



INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR
KHARAGPUR, WEST BENGAL 721302

E -TENDER DOCUMENT

for

**SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF AIR
CONDITIONING WORK FOR VGSOM BUILDING, IIT KHARAGPUR**

NIT No.: IITKGP/IW/RAC/VGSOM/2020-21 DATED 25.08.2020

Notice Invitation Tender Serial No. IITKGP/IW/RAC/VGSOM/2019-20 DATED 14.08.2020

Tender Serial No. _____ *Issued to:*

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7Schedule of Quantities (BOQ).....uploaded separately in BOQ section on <https://eprocure.gov.in/eprocure/app>



NOTICE INVITING TENDER**1.1. INTRODUCTION**

INDIAN INSTITUTE OF TECHNOLOGY (IIT) KHARAGPUR, HEREINAFTER CALLED IITKGP, INVITES SEALED TENDERS FROM THE ELIGIBLE CONTRACTORS FOR "SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF AIR CONDITIONING WORK FOR VINOD GUPTA SCHOOL OF MANAGEMENT (VGSOM) BUILDING, IIT KHARAGPUR" PARTICULARS OF THE PROJECT ARE AS FOLLOWING.

1.2. PARTICULARS

1.NIT Number	NIT No. IITKGP/IW/RAC/VGSOM/2020-21
2.Name of Work	SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF AIR CONDITIONING WORK FOR VGSOM BUILDING, IIT KHARAGPUR
3.Location of Work	AT VGSOM BUILDING, IIT KHARAGPUR, West Bengal 721302.
4.Estimated Cost(including GST)	Rs. 96,81,922.00/- (Rupees Ninety six Lakhs Eighty one Thousand Nine Hundred and Twenty two Only)
5.Earnest Money Deposit	Rs. 1,94,000.00(Rupees One Lakh and Ninety four Thousand Only)
6.Time Limit	100 days from Date of start
7.Tender Basis and Mode	Two stage (Technical Bid & Financial Bid)
8.Mode of Payment to IITKGP(EMD/Tender fee)	i) Original Demand Draft/Pay Order or copy of valid registration certificate under MSE category has to be submitted physically at the office of SE(E&M) on or before the due date/extended date of submission of bid. & Scanned copy of Demand Draft/Pay Order/Registration under MSE category has to be uploaded on https://eprocure.gov.in/eprocure/app ii)Demand Draft/Pay order to be drawn in favour of IIT KHARAGPUR payable at Kharagpur.
9. Pre bid meeting	09 th Sept , 2020 at 12:30 AM in the Meeting Room of SE(E&M) located in the Old building, IIT Kharagpur
10.Closing Date & Time for Receipt of bids	16 th st Sept. 2020 up to 15:30hrs
11.Date& Time for Opening Technical of Bid	17 st Sept 2020 at 16:00hrs
12. Date& Time for Opening of Price Bid	To be informed later to the successful bidder
13. Engineer-in-charge and contact details.	Mr. S. Banerjee, Engineer(RAC) Tel: 03222-282724Email: sbanerjee@adm.iitkgp.ac.in
14. Address for tender issue, submission and opening	Office of Superintendent (Electrical),1 st Floor, Old Building, IIT Kharagpur, Kharagpur WB 721302
15.Website for full and updated publishing information	https://eprocure.gov.in/eprocure/app http://www1.iitkgp.ac.in/topfiles/tenders.php
16. Website for tender submission & processing (This is e-Tender only submission by Online)	https://eprocure.gov.in/eprocure/app

1.3. ELIGIBILITY CRITERIA

- 1.3.1. The bidder must be registered in appropriate class of works with Government organization like CPWD/ PWD/ MES or PSUs or those having experience in similar nature of works awarded by Government / Semi Government Organizations/ Government Funded Autonomous Organization.
- 1.3.2. The bidder must have done at least 1 (ONE) similar work of value of 80% of the estimated cost or 2 (TWO) similar works for projects each of value 60% of the estimated cost or 3 (THREE) similar work for projects each of value 40% of the estimated cost with Government/ Semi-government/ PSU/ Government Funded Autonomous Organization during last 7 (seven) years preceding last date of the month of tender submission.

Note:

- (i) The estimated cost is **Rs. 96,81,922.00/-** (Rupees Ninety six Lakhs Eighty one Thousand Nine Hundred and Twenty two Only).
- (ii) The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to the last date of receipt of applications for tender.
- (iii) The bidding capacity of the contractor should be equal to or more than the estimated cost of the work put to tender. The bidding capacity shall be worked out by the following formula:

$$\text{Bidding Capacity} = \{[A \times N \times 2] - B\}$$

Where,

A= Maximum turnover in construction works executed in any one year during the last five years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N= Number of years proscribed for completion of work for which bids has been invited.

B= Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited.

