKING:

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of switch board:

a. Handle interlock to prevent unnecessary manipulation of the breaker.
b. Door interlock to prevent the door being opened when the breaker is in “ON” position.
c. De-interlocking device to open the door even, if the breaker is in “ON” position.

1.5 RUPTURING CAPACITY:

The moulded case circuit breaker shall have a returning capacity of not less that 10KA Rms at 415 volts. Wherever required, higher rupturing capacity breakers to meet the system short circuit fault shall be used. All such ratings shall be as per equipment schedule/B.O.Q.

1.6 TESTING:

a. Original certificate of the MCCBS as per BS: 3871 or JS-C-8370 shall be furnished.
b. Pre-commissioning tests on the switch boards panel incorporating the MCCB shall be done as per specifications.

GENERAL SPCIFICATION FOR: MEDIUM VOLTAGE CABLES

1.1 TYPE:

Medium voltage cables shall be aluminium conductor, PVC insulated, PVC sheathed and steel wire armoured or steel tape armoured construction. Aluminium conductors up to 10 sq.mm may be solid, circular in cross section, and sizes above 10sq.mm. shall be stranded. Sector shaped stranded conductors shall be used for sizes above 25sq.mm. The cable shall conform to IS 1554 (Part I).

1.2 RATING

The cable shall be rated for a voltage of 650/1100 Volts.

1.3 CONSTRUCTION

The conductors for power cables shall be made of electrical purity aluminium & that for control cable from annealed high conductivity copper. The conductors shall be insulated with high quality PVC base compound. A command covering (bedding) shall be applied over the laid up cores by extrusion or wrapping of a filling material containing unvulcanized rubber or thermoplastic material, armouring shall be applied over the inner shath of bedding, over the armouring a tough outer sheath of PVC sheathing shall be extruded. The outer sheath shall bear the manufacturers name and trade mark at every 30 meter interval.

1.4 CORE IDENTIFICATION:

Core shall be provided with the following colour scheme of PVC insulation.

i.	Core	:	Red/Black/Yellow/Blue
ii.	Core	:	Red and Black
iii.	Core	:	Red, Yellow, and Blue
iv.	3.5/4 core	:	Red, Yellow, Blue and black.

1.5 CURRENT RATINGS:

The current rating shall be based on the following conditions.

i.	Maximum conductor temperature		: $70^{O}C$
ii.	Ambient air temperature	:	$40^{O}C/50^{O}C$
iii.	Ground temperature	:	$70^{O}C$
iv.	Depth of laying	:	75cm

1.6 SHORT CIRCUIT RATING:

Short circuit ratings for the cables shall be as specified in IS: 1554 Part -I.

1.7 SELECTION OF CABLES:

Cables have been selected considering the conditions of the maximum connected load, ambient temperature, grouping of cables & the allowable voltage drop. However, the contractor shall recheck the sizes before the cables are fixed and connected to the service.

a. Storing

All the cables shall be supplied in drums. On receipt of cables at site, the cables shall be inspected and stored in drums with flanges of the cable drums in vertical position.

b. Laying

Cables shall be laid as per the specifications given below. The system adopted for this job shall be as per BOQ:

i. Cable on Tray / Racks:

Cables shall be laid on cable trays/ racks wherever specified. Cable racks/trays shall be of ladder, trough or channel design suitable for the purposes. The nominal depth of the trays/ racks shall be 150mm. The width of the trays shall be as per the design shown on drawing. The cable trays shall be made of steel or aluminium. The trays/ racks shall be completed with end plates, tees, elbows, risers, and all necessary hardware. Steel trays/ Rack shall be painted with two coats of enamel paint of approved shade over a coat of red oxide primer. Cable trays shall be erected properly to present a neat and clean appearance. Suitable cleats or saddles made of aluminium strips with PVC covering shall be used for securing the cables to the cable trays. The cable trays shall comply with following requirements:

1. The trays shall have suitable strength and rigidity to provide adequate supports for all contained cables.

2. It shall not present sharp edged, burrs or projections injurious to the insulation of the wiring/ cables.

3. If made of metal, it shall be adequately protected against corrosion or shall be made of corrosion resistant material.

4. It shall have side rails or equivalent structural members.

5. It shall include fittings or other suitable means for changes in direction and elevation of runs.

1.8 INSTALLATION

1. Cable trays shall be installed as a complete system. Trays shall be supported properly from the building structure. The entire cable tray system shall be rigid.

2. Each run of the cable tray shall be completed before the installation of cables.

3. In portion where additional protection is required, non combustible covers/ enclosures shall be used.

4. Cable tray shall be exposed and accessible.

EARTHING FOR ELECTRICAL WORK

1.1 General

All non-current carrying metal parts of the electrical installation shall be earthed as per IS: 3043. All metal conduits, trunkings, cable armour, switchgear, distribution boards, meter, light fixtures, fans and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes. Earthing shall also be in conformity with the provisions of Rules 32, 61, 62, 67 & 68 of IER 1956. These specifications apply to both copper and GI earthing system. The material to be used shall be as per that give in BOQ.

1.2 Earthing Conductors

1.2.1 All earthing conductors shall be of high conductivity copper or GI and shall be protected against mechanical damage and corrosion. The size of earth conductors shall not be less than half that of the largest current carrying conductor. The connection of earth continuity conductors to earth bus and earth electrodes shall be strong and sound and shall be easily accessible. The earth tapes shall be joined together using double rivets. The earthing conductor shall be laid in cable trenches, cable trays or conduits or on cable by using suitable clamps made of non-ferrous metals compatible with the earthing conductor. The following earthing conductors and required to be used for various sections of the installations.

a. 10SWG bare copper wire or GI wire.

b. All single phase switches and DBs above 30A and upto 63A rating shall be earthed with one run of 8SWG bare copper wire or GI wire.

c. All three phase switches/ DBs upto 30A rating shall be earthed with 2 runs of 10SWG copper wire/ GI wire.

d. All three phase switches/ DBs above 30A and upto 63A shall be earthed with 2 runs of 8 SWG copper wires/ GI wires.

e. All three phase switches/DBs above 63A and upto 100A shall be earthed with 2 runs of 25x3mm Copper Strip/GI Strip.

f. All three phase switches/DBs of 200A rating and above shall be earthed with 2 runs of 25x6mm copper Strip / GI Strip.

g. All motor frames shall be earthed by two earthing conductors of specified cross section.

Earth conductors shall be properly terminated with bolts to the frames of panels/eqpts. And provided with crimped sockets in case of wires.

1.2.2 Main earth bus shall be taken from the main medium voltage panel to the earth electrodes. The number of electrodes required shall be arrived at taking into consideration the anticipated fault on the medium voltage net-work and soil resistivity.

1.2.3 All the sub mains and sub circuits shall be provided with earth continuity conductors as specified and connected to the main earth bus. Earthing conductors for equipment shall be run from the exposed metal surface of the equipment and connected to a suitable point on the sub main or main earthing bus. All switches shall be connected through double earthing conductor to the earth bus. Earthing conductors shall be terminated at the equipment using suitable lugs, bolts, washers and nuts.

1.2.4 All conduits, cable armouring, raceway, rising mains, etc. shall be connected to the earth all along their run by earthing conductors of suitable cross sectional area, sprinkler, pipes, LPG pipes, water pipes, steel structural elements, cable trays/ racks lighting conductors shall not used as a means of earthing an installation. The electrical resistance of earthing conductors shall be low enough to permit the passage of fault current necessary to operate a fuse/ protective device a circuit breaker and shall not exceed 2 ohms. As rough guide the following sizes of earth continuity conductors shall be used for circuit wiring.

Size of circuit wires/ cables	Size of copper or GI earth wires
a. 2.5 sq.mm.	16 SWG or 1.5sq.mm. Cu. PVC insulated
b. 4 sq.mm.	14 SWG or 2.5sq.mm. Cu. PVC insulated
c. 6 sq.mm.	12 SWG or 2.5sq.mm. Cu. PVC insulated
d. 10 sq.mm./ 16 sq.mm.	8 SWG or 4.0sq.mm. Cu. PVC insulated
e. 25 sq.mm. / 35 sq.mm.	6 SWG or 6.0sq.mm. Cu. PVC insulated

All Single phase wiring have one run of earth wire and three phase wiring shall be provided with two runs of earth wires.

1.4 PRECAUTIONS:

1.4.1 Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passages of fault currents.

1.4.2 Joints shall be soldered, tinned and double rivertted in case of copper and joints shall be filed and doubled rivertted in case of GI. All the joints shall be mechanically, electrically, continuous and effective.

1.5 TESTING:

1.5.1 On the completion of the entire installation, the following tests shall be conducted.

a. Earth resistance of electrodes.
b. Earth loop impedance as per IS L 3043/NEC.

1.5.2 All meters, instruments and labour required for the tests shall be provided by the contractor. The results shall be submitted in triplicate to the engineer-in-charge for approval.

5.13 **Other Components**

5.13.1 Moulded Case Circuit Breaker (MCCB**)**

The MCCB (moulded case circuit breaker) shall conform to the latest IEC 947-2 & IEC 947-3–1989. The Service Short Circuit Breaking Capacity (Ics at 415VAC) should be as specified at the required level.
The MCCB shall be Current Limiting type and comprise of Quick Make – Break switching mechanism, preferably Double Break Contact system, arc extinguishing device and the Tripping unit, contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stresses. All MCCBs shall be capable of defined Variable overload adjustment. All MCCBs rated 200Amps and above shall have adjustable Magnetic short circuit pick up.

The trip command shall over ride all other commands. The MCCB shall employ maintenance free double break contact system to minimize the let thru energies and capable of achieving discrimination up to the full short circuit capacity of the downstream MCCB. The manufacturer shall provide both the discrimination tables and let thru energy curves. The MCCB shall not be restricted to Line/ Load connections.

The handle position shall give positive indication of 'ON', 'OFF'' or 'Tripped' thus qualifying to Disconnection as per the IEC947-3 indicating the true position of all the contacts. In case of 4 pole MCCB the neutral shall be defined and capable of offering protection. **MCCBs controlling motors should be suitable for motor protection.**

5.13.2 Miniature Circuit Breaker (MCB**)**

Miniature Circuit Breaker shall comply with IEC898 – 1996. The Miniature circuit breakers (MCB) shall be quick make and break type for 230 / 415 VAC 50 Hz application with thermal magnetic releases for over current and short circuit protection. The Breaking capacity shall not be less than 10 KA at 415VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Energy Class–3). MCBs shall be classified (B, C, D as per the IEC 898 standards) as per their Tripping characteristic curves defined by the manufacturer. The MCB shall have

the minimum power loss (Watts) per pole defined as per the IS/IEC and the manufacturer shall publish the values.

The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP and TPN miniature circuit breakers shall have a common trip bar independent to the external operating handle.

5.13.3 Switch Fuse Units

a. High rupturing capacity fuse (HRC Fuse) shall carry ISI mark on it and shall be rated for duty as indicated on the drawing/schedule of Quantities. The rating of HRC fuse shall be as per the rating of motor/equipment. The rating of fuse shall be selected so as to provide discrimination.

a. The switch fuse units shall be three pole double break action with switched neutral. All switch fuse units shall be provided with the hinged doors duly interlocked with operating mechanism so as to prevent opening of the door when the switch is 'ON' position and also to prevent energizing the switch when the door is not properly secured. All contacts shall be silver plated and alive parts shall be shrouded. High rupturing capacity (HRC) fuse links shall be provided with switch fuse units and shall have rupturing capacity of not less than 31 MVA at 415 volts. All switch fuse units shall be provided with visible indicators to show that they are in 'ON or OFF' position. All switch units shall be of AC-23 category.

5.13.4 Motor Starter

The Motor Starter shall be a combination starter consisting of motor protection circuit breaker and suitable contactor for remote starting.

a. Motor protection circuit breaker

The motor protection circuit breaker must comply to the latest IEC 947-4 and the corresponding IS 13947-4. The motor protection circuit breaker should be suitable for AC3 duty at 415V. The motor protection circuit breaker should offer built in coordinated overload and short circuit protection. The motor protection circuit breaker should have built in single phase / phase loss preventor. The motor protection circuit breaker should offer separate ON/OFF indication and Fault signal contacts which should be wired onto the panel for indication. The motor protection circuit breaker should offer Type 2 coordination along with the contactor.

b. Contactors

The contactor should be suitable for AC3 duty at 415V and should comply to the latest IEC 947-4 and the corresponding IS 13947-4. The contactor should have minimum 10 x IE rated making / breaking capacity as per the latest standard. The same should be suitable for Type 2 coordination along with motor protection circuit

breaker. The contactor should have Class H insulation for the coil to prevent heating and to facilitate frequent start / stop function without heating.

5.13.5 Earth Leakage CB/ Residual Current CB

The ELCB/RCCB shall comply with IEC 1008. The ELCB/RCCB shall current operated independent of the line voltage. ELCB / RCCB shall work on the principle of core balance transformer. The ELCB / RCCB shall be rated for current sensitivity of a Min of 30mA and a Max of 300mA at 240 / 415VAC.The terminals shall be protected against finger contact to IP20 degree of protection. The ELCB / RCCB shall have a minimum of 20,000 electrical operations.

Testing Provision for the Earth Leakage Circuit Breaker

A test device shall be incorporated to check the integrity of the earth leakage detection system and the tripping mechanism. When the unit is connected to service, pressing the test knob shall trip the ELCB and the operating handle shall move to the "OFF" position.

5.13.6 Air Circuit Breaker (ACB)**:**

The ACB shall conform to IEC 947-2-1989 & IS 13947 (Part –2). The Service Short Circuit Breaking Capacity shall be as specified and equal to the Short circuit Withstand Values. The ACB shall be provided for controlling the in coming supply feeder or as required and specified in schedule. Shall be available in 3 or 4 pole with modular construction, fixed or draw out, manually or electrically operated versions as specified. ACB shall be capable of providing short circuit, overload and earth fault protection (in absolute values) if required, through microprocessor based control unit sensing the true RMS values to ensure accurate measurement meeting the EMI/ EMC requirement as per the standard.

The breaker should have 3 distinct positions – SERVICE /TEST / ISOLATED within the cubicle. It should be possible to withdraw the breaker for testing with the door closed. Safety interlock must be provided to prevent the ACB from falling out in a fully withdrawn position. The ACB shall be provided with a door interlock. The contacts should be copper and silver plated only with a feature of contact wear inspection indicating the life of the contacts. The ACB shall have double insulation (Class-II) with moving and fixed contacts totally enclosed for enhanced safety and inaccessibility to live parts.

All electrical closing of breaker should be with Electrical motor wound stored energy spring closing mechanism with Mechanical indicator to provide ON / OFF status of ACB.

For all ACBs the Operating handle should be provided for charging the spring in continuous action. The spring shall be released with ON / OFF push button command in one operation at the correct speed independent of operator speed. A direct mechanical coupling should indicate the ACB in ON or OFF position thus qualifying to Disconnection as per the IS/IEC indicating the true position of all the contacts. One set of NO / NC potential free contacts to be provided for operation on Building Management System. All accessories like shunt,

under voltage motorized mechanism etc. shall be front mounted, requiring no adjustments and can be fitted at site.

The manufacturer shall provide details of opening time and deration with temperature to ensure discrimination and proper selection for feeders protection. All ACBs of 4000 A and above shall be a single ACB and Tandom operated will not be acceptable.

5.13.7 SAFETY FEATURES:

1. The safety shutter shall prevent inadvertent contact with isolating contacts when breaker is withdrawn from the Cradle.
2. It should not be possible to interchange two circuit breakers of two different thermal ratings.
3. There should be a provision of positive earth connection between fixed and moving portion of the ACB either thru connector plug or sliding solid earth mechanism.
4. Earthing bolts must be provided on the cradle or body of fixed ACB.
   Arc Chute covers should be provided wherever necessary.
5. The incoming panel accommodating ACB shall be provided with indicating lamps for ON-OFF positions, voltmeter and ammeter of size not less than 96mm x 96mm, selector switches, fuses for potential circuit and current transformers.
6. It should be possible to bolt the draw out frame not only in connected position but also in TEST and DISCONNECTED position to prevent dislocation due to vibration and shocks.

5.13.8 PROTECTIONS

1. The Electro magnetic and thermal release or Microprocessor based unit should be provided on circuit breaker for short circuit, over current and earth fault protection with adjustable settings.
2. Specific LED indications should be provided for over current and earth fault operation.
3. Relays should be CT operated through shunt trip for short circuit and earth fault protection.
4. Under voltage relays should be provided.
5. Minimum 6 NO and 6 NC auxiliary contacts shall be provided on each breaker. The contacts shall be rated 5 Amps.
6. Rated insulation voltage is 1000 volts AC.

5.13.9 Push Button Stations

Push button stations shall be provided for manual Start & Stop of equipment. Push button shall have ON & OFF indicating lamp in red and green colour. Push button shall be fabricated in 16 gauge sheet steel.

These station shall be factory fabricated. ON & OFF operations shall be carried out from front without opening the door. One set of NO & NC contact shall be provided in push button station as spare.

5.13.10 Toggle Switch

The toggle switch shall be of minimum 5 Amps rating.

5.13.11 Thermal Overload

The relay shall be factory calibrated, sealed and suitable for an ambient temperature at site or 50 deg C whichever is higher.

It should provide reliable and accurate protection against overload, single phasing and locked rotor conditions. Relays are to be provided with:

(a) Trip alarm contact
(b) Trip lever for testing
(c) Auto reset facility

Rated insulation voltage shall be 660 volts AC.

5.14 **Instruments**

a. General:

The specifications hereinafter laid down shall cover all the meters and instruments.

b. **Instrument Transformers**

(i). Current Transformers

Current transformers shall be in conformity with IS : 2705 (Part I,II,III & IV) in all respects . All current transformers used for medium voltage applications shall be rated for 1 KV. However, the rated secondary current shall be 5 A unless otherwise specified. The acceptable minimum class of various applications shall be as given below :

Measuring: Class 0.5 to 1
Protection: Class 10 p

Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 35 MVA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identifications of poles. Current transformers shall be provided with earthing terminals, for earthing chasis frame work and fixed part of the metal casing (If any). Each CT shall be provided with rating plate indicating the following:

i. Name and make
ii. Serial Number
iii. Transformation Ratio
iv. Rated Burden

v. Rated Voltage
vi. Accuracy Class

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CT's shall be copper conductor, PVC insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in a neat & clean manner.

c. Potential Transformers

Potential transformers shall be provided if specifically called for potential transformers shall comply with the requirements of IS : (Part I,II,III) in all respects.

d. **Measuring Instruments**

i. General

Direct reading electrical instruments shall be in conformity with IEC-51, BS:89 or IS :1248. The accuracy of direct reading shall be 1.0 for voltmeters and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5. The meters shall be suitable for continuous operation between -10 deg C and +50 deg C. All meters shall be of flush mounting type with square pattern. The meter shall be enclosed in a dust tight housing. The meters shall be provided with white dials and black scale markings. The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside.

ii. Ammeters

Ammeters shall be of moving-iron type. The moving part assembly shall be with jewel bearings. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. The ammeters shall be manufactured and calibrated as per the latest edition of IS: 1248 or BS:89. Ammeters shall be instrument transformer operated, and shall be suitable for 5 A secondary.

Upto 30 Amps the ammeter shall be direct operated without current transformer on one phase only. Beyond 30 Amps the ammeter shall be CT operated with selector switch.

iii. Voltmeters

Voltmeters shall be of moving-iron type. The range for 400 volts, 3 phase voltmeters shall be 0 to 500 volts. The voltmeter shall be provided with protection fuse of suitable capacity.

5.15 **Earthing**

a. General

All non-current carrying metal parts of the electrical installation shall be earthed as per IS-3043. All metal conduits, trunking, cable sheathes, switchgear, distribution boards and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to control panel. Earthing shall meet the requirements of IER 1956.

b. Earthing Conductor

All earthing conductors shall be of high conductivity copper as specified and shall be protected against mechanical damage and corrosion. The size of the earth conductor shall not be less than half of the largest size of the current carrying conductor. The connection of the earth continuity conductor of earth and earth electrodes shall be strong and sound and shall be rigidly fixed to the walls, cable trenches, cable trays or conduits and cables by using suitable clamps made of non ferrous metals. Incoming power supply along with earthing upto MCC/AHU control panel shall be provided by other agency. The panel shall be earthed to building main earthing. The motor shall be double earthed to the panel.

The earthing shall be done with wires/flat as under:

S.No.	Equipment	Size of Earth Wire/Strip	
		GI	Copper
01.	Motors Upto 5 HP	2 Nos 8 SWG	2 Nos. 14 SWG
02.	Motors Upto 15 Hp	2 Nos 8 SWG	2 Nos 12 SWG
03.	Motors Upto 30 HP	2 Nos 4 SWG	2 Nos. 8 SWG
04.	Motors Upto 50 HP Flat	2 Nos 25x6mm	2 Nos. 4 SWG
05.	Motors above 50 HP Flat.	2 Nos 32x6mm	2 Nos. 25x3mm

Packaged unit electrical panel shall generally be wall mounted type. Above stated specifications shall also stand good where applicable. The packaged unit motor shall be double earthed with two independent earth conductors as per the Indian Electricity Rules & Regulations-1956.

PREAMBLE

1. All equipment described hereafter shall be in accordance with the specifications.

2. All equipment shall be selected and installed for the lowest operating noise level.

3. Supply of various equipment shall include all expenses for correspondence with manufacturers, submission of shop drawings, documents and their approval by the Architects , procurement of equipment, transportation, shipping, payment of all taxes and levies, storage, supply of equipment at the point of installation, furnishing all technical literature required, replacement of defective components and warranty obligations for the individual equipment.

4. Installation of various equipment shall include all material and labour associated with hoisting and lowering of equipment in position, insulation of the components and vibration isolation as required, grouting & anchoring or suspension arrangements and all incidentals associated with the installation as per the specifications and manufacturer's recommendation.

5. Vibration isolators as specified or as recommended by the manufacturer shall be installed with each component. Performance ratings, power consumption and sound power data for each component shall be verified at the time of testing and commissioning of the installation, against the data submitted with the tenders.

6. Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirit, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the finish over the adjoining shop painted surfaces.

7. Testing and commissioning shall include furnishing all labour, materials, equipment, instruments and incidentals necessary for complete testing of each component as per the specifications & manufacturer's recommendations, submission of test results to the Owners/Architects, obtaining their approval and submission of necessary completion documents & drawings. providing minor dressing of walls and floor, providing and installing pipe sleeves as required and treatment to pipes as per the specifications.

8. All piping should be installed conforming to the relevant Indian Standards, approved shop drawings and the specifications. All water/refrigerant re- circulation piping should be tested as per the specifications.

9. Piping installation should include all costs towards supplying and fixing of pipes and fittings (elbows, tees, reducers) cutting, threading, joining, welding, soldering and affecting connections are required, providing non- hardening sealing material as well as rubber gaskets for screwed flanges, providing and installing adequate number of clamps, hangers, saddles, brackets, rawl plugs and other accessories for pipe supports, providing minor dressing of walls and floor, providing and installing pipe sleeves as required and treatment to pipes as per the specifications.

10. Exposed steel pipes shall be given two coats of approved paint as per the relevant Indian Standards for color coding of pipes and direction of flow of fluid in the pipes shall be visibly marked with identifying arrows.

11. Valves, union, strainers, drain, air- valves, expansion joints, pressure gauges and thermometers shall be provided in the various pipe lines as per the approved shop drawings and specifications.

12. After completion of the installation, the entire piping system shall be tested for leak in accordance with the specifications.

13. All ducts shall be fabricated and installed conforming to the relevant Indian Standards, approved shop drawings and the specifications.

14. Duct installation shall include fabricating and installing the ducts, splitter dampers, turning vanes, distribution grids within the ducts in position extruded aluminium hardware fittings such as handles thunder bolts hinges, factory fabricated access door and providing , installing , MS hangers with dash fasteners, foam rubber insertions, nuts, bolts and screws as required. Making all joints air tight using rubber insertions in addition multi-louvered manually adjustable dampers shall be provided in various branch ducts as required or shown on drawings for proper balancing of air flow. All primer coated MS hangers, dampers, base frames etc. shall be painted with black enamel paint.

15. Grilles and diffusers shall be provided with a soft continuous rubber gaskets between their periphery and the surface on which these have to be mounted.

16. Grilles and diffusers shall be given, at the factory, a rust resistant primer coat and enamel paint finish of approved color. Aluminium grilles and diffusers shall be fabricated out of extruded aluminium sections.

17. After completion of the installation, the entire air distribution system shall be tested for leaks and balanced in accordance with the specifications.

18. All equipment and material to be supplied under this contract shall be conforming to the relevant latest Indian Standards and international standards as applicable.

19. Appropriate troughs in the suspended ceiling be provided for terminating duct collars for diffusers and grilles by other agencies to achieve desired interior finishes.

20. Contractor to verify the static pressure of various air handling units in accordance with the approved for construction shop drawings before selection of motor.

21. **Mode of Measurement**

The mode of measurement for the various items, unless otherwise specified, shall be as follows:

21.1 Ducting

Payment for ducting shall be made on the basis of the external surface area of the ducting including all material and labour for installed duct.

The rates per Sft of the external surface shall include MS angle iron /GSS flanges, gaskets for joints, nuts & bolts , duct supports & hangers, vibration isolation pads or suspenders, dash fasteners, inspection doors, dampers, turning vanes, major hardware such as thunder bolts, hinges, handles in extruded aluminium construction and any other item which will be required to complete the duct installation except external insulation and acoustic lining.

The external area shall be calculated by measuring the overall width and depth (including the corner joints) in the centre of the duct sections and overall length of each duct section from flange face incase of duct lengths with uniform cross section. Total area will be arrived at by adding up the areas of all duct sections.

In case of taper pieces average width and depth will be worked out as follows :

W1 = width of small cross section
W2 = width of large cross section
D1 = depth of small cross section
D2 = depth of large cross section

$$\text{Average width} = \frac{W1 + W2}{2}$$

$$\text{Average depth} = \frac{D1 + D2}{2}$$

Width and depth in the case of taper pieces shall be measured at the edge of the collar of the flange for duct sections fitted with angle iron flanges, otherwise at the bottom of the flange where flanges are of duct sheet.

For the circular pieces the diameter of the section mid-way between large and small diameters shall be measured and adopted as the mean diameter for calculating the surface at the taper piece.

For the face length of taper piece shall be the mean of the lengths measured face to face from the centre of the width and depth of flanges.

For the special pieces like bends, branches, and tees etc. same principle of area measurement as for linear lengths shall be adopted except for bends and elbows, the length of which shall be the average of the lengths of inner and outer periphery along with curvature or angle of the piece.

21.2 Duct Insulation

This item is provided separately for various thickness and shall be paid for on area basis of un-insulated duct. The area of the duct to be insulated shall be measured before application of insulation.

21.3 Grilles & Diffusers

All extruded aluminium grilles and diffusers shall be paid on the basis of actual measurement at site on area basis using neck size as base for diffusers having outer size less than 600mm. For 600mm x 600mm size diffusers being installed in grid ceiling, shall be counted at site and payment shall be made on unit basis. Slot diffusers shall be paid on actual measurement at site on running length basis.

21.4 Refrigerant Piping

Payment for refrigerant piping and condensate drain piping shall be made on the basis of linear measurement including all material and labor for installed pipes. The linear rate per meter/feet for each nominal diameter shall include all pipe fittings except refnet joints, pipe supports & hangers, vibration isolation arrangement, closed cell elastomeric insulation material and any other item required to complete the pipe installation except valves of any kind and strainers.

21.5 Refnet Joints

Payment shall be made on unit basis.

22. All quantities reflected in the schedule are for contractor's guidance only.

TECHNICAL DATE TO BE FILLED UP BY THE VENDORS AND TO BE SUBMITTED ALONG WITH THE OFFERS

VARIABLE REFRIGERANT FLOR SYSTEM

S.No	Item	Particulars	
1.	**Outdoor Units**		
	General		
1.1	Manufacturer		
1.2	Country of Origin		
1.3	Type of Unit		
1.4	Model and No. of Units		
1.5	Overall Dimensions (mm)		
1.6	Noise Level (dB) at 1M distance		
1.7	Whether Night time quiet operation feature adopted		
1.8	Operating Weight (Kg)		
1.9	Material of casing		
1.10	Type of finish		
1.11	Cooling Capacity (HP)		
1.11.1	Nominal		
1.11.2	Actual		
1.12	Power consumption of overall unit at 35C ambient (KW)		
1.13	Power consumption of overall unit at 43.8 C ambient (KW)		
1.13.1	Running Current drawn (Amp)		
1.13.1	Starting Current drawn (Amp)		
1.14	Recommended Incomer switch rating (Amp)		
1.15	Recommended Aluminium cable size		
1.16	Vibration isolation arrangement		
1.17	COP of overall unit		
1.18	Maximum allowable actual piping length (M)		
1.19	Maximum Level Difference (M)		
2.	**Compressor**		
2.1	Manufacturer		
2.2	Country of origin		
S.No	**Item**	**Particulars**	
2.3	Type and number of compressor/s		

2.4	Model No.		
2.5	Nominal capacity		
2.6	Suction Temperature		
2.7	Discharge Temperature		
2.8	Actual capacity at above parameters		
2.9	Type of refrigerant		
2.10	Type of capacity control		
2.11	Number of steps of capacity control		
2.12	Power consumption (KW)		
2.13	Number of Fixed Speed Type Compressors		
2.14	Number of Variable Speed Type Compressors		
2.15	Power Supply requirement		
2.16	Power consumption at rated capacity		
3.	**Air Cooled Condenser**		
3.1	Manufacturer		
3.2	Type of condenser		
3.3	Tube material		
3.4	Fin material		
3.5	Coil face velocity (FPM)		
3.6	Type of fans		
3.7	Number of fans		
3.8	Motor rating of each fan		
3.9	Static Pressure of each fan (mm WG)		
4.	**Indoor Units**		
4.1	Manufacturer	--	
4.2	Country of Origin		
4.3	Type of Unit		
4.4	Model No. of Unit		
4.5	Overall Dimensions (mm)		
4.6	Noise Level (dB) Hi/Low		
4.7	Airflow Min/Max (Cfm)		
4.8	Cooling Capacity (TR)	--	
4.9	Operating Weight (Kg)		
4.10	Is remote controller provided with each unit		
4.11	Type of remote controller provided		
4.12	Power Characteristics (3Ph/1Ph)		

S.No.	Item	Particulars	
4.13	Electrical Power Requirement (Watts)		
5.	**Centralized Controller**		
5.1	Manufacturer		
5.2	Country of Origin		
5.3	Type of Controller		
5.4	Salient Features		
6	**Refrigerant Piping**		
6.1	Material of piping		
6.2	Material of Fittings		

DX – AIR HANDLING UNITS

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer	
1.2	Type of Unit	
1.3	Overall Dimensions (mm)	
1.4	Noise Level at 1M distance from AHU	
1.5	Operating Weight (Kg)	
1.6	Material of casing	
1.7	Thickness of inner skin (mm)	
1.8	Thickness of outer skin (mm)	
1.9	Type of insulation	
1.10	Thickness & density of insulation	
1.11	Material & thickness of drain pan.	
1.12	Whether thermal break profile provided	
1.13	Whether canopy provided	
1.14	Whether heaters provided	
1.15	Whether Mixing Chamber provided	
2.	**Centrifugal Fan**	
2.1.	Manufacturer	
2.2	Type of fan	
2.3	Model No.	
2.4	Air Quantity. (Cfm)	
2.5	Static Pressure (mm WG)	
2.6	Fan Outlet Velocity	
3.	**Motor**	

S.No.	Item	Particulars
3.1	Manufacturer	
3.2	Type	
3.3	Rating (HP)	
3.4	Speed (RPM)	
3.5	Electrical Characteristics	
4.	**DX Cooling Coil**	
4.1	Manufacturer	
4.2	Type	
4.3	Material & Thickness of tubes	
4.4	Material & Thickness of fins	
4.5	Number of fins per cm	
4.6	Pressure drop (M of water)	
4.7	Water Velocity (MPS)	
4.8	Face velocity (FPM)	
4.9	Material of header	
4.10	Number of rows deep	
5.	**Filters**	
5.1	Manufacturer	
5.2	Type	
5.3	Thickness (mm)	
5.4	Filter Face Velocity	
6.	**Control for AHUs**	
6.1	Manufacturer	
6.2	Type	

INLINE FANS

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer	
1.2	Type	
1.3	Electrical Characteristics	
1.4	Whether Capacitors Provided	
1.5	Whether speed regulators Provided	
1.6	Whether gravity louvers and bird screen provided	

AXIAL FLOW FANS

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer	

1.2	Model No.	
1.3	Type of Unit	
1.4	Dia (mm)	
1.5	Noise Level	
1.6	Operating Weight (Kg)	
1.7	Material of casing	
1.8	Type of finish	
1.9	Operating Temperatures	
1.10	Air Quantity. (Cfm)	
1.11	Static Pressure (mm WG)	
1.12	Noise Level	
2.	**Motor**	
2.1	Manufacturer	
2.2	Type	
2.3	Rating (HP)	

REFRIGERANT PIPING

S.No.	Item	Particulars
1.	**Hard/ Soft Drawn Piping**	
1.1	Make	
1.2	Material	
1.3	Material of fittings	
1.4	Thickness	
1.5	Make & Material for Drain pipes	

DUCT WORK

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer of GI Sheet	
1.2	Class	
1.3	Zinc coating (gm/SqM)	
1.4	Thickness	
1.5	Manufacturer of Factory Fabricated Ducts	
1.6	Type of flanges for factory fabricated ducts For Exposed Ducts For Concealed Ducts	

GRILLES, DIFFUSERS AND DAMPERS

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer	
1.2	Material	

ACOUSTIC LINING OF DUCT

S.No.	Item	Particulars
1.	**General**	
1.1	Material	
1.2	Manufacture	
1.3	Density	
1.4	Thickness	
1.5	Thermal Conductivity (K Value)	

EXTERNAL THERMAL INSULATION OF DUCT

S.No.	Item	Particulars
1.	**General**	
1.1	Material	
1.2	Manufacture	
1.3	Density	
1.4	Thickness	
1.5	Thermal Conductivity (K Value)	
1.6	Class of insulation	

EXPOSED DUCT THERMAL INSULATION

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer	
1.2	Material	
1.3	Density	
1.4	Thickness	

UNDERDECK THERMAL INSULATION

S.No.	Item	Particulars

1.	**General**	
1.1	Manufacturer	
1.2	Material	
1.3	Type	
1.4	Density	
1.5	Thickness	

ELECTRICAL

S.No.	Item	Particulars
1.	**General**	
1.1	Manufacturer of panels	
1.2	Make of following components	
1.2.1	MCCB	
1.2.2	MCB	
1.2.3	Starters	
1.2.4	Ammeters / Voltmeters	
1.2.5	Push Buttons	
1.2.6	Indication Lights	
1.2.7	Current Transformers	
1.3	Power Cables	
1.4	Control Cables	
1.5	Stabilizers	

LIST OF EQUIPMENT & ACCESSORIES WHICH CONTRACTOR HAS TO BRING, KEEP AND MAINTAIN AT HIS OWN COST AT SITE DURING THE CURRENCY OF THE CONTRACT IN GOOD CONDITION

S.No.	PLANT/EQUIPMENT	NUMBER
01.	Hydraulic Test Machine	1
02.	Floor mounted drill machine	2
03.	Hand drill machine	3
04.	Lock forming machine for duct fabrication	1
05.	Hand held lock closing machine	2
06.	Collar cutting machine	2
07.	Mechanized saw for cutting angles & channels	1
08.	Duct smoke test kit	1
09.	Thermometers	1
10.	Water line pressure testing kit	1
11.	For application of closed cell elastomeric insulation i. 1200 long steel scale ii. 1200x900 size 40mm thick commercial ply board iii. Paper cutter of different sizes	 2 2 3

and any other equipment required for efficient execution of work within the stipulated period.