(iv) **Similar works shall mean: Supply, installation, testing commissioning of VRF Air conditioning system.**

- 1.3.3. The bidder or the specialized agency the bidder intends to associate with must be registered with appropriate government authority as a bonafide business entity and must have GST registration certificate and Permanent Account Number of income tax.
- 1.3.4. The validity of the registrations and licenses should be valid as on the date of tender submission.
- 1.3.5. **The bidder shall get specific authorization letter from the OEM (Signed by officer of OEM representative in the rank of Regional manager/ Zonal Head or business head) for quoting this particular NIT. The copy has to be submitted alongwith the tender in the form of hard copy and soft copy as well.**
- 1.3.6. **The Bidder has to quote with latest generation of VRF machines and shall furnish the details alongwith with catalogue of the product in the technical bid.**

1.3.7. Special condition for HVAC related Electrical and Civil Work:

The scope of HVAC shall include following civil and electrical work , these are non-billable -

- Opening /Closing / Making hole in existing Masonry wall/ Concrete / Glass structure to facilitate entry and exit of duct / pipe work and finishing it good.
- Supply & Installation of decorative pelmets if required to install the IDUs.
- Termination of drain upto ground floor with suitable size of U PVC pipe of schedule 40 grade.



- IIT shall provide electrical feeder to the HVAC electrical panel located in the electrical room. The HVAC electrical panel shall be provided by the Contractor as specified.
 - Single phase power socket will be made available in the vicinity of the IDU's .Plug top and further termination upto the IDU's shall be the scope of HVAC contractor.
1. Quality of above works shall be assessed by the bidder before quote as per his scheme of execution.
 2. All above work shall be executed and finished good to the satisfactory of Engineer- in-charge.

Sd/-
Chief Engineer

On behalf of the Director, Indian Institute of Technology Kharagpur

Copy to:

- 1) Dean Infrastructure(IW)
- 2) Asso. Dean Infrastructure(IW- Civil)
- 3) Asso. Dean Infrastructure(IW- RAC)
- 4) PIC RAC
- 5) Dean (VGSOM)
- 6) Superintending Engineer (E&M)
- 7) Sr. EE Civil , Mr. S K Biswas
- 8) Engineer/Assistant Engineer/ Junior Engineer (RAC)
- 9) Notice Board
- 10) Tender Notice uploaded to CPPP portal & Institute Website
- 11) Office file

1. INFORMATION TO BIDDERS

1.1. GENERAL INSTRUCTIONS

- 1.1.1. The IITKGP intends to award the work of “SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF AIR CONDITIONING WORK FOR VGSOM BUILDING, IIT KHARAGPUR”. The work consists of comprehensive repair, renovation and modification of existing electrical systems.
- 1.1.2. The vendor shall work out execution sequence and methodology so as to complete the project within the envisaged time and the estimated cost, duly handling the constraint mentioned above.
- 1.1.3. Bidding documents are to be obtained electronically through websites: <https://eprocure.gov.in/eprocure/app>
- 1.1.4. <http://www1.iitkgp.ac.in/topfiles/tenders.php>.
- 1.1.5. This bid document shall be read in conjunction with GCC (General Conditions of Contract) available on <http://www1.iitkgp.ac.in/topfiles/tenders.php>.
- 1.1.6. The bidder shall visit and inspect the site and obtain all information on his own responsibility and at own cost, which may be necessary for the purpose of quoting and submitting the tender. No excuse or ignorance as to site conditions and local information shall be accepted after awarding of the contract. Access to the site will be granted by the Engineer-in-charge on all working days within working hours.
- 1.1.7. IITKGP shall not provide any space at site for labour hutments.
- 1.1.8. All clarifications about the tender shall be sought by bidder on or before **09th Sept, 2020 at 11.30AM** through e-mail to the Engineer-in-charge on sbanerjee@adm.iitkgp.ac.in
- 1.1.9. Completion certificate issued by Competent Authority will only be considered as credential. If the Completion certificate issued by Competent Authority does not reflect the type of work, then Final bill / Schedule of Quantity of the qualifying works also to be attached along with the Completion certificates. Certificate from private individuals / organizations for whom such works have been executed shall not be accepted.
- 1.1.10. The bidding document (consisting of specifications, the schedule of quantities of various types of items to be executed, the set of terms and conditions of the contract and other documents / drawings, if any), Addendum/Corrigenda, Clarifications to Pre-bid queries can be downloaded from the websites: i) <https://eprocure.gov.in/eprocure/app>
- 1.1.11. <http://www1.iitkgp.ac.in/topfiles/tenders.php>; iii) <https://eprocure.gov.in/eprocure/app>. Corrigenda, if any shall be published only on these websites *at any time before the closing time of tender*. The institute shall not be responsible for any delay / difficulties / inaccessibility of downloading facility for any reason whatsoever. *The tenderers who have downloaded the tender documents from website must visit the website and ensure that such addendum(s)/corrigendum(s) (if any) is also downloaded by them. This shall be the responsibility of the prospective registered bidders to check the web site for any such corrigendum/addendum before closing time of tender and ensure that bid submitted by them are in accordance with all the corrigendum's/addendums.*
- 1.1.12. All costs, charges & expenses that may be incurred in connection with the preparation of his tender shall be borne by him and the Institute accepts no liability whatsoever therefore.
- 1.1.13. **Rates quoted by the bidders shall be inclusive of GST (Goods and Services Tax - Central, State and Interstate) and all applicable taxes. Income Tax and all other statutory deductions like labourcess etc. will be deducted from the bill as per prevailing rules.**
- 1.1.14. Exemption to IITKGP against any tax/ duty/ fee/ surcharge/ charge/ cost, if any, found applicable or sought later from IITKGP after award shall be passed on to IITKGP by the contractor without dispute.
- 1.1.15. IITKGP reserves the right to reject any or all of the bids without assigning any reason.
- 1.1.16. **Bid Validity:** Bid shall remain valid for 120 days from the date of submission.
- 1.1.17. **Firm Price:** Bidder's quoted Rates/Prices for executing the activities under the Contract shall remain firm till completion of the entire work & shall not attract any escalation under any circumstances whatsoever.
- 1.1.18. If any information furnished by the bidder is found as false / fabricated, then his bid will be rejected and treated as cancelled. Even if the such manipulation is detected at any stage after signing of the contract, it would lead to termination of the contract besides forfeiture of Earnest Money Deposit and liabilities towards prosecution. In such cases the bidder will be debarred from participation in future tendering process in IITKGP for next 05 (Five) years.
- 1.1.19. **Earnest Money Deposit(EMD)** of requisite amount and that in prescribed mode or proof of payment thereof shall be submitted with the Technical Bid explained in following section. MSEs registered with District Industries Centers, National Small Industries Corporation and any other body specified by Ministry of MSME or Startups as recognized by Department of Industrial Policy and Promotion shall be exempted from payment of EMD in the bid. The self attested photocopy of their evidence should be submitted by the bidder(s) along with the formal request letter for exemption.