LIST OF APPROVED MAKES FOR HVAC WORK

S. No.	EQUIPMENT AND MATERIAL	ACCEPABLE MAKE
A.	**EQUIPMENT**	
1.	VRF System	Daikin VRV IV/Toshiba/Mitshubishi Electric/Hittachi
2.	HRV System	Daikin/Toshiba/ /Mitshubishi Electric /Hittachi
3.	Ductable & Non-Ductable Split Units/	Daikin/ Hitachi/Toshiba
4.	Compressor for Split Units	Daikin/Tecumseh/Copeland/ Hitachi
5.	Fresh Air Treatment Units DX AHU & Cooling coils for AHUs	Daikin/System air /Edgetech
6.	Voltage Stabilizers	Logicstat/shilpa
7.	Centrifugal Fans	Nicotra(Italy)/ Kruger (Singapore)
8.	Axial Flow Fans	Kruger/Nicotra/ Systemair
9.	Motor	ABB/ Siemens/Bharat Bijli
10.	V-Belts	Fenner India/ Dunlop
11.	Inline Fans	Sphere Vent/Carryaire/Kruger
12.	Propeller Fans	Alstom Marathan
13.	Vibration isolators/ suspenders	Resistoflex/Gerb
14.	Air curtain	Beacon/Thermadyne/ Tristar
15.	Pressure/Temperature & RH Sensor	Honeywell/Siemens-Staefa/Johnson/Omicron
16.	Electrostatic Air Cleaners	Honeywell/Magneto
B.	**PIPING**	
1.	Pipes (MS & GI)	Tata Steel/ Jindal (Hissar)
2.	Copper Refrigerant Piping	Rajco/Mandev /Jindal
C.	**DUCTWORK AND AIR TERMINALS**	

S. No.	EQUIPMENT AND MATERIAL	ACCEPABLE MAKE
1.	GS Sheet	SAIL/Tata Steel/National/Jindal/Lloyd
2.	Factory Fabricated Ducts & TDC flanges	Ductofab /Spiro duct
3.	Pre Filters	Purolator/Thermodyne/Spectrum
4.	Extruded Aluminium Grilles & Diffusers	Servex/ Tristar/Air Master
5.	Dash Fasteners	HILTI/Fischer
6.	Intake Louvers	Servex/Tristar /Air Master
7.	Duct /grille dampers & Air Transfer Grille	Servex / Tristar /Air Master
8.	Smoke cum Fire Dampers	Caryaire/Systemair
9.	Actuators for Fire Dampers	Belimo(Swiss), Joventa (Swiss), Siemens
10.	Flexible connections for fan outlet	Mapro/Caryaire
11.	PLC Auto sequencers	Proton
12.	Flexible Ducts	UP Twiga/GP Spiro
14.	Steel Wire Rope Hangers & Supports	Gripple
D.	**INSULATION**	
1	Fibre Glass	Owens Corning
2.	Closed Cell Elastomeric Insulation	Armacell/ Eurobatex/Supreme
3.	Open Cell Elastomeric Insulation	Armacell/ Eurobatex/Supreme
4.	Expanded Polystyrene	Beardsell/ Toshiba/SHI
5.	RP Tissue	Owens Corning
6.	Adhesive for application of closed & open cell insulation (Low VOC)	Pidilite/ Aeroseal Glue/Armaflex/ Paramount Polytreat
7.	Glass cloth & UV protection paint	Armacell/ Paramount
8.	Extruded polystyrene Insulation	Owens Corning/Insuboard
F	**ELECTRICAL**	

S. No.	EQUIPMENT AND MATERIAL	ACCEPABLE MAKE
1.	Panel Manufacturers	Advance / Madhu Electricals / N K Electricals/ Tricolite/ SPC Electrotech/Adlec
	Components	
1.	MCCB	Schneider(Imported)/HAGER/MGE/ABB/ L & T
2.	MCB	ABB/Hager/ (L&T) / MDS Legrand/ Siemens / Schneider Electric
3.	ELMCB/ELCB	ABB/Hager/ (L&T) /MDS Legrand / Siemens / Schneider Electric
4.	Contractors	L&T/Schneider (Imported) ABB/ Siemens
5.	Overload Relay	L&T/Schneider (Imported) ABB/ Siemens
	Cables	
1.	Power Cables	Havells/Polycab/Rallison/Skytone
2.	Copper Control Cables	Finolex/ National/ Skyline/ Rallison
3.	Cable Gland	Commet
4.	Lugs	Dowells crimping type/3D/Jainsons
5.	Connectors	Elmec/ VKS/ ESSEN
	Meters/ Indicators	
1.	Ammeters / Volmeters (Digital Type)	L&T/Enercon/Trinity/Conzerv
2.	Indicating Lamps (LED Type)/ Push Buttons	L & T, Schneider, ABB
3.	Current Transformer	AVK SCGC / Kappa / Gilberts & Maxwell / Automatic Electric / Rishline (L & T)/ Matrix / Pree
4.	Selector Switches	Salzer (I&T)/ Kaycee

NOTES:

1. Make of any other equipment/ material not mentioned above shall be got approved from the Architects/ Owners before execution.

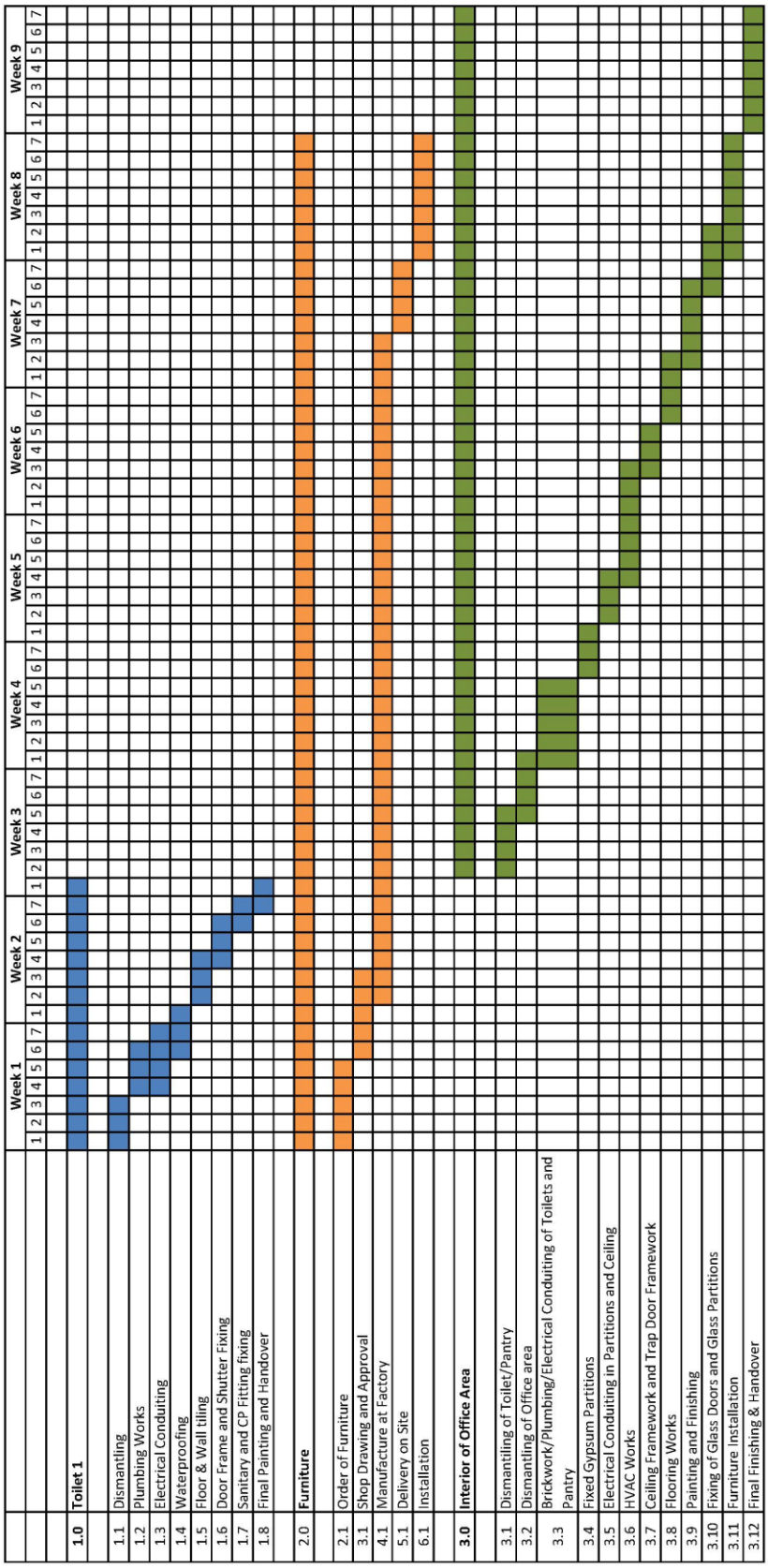
2. Relevant catalogue to be submitted along with the offers.

3. Relevant Test Certificates to be produced for various equipment & material during billing process.
4. Under electrical, wherever, there is multiple choices of brands /approved makes, the brands/make nominated by Owners/ Architects out of the multiple brands shall have to be supplied.

SECTION V: LIST OF TENDER DRAWINGS

SL. NO	DWG. NO / DOCUMENT	DWG. / DOCUMENT TITLE
INTERIOR		
1	NBCFDC-AR-01	EXISTING LAYOUT
2	NBCFDC-AR-02	FURNITURE LAYOUT PLAN
3	NBCFDC-AR-03	PARTITION LAYOUT PLAN
4	NBCFDC-AR-04	SECTION AA & BB
5	NBCFDC-AR-05	SECTION CC & DD
6	NBCFDC-AR-06	LIGHTING & FALSE CEILING PLAN
7	NBCFDC-AR-T-01	TOILET AND P ANTRY DETAIL
8	NBCFDC-AR-T-02	TOILET AND P ANTRY DETAIL
9	NBCFDC-AR-1.0	DOOR SCHEDULE
FURNITURE DETAIL		
10	NBCFDC-FU-01	TABLE & SIDE UNIT - T1/SU1 (DETAIL)
11	NBCFDC-FU-01A	TABLE - T2, S1 & BU2 (DETAIL)
12	NBCFDC-FU-01B	TABLE - T3, S2 & BU3 (DETAIL)
13	NBCFDC-FU-02	LOW HT LAM STORAGE - BU1
14	NBCFDC-FU-03	LOW HT LAM STORAGE - BU2
15	NBCFDC-FU-04	LOW HT LAM STORAGE - BU3
16	NBCFDC-FU-05	LOW HT LAM STORAGE - BU4
17	NBCFDC-FU-06	LOW HT LAM STORAGE - BU5
18	NBCFDC-FU-07	PRELAM OVERHEAD STORAGE - OS1
19	NBCFDC-FU-08	PRELAM OVERHEAD STORAGE - OS2
20	NBCFDC-FU-09	PRELAM OVERHEAD STORAGE - OS3
21	NBCFDC-FU-10	PRELAM OVERHEAD STORAGE - OS4
22	NBCFDC-FU-11	PRELAM OVERHEAD STORAGE - OS5
23	NBCFDC-FU-12	WORKSTATION - WS1
24	NBCFDC-FU-13	WORKSTATION - WS2, TYPE - A
25	NBCFDC-FU-14	WORKSTATION - WS2, TYPE - B
26	NBCFDC-FU-15	DESPATCH AREA WORKSTATION - WS3
27	NBCFDC-FU-16	L SHAPE WORKSTATION - WS4
28	NBCFDC-FU-17	LAMINATE PEDESTAL
29	NBCFDC-FU-18	LAMINATE 1200 HT STORAGE - S1
30	NBCFDC-FU-18A	LAMINATE 2100 HT STORAGE - S2
31	NBCFDC-FU-19	LAMINATE 2100 HT STORAGE - S4
32	NBCFDC-FU-20	LAMINATE 750 HT STORAGE - S3
33	NBCFDC-FU-21	METAL KEYBOARD TRAY PLASTIC CPU TROLLEY
HVAC		
34	NBCFDC-H-01	HVAC LAYOUT PLAN
35	NBCFDC-H-02	HVAC ROOF PLAN
ELECTRICAL		
36	NBCFDC-E-01	LIGHTING PLAN
37	NBCFDC-E-02	DB DETAIL

SECTION IV: PROPOSED SCHEDULE FOR WORKS TO BE ADHERED BY SELECTED AGENCY



National Backward Classes Finance & Development Corporation
5th Floor, NCUI Building, 3, Siri Institutional Area, August Kranti Marg, New Delhi-110016
Tel: +91-11-45854400/26511027/ 26511028
E-mail: nbcfdc@del3.vsnl.net.in

TENDER DOCUMENT

FOR GENERAL CIVIL AND INTERIOR RENOVATION WORKS FOR NBCFDC AT 5TH FLOOR, N.C.U.I. BUILDING
3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI-110016

PART 2 FINANCIAL BID

M/s ABRD ARCHITECTS
INTERIOR DESIGNERS
C-22, Golf View Apartments, Saket, New Delhi-110017
CONTACT NO. – 9810137551 (M) 01146542974 (O)
Mail Id:- abrdarchitects@gmail.com

INDEX

SECTION – VII PREAMBLE TO BILL OF QUANTITES

I. GENERAL

This Preamble is to be read in conjunction with the description of various items given in the Bill of Quantities (BOQ). These items are deemed to be a part of the BOQ and shall be read along with the same. The rates quoted for various items in BOQ are deemed to include the various provisions made herein. Whether specifically mentioned or not in the BOQ, the requirements given below shall be deemed to be included:

1. Abbreviations

BWP - Boil Water Proof
M.S. - Mild Steel
O.B.T. Wood - Old Burma Teak Wood
B.T.W. - Burma Teak Wood
C.P. Teak Wood - Central Province Teak Wood
Rmt. - Running Meter
Sqm. - quare
Meter Cum. - Cubic Meter
T.W. - Teak Wood
Q.R.O. - Quote Rate only
C / C - Centre to Centre
C.M. - Cement Mortar
M.T. - Metric Ton
C.P. - Chrome Plated No. - Number/Each
MM - Millimeter
G.I. - Galvanized Iron
A.C. - Asbestos Cement
C.I. - Cast Iron
All dimensions are in mm unless otherwise stated.

2. The quoted rate shall be all inclusive and cover the cost of material including wastage, freight, all types of taxes except GST, duties, royalties, erection, construction, testing of materials, samples brought for approval, tools and tackles, plant and equipment, supervision, overheads, profit and any other expenditure incurred for completion of work as per drawings, specifications and to the full satisfaction of Architect/NBCFDC.

3. The rates quoted shall be valid for working at all heights, depths and on all floor levels. No extra payment shall be made for scaffolding, staging, ladders, etc., for transportation of men and material at higher or lower levels.

4. The contractor shall have to carry out the work in accordance with the drawings, technical specifications and / or other conditions laid down in tender document and to the full satisfaction of Architect/NBCFDC.

5. Rates for doors shall include all hardware brass/stainless steel Heavy duty hardware, locks, special door handles, door buffers etc. as specified in relative items. Size and type of door closer / floor-spring shall be suitable for types of door. The contractor shall give guarantee for performance of door closer / floor- spring from himself as well as from manufacturer.

6. Rates for painting and polishing shall include cleaning or glass panels, fans, floor, etc.

7. After completion of work the site shall be handed over absolutely clean, after ensuring that all laminates, floors, walls, etc. are spotless clean.

8. Rates of all items shall remain constant irrespective of floor level and no extra shall be paid for handling and stacking of material, removing debris etc. from the site.

9. Contractor shall clean the site and mark the lining out on the floor for partition/table etc. with brown adhesive tape for approval. The same shall not be paid separately.

10. All pipes and fittings shall emerge at tile joints preferably. No fittings or pipe shall be taken out by breaking tiles.

11. Wherever contractor proposed to use "equivalent" makes (i.e. other than specified) he shall obtain corporation's prior approval. Corporation may consult Consultants before giving approval to the same. Any additional cost and time lost due to this shall be on Contractor's account and no claims shall be entertained.

12. The back of marble slab shall be applied with white cement paste before fixing.

13. The contractor shall take approval for make & manufacturer from the Architect/NBCFDC before using any material which does not appear in the list of approved manufacturers.

14. All internal framework, if in wood/wood substitute to be coated with wood preservative & fire retardant paint from approved make.

15. The grade of plywood confirming to relevant IS specification (IS-710-1976) shall be used unless otherwise specified.

16. Rate for all items include materials, labor, testing of materials at laboratory or site, tools & tackle, lift & lead charges, transportation charges, loading - unloading charges, insurance cover as per tender, all taxes & duties including works Contract Tax except GST (Goods and Services Tax) Polishing & painting charges wherever applicable, arranging

in position, cleaning, making mock-up etc. up to the entire satisfaction of Project-in-charge.

17. Rate of framework for partitions shall include cost of cutting slots & providing additional supports for electrical conduits, switches, accessories or fixtures, A.C., ducts, monument boxes etc. as per markings given by respective contractors.

18. All rates shall be inclusive of providing & fixing T.W. edge binding strips of 6 mm thickness for exposed edges of plywood & polishing the same.

19. Rate of all types of false ceiling shall include fixing required wooden sleeves or supports & making openings for ducts, grills, light fixtures, speakers, all types of detectors, indicators; finishing of joints, making grooves in required profile as per details in the false ceiling or between false ceiling & wall / partition with required wooden strips, etc., for which no extra payment shall be made.

20. All exposed wooden & plywood unfinished work shall be finished with 3 coats of melamine polishes of approved shade & color unless otherwise specified.

21. All materials which shall be brought on site shall be of approved make & manufacturers failing which payment shall be deducted suitably from every running bills/final bill. Percentage of the same shall be assessed by Architect/NBCFDC and they at their discretion either to ask contractor to remove / rectify the same or to decide the new proper rate of that particular item.

22. Colors, Shades of laminate, Paints, Polish shall be exclusively approved by Architect/NBCFDC only. No violation, deviation shall be accepted in the case.

23. Laminate shall be used of 1 mm thk only for exposed sides unless otherwise specified.

24. Hardware's such as Locks, Handles, Hinges, Tower Bolts, Ball Catches etc. shall be as per Hettich/Geze & Hafele . Alternative makes shall be used for these accessories after getting approval of consultants / owner in case of non- availability in market.

25. All the drawers & trays of Desk units & Credenza units shall have telescopic drawer's fittings including stoppers systems.

26. The colors, shades of melamine polish shall be as approved by Consultants. No violation shall be permitted in any of the item. 3 or more coats of melamine polish shall be applied wherever specified.

27. Items of flush doors such as laminated doors, glass paneled doors and glass doors shall be including the rates of handles, locks, springs, hinges, wooden door frames as per the instructions given by Architect/NBCFDC.

28. The rates for storage units shall be all inclusive of hardware's such as locks, handles, demountable hinges/normal but hinges, tower bolts, ball catches, etc. The mode of measurements for storage units shall be front elevation area only unless otherwise mentioned in the item.

29. The similar design of glass doors & glass partitions shall be adopted unless otherwise specified. Rate of glass doors/ rate of glass partitions shall be all inclusive of hardware that of mentioned in clause no. 36 above.

30. The payment shall be made based on actual work measured on site by Owner/ Architect representatives.

31. The furniture rates shall be quoted including that of providing necessary wire managers, making holes on table, table glass surface tops and in side units if required to take the cable out to the table top.

32. No extra payment shall be made for additional aluminum/wooden supports require to be provided for glass partitions where only front elevation area including the support finished surface shall be measured and paid accordingly.

33. All ply woods, ply boards, shall have edge binding strips finished with melamine / wax polish as applicable.

34. The inside surfaces for all storage area shall be finished with 0.8 mm laminate /2 or more coats of enamel paint as specified in the respective item.

35. All drawers to furniture shall have sliding drawer channels of approved make.

36. All rates shall be inclusive of providing & fixing T.W. Edge Binding strips of 6mm thickness for exposed edges of plywood & polishing the same.

42. All sizes of wooden sections specified in the items stated under are with permissible tolerance & for best quality teak wood.

43. All brass fittings / fixtures shall have oxidized finish except Knobs & magnetic catches unless specified otherwise.

44. All shutters with locking arrangement shall be provided with brass Shoe for key holes and magnetic catches.

45. All wooden frameworks shall be treated with fire-retardant Paint & anti-termite treatment. All internal faces of skinning & other wood work shall be treated with both the above mentioned treatments from inside.

46. For items of painting & polishing the rate quoted shall be valid for any width.

47. All materials and workmanship shall comply with relevant latest BIS standards, whether the reference nos. are specifically mentioned or not.

48. The plywood of various thicknesses i.e. 4mm and above shall be of marine ply variety bonded by phenol formaldehyde resin by hot pressing conforming to IS: 710-1976.

49. The flush door shall be 35mm/approved thick and solid core of block board type bonded with phenol formaldehyde synthetic resin thermo pressed with 8 mm thick teak wood external lipping unless specified in item. The finish of shutter shall match the adjoining partitions and shall be either laminate or decorative veneer to match the adjoining partition. Wherever the side of the flush shutter abuts plastered surfaces, it shall be finished with matt finish laminate. The rate quoted in flush doors shall include finishing all surfaces to design patterns as in drawing.

50. Wherever edges of polished Italian Marble/Granite either in cladding or in table tops are exposed, the quoted rate shall include chamfering of edges and polishing of edges. Wherever polished granite is specified in floor or in cladding, the quoted rate shall include lying according to patterns or designs required by the Consultants. No extra payment shall be made towards cutting and wastage in formation of patterns and designs.

51. All hardware fittings shall be of best quality stainless steel of approved make and design unless specified otherwise in the item specification.

52. The electrical installation shall be carried out through a Licensed Contractor who possesses valid License to work in DELHI issued by the Electrical Licensing Authority.

53. The Bidder is required to inspect the site of the work and ascertain for himself site conditions, facilities available and other aspects before quoting for the work. The bidder is also required, before quoting, to carefully peruse the tender documents, the tender drawings and connected details so as to understand clearly the scope and intent of the tender. Any claims by the successful bidder at a later date on account of his failure to comply with the above instructions shall not be

entertained.

54. The bidder shall note that the furniture and connected works are to be carried out and installed in the existing building. The bidder shall note that he shall execute his part of the work without causing any damage to any component of the building or services. Any damage so caused shall be made good at the cost and risk of the successful bidder. The successful bidder shall protect all other items of his work from other agencies from any damage and shall be responsible for final clearing of the floor, walls etc. before handing over. No extra is payable towards this the successful bidder shall include in their bid the rate all minor civil works such as chasing wall, drilling hooks etc. and making good and no extra is payable towards this. Neat housekeeping at all shapes of work is the responsibility of the successful bidder, who shall also ensure that removal of debris, wood shaving, waste materials etc. from the site at his own cost is organized at regular basis. The successful bidder shall also be responsible for safety and security of all his materials and also for ensuring fire prevention steps are taken at all times.

55. The bidder shall note that the tender drawings and other documents describing each item of the schedule are only indicative in nature and cannot be taken as complete in detail and finishes. Being tender for interior works which calls for workmanship and finish including use of good quality materials of high standard, it is expected that the bidder shall understand the intent of the tender drawings and specifications and provide for materials, workmanship, finishes and accessories appropriately so as to deliver the product of high standards in keeping with the function for which the furniture is being specified. No claim from the contractor at a later date shall be entertained for his failure to understand this condition. The decision of Architect/NBCFDC in respect of the quality of materials, type of construction, fabrication / assembling, workmanship, finish, etc., shall be final and binding and the contractor's claim for not providing in his tender for such materials, construction, workmanship and finish cannot be entertained.

56. Architect/NBCFDC reserve the right to insist on selection of material, workmanship, detailing and finishes which they consider are appropriate, and suitable for the intended use. The contractor is not eligible for claims to extra on this account.

57. Architect/NBCFDC reserve the right to insist on prototype/mock-up to be made for each item of work for approval before starting the full-fledged manufacture of each type of furniture. The mock up items shall be paid in respective items.

58. Architect/NBCFDC reserve the right to suggest or make modification at

the prototype /mock-up stage which the contractor shall comply with without any extra cost.

59. Architect/NBCFDC shall require the contractor to produce samples of all materials, accessories/finishes prior to procurement / manufacture. Failure to comply with these instructions may result in rejection of the work.

60. All the works done under this contract shall be guaranteed for a period of one year from virtual date of completion of works certified by Architect/NBCFDC covering, materials, workmanship and finish. Any defects or shrinkage, warping or other forms of deterioration shall be made good by the contractor at his own cost within the guarantee period, immediately on being informed of such defects. Failure to comply shall entail NBCFDC to unilaterally decide on getting the repair done through other agency at the cost and risk of the contractor.

61. The contractor shall use only the best material. Teakwood or other timber specified shall be of the best quality, free of defects of any kind. All plywood, particle board, laminate etc., shall comply with respective Indian standard (BIS). If required by Architect/NBCFDC, the contractor shall be required to arrange for testing products and produce test certificate from recognized test houses to establish the quality of materials at his own cost. Any defective material not meeting with the standard shall be replaced at the contractor's own cost. Manufacturer's test certificates for all items have to be obtained and submitted to client time to time.

62. The bidder shall indicate the makes of all the finishing materials with catalogues in his tender, based on which rates have been quoted. The bidder shall be prepared to produce samples when called for before consideration of the tender further at his own cost and responsibility and without any liability on **NBCFDC**.

63. The dimensions of furniture provided in the schedule as well as in drawing are likely to vary according to the size of space available in the respective rooms where they are to be provided or placed. Architect/NBCFDC have the right to slightly modify the dimensions of furniture items to suit the site for which no extra claim shall be entertained.

69. The contractor shall provide and retain the following at site, during course of project to take care of any fire exigencies.
Fire extinguishers - 2 nos.DCP / 2
nos. CO2 One FIRST-AID box

70. The normal working hours for carrying out the interior job shall be from 8.00 A.M up to 7.30 PM on working days (from Monday to Friday) and shall be 8.00 AM to
6.30 PM on Saturdays, Sundays and all holidays. However the work can be continued during the night hours subjected to the permission given by the EIC and no complaints received from neighbors and police etc in line with the prevailing statutory regulation. It may be noted that the floors above and below are occupied by other corporate and sound making work may have to be limited during the office hours in order to avoid stoppage of work for which no extra claim from the party shall be entertained.

II SPECIFIC CONDITIONS

1. The various works described in the Bill of Quantities and in the drawings shall be executed in strict accordance with the specifications and drawings to the entire satisfaction of the Architect/NBCFDC. The quality of materials and workmanship shall be of high quality and shall conform to the relevant I.S. Specifications wherever applicable. The successful bidders shall be required to produce for Consultants approval samples of all materials and procurement shall be arranged only after specific approval. Samples of finished work shall also be shown for Consultants approval wherever directed and finished work shall conform strictly to the approved samples. The decision of the Consultants in this matter shall be final.

2. The bidders shall ensure that the place of work is kept neat and tidy during the progress of work and also clean at the end of each day's work. The contractor shall also ensure that the site is cleared of all rubbish, and other unwanted materials and handed over in a neat and satisfactory conditions as may be directed by Architect/NBCFDC.

3. The bidders shall take maximum precaution in protecting persons, things and properties belonging to the NBCFDC**,** Public and also their own during the progress of work. The bidders shall be solely responsible for any damage caused during the progress of work and the successful bidder shall indemnify the NBCFDC by suitable guarantee / insurance cover from any claims on any account due to damages caused during their work.

4. Pre-measurements to be recorded for all the dismantling items before starting of work.

5. Site meetings shall be held regularly once in a week, if necessary meeting shall be held in between also. The contractor or their authorized representative would be present for the meeting to take instruction and carry out the same for execution.

6. The contractor shall maintain measurement books in which he shall

record measurements of work done from time to time and checked by the Architect/Site Engineer. There shall be no corrections or over writing in the measurements

7. The Contractor on starting the work shall herewith furnish to the Consultants a programme for carrying out the work stage by stage with in the stipulated time. A graph or chart on individual work shall be maintained showing the progress week by week. The Contractors shall submit to the Architect a weekly progress report stating the number of skilled and unskilled laborers' employed on the works, working hours done, quantity of cement used, place, type and quantity of work done during the period.

8. All the toilets in the floor shall be kept under lock and key, out of which one toilet shall be earmarked for use by workers. After completion of work, the toilet shall be thoroughly cleaned including replacement of broken fittings etc. by the Contractors and handed over to NBCFDC. Any cost incurred in such cleaning, modifications etc. shall be proportionately recovered from various Contractors engaged in the work.

9. The Contractor shall engage an independent Housekeeping – debris removal agency on a day-to-day basis. Hence Contractor would be responsible for cleaning up the debris and waste materials accrued from his work and dispose the accumulated debris on a daily basis. If the Contractor fails to comply with this requirement, the Employer shall be at liberty to direct the cleaning agency to do the regular cleaning responsibility.

10. Architect/NBCFDC reserve the right to delete all /any of these associated works from the scope or include them prior to placement of work order. If awarded, the main agency shall get the associated works carried out only through approved sub- specialist in each trade if specified in the BOQ. Such works shall be done to satisfy standards of Architect/NBCFDC and also to meet their requirements and specifications of **NBCFDC**. Any suggestions / modifications suggested by Architect/NBCFDC for integrating these associated works with the main system of **NBCFDC** shall also be got done by the main agency to the satisfaction of Architect/NBCFDC. No extra cost is payable on account of executing works through the approved agency for integrating the same with **NBCFDC's** overall scheme or implementing the suggestions given by Architect/NBCFDC. The contractor may note that they have to do day to day coordination with other agencies already mobilized in site for executing other related jobs

11. The Contractor shall strictly follow and comply with the guidelines (which are applicable to them) given in NBCFDC during execution.

III MODE OF MEASUREMENTS

Unless otherwise stated in the Schedule of Quantities the method of measurement for various items in the tender shall be generally in accordance with the **IS: 1200** subject to the following

a) DEMOLITION WORK:

Pre-measurements to be recorded for all dismantling items before starting of the work.

b) WOOD WORK:

No extra measurements shall be given for the shape, joints of the partitions counter, tables work etc. All work shall be measured net as fixed. No extra measurement shall be given for shape, joints, played meeting styles of doors and windows and shall be measured in unit of square meter.
Areas over one face inclusive of exposed frame thickness (excluding width of cover mould) shall be measured in case of T.W. Doors, Windows and Ventilators, Louvers. Portions in masonry or flooring shall not be measured.

c) PAINTING, WHITEWASHING, COLOUR WASHING & DISTEMPERING:

All painting work shall be measured in Sq. Meters.
Net area of the surface painted shall be measured. No deductions shall be made for unpainted surfaces of ends of joints, beams, posts, etc., and opening not exceeding
0.5 Sq. Meters each and no addition shall be made for reveals, jambs, soffits, sills, etc., of these openings.

The following multiplying factors for obtaining equivalent areas shall be

adopted: - Paneled, Framed, Measured flat 1 1/3 (for each side)

Ledged, braced and (Not girthed)
Battened Including Frames, edges, Checks,
cleats, etc. Item
Flush, Part -- do -- 1 (for each side)

Paneled and part
Glazed or glazed.
Partition, Paneling Sqm. area one side only
Storage units Sqm. Area/RM as specified - front elevation.
Staff desk Units Per number, Single unit-Double unit, Refer Specific item in BOQ Fascia, Band, Skirting Total running length in metres measured. Sill board fascia skirting along bottom edge, regardless of the shape on top A.C. Fascia Running meter-running length of the Facia.

False ceiling Sq m. area-finished length finished width.
No deduction for A.C. grills, lights & Cut-outs drop to be measured separate in Sqm. Soffit Sqm. total finished length x total finished
Depth (width including drop of pelmet, if any)
Side units Sqm/RM same as specified in
storage item (Height x Elevational length)
Venetian Blinds Total Sqm area covered.
Carpet and other floor as laid Sqm area. No wastage coverings to be added.
Window sill Total RM along the finished edge for the Specified thickness
Rounding off measurement: All measurements shall be rounded off to nearest second decimal point e.g. 21.465m shall be recorded as 21.47m. or 21.464 m shall be recorded as 21.46m.

BOQ OF GENERAL CIVIL AND INTERIOR RENOVATION WORK OF OFFICE FOR NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION AT 5TH FLOOR, N.C.U.I. BUILDING, 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI

SUMMARY

S.NO.	DESCRIPTION	Amount in Figure	Amount in Words	Amount with GST in Figure	Amount with GST in Words
	PART A				
A	DISMANTLING				
B	CIVIL WORK				
C	JOINERY WORK				
D	INTERIORS				
E	FINISHING				
F	CHAIRS				
	PLUMBING & SANITARY WORKS				
G	PH WORK, CP FITTING & SANITARY FITTINGS				
	ELECTRICAL WORKS				
H	POINT WIRING AND EQUIPMENT				
I	SUPPLY AND INSTALLATION OF LIGHTING FIXTURES				

	HVAC WORKS				
J	HVAC EQUIPMENT				
K	HVAC PIPING				
L	AIR DISTRIBUTION				
M	INSULATION				
N	ELECTRICAL INSTALLATION				
	TOTAL OF PART A				
PART B					
O	FURNITURE				
	TOTAL OF PART B				
P	**TOTAL OF PART A & PART B**				

Sign. of Contractor's

Date of Submission

BOQ OF GENERAL CIVIL AND INTERIOR RENOVATION WORKS OF OFFICE FOR NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION AT 5TH FLOOR, N.C.U.I. BUILDING, 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
A		**DISMENTALLING**								
A1	NS	**DISMANTLING CEMENT CONCRETE ALL TYPES**								
		Dismantling of cement concrete / RCC by manual / mechanical means and removal / disposal of debris to the satisfaction of site engineer. The debris or dismantled product to be taken away from the building premises To any unobjectionable area within / municipal dump yard valid order from Engineer in charge/ Architect All including cartage and transportation. The item includes necessary labour, scaffolding, all tools and tackles to remove the same as required at site . All Item to be include getting for approved by Engineer in charge / Architect.	Cum	0.13						
A2	NS	**REMOVAL OF EXISTING FLOORING / TILES**								
		Preparation of existing floor / toilet walls by way of hackling, removal of tiles if required and cleaning the surfaces to a maximum depth of 50 mm. The debris or dismantled product to be taken away from the building premises. To any unobjectionable area within / municipal dump yard valid order from Engineer in charge / Architect All including cartage and transportation. Item to be include getting for approved by Engineer in charge / Architect.	Sqm	165						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
A3	NS	**REMOVAL OF ALL TYPES OF DOORS AND WINDOWS**								
		Removal of all types of doors and windows including all fixtures, disposal of debris making area dust free and clean and stacking the same in / outside building safety and taking away from the building premises to any unobjectionable area by transporting it to with in 40 kms radius of the listed site address at Delhi with in 48 hours of the shift order from Engineer in charge / Architect. The item includes transportation, loading and unloading of the material in any unobjectionable place, item to include getting for approved by Engineer in charge / Architect making area dust free and clean. The item includes all tackles and tools, required scaffolding etc. with all labour with electrical accessories to tap from nearest power point etc. item to be include getting for approved by Engineer in charge / Architect.	Nos.	15						
A4	NS	**DISMANTLING OF BRICK WORK**								
		Dismantling of brick work by manual / mechanical means and removal disposal of debris to the satisfaction of site engineer. The debris of dismantled product to be taken away from the building premises to any unobjectionable area / municipal dump yard near to the listed site address at Delhi and within 24 hours of valid order from Engineer in charge, All including cartage and transportation. The item includes necessary labour, scaffolding, all tools and tackles to remove the same as required at site . All item to be include getting for approved by Enginner in charge / Architect.	Sqm	4.31						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
A5	NS	**DISMANTLING OF PARTITION**								
		Dismantling of partitions by manual / mechanical means and removal disposal of debris to the satisfaction of site engineer. The debris of dismantled product to be taken away from the building premises to any unobjectionable area / municipal dump yard near to the listed site address at Delhi and within 24 hours of valid order from Engineer in charge, All including cartage and transportation. The item includes necessary labour, scaffolding, all tools and tackles to remove the same as required at site . All item to be include getting for approved by Engineer in charge / Architect.	Sqm	153.36						
A6	NS	**DISMANTLING OF FALSE CEILING**								
		Dismantling of false ceilings by manual / mechanical means and removal disposal of debris to the satisfaction of site engineer. The debris of dismantled product to be taken away from the building premises to any unobjectionable area / municipal dump yard near to the listed site address at Delhi and within 24 hours of valid order from Engineer in charge, All including cartage and transportation. The item includes necessary labour, scaffolding, all tools and tackles to remove the same as required at site . All item to be include getting for approved by Engineer in charge / Architect.	Sqm	6.72						
A7	NS	Dismantling of ceramic tiles on walls by manual / mechanical means and removal disposal of debris to the satisfaction of site engineer. The debris of dismantled product to be taken away from the building premises to any unobjectionable area / municipal dump yard near to the listed site address at Delhi and within 24 hours of valid order from Engineer in charge, All including cartage and transportation. The item includes necessary labour, scaffolding, all tools and tackles to remove the same as required at site. All item to be include getting for approved by Engineer in charge / Architect.	Sqm	25						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
A8	NS	Dismantling of miscellaneous items like Existing Furniture, Storage Units, Sanitary Fittings, C.P. Fittings, Pipes, Conduits etc. in existing walls by manual / mechanical means and removal disposal of debris to the satisfaction of site engineer. The debris of dismantled product to be taken away from the building premises to any unobjectionable area / municipal dump yard near to the listed site address at Delhi and within 24 hours of valid order from Engineer in charge, All including cartage and transportation. The item includes necessary labour, scaffolding, all tools and tackles to remove the same as required at site. All item to be include getting for approved by Engineer in charge / Architect.	L.S.	1						
		TOTAL OF DISMANTLING								
B		**CIVIL WORK**								
B1		**115 mm thk Brick work**								
	6.13.1	Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level. Cement mortar 1:3 (1 cement :3 coarse sand)	Sqm	27.52						
B2		**PLASTER**								
		12 mm cement plaster								
	13.1.1	1:4 (1 cement: 4 fine sand)	Sqm	55.04						
B3	NS	**DIGITAL WALL TILE**								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Providing and fixing Digital Wall tile of Johnson (Retro Decor) (size 300 x 300) or similar in specific an to make like (NITCO,ORIENT BELL& KAJARIA) (thickness to be specified by the manufactures) with water absorption less than 0.08% and conforming to IS : 15622 of approved make in all colours and shades, laid on 12 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) including grouting the joints with white cement and matching pigments etc. complete. In case the tiles have to be fixed on existing bed, then tile adesive (Bal endura, Ruff or equivalent with star white quality) with adhesive thicknes of 4 mm to be used without any extra charges. (For Toilets walls) Please note that the rates shall be inclusive of providing and finishing 4mmX4mm groove filled with Bal - Endura adhesive epoxy between each tile strictly as per detailed floor design item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Makes :- ORIENT BELL, NITCO & KAJARIA**	Sqm	50.3						
B4	NS	**TOILET WATER PROOFING**								
		Providing and laying water proofing treatment in toilet etc., by applying cement slurry mixed with water proofing cement compound consisting of applying: (a) First layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/ sqm. This layer will be allowed to air cure for 4 hours. (b) Second layer of slurry of cement @ 0.242 kg/sqm mixed with water proofing cement compound @ 0.126 kg/sqm. This layer will be allowed to air cure for 4 hours followed with water curing for 48 hours. The rate includes preparation of surface, treatment and sealing of all joints, corners, junctions of pipes and masonry with polymer mixed slurry item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Makes :- Pidilite, Sikka & Fosroc.**	Sqm	25						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
B5	NS	**VITRIFIED TILES 600 X 600 MM**								
		Providing and fixing Vitrified tile (Polished Double charged - Vogue flayer Series of ORIENTBELL, thickness to be specified by the manufactures or equivalent brands like (NITCO) with water absorption less than 0.08 % and conforming to IS : 15622 of approved make in all colours and shades, laid on 12 mm thick cement mortar 1:3 (1 cement :3 coarse sand) including grouting the joints with white cement and matching pigments etc. complete. In case the tiles have to be fixed on existing bed, then tile adesive (Balendura, Ruff or equivalent with star white quality) with adhesive thicknes of 4 mm to be used without any extra charges. (i) Size of Tiles 80x80 cm. Rates shall be inclusive of providing and finishing 4mm x 4mm groove filled with Bal - Endura adhesive epoxy between each tile stricktly as per detailed design and drawing to be complete advised by Engineer in charge / Architect. **Approved Makes:- ORIENTBELL, Kajaria & Johnson.**								
		DGVT - 600 X 600	Sqm	150						
		DGVT - 300x300	Sqm	50						
B6	11.48	Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix of 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg), including filling / grouting and finishing complete as per direction of Engineer-in-charge.								
		Size of Tile 600x600 mm / 300x300mm	Sqm	200						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
B7	NS	Providing and fixing stone slab with table rubbed, edges rounded and polished of size 75x50 cm deep and 1.8 cm thick, fixed in urinal partitions by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in-charge and finished smooth.								
		Granite Stone of approved shade	Sqm	0.375						
		TOTAL OF CIVIL WORK								
C		**JOINERY WORK**								
C1		Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately).								
	9.1.1	Second class teak wood	Cum	0.040						
C2		Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) non-decorative type, core of block board construction with frame of 1st class hard wood and 1.5mm thk. Laminate on both faces of shutters, inclusive of all harwdware, door closer, mortice lock etc. all complete as per directions of the engineer in charge.								
	9.20.1	35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws	Sqm	6.72						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
C3	NS	Extra over above for making a sliding door shutter along with all necessary harware, rail etc. all complete as per directions of the engineer in charge.	L.S.	1.00						
C4	NS	P/F of Trap door in False Ceiling - Frame for Trapdoor made with 50x50mm Teak Wood Framwork, trap door openable panel made with 20mm thk. Both side laminated MDF all complete with frame and sides polished as per directions of Engineer in Charge.	Sq.m.	3.00						
		TOTAL OF JOINERY WORK								
D		**INTERIOR WORKS**								
D1	NS	**GYPSUM BOARD PARTITIONS** Providing and fixing partition upto ceiling height consisting of G.I. frame and required board, including providing and fixing of frame work made of special section power pressed / roll form G.I. sheet with zinc coating of 120 gms/sqm(both side inclusive), consisting of floor and ceiling channel 50mm wide having equal flanges of 32 mm and 0.50 mm thick, fixed to the floor and ceiling at the spacing of 610 mm centre to centre with dash fastener of 12.5 mm dia meter 50 mm length or suitable anchor fastener or metal screws with nylon plugs and the studs 48 mm wide having one flange of 34 mm and other flange 36 mm and 0.50 mm thick fixed	Sqm	32.7						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		vertically within flanges of floor and ceiling channel and placed at a spacing of 610 mm centre to centre by 6 mm dia bolts and nuts, including fixing of studs along both ends of partition fixed flush to wall with suitable anchor fastener or metal screws with nylon plugs at spacing of 450 mm centre to centre, and fixing of boards to both side of frame work by 25 mm long dry wall screws on studs, floor and ceiling channels at the spacing of 300 mm centre to centre. The boards are to be fixed to the frame work with joints staggered to avoid through cracks, M.S. fixing channel of 99 mm width (0.9 mm thick having two flanges of 9.5 mm each) to be provided at the horizontal joints of two boards, fixed to the studs using metal to metal flat head screws, including jointing and finishing to a flush finish with recommended jointing compound, jointing tape, angle beads at corners (25 mm x 25 mm x 0.5 mm), joint finisher and two coats of primer suitable for board as per manufacture's specification and direction of engineer in charge all complete.								
		through cracks, M.S. fixing channel of 99 mm width (0.9 mm thick having two flanges of 9.5 mm each) to be provided at the horizontal joints of two boards, fixed to the studs using metal to metal flat head screws, including jointing and finishing to a flush finish with recommended jointing compound, jointing tape, angle beads at corners (25 mm x 25 mm x 0.5 mm), joint finisher and two coats of primer suitable for board as per manufacture's specification and direction of engineer in charge all complete.								
		75 mm overall thickness partition with 12.5 mm thick double skin fire rated board conforming to IS: 2095: part I								

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
D2	NS	Providing and Fixing 1200 high low height paritition made with 50x50 Hardwood framework, 12mm ply on both sides covered with 1.0mm laminate on both sides and 20 MDF Coping on top including all hardware, finishing etc. complete as per directions of the engineer in charge	Sqm	24.36						
D3	NS	**GLASS DOORS**								
		Providing and Fixing frameless doors with patch fittings consisting of 12 mm thick clear toughened glass with DORMA (PT standard). Patch fittings such as PT 24 top pivot, PT20-top patch PT-10-bottom patch US 10 corner lock with EPC, lock keeper plate and floor spring DORMA BTS75V conforming to DIN EN1154 with adjustable spring strength EN (1-4), leaf weight upto 130 kg. The above work complete in all respect as per approved drawings and to the satisfaction of engineer-in-charge / architect consultant. For doors with more closer type BTS 80 higher type (eg. EN6) without back check.								
a.		**(Size of Door - 1000 W x 2100 H)**	Each	2						
b.		**(Size of Door - 900 W x 2100 H)**	Each	3						
D4	NS	**FRAMELESS GLASS FIXED PARTITION**								
		Providing and Fixing Fixed glass partition and manual glass doors with S/S patch fitting frameless glass partition with 12mm clear toughened glass with DORMA (PT standard). Patch fittings such as PT-24-top pivot, P120-top patch PT10-bottom patch, US 10 corner lock with EPC, lock keeper plate, PT-40top patch with over panel PT-90 central connector, PT-91corner connector, PT92 side connector,'H'pul) handle spring DORMABTS75V conforming to DIN EN1154 with adjustable spring strength EN (1-4). The above work complete in all respect as per approved drawings and to the satisfaction of engineer-in-charge / architect consultant.	Sq.m.	42						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
D5	NS	Privacy Films; Providing and fixing Privacy Films on Glass Partitions and Glass Doors	Sq.m.	52						
D6	NS	**TECHZONE FALSE CEILING**								
		ACOUSTICAL CEILING TILE OF SIZE 600x1200 - Providing and fixing of Techzone Suspended ceiling system or equivalent with sand textured mineral fibre tiles 16mm thick with 15mm exposed grid system. (General Office Areas)	Sqm	125						
		The Techzone ceiling system has a ceiling module of 1200x1350 and the on centre spacing between two adjacent technical zones is 1350 mm. The Techzone orientation is such that the main runners run parallel to the technical zone and hence making this layout compatible with continuous lighting fixtures or Air diffusers. Field panel is of size 600x1200x16mm. The 150mm wide technical zone formed is where the technical elements like lighting fixtures & air diffusers would be installed. Where there are no technical elements the technical zone would be covered by using mineral fibre tile Technical Panels of size 1200mm x150mm in conjunction with a special 150mm long cross tee.								
		The ceiling panels should have Humidity Resistance (RH) of 99, NRC 0.5, Light Reflectance ≥85%, Thermal Conductivity k = 0.052 - 0.057 w/m K, Colour White, Fire Performance UK Class 0 / Class 1 (BS 476 pt - 6 &7), suitable for Green Building application, with Recycled content of 32%. The panels shall be laid on 15 mm wide T - section flanges with 38mm web height, colour white having rotary stitching on all T sections i.e. the Main Runner & 1200 mm Cross Tees with a web height of 38mm. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of minimum 100 Kgs and need to be installed with suspension system.								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
	26.27	Providing and fixing mineral fibre false ceiling tiles at all heights of size 595X595mm of approved texture, design and pattern. The tiles should have Humidity Resistance (RH) of 99%, Light Reflectance > 85%, Thermal Conductivity k = 0.052 - 0.057 w/m K, Fire Performance as per (BS 476 pt - 6 &7)in true horizontal level suspended on interlocking T-Grid of hot dipped all round galvanized iron section of 0.33 mm thick (galvanized @120 gsm) comprising of main T runners of 15x32 mm of length 3000 mm, cross T of size 15x32mm of length 1200 mm and secondary intermediate cross T of size 15x32 mm of length 600 mm to form grid module of size 600x600 mm suspended from ceiling using galvanized mild steel								
		item Galvanised@80gsm) 50 mm long 8mm outer diameter M-6 dash fasteners, 6 mm diameter fully threaded hanger rod up to 1000 mm length and L-shape level adjuster of size 85x25x2 mm, spaced at 1200 mm centre to centre along main 'T'. The system should rest on periphery walls / partitions with the help of GI perimeter wall angle of size24x24X3000 mm made of 0.40 mm thick sheet, to be fixed to the wall with help of plastic rawl plug at 450 mm centre to centre & 40 mm long dry wall S.S. screws. The exposed bottom portion of all T-sections used in false ceiling support system shall be pre-painted with polyester baked paint, for all heights. The work shall be carried out as per specifications, drawings and as per directions of the engineer-in-charge								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
	26.27.1	With 16 mm thick beveled tegular mineral fibre false ceiling tile (NRC 0.55 to 0.6	Sqm	20						
D7		**GYPSUM FALSE CEILING**								
	12.45.1	Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to	Sqm	25						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with 12.5 mm thick tapered edge gypsum plain board conforming to IS: 2095- Part I. **Approved Makes:- Saint Gobin (Gyproc)**								
D8	NS	Providing and fixing change room / toilet cubicle (of following standard dimension which includes 600mm door size width) made of heat, bacteria, water, chemical, scratch, impact and anti bacterial resistant 12mm thick solid compact laminate panels. Finish of the compact laminate should be suede, which includes doors, pilasters and intermediate panels finished with approved texture / shade as per the detail drawings as per IS 2046 (Indian Standard) and as per fire retardant BS-476/97 standard. Panel is anchored to the wall with SS 304 grade U & F Channel. This also includes providing and fixing in position necessary hardware made out of stainless steel (Grade 304) as per manufacturer's specification & instruction of Engineer-in-charge like (1) SS Door Knob, (2) SS Gravity Hinges,	Sqm	3.57						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		(3) SS Thumb turn lockset with occupancy indicators, (4) SS coat hooks with door stopper (5) SS U-channels, (6) Adjustable foot/ pedestal, (7) SS Top Rectangular rail (8) Rubber noise deafening tape, (9) screws & wall plugs. The top fitting should consist of SS top rectangular rail. SS wall fixing is used only on the wall which will hold the SS top rail. All screws will of 304 Grade in stainless steel with satin finish. All pilasters are supported by stainless steel bottom cladding. The base of the stainless steel bottom cladding will be anchored to the floor."								
		NOTE: The mode of measurement for payment purpose shall be per sqm area of laminated panels . For combined cubicles the common partition shall be measured only once for payment. Nothing extra will be paid on account of lamination of both sides. Doors also will be measured as plain panels.								
		TOTAL OF INTERIOR WORK								
E		**FINISHING WORKS**								
E1	NS	**TEXTURE PAINT**								
		Providing and applying 'Premier Emulsion Texture Paint' of approved make and shade on all surfaces & at all heights in three coats including scaffolding, preparing the surface by brushing and brooming down, applying primer, patti & a coat of white cement putty etc. complete The dry / wet cleaning of floors / pipes / glass etc. after painting is to be carried out. Item to include all accessories, tools & labour, men material & Lift upto 5 mts. scaffolding with all cleaning, depropping, clearing complete. Item to include getting mock-up for 2 sqm area approved by Engineer in charge / Architect / Engineer in-charge. **Approved Makes:- Heritage marketing & Asian Paint**	Sqm	250						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
E2	NS	**PLASTIC ACRYLIC EMULSION PAINT**								
		Providing and applying two coats of Premier plastic / Acrylic emulsion paint approved make and colour / shade over a coat of water based primer including preparation of surface by through cleaning as per manufacturer‟s specifications fully to give an even shade as approved and curing as per manufacturers specifications and as directed. Item to include all accessories, tools and labour, men material and lify up to 10 mtrs. Scaffolding with all cleaning, depropping, clearing complete. Item to include getting mock up for 2 sqm area approved by Engineer in charge / Architect. **Approved Makes :- Dulux & Asian Paint**	Sqm	750						
		TOTAL OF FINISHING WORK								
F		**CHAIRS**								
F1	NS	**Main Chair in Sr. Manager Cabin (C1)** The seat shall be made of injection molded plastic outer and inner. Plastic inner shall be upholstered with fabric and moulded polyurethane foam of density 67+/-2kg/m ^{3}, and hardness load 16+/-2kgf as per IS:7888 for 25% compression. The cushioned back shall be made of PU foam with molded MSERW oblong Tube of size 3.5+/-0.03cm x 1.5+/-0.02cm x 0.2+/- 0.016cm. It shall be upholstered with fabric. The dimensions of seat shall be- 46.0cm(W) x 48.0cm(D) and of back shall be 45.8cm(W) x 62.8cm(D). The armrest top shall be moulded from polyurethane and mounted on to a drop lift adjustable type tubular armrest support made of dia 3.81^o +/-0.03cm x 0.2+/-0.01 cm thick MSERW tube. Armrest height adjustable upto 6.5+/-0.5cm in 5 steps.. The mechanism of the chair shall have following features : 360 revolving type, Active Bio-synchro mechanism, Tilt tension adjustment, 5-position tilt limiter giving option of variable tilt angle to the chair. Seat/Back tilting ratio of 1:2. The chair shall be provided with pneumatic height adjustment which shall have stroke of 10.0 +/- 0.3 cm.	Nos.	2						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Seat depth adjustment shall be integrated in the seat through a sliding mechanism. Seat depth adjustment range shall be 6.0+/-0.5cm. Back frame shall be connected to the Up/Down mechanism housed in plastic T spine. it can be adjusted in the range of 7.42+/-0.5 cm for the comfortable back support to suit individual need. The pedestal shall be injection moulded in black 33% GF Nylon66. it shall be fitted with 5 nos twin wheel castor. The size of the pedestal shall be 66.1+/- 0.5 cm pitch-centre-dia (76.1 +/- 1.0 cm with castors). The twin wheel castors shall be made of PP. Overall dimensions of Chair shall be, Width of Chair - 76.1cm, Depth of Chair - 76.1 cm as measured from pedestal below. Height from ground - min 99.2 to max 116.7cm. Seat height - min 43.6 to max 53.6cm. Dimensions tolerance / variations shall be within +/- 1 cm. **Approved Makes:- HNI, Goodrej, Steelcase**								
F2	NS	**Visitor chair in sr. manager cabin of GOODREJ make (C2)** The cushioned seat is made of Injection molded Plastic outer & inner. Plastic Inner is upholstered with foam laminated fabric and moulded High Resilience Polyurethane foam of Density 45±2 kg/m^3 for 25% compression. Seat SIZE : 46.0 cm. (W)* 48.0 cm. (D). The cushioned back is made of PU Foam with insitu molded MS E.R.W Round Tube of size 1.9±0.03cm * 0.16 ±0.0128cm. It upholstered with foam laminated fabric. BACK SIZE : 46.6CM (W) * 59.6 CM. (D) The armrest top is moulded from olyurethane(PU) and mounted on to a drop lift adjustable type tubular armrest support made of 3.81±0.03 cm * 0.2±0.01 cm thk MS E.R.W tube. The Aremrest structure is powder coated (DFT 40-60 micron).The back connected to frame through powder coated (DFT 40-60 micron) high pressure die cast connector piece. Overall size of the chair shall be WIDTH (W) : 60.9 CM.*DEPTH (D) : 64.3 CM.*HEIGHT (H) :98.2 SEAT HEIGHT (SH) : 44.6. **Approved Makes:- HNI, Goodrej, Steelcase**	Nos.	4						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
F3	NS	**Bravo Midback Chair in open cabin (C3)** - Providing and placing Green Guard certified (VOC emissions within permissible limits of International standard and product should be duly certified from a reputed lab for VOC Emissions within permissible limits) mid back Chair of these at and back should be made up of 1.2 cm. thick hot-pressed plywood, upholstered with fabric upholstery covers and moulded Polyurethane foam. The back foam should be designed with contoured lumbar support for extra comfort. The seat should have extra thick foam on front edge to give comfort to popliteal area as per bifma standards. Back SIZE : 47.5 cm (W) x 58.0 cm (H) SEAT SIZE : 47.0 cm. (W) x 48.0 cm. (D) 2) POLYURETHANE FOAM: The Polyurethane foam should be moulded with density = 45 +/-2 kg/m3 and Hardness = 20 +/-2 at 25% compression. ARMRESTS: The one- piece armrests should be injection moulded from black Co-polymer Polypropylene. CENTER TILT SYNCHRO MECHANISM : The mechanism should be designed 360 Degree revolving type.• Upright position locking.•	Nos.	7						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Tilt tension adjustment.• Seat/back tilting ratio of 1:3 (60 seat tilt/180 back tilt) PNEUMATIC HEIGHT ADJUSTMENT : The pneumatic height adjustment should have an adjustment stroke of 12.0 cm. TELESCOPIC BELLOW ASSEMBLY : The bellow should be 3 piece telescopic type and injection moulded in black Polypropylene. PEDESTAL ASSEMBLY : The pedestal should be injection moulded in black 30% glass-filled Nylon and fitted with 5 nos. twin wheel castors. The pedestal is 66.0cm pitch-center dia. (76.0 cm with castors.) 8) TWIN WHEEL CASTORS : The twin wheel castors should be injection moulded in 30% Glass Filled black Nylon. **Approved Makes:- HNI, Goodrej, Steelcase**								
F4	NS	**Visitor Chair in open cabin (C4)**-Vesa Canvas in open cabin and reception .The cushioned seat is made of Injection molded Plastic outer & inner. Plastic Inner is upholstered with foam laminated fabric and moulded High Resilience Polyurethane foam of Density 45±2 kg/m^3 for 25% compression. Seat SIZE : 46.0 cm. (W)* 48.0 cm. (D). The cushioned back is made of PU Foam with insitu molded MS E.R.W Round Tube of size 1.9±0.03cm * 0.16 ±0.0128cm. It upholstered with foam laminated fabric. The armrest top is moulded from polyurethane(PU) and mounted on to a drop lift adjustable type tubular armrest support made of 3.81±0.03 cm * 0.2±0.01 cm thk MS E.R.W tube. The Aremrest structure is powder coated (DFT 40-60 micron).The back connected to frame through powder coated (DFT 40-60 micron) high pressure die cast connector piece. Overall size of the chair shall be WIDTH (W) : 60.9 CM.*DEPTH (D) : 64.3 CM.*HEIGHT (H) :98.2 SEAT HEIGHT (SH) : 44.6 .**Approved Makes:- HNI, Goodrej, Steelcase**	nos.	10						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
F5	NS	**Bravo Midback Chair for workstation (C5):**-Providing and placing Green Guard certified (VOC emissions within permissible limits of International standard and product should be duly certified from a reputed lab for VOC Emissions within permissible limits) mid back Chair of these at and back should be made up of 1.2 cm. thick hot-pressed plywood, upholstered with fabric upholstery covers and moulded Polyurethane foam. The back foam should be designed with contoured lumbar support for extra comfort. The seat should have extra thick foam on front edge to give comfort to popliteal area as per bifma standards. Back SIZE : 47.5 cm (W) x 58.0 cm (H) SEAT SIZE : 47.0 cm. (W) x 48.0 cm. (D) 2)POLYURETHANE FOAM: The Polyurethane foam should be moulded with density = 45 +/-2 kg/m3 and Hardness = 20 +/-2 at 25% compression. ARMRESTS: The one- piece armrests should be injection moulded from black Co-polymer Polypropylene. CENTER TILT SYNCHRO MECHANISM : The mechanism should be designed 360 Degree revolving type	Nos.	20						
		.• Upright position locking.• Tilt tension adjustment.• Seat/back tilting ratio of 1:3 (60 seat tilt/180 back tilt) PNEUMATIC HEIGHT ADJUSTMENT : The pneumatic height adjustment should have an adjustment stroke of 12.0 cm. TELESCOPIC BELLOW ASSEMBLY : The bellow should be 3 piece telescopic type and injection moulded in black Polypropylene. PEDESTAL ASSEMBLY : The pedestal should be injection moulded in black 30% glass-filled Nylon and fitted with 5 nos. twin wheel castors. The pedestal is 66.0cm pitch-center dia. (76.0 cm with castors.) 8) TWIN WHEEL CASTORS : The twin wheel castors should be injection moulded in 30% Glass Filled black Nylon. **Approved Makes:- HNI, Goodrej, Steelcase**								

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
F6	NS	**2 Seater Sofa (FR-14)** of Width 146.0 Cm, Depth 92Cm, Height 82 Cm, Seat Height 45Cm. Seat made of PU Foam Density 32+/-2Kg/cu.mt having an additional layer of PU foam of density 28+/-2 Kg/Cu.mt. Back made of PU Foam Density 28+/-2Kg/cu.mt having two additional layer of super soft faom of density 23+/-2 Kg/Cu.mt. Understructure is made of 1.2 mm thick hot pressed Plywood. 4mm Dia zigzagspring assemebly is mounted in understructure for additional cushioning purpose. Leg welded Assembly is of stailess Steel (Grade SS 202) Tube & Plate. **Approved Makes:- HNI, Goodrej, Steelcase**	Nos.	2						
		TOTAL OF CHAIRS								

BOQ OF GENERAL CIVIL AND INTERIOR RENOVATION WORKS OF OFFICE FOR NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION AT 5TH FLOOR, N.C.U.I. BUILDING, 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G		**PH WORK, CP FITTING & SANITARY FITTINGS**								
G1	NS	**EUROPEAN WC WALL HUNG**								
		Providing and fixing White wall hung wc with PP Soft Close Seat Cover, Hinges, accessories set, size: 370x515x400 mm. There shall be a pair of rack bolt of Jaquar Make SLS-WHT-6951 to hang the seat. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make**:- **Jaquar, Kohler, Hindware.**	Each	3						
G2	NS	Providing and fixing of Toilet Roll Holder of Jaquar Make CAN-CHR-1151N. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed Item to be completed in all respects as per drawings & instructions from Engineer / Architect. **Approved Make:- Jaquar, Kohler, Hindware.**	Each	3						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G3	NS	Providing and fixing of hand shower of Jaquar Make cat no. ALD-CHR-573 (Health Faucet with 8mm dia) 1.2 Meter Long flexible Tube and wall hook. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar, Grohe & Kohler.**	Each	3						
G4	NS	Providing and fixing of Single Piece Slim concealed cistern body with installation kit & ''S-Type" Drain pipe connection set for wall Hung WC (without Flush Control Plate) of Jaquar Make cat no. JCS-WHT-2400S. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Makes :- Jaquar, Grohe & Kohler.**	Each	3						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G5	NS	Providing and fixing of Control Plate Opal of Jaquar Make cat no. JCP-CHR-152415 Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in- charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar, Roca & Kohler.**	Each	3						
G6	NS	Providing and fixing of Regular body of concealed stop cock suitable for 15mm pipe line with plastic protection cap (without exposed Parts) of Jaquar Make cat no. ALD-CHR-083 FT Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar, Kolher & Grohe**	Each	3						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G7	NS	Providing and fixing of Exposed Part Kit of Concealed stop cock with fitting sleeve, operating lever & adjustable wall falange (compatible with ALD-083 ft & ALD-089 ft of Jaquar Make cat no. CON-CHR-083FTK. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	3						
G8	NS	Providing and fixing of 2 way BIB- Cock with wall flange of Jaquar Make cat no. CON-CHR-041KNF. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	3						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G9	NS	Providing and fixing of RAG Bolt-WC- to Fix WC With Wall stainless steel Jaquar Make cat no. ZPS-SNS-RB01. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make**:- **Jaquar, Kolher & Grohe**	Each	3						
G10	NS	**WASH BASIN ITEMS**								
		Providing and fixing of wall hung basin with fixing accessories set size 580x460x210mm of jaqure make cat no. SLS-WHT- 6801. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make**:- **Jaquar, Kolher**	Each	2						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G11	NS	Providing and Fixing of Under counter Wash Basin oval. ate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar, Kolher**	Each	1						
G12	NS	Providing and fixing of Half pedestal with fixing accessories set for SLS-WHT-6801 jaqure make cat no. SLS-WHT-6305. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Kolher**	Each	2						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G13	NS	Providing and fixing pillar cock auto closing system of jaqure make cat no. PRS- CHR-031. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	2						
G14	NS	Providing and fixing angular stop cock with wall flange of jaqure make cat no. CON- CHR-059KN. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	2						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G15	NS	Providing and fixing bottle trap (with internal partition) 32 mm size with 300 mm & 190 mm long wall connection pipes & wall flange of jaqure make cat no. ALD-CHR-769L300x190. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	2						
G16	NS	Providing and fixing waster couple 32 mm half thread of jaqure make cat no. ALD- CHR-709 .Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	2						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G17	NS	Providing and fixing towel ring square of jaqure make cat no. ACN-CHR-1121N. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in- charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	4						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
G18	NS	Providing and fixing soap dispenser with metallic bottle of jaqure make cat no. ALD- CHR-1137N. Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	3						
G19	NS	Providing and fixing RAG Bolt -WB- to Fix WB with Wall - Mild Steel jaqure make cat no ZPS-MST-RB03.Rate shall be inclusive of cutting, grooving making good the walls, providing and fixing of all necessary fittings etc. complete.as approved by Architect / Engineer-in-charge, men material and lift up to 20 mts., installed complete. Item to be completed in all respects as per drawings & instructions from Engineer in charge / Engineer in charge / Architect. **Approved Make:- Jaquar & Grohe**	Each	2						
G20	NS	**URINAL ITEMS**								

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Providing and Fixing White vitreous china Urinal of with integrated automatic flushing sensor (electric operated / battery operated) complete including painting the fittings, cutting and making good the walls where required as per directions of Engineer incharge. (Basic Price- Rs. 8,000/-). **Approved Make**:- **Jaquar, Kolher**	Each	2						
G21	NS	**GLASS MIRRORS IN TOILET**								
		Providing and Fixing Mirrors in toilet, homogenous piece 5 mm thick faultless Float glass mirrors of approved source glass. Mounted with approved 316 grd. SS Studs on 12mm thick Marine grade BWR & AT rated ply board backing of Ply or equip., entire assembly mounted over specified Dado to locations as per drawing and approval. Ply board edges to be sealed with min. 4 mm thick TW lipping AT treated and clear matt PU finished; and glass edges to be avg. 2.5 mm bevelled & grinded finished smooth. Exposed	SQM	2						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		SS mounting studs on face of glass to be of brushed steel/Butler finish. Item to include all fixing hardware & accessories as approved, and a single unit mock-up for approval of the Architects. Item to be mounted, cleaned finished complete to correct line, surface level and plumb; and inclusive of all men, material & lift up to 10 mts; finished item suitably protected till handover. Item to be completed in all respects as per drawings & instructions from Project- in- charge / Architect. Approved Make :- Saint gobin & Asai								
G22	NS	**FLOOR TRAP AND GRATING**								
		Providing and fixing trap of self cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making good the walls and floors : Item to be completed in all respects as per drawings & instructions from Project- in-charge / Architect.								
		100 mm inlet and 100 mm outlet								
		Sand Cast Iron S & S as per IS: 1729	Each	5						
G23	NS	**25MM GATE VALVE**								

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		providing and fixing Gun metal valves of 25 mm size of approved make teste upto 300 lbs. sq local 20kg/sqcm. of approved quality. Item to be include all fixing accessories. Men material and lift upto 10 mtr. Installed complete item to be complete in all respect as per drawing and instructions from project in charge / Architect.	Each	1						
G24		**CPVC PIPE - 20 MM DIA.**								
	18.8.2	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in charge / Architect. **Approved Make :- Astral & Supreme.**	Mtr.	20						
G25		**CPVC PIPE - 25 MM DIA.**								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
	18.8.3	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in charge / Architect. **Approved Make :- Astral & Supreme**	Mtr.	20						
G26	NS	**UPVC PIPE - 100 MM DIA.**								
		Providing and fixing in position PVC pipe (4 kg/sq.cm. of approved make) with required fittings & material and labour etc. complete including providing & fixing M.S. fabricated double angle bracket of required size with all necessary welding & fixing the same and grouting in wall / R.C.C wall using anchor fasteners of required size with clamping the pipe with „U" clamp with nut & bolts and washers with giving red oxide paint to bracket etc. complete s per direction of Engineer in charge / Architect**.** **Approved Make :- Supreme & prakash**	Mtr.	20						
G27	NS	Providing and Fixing Clothes hooks in heavy duty Nylon as per direction of Engineer in charge / Architect.	Nos.	4						
G28	NS	**KITCHEN SINK**								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Providing and Fixing of stainless steel kitchen sink (MAKE JAYNA, MODEL NO JUPITER SBSD 09) size 460 x 400 x 200 mm with R.S. or CI bracket (painted white), 40 mm dia C.P. brass waste of standard pattern, C.P. brass chain and rubber plugh, 40 mm dia swivel trap of PP with air admittance valve of adequate air flow capacity (McAlpine, UK, Model: TP31V) complete with cutting and making good the walls where required. **(Basic Price- Rs. 10,500/-)**	Nos.	1						
G29	NS	Providing and fixing wall mounted single lever basin mixer (Jaquar Cat. No. FLR 5177B or approved equivalent) low flow fixture as per Griha requirement for kitchen sink	Each	1						
		TOTAL OF PH WORK, CP FITTING & SANITARY FITTINGS								

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S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H		**POINT WIRING AND EQUIPMENT**								
H1	1.3.3	Wiring for light point / fan point / exhaust fan point / call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required. Group-C	Point	62						
H2	1.5	Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/recessed steel conduit alongwith 1 No. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	Metre	60						
H3	1.7	Wiring for circuit / submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface / recessed steel conduit as required.								
a.	1.7.1	2 x 1.5 sq. mm + 1 x 1.5 sq. mm earth wire	Metre	200						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
b.	1.7.2	2 x 2.5 sq. mm + 1 x 2.5 sq. mm earth wire	Metre	650						
c.	1.7.4	2 X 6 sq. mm + 1 X 6 sq. mm earth wire	Metre	100						
d.	1.7.8	4 X 4 sq. mm + 2 X 4 sq. mm earth wire	Metre	120						
e.	1.7.9	4 X 6 sq. mm + 2 X 6 sq. mm earth wire	Metre	25						
f.	1.7.10	4 X 10 sq. mm + 2 X 6 sq. mm earth wire	Metre	60						
H4	1.31	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 amps modular socket outlet and 5/6 amps modular switch, connection, painting etc. as required.	Each	122						
H5	1.32	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 15/16 amps modular socket outlet and 15/16 amps modular switch, connection, painting etc. as required.	Each	7						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H6	1.20	Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.								
a.	1.20.1	20 mm	Metre	150						
b.	1.20.2	25 mm	Metre	200						
c.	1.20.3	32 mm	Metre	50						
H7	NS	Providing and fixing **computer outlet (RJ-45)** in MS flush box complete with all accessories, connection etc. complete as required.	Nos.	28						
H8	NS	Supply, installation, testing and commissioning of **Telephone socket outlet (RJ11)** on modular plate, suitable zinc passivated box including connections etc. complete as required.	Each	28						
H9	NS	Supply, Wiring, installation, testing & commissioning of 2 **pair 0.5mm FR PVC** insulated copper conductor, unarmoured telephone cable in the existing surface / recessed steel conduit complete as required.	Metre	400						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H10	NS	Supply, installation, Testing & Commissioning of Armourd cat-6 UTP cable with all accessories complete as required.	Rmtrs	400						
H11	NS	**Dome camera** - Supply, Installation, Testing & Commissioning of IP Network TDN Low-Light IR Dome Camera, 1/2.7" CMOS, 2 MP @ 25fps or better, triple stream, Min. Illumination required 0.1 lux @ F1.4 (color), 120dB True WDR, Min. Pixels 1920 × 1080, triple stream, 2.7–12 mm motorized focus & zoom lens, BLC, HLC, 3DNR, Privacy Mask, 3 IR LEDs Smart IR with upto 30m IR distance, 128GB SD card support, IP66, IK10, PoE, H.264 High Profile and MJPEG, PoE Class 3 and 12V DC, Having Operating temp range : –30°C to 60° C. Certifications: ONVIF Profile S & Profile G compliant, UL, CSA 60950-22, CE (EN 50130-4 & EN 55022) , FCC Part 15 & RoHS compliant.	Nos.	5						
H12	NS	Supply of following size of 1.1 KV grade, XLPE insulated PVC sheated Copper Conductor armoured cable confirming to IS: 7098 part -I amended upto date.								
a.		4 core X 10 Sq.mm	RM	50						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H13	NS	Supplying and making end termination with double brass compression gland and copper lugs for following size of PVC insulated and PVC sheathed / XLPE copper conductor cable of 1.1 KV grade as required.								
		4 core X 10 Sq.mm	Nos.	2						
H14		Supply and fixing of following bare GI strip / wires including all necessary fixing accessories and effecting connections as per specifications.								
a.	NS	25 x 5 mm thick GI Strip.	RM	30						
H15	5.18	Providing and fixing 8 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface / recessed conduit/ submain wiring / cable as required.	Mtrs.	75						
H16	17.2.4	Supplying, installation, testing & commissioning of intelligent analog addressable **Photothermal / Multicriteria Detector** detector complete with mounting base complete as required.	Nos.	26						

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H17	17.2.5	Supplying, installation, testing & commissioning of response indicator on surface / recessed MS Box having two LED, metallic cover complete with all connections etc as required.	Nos.	4						
H18	17.3.2	Supplying, installation, testing & commissioning of 1.5 / 3 / 6W ceiling speaker complete as required.	Nos.	15						
H19	15.1	Supplying, installation, testing and commissioning of Passive Infrared (PIR) technology based occupancy sensor having high preformance, non regulating programmable type, suitable for connected load upto 10Amp, for mounting height up to 2.8 mtr and for 5 m diameter coverage area along with necessary fixing arrangements i/c programming at site etc. complete as required.	Nos.	2						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H20	NS	Supply installation testing and commissioning of 20 A three phase metal clad interlocked switch socket outlet (IP67) complete with accessories.	Nos.	2						
H21	NS	**VTPN DB:-** Supply installation testing and commissioning of VTPN DB as defined below:-	Nos.	2						
		i) 1 No. - 100 amps four pole MCCB (25 KA) with following accessories:								
		a) 3 Nos. Phase indication LED lamps with 2Amp back up MCB, breaker 'ON/OFF' indicating light with 2A MCB.								
		b) Set of Digital flush type class 1 accuracy multifunction meter, showing V, A, PF, Hz, KW, KWH, KVAR, etc. and 3 Nos. cast resin current transformers of 100/ 5 Amp ratio, 10 VA Class 1 metering.								
		Bus Bar :								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		4P tinned copper extensible type main bus bars of minimum of 200 Amp capacity (25kA) with heat shrinkable coloured sleeves and i/c DMC/SMC bus bars supports at required intervals complete.								
		Outgoings:								
		i) 36 Nos. - 10/16/20 Amp. SP MCB (As per RYB phases)								
		ii) 3 Nos. - 32 Amp. TPN MCB								
		iii) 2 No. - 25 Amp. TPN MCB								
		iv) 10 No. - 20 Amp. TPN MCB								
		VTPN DB as described above	Set	1						
H22	NS	Design, manufacturing, supply and installation of overhead raceways made from 1.6mm thick G.I. sheet in following size for Low voltage system complete with suitable knockouts, suspended rods / angle iron, reducer, removable top cover and cable holding arrangement :								
a.		100mm x 50mm x 1.6 thick with two compartments	RM	35						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
H23	NS	Design, manufacturing, supply and installation of overhead raceways made from 1.6mm thick G.I. sheet in following size for Low voltage system complete with suitable knockouts, suspended rods / angle iron, reducer, removable top cover and cable holding arrangement :								
a.		50mm x 50mm x 1.6 thick	RM	50						
		TOTAL OF POINT WIRING AND EQUIPMENT								
I		**SUPPLY AND INSTALLATION OF LIGHTING FIXTURES**								
1		The rates shall include all components that may be required to make the supply and installation complete in all respects such as :								
a		All led								
b		Internal wiring between accessories								
c		Earthing terminal								
d		Complete provision for installation								
e		Suitable length of GI down rod, hanger and connecting wires where called for.								
f		Wires for connecting the fixtures to the point through connector block.								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
g		All metal blocks to serve as base of fixtures								
h		Bonding with earth wires.								
2		Drilling holes in supports wherever required.								
3		Fixing clamps, GI bolts and nuts, brass screws, saddles, rawl bolts and other fixing accessories as required.								
4		All recessed type fixture shall be considered with suitable length of flexible G.I. conduit.								
5		Testing of all fixtures & fans before and after installation.								
A		**SUPPLY OF LIGHTING FIXTURES**								
		Supply of the following lighting fixtures with all fixing accessories etc. as required.								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
I1	NS	Supply of Recess Mounted LED panel made of CRCA housing, LED Used shall be SMD type and fixture should have minimum efficacy at System level (Not Chip Level) >=115 lumens/watt with Minimum system Lumens 3600, Life of fixture (Including Driver) : 50000 burning Hrs. @ L70B50 Lumen maintenance, CCT of 6500/4000K (SDCM<=5) fixture should have CRI >80, PF >0.95, Min working temp range - 0°C < Ta < 45°C, an operating Voltage Range of 140 - 270 VAC. Minimum Internal Surge Protection 2.5KV. The fixture design should comply with EMC / EMI compliance along with BIS certification for LED Driver & Luminaire seperately. Luminair manufacture shall provide LM79report & LM80 report issued by LED manufacturer. Similar to Philips RC380B LED36S G4 L60 W60 PSU or equivalent.	Nos.	8						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
I2	NS	Supply of Recess LED Downlighter made of pressure die cast alu. housing, LED Used shall be SMD type and fixture should have minimum efficacy at System level (Not Chip Level) >=110lumens/watt with Minimum system Lumens 1200, Life of fixture (Including Driver) : 50000 burning Hrs. @ L70B50 Lumen maintenance, CCT of 3000/4000/6500K (SDCM<5), CRI >80, PF >0.95, Min working temp range - 0°C < Ta < 45°C, an operating Voltage Range of 130 - 320 VAC .Minimum Internal Surge Protection 2.5KV & The fixture design should comply with EMC / EMI compliance along with BIS certification for LED Driver & Luminaire. Ceilling Cutout is 150mm. Luminaire manufacture shall provide LM79 & LM80 report issued by LED manufacturer.Similar to Philips DN296B LED12S PSU WH or equivalent.	Nos.	17						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
I3	NS	Supply of linear receesed fitting made of extruded aluminium housing. Fixture should have minimum efficacy at System level (Not Chip Level) >110lumens/watt and a minimum system lumen output of 2200 (downlight) lumens and maximum system wattage of 19. Luminaire should have Life of 50000hrs@L70B50 Lumen maintenance, CCT up to 4000/6500K, CRI >80, PF >0.95, THD<10% and an operating Voltage Range of 140 - 270 Internal Surge Protection 2.5KV. Fixture is available in both 4 ft and 8 ft module with 60 and 75 mm width options available. Fixture should be available in DALI dimmable version also.	Nos.	35						
		The fixture should comply with the parameters as per IS10322. The LED driver should comply to IEC61000-3-2 ed.3.2, 2009 for Harmonics, IEC61347 -2 -13, 2006 in Conjunction with IEC61347-1 ed.2.0, 2007 for Electrical Safety, IEC62384 ed.1.1, 2011 for performance and IEC61547 ed.2.0, 2009, CISPR-15 for EMI. LM 79 and LM80 reports need to be submitted to verify above parameters. Similar to Philips Models RC780X LED22S or equivalent.								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
I4	NS	Supply of 1x10W Mirror LED With Made of ultra slim co-extruded polycarbonate channel with housing part in white finish & diffuser part in reeded opal finish of approved make.	Nos.	2						
B		**INSTALLATION OF LIGHTING FIXTURES**								
	DSR 1.41	Installation, testing and commissioning of following pre-wired, LED fitting of all types, complete with all accessories and tube etc. directly on ceiling / wall, including connection with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable and earthing etc. as required.								
I5		Installation, testing and commissioning of Recess Mounted LED panel made of CRCA housing, LED Used shall be SMD type and fixture should have minimum efficacy at System level (Not Chip Level) >=115 lumens/watt with Minimum system Lumens 3600, Life of fixture (Including Driver) : 50000 burning Hrs. @ L70B50 Lumen maintenance, CCT of 6500/4000K (SDCM<=5) fixture should have CRI >80, PF >0.95, Min working temp range - 0°C < Ta < 45°C, an operating Voltage Range of 140 - 270 VAC. Minimum Internal Surge Protection 2.5KV. The fixture design should comply with EMC /	Nos.	8						

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		EMI compliance along with BIS certification for LED Driver & Luminaire seperately. Luminair manufacture shall provide LM79report & LM80 report issued by LED manufacturer. Similar to Philips RC380B LED36S G4 L60 W60 PSU								
I6		Installation, testing and commissioning of Recess LED Downlighter made of pressure die cast alu. housing, LED Used shall be SMD type and fixture should have minimum efficacy at System level (Not Chip Level) >=110lumens/watt with Minimum system Lumens 1200, Life of fixture (Including Driver) : 50000 burning Hrs. @ L70B50 Lumen maintenance, CCT of 3000/4000/6500K (SDCM<5), CRI >80, PF >0.95, Min working temp range - 0°C < Ta < 45°C, an operating Voltage Range of 130 - 320 VAC. Minimum Internal Surge Protection 2.5KV & The fixture	Nos.	17						
		design should comply with EMC / EMI compliance along with BIS certification for LED Driver & Luminaire. Ceilling Cutout is 150mm. Luminaire manufacture shall provide LM79 & LM80 report issued by LED manufacturer. Similar to Philips DN296B LED12S PSU WH								

S. No.	DSR/NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
I7		Installation, testing and commissioning of linear receesed fitting made of extruded aluminium housing. Fixture should have minimum efficacy at System level (Not Chip Level) >110lumens/watt and a minimum system lumen output of 2200 (downlight) lumens and maximum system wattage of 19. Luminaire should have Life of 50000hrs@L70B50 Lumen maintenance, CCT up to 4000/6500K, CRI >80, PF >0.95, THD<10% and an operating Voltage Range of 140 - 270 Internal Surge Protection 2.5KV. Fixture is available in both 4 ft and 8 ft module with 60 and 75 mm width options available. Fixture should be available in DALI dimmable version also. The fixture should comply with the parameters as per IS10322. The	Nos.	35						
		LED driver should comply to IEC61000-3-2 ed.3.2, 2009 for Harmonics, IEC61347 -2 -13, 2006 in Conjunction with IEC61347-1 ed.2.0, 2007 for Electrical Safety, IEC62384 ed.1.1, 2011 for performance and IEC61547 ed.2.0, 2009, CISPR-15 for EMI. LM 79 and LM80 reports need to be submitted to verify above parameters. Similar to Philips Models RC780X LED22S.								

S. No.	DSR/N DSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
I8		Installation, testing and commissioning of 1x10W Mirror LED With Made of ultra slim co-extruded polycarbonate channel with housing part in white finish & diffuser part in reeded opal finish of approved make.	Nos.	2						
		TOTAL OF SUPPLY AND INSTALLATION OF LIGHTING FIXTURES								

BOQ OF GENERAL CIVIL AND INTERIOR RENOVATION WORKS OF OFFICE FOR NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION AT 5TH FLOOR, N.C.U.I. BUILDING, 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
J	**HVAC EQUIPMENT**								
J1	**OUTDOOR UNITS**								
	Supply, Installation, Testing and Commissioning of air cooled variable refrigerant volume modular type outdoor units, each comprising of energy efficient multiple scroll compressors, topping up of R410A refrigerant gas and all accessories as per the specifications. The condensing units shall be suitable to work on cooling as well as heating mode. The condensing units shall be suitable for operation on 415 ±10% volts, 50Hz, 3 phase AC power supply and complete with auto check function for connection error, auto address setting etc. The outdoor units shall be low noise type.Quoted price shall also be inclusive of loading, unloading, lifting & shifting on Terrace above second floor Floor level as per drawing or any other suitable location, positioning charges besides including charges towards vibration isolation arrangement etc. Quoted price shall also be inclusive of Power Cable from ELCB/MCCB to Outdoor unit & MS frame duly applied with 2 coat of primer & one coat of black enamel paint. The outdoor uni position locking.•omplete. without m								

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
a.	10 HP nominal capacity high COP outdoor unit comprising of single module of requisite capacity.	No	2						
b.	6 HP nominal capacity high COP outdoor unit comprising of single module of requisite capacity.	No	1						
J2	**INDOOR UNITS**								
a.	**STANDARD TYPE**								
	Supply, Installation, Testing and Commissioning of variable refrigerant volume modular type indoor units comprising of all accessories as per the specifications. The indoor units shall be suitable to work on cooling as well as heating mode. The indoor units shall be suitable for operation on 220 ± 6% volts, 50Hz, 1 phase AC power supply except floor standing units suitable for operation on 415 ±10% volts, 50Hz, 3 phase AC power supply. Ductable indoor units shall be suitable to handle extent of ductwork as shown in the design drawings and dehumidified air quantity as mentioned in the heat load summary sheet under "Special Conditions" and the indoor units shall be of following capacities. Quoted price shall be inclusive of Plug Top & necessary power cable. Ductable indoor units shall be provided with 250mm depth for entire width for mounting of Electrostatic Air Cleaners. AHUs shall be of following design parameters:								
i.	635 Cfm Fresh Air Unit ductable Type (3.9TR)	No.	1						
b.	**CONVENTIONAL TYPE**								

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
	Supply, Installation, Testing and Commissioning of double skin ceiling mounted type air handling units in sheet metal construction, each complete with synthetic fibre filters, 6 rows deep R-410a refrigerant cooling coil of copper tube and aluminium fins construction, forward curved DIDW centrifugal fan/s, belt drive package & squirrel cage **IE 3** induction motor, SS insulated auxiliary drain pan, separate compartment for housing all valves and vibration isolation arrangement all complete as per the specifications. AHUs shall be selected for a maximum face velocity of 500 FPM. Fan outlet velocity shall not exceed 1800 FPM. Suspension arrangement for ceiling suspended AHUs shall also include spring type vibration isolators and rubber groomets etc. to make the installation totally vibration free. AHUs shall be of following design parameters:								
	No. (Cfm) (mm WG) Rows Rating(HP) (TR)								
	Fifth Floor								
	AHU-1 3000 36 6 1 x 3 7.5	No	2						
J3	**REMOTE CONTROLS**								
i	Supply, Installation, Testing & Commissioning of Corded remote controls for the above indoor units.	No	3						
J4	Supply, Installation, Testing and Commissioning of main centralised controller as per specifications to hook up indoor units as mentioned above. Controller shall however, be suitable for minimum 120 groups of indoor units. Centralised controller shall act as master controller for controlling of Heating - cooling mode of outdoor units and their associated indoor units. **Controller shall be located in Office**	No	1						
J5	**INLINE FANS (Single Phase)**								

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
	Supplying, Installaing, Testing and Commissioning of circular / rectangular inline fans for exhaust complete with sheet metal casing, direct driven centrifugal fan, motor with proper protection and inspection door. Fan shall be suitable for operation on 220±6 % volts,50 Hz,1phase AC power supply. Fan shall be installed as shown in the drawings and will be of following characteristics. All single phase inline fans shall be provided with factory fitted speed regulators:								
	Fan Capacity S.P Area to be								
	No. (Cfm) (mmWG) exhausted								
	IF-1(Circular) 110 12-14 Pantry	No	1						
	IF-2(Circular) 120 12-14 Toilet	No	1						
	IF-3(Circular) 150 12-14 Toilet	No	1						
J6	**AXIAL FLOW FANS**								
	Supply, Installation, Testing & Commissioning of tube axial type axial flow fans complete with MS/GI casing, impeller and motor with class 'F" insulation to withstand 300 deg C for 60 minutes for normal & smoke extraction as shown in the drawings. Motor shall be mounted out of air stream and shall be suitable for operation on 415±10% volts, 50Hz, 3 phase AC power supply. Motor shall also be suitable to operate in VFD. (Normal & Makeup air fans only) Axial flow fans shall be provided with inlet and outlet cones fabricated at site using GS sheet and necessary vibration isolation arrangement including spring type vibration isolators and rubber groumet etc. as required. Fans associated with normal ventilation shall not exceed 1200 RPM. The noise level of normal & make up fans should not exceed 70 db.								
	A.F. Capacity S.P Motor Fan Area being								
	No. (Cfm) (mmWG) Rating Dia extracted								
	(HP) (mm)								
	FOR SMOKE EXTRACTION								
	AF-1 /S 3500 25 3/4P 450 5th Floor	No	1						
	FOR MAKE-UP AIR (Single Phase Fans)								
	AF-2 /E 1000 15 0.75 400 5th Floor	No	2						
	FOR MAKE-UP AIR (Single Phase Fans)								
	AF-3 /S 300 15 0.5 300 5th Floor	No	4						

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
	TOTAL OF HVAC EQUIPMENT								
K	**HVAC PIPING**								
K1	**COPPER REFRIGERANT PIPING - VRF UNITS**								
	Supply, Installation, Testing & Commissioning of high pressure copper refrigerant piping including R410a refrigerant of suitable size as required and duly insulated with19mm/13mm thick closed cell elastomeric insulation in tubing form. External Refrigerant piping shall be laid on GI covered cable trays. Piping inside occupied spaces shall be supported using MS hangers duly painted with black enamel paint. Entire refrigerant piping work shall be carried out in accordance with the specifications.MS sleeves of requisite size shall be provided at wall crossing. Quoted price shall be inclusive of necessary Insulation, glass cloth and minimum two layers of UV protection paint to be applied over insulation. Piping shall be of following sizes:								
	Pipe Size Thickness of CSE								
	(O.D.) Insulation								
a.	22.2 mm 19 mm	RM	35						
b.	19.1 mm 13 mm	RM	15						
c.	9.5 mm 13 mm	RM	40						
K2	**CONDENSATE DRAIN PIPING**								
	Supply, Installation, Testing and Commissioning of GI medium class (Class 'B') pipes cut to required lengths and installed with all screwed joints for condensate drain. Quoted price shall be inclusive of supply and fixing in position the necessary fittings like elbows, tees reducers etc., and supporting arrangement in accordance with the approved shop drawings and specifications. Pipes shall be insulated with 9mm thick closed cell elastomeric insulation in tubing form. Quoted price shall include cost of Insulation etc. Pipes shall be of following sizes:								

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
a.	50mm dia	RM	10						
b.	40mm dia	RM	10						
c.	25mm dia	RM	10						
	TOTAL OF HVAC PIPING								
L	**AIR DISTRIBUTION**								
L1	**CONVENTIONAL DUCTING**								
	Supply of factory fabricated dutwork, Installation and Testing of galvanised sheet metal ducts including elbows, turning vanes, neoprene / PVC fire retardant gaskets, slip on flanges, GI fully threaded rods / Gripple, GI supports / hangers etc. in accordance with the approved shop drawings and specifications.								
a.	1mm to 750mm -- 26G GSS with C&SS Joints	SqM	90						
b.	751mm to 899mm -- 26G GSS with TDC Joints	SqM	10						
c.	2101mm to 2700mm - 18G GSS with TDC Joints	SqM	15						
L2	**SITE FABRICATED DUCTING**								
	Supply, Fabrication, Installation and Testing of sheet metal ducts complete with vanes, splitter dampers, hanging arrangement including check nuts in accordance with the approved shop drawings and specifications								
a.	0.63mm (24 gauge) GSS	SqM	5						
b.	0.8 mm (22 gauge) GSS	SqM	5						
c.	1.0mm (20 gauge) GSS	SqM	5						
L3	**FLEXIBLE CANVASS CONNECTIONS**								
	Supply, Installation and Testing of 125mm deep Antivibration Flexible Joints made out of imported fire retardant fabric with extruded aluminium frame / flange on both sides of approved make.	RM	5						

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
L4	**LOUVER DAMPERS FOR COLLARS**								
	Supply, Installation and Testing of multi blade type louver dampers of galvanised steel sheet for collars to be provided with suitable links, levers and quadrants for manual control of volume of air flow and for proper balancing of the air distribution system as per the approved shop drawings and specifications.	SqM	2.8						
L5	**BOX TYPE DUCT DAMPERS**								
	Supply, Installation and Testing of multiblade box type galvanised steel sheet dampers for ducts to be provided with suitable links, levers and quadrants for manual control of volume of air flow and for proper balancing of the air distribution system as per the approved shop drawings and specifications.	SqM	1.3						
L6	**LINEAR GRILLES**								
	Supply, Installation, Testing and Balancing of one way blow linear supply cum return air grilles complete with fixed core as per approved shop drawings and specifications. The grilles shall be of approved colour & shade. Powder coated aluminium grilles of extruded sections with integral flanges on both sides & ends as required complete with corner pieces.								
	i. 100 / 150 / 250 mm High grilles	SqM	6.5						
L7	**AIR TRANSFER GRILLES**								
	Supply, Installation and Testing of extruded aluminium powder coated air transfer grilles to be provided at the door of toilets / pantry.	SqM	0.3						
L8	**SUPPLY AIR DIFFUSERS**								

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
a.	Supply, Installation, Testing and Balancing of square supply air & toilet exhaust air diffusers with removable key operated volume control dampers as per the approved shop drawings and specifications. The diffusers shall be anti-smudge ring type / flat type as approved by the interior designer.								
	Powder coated extruded aluminium diffusers of approved colour & shade.	SqM	1.3						
b.	Supply, Installation, Testing and Balancing of square supply air diffusers with factory fitted removable key operated volume control dampers & 150mm high GSS plenum as per the approved shop drawings and specifications. The diffusers shall be anti-smudge ring / flat type.								
	600x600 Powder coated extruded aluminium diffusers of approved colour & shade suitable for fixing in grid ceiling.	No	5						
L9	**RETURN AIR DIFFUSERS**								
a.	Supply, Installation, Testing and Balancing of square return air diffusers same as supply air diffusers but without volume control dampers as per the approved shop drawings and specifications. The diffusers shall be anti - smudge ring type.								
	Powder coated extruded aluminium diffusers of approved colour & shade.	SqM	0.6						
b.	Supply, Installation, Testing and Balancing of square return air diffusers same as supply air diffusers but without volume control dampers as per the approved shop drawings and specifications. The diffusers shall be anti -smudge ring / flat type.								
	600x600 Powder coated extruded aluminium diffusers of approved colour & shade suitable for fixing in grid ceiling.	No	5						

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
L10	Supply, Installation, Testing and Balancing of lilear slot diffusers with Hit & Miss type extruded aluminium volume control dampers at supply air outlets as per the approved shop drawings and specifications.								
a.	3 slot / 2slot / 1slot, powder coated extruded aluminium diffusers of approved colour & shade for supply air with Hit & Miss type dampers	SqM	2						
L11	Supply, Installation,Testing and Balancing of flexible ducting comprising of inner as well as outer skin constructed out of aluminium & fibre glass insulation 32mm thick of minimum 24 kg/cu.m density insulation sandwitched in between. Duct should confirm to fire rating standards BS-476 part 5, 6 & 7. Flexible Ducts of following sizes as per approved shop drawings, specifications :								
a.	200 mm dia	RM	5						
b.	150 mm dia	RM	8						
c.	100 mm dia	RM	5						
L12	Supply, Installation and Testing of single piece GI round spigot made out of spinning process with 50mm height and having grooves on both sides and circular flanges. Spigots shall be installed on main ducts to facilitate connection of flexible ducts.								
a.	200 mm dia	No	2						
b.	150 mm dia	No	20						
c.	100 mm dia	No	3						

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
L13	Supply, Installation and Testing of fresh air grilles of powder coated / anodised extruded aluminium with GI wire mesh, inlet louvers, Box type VCD & bird screen, as per the approved shop drawings and specifications.	SqM	0.2						
L14	Supply, Installation and Testing of extruded aluminium powder coated louver with GI wire mesh to be installed outside for discharge of exhaust air from exhaust fans as per the specifications and shop drawings. Sample of louvers to be got approved from consultants and Clients prior to procurement, air distribution grid, removable key-operated volume control damper. The diffusers shall be anti-smudge ring type.	SqM	1						
	TOTAL OF AIR DISTRIBUTION								
M	**INSULATION**								
M1	Supply and Application of acoustic lining / internal thermal insulation of supply / return air ducting with open cell elastomeric insulation as per the specifications and drawings.								
	15mm thick	SqM	10						
M2	**(Using Factory Laminated aluminium foil faced, Class 'O' Closed Cell Elastomeric insulation)**								
	Supply and Application of external thermal insulation of supply /return air ducting using aluminium foil faced closed cell elastomeric insulation with class 'O' fire retardant properties as per the specifications and drawings. Foil shall provide protection from mechanical impact, ultra voilet radiations and Scratches etc. caldding shall not have any fibre erosion.Both insulation & aluminium foil should have built in antimicrobial protection.								
	a. 16mm thick	SqM	25						
	b. 9 mm thick	SqM	75						

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
M3	**THERMAL INSULATION OF EXPOSED ROOF**								
	(Using Factory Laminated aluminium foil faced, Class 'O' Closed Cell Elastomeric insulation)								
	Supply and Application of thermal insulation for exposed roofusing aluminium foil faced closed cell elastomeric insulation withclass 'O' fire retardant properties as per the specifications and drawings. Foil shall provide protection from mechanical impact, ultra voilet radiations and Scratches etc. caldding shall not have any fibre erosion. Both insulation & aluminium foil should have built in antimicrobial protection.								
a.	16mm thick insulation	SqM	140						
	TOTAL OF INSULATION								
N	**ELECTRICAL INSTALLATION**								
N1	**AHU ELECTRICAL PANELS**								
	Supply, Installation, Testing & Commissioning of wall mounted cubicle type electrical panels including system control wiring with incoming, outgoing feeders as described below and as per specifications.								
	AHU Panel casing shall be large enough to accommodate variable frequency drives as well with adequate ventilation provisions.								
A.	**PANEL-'A'**								
	Location: Near AHU								
a.	32/25A TP MCB for 3/2 HP motor - 01set.								
b.	Digital type voltmeter (0-500) V, digital type Ammeter, selector switches, RYB LED type indication lights - 01 set.								
c.	Fully automatic DOL starter with builtin single phasing preventor, over load relay suitable for 3/2HP motor - 01 set.								
d.	16A single phase MCB - 01 set								

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
e.	Auto-Manual type selector switch to facilitate auto start of AHU after restoration of power.								
f.	Control wiring & safety circuit as required with Start-Stop PB's stayput or lockable type and LED type 'ON' 'OFF' indication lights.								
	AHU Panel as described above.	No	2						
N2	**POWER CABLING (FRLS)**								
	Supply, laying, affecting connections and Testing of the following sizes of 1.1 KV armoured PVC insulated aluminium / copper conductor cables. Cables shall be inclusive of all clamps, saddles, screws, cable identification tags, cable terminal joints including terminal lugs, glands, ferruling insulating tapes,affecting terminal connections to the equipment as per the specifications and as required.								
a.	4C/3C x 6 Sqmm cable (Copper)	RM	15						
N3	**CONTROL CABLING**								
	Supply, laying & Fixing of copper control cabling of following sizes :								
a.	2C x 1.5 Sqmm cable	RM	120						
b.	6C x 1.5 Sqmm cable	RM	10						
N4	**CABLE TRAYS**								
	Supplying & Fixing of following sizes of MS cable tray duly painted perforated type along with necessary elbows, bends, reducers etc. anchored along the wall / suspended from the ceiling with necessary MS supports. Supports shall be in the form of 40mmx40mmx5mm angles and provided at a distance of 1200mm including grouting in the wall and making good. Cable trays on terrace should match with the existing cable trays.								
a.	40 x 50 x 40 x 2mm	RM	15						
b.	40 x 100 x 40 x 2mm	RM	10						

S. NO	DESCRIPTION	UNIT	QTY.	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
N5	**EARTHING**								
	Providing & fixing in position the following bare GI tape, Cu wire including providing all fixing accessories & effecting proper connections.								
a.	8 SWG Cu Wire	RM	30						
N6	Supply and fixing of 1.1 KV grade rubber mat 914.4 mm wide 6mm thick to withstand 1.1 KV dielectric strength in front of each panel.	RM	0.5						
	TOTAL OF ELECTRICAL INSTALLATION								

BOQ OF GENERAL CIVIL AND INTERIOR RENOVATION WORKS OF OFFICE FOR NATIONAL BACKWARD CLASSES FINANCE AND DEVELOPMENT CORPORATION AT 5TH FLOOR, N.C.U.I. BUILDING, 3, SIRI INSTITUTIONAL AREA, AUGUST KRANTI MARG, NEW DELHI

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O		**FURNITURE**								
O1	NS	**Providing, fixing of SR. MANAGER MAIN TABLE 1650 X 750 X 750 WITH SIDE CREDENZA 1000 X 400 X 675 (T1)**	Nos.	2						
		Office table with robust structure, good stability and a Solid Thicker look with leveling adjustment to adjust with uneven floor surface Table Top :- 54mm thick facia Dark colored Table top made up of 18mm thick Pre- laminated Particle board with Two batten of same thickness fixed along two long edges from bottom side which provide decorative twin colored thick edge look. The decorative trim to be connected in a way to form connectivity of 45degree with Gable end. Support Stiffener made up of M.S. rectangular pipe of 20X40X0.8mm thickness is provided for extra support for the Top of length of 1200mm and above.LEG :- 18mm thick Leg or Gable End made up of 18mm thick Pre-laminated Particle board with two batten of same thickness fixed to it from front side providing straight as well as a consolidated thicker look to table with two colored edge profile. Modesty : - Modesty Panel of lighter shade made up of 18mm thick Pre-laminated Particle board providing stability to structure and allow sufficient leg privacy to user.								

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		SIDE CREDENZA 1000 X 400 X 750 :-Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Three shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. The rate of material is inclusive in the above item .								
		Providing, fixing of SR. MANAGER MAIN TABLE 1500 X 750 X 750 (T2)	Nos.	3						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O2	NS	Site table with robust structure, good stability and a Solid Thicker look with leveling adjustment to adjust with uneven floor surface Table Top :- 54mm thick facia Dark colored Table top made up of 18mm thick Pre- laminated Particle board with Two batten of same thickness fixed along two long edges from bottom side which provide decorative twin colored thick edge look. The decorative trim to be connected in a way to form connectivity of 45 degree with Gable end. Support Stiffener made up of M.S. rectangular pipe of 20X40X0.8mm thickness is provided for extra support for the Top of length of 1200mm and above. LEG :- 18mm thick Leg or Gable End made up of 18mm thick Pre-laminated Particle board with two batten of same thickness fixed to it from front side providing straight as well as a consolidated thicker look to table with two colored edge profile. Modesty : - Modesty Panel of lighter shade made up of 18mm thick Pre-laminated Particle board providing stability to structure and allow sufficient leg privacy to user.								
		Providing, fixing of SR. MANAGER MAIN TABLE 1350 X 750 X 750	Nos.	2						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O3	NS	Site table with robust structure, good stability and a Solid Thicker look with leveling adjustment to adjust with uneven floor surface Table Top :- 54mm thick facia Dark colored Table top made up of 18mm thick Pre- laminated Particle board with Two batten of same thickness fixed along two long edges from bottom side which provide decorative twin colored thick edge look. The decorative trim to be connected in a way to form connectivity of 45 degree with Gable end. Support Stiffener made up of M.S. rectangular pipe of 20X40X0.8mm thickness is provided for extra support for the Top of length of 1200mm and above. LEG :- 18mm thick Leg or Gable End made up of 18mm thick Pre-laminated Particle board with two batten of same thickness fixed to it from front side providing straight as well as a consolidated thicker look to table with two colored edge profile. Modesty : - Modesty Panel of lighter shade made up of 18mm thick Pre-laminated Particle board providing stability to structure and allow sufficient leg privacy to user.								
		SIDE TABLE 600 X 600 X 400(H) (ST1)	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O4	NS	Site table with robust structure, good stability and a Solid Thicker look with leveling adjustment to adjust with uneven floor surface Table Top :- 35mm thick facia Dark colored Table top made up of 18mm thick Pre- laminated Particle board with Two batten of same thickness fixed along two long edges from bottom side which provide decorative twin colored thick edge look. LEG :- 18mm thick Leg or Gable End made up of 18mm thick Pre-laminated Particle board with two batten of same thickness fixed to it from front side providing straight as well as a consolidated thicker look to table with two colored edge profile.								
O5	NS	**LOW HEIGHT BACK STORAGE 2300 (W) X 400(D) X 675(H)**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Office Table height storage with two openable shutters, usable as return storage or back unit. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Five shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**								

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O6	NS	**LOW HEIGHT BACK STORAGE 2200 (W) X 400(D) X 675(H) (BU2)** Office Table height storage with two openable shutters, usable as return storage or back unit. **Carcass :-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & **Five** shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	2						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O7	NS	**LOW HEIGHT BACK STORAGE 2020 (W) X 400(D) X 675(H) (BU3)** Office Table height storage with two openable shutters, usable as return storage or back unit. **Carcass :-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & **Three** shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O8	NS	**LOW HEIGHT BACK STORAGE 1400 (W) X 400(D) X 675(H) (BU4)** Office Table height storage with two openable shutters, usable as return storage or back unit. **Carcass:-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & **Three** shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O9	NS	**LOW HEIGHT BACK STORAGE 1050 (W) X 400(D) X 675(H) (BU5)** Office Table height storage with two openable shutters, usable as return storage or back unit. **Carcass :-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & **Three** shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- Spacewood Office Soloution (SOS), Goodrej & Wipro**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O10	NS	**LOW HEIGHT BACK STORAGE 1450 (W) X 400(D) X 675(H) (BU6)** Office Table height storage with two openable shutters, usable as return storage or back unit. **Carcass :-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & **Three** shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						
O11	NS	**OVER HEAD STORAGE 6000x350x900H) - (OS1)**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Over head storage with openable shutters. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Five shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt.Approved Makes:- HNI, Goodrej & Steelcase								

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O12	NS	**OVER HEAD STORAGE 3250x350x900H - (OS2)** Over head storage with openable shutters. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Five shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt**. Approved Makes:- Spacewood Office Soloution (SOS), Goodrej & Wipro**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O13	NS	**OVER HEAD STORAGE 3050x350x900H) - (OS3)** Over head storage with openable shutters. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Five shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O14	NS	**OVER HEAD STORAGE 4250x350x900H) - (OS4)** Over head storage with openable shutters. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Five shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt**. Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O15	NS	**OVER HEAD STORAGE 3700x350x900H) - (OS5)** Over head storage with openable shutters. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Five shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt**. Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						
O16	NS	**WORKSTATION TABLE 1800(W) X 600(D) X 750(H)-(WS1)**	Nos.	2						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		TOP - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau. m thick PVC edge-band . GABLE END - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau. m thick PVC edge-band . MODESTY@300HT - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau make thick PVC edge-band. Approved Makes:- HNI, Goodrej & Steelcase								
O17	NS	**WORKSTATION TABLE 1200(W) X 600(D) X 750(H)-(WS2)** TOP - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau m thick PVC edge-band . GABLE END - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau. m thick PVC edge-band . MODESTY@300HT - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau make thick PVC edge-band**. Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	15						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O18		**WORKSTATION TABLE 2600(W) X 600(D) X 750(H)-(WS3)** TOP - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau m thick PVC edge-band . GABLE END - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau. m thick PVC edge-band . MODESTY@300HT - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau make thick PVC edge-band**. Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						
O19	NS	**WORKSTATION TABLE L-SHAPE 3000x600x750H + 1800x600x750H - (WS4)** TOP - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau. m thick PVC edge-band . GABLE END - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau. m thick PVC edge-band . MODESTY@300HT - made up of 25mm thick Prelaminated partcle board. All Edges are sealed with 2mm thick PVC edge-band from Rehau make thick PVC edge-band**. Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						
O20	NS	**LAMINATE PEDESTAL (2D+1F) WITH LEVLLER @400L x 450D x 685HT With Levller**	Nos.	19						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Carcass & Facia made up of 18mm thick Pre-laminated particle board. Back Panel from 9mm PPB. All exposed edges are sealewd with 2mm thick PVC edge-band & Non-exposed edges with 0.8mm thick PVC edge-band .Approved Makes:- HNI, Goodrej & Steelcase								
O21	NS	**STORAGE UNIT 1500(W) X 400(D) X 1200(H) (S1)**	Nos.	3						
		Office Table height storage with two openable shutters, usable as return storage or back unit. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Three shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. Approved Makes:- HNI, Goodrej & Steelcase								
O22	NS	**STORAGE UNIT 1350(W) X 400(D) X 1200(H) (S2)**	Nos.	2						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Office Table height storage with two openable shutters, usable as return storage or back unit. Carcass :- Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. Shelf and Shutter :- Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Three shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. Approved Makes:- HNI, Goodrej & Steelcase								

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O23	NS	**STORAGE UNIT 880(W) X 300(D) X 750(H) (S3)** Office Table height storage with two openable sliding shutters, usable as storage **Carcass :-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Two shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	6						

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
O24	NS	**STORAGE UNIT 3000(W) X 450(D) X 2700(H) (S4)** Office Table height storage with two openable shutters, usable as return storage or back unit. **Carcass :-** Top, Side Panel, Bottom and Shelf panel of Dark shade are made up of 18mm thick pre-laminated particle board. There is grooving operation done near back side edge of Side, Top and Bottom for fixing of back panel made up of 9mm thick pre-laminated particle board of same shade. **Shelf and Shutter :-** Two adjustable shelf with five point adjustment of 64mm from lower position reference point, supported on shelf support lug & Three shutters of Lighter shade made up of 18mm thick Pre-laminated particle board mounted on 0 crank hinges with the Provision of D type Aluminum alloy slim handle. Both the stutters are lockable with the help of multipurpose square lock and Tower Bolt. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	1						
O25	NS	**METAL KEYBOARD TRAY CRCA** Sheet duly powder coated 45-60 micron thickness on metal surface of approved shade. **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	22						
O26	NS	**METAL CPU TROLLEY** Floor CPU trolley with 4 nos of lockable castors made of 0.8mm CRCA sheet duly powder coated . **Approved Makes:- HNI, Goodrej & Steelcase**	Nos.	22						
O27	NS	**KITCHEN CABINETS AND WORKTOP**								

S. No.	DSR/ NDSR	Description of item	Unit	Qty	Rate in Figure	Rate in Words	Amount (Qty x Rate)	CGST	SGST	Total Amount
		Providing and Fixing in position Kitchen Modular Cabinetry 600 deep below counter and 350 deep above counter made with 18mm thk. HDF Board with 1.5mm thk. Laminate on shutter and drawer fascia including all necessary hardware / accessories, inside surfaces finished with synthetic Enamel paint of approved shade all complete as per drawings and instructions of Engineer in Charge.								
		Under Counter Modular Cabinets 1.7m x .6m x .80m Height consisting of drawers, shutters, top with 18-20mm thk. Granite Stone top, shelves all complete as per drawings and specifications including all necessary hardware	Nos.	1						
		Shutters below Kitchen Sink .8mX.8 Height all complete as per drawings and specifications including all necessary hardware	Nos.	1						
		Overhead Cabinets 2.30m x .8m x .35m depth with intermediate shelf and double openable shutters all complete with as per drawing and with all necessary hardware.	Nos.	1						
		TOTAL OF FURNITURE								