a. In case the NSIC/MSEs registration certificate is found invalid during evaluation, the bid of such bidder shall be rejected.

b. Bidder so exempted for submission of EMD shall have to submit an undertaking as per Annexure-II.

1.1.20. Refund / Conversion of Earnest Money Deposit: The Earnest Money received shall be refunded to the unsuccessful bidders without any interest after the opening of financial bids. The Earnest Money Deposit of successful bidder shall be retained and converted into part of Security Deposit.

1.1.21. Forfeiture of Earnest Money Deposit: Earnest Money Deposit will be forfeited in any of the following cases:

- (i) The bidder withdraws / modifies his tender during the period of Bid Validity.
- (ii) The bidder, in case of tie between lowest bids, refuse to submit revised offer.
- (iii) The bidder does not accept the correction of arithmetical errors of his tender.
- (iv) The bidder fails to deposit Performance Guarantee and information as per format given in GCC within the stipulated time period before award of the work.

1.2. SUBMISSION OF TENDER

1.2.1. Help for Contractors, FAQ, Information about DSC and Bidders Manual Kit containing the detailed guidelines for e-Procurement system are also available on Central Public Procurement Portal. [<https://eprocure.gov.in/eprocure/app>]

1.2.2. It is mandatory for all the bidders to have a valid Class-II/Class-III Digital Signature Certificate (in the name of person having power of attorney to sign the Bid) from any of the licensed Certifying Agency (Bidders can see the list of licensed CA's from the link www.cca.gov.in) to participate in e-Procurement of IIT KHARAGPUR.

1.2.3. It is mandatory for the bidders to get their firm /company registered with e-procurement portal <https://eprocure.gov.in/eprocure/app> to have user ID & password.

1.2.4. Tender documents will be available online on website <https://eprocure.gov.in/eprocure/app> which can be downloaded free of cost.

1.2.5. Bidders may download and refer the "Instructions for Online Bid Submission" from (<https://eprocure.gov.in/eprocure/app;jsessionid=A8B54EEC72D86DF9AA9D9B2DDACDAB8D.eprocgep4?page=BiddersManualKit&service=page>).

1.2.6. The tender documents shall be submitted online in the prescribed format given on the websites and technical bids received online shall be opened as per NIT or Corrigendum thereof. No other mode of submission is acceptable. Detailed credentials as per the requirement of eligibility criteria and all tender papers except Bill of Quantities are to be submitted in "Technical Bid".

Bill of Quantities with rates duly filled in are to be submitted in the format provided online in the name of "Financial Bid". Hence, physical submission of the documents is limited to submission of original Earnest Money Deposit in the form of Pay Order/ Demand Draft / Bank Guarantee/MSE registration certificate as per provision given in sub-clause 1.2.5 of NIT & 2.2.15 of Information to Bidders.

Representative of the bidder, who chooses to attend, may attend the online opening of the technical bids on the scheduled date and time of Bid opening. However, such representatives shall be allowed to attend the opening of the Technical Bids, only, if such person presents the letter of authority issued in his name by the bidder on his letter head.

1.2.7. Bidders cannot submit the tender after the due date and time of e-bid submission. Time being displayed on Central Public Procurement Portal <https://eprocure.gov.in/eprocure/app> ("Server System Clock Time") shall be final and binding on the bidder. e-Bids are required to be submitted by bidders, only as per the Indian Standard Time (IST) and not the time as per their location/country.

1.2.8. The bidders are advised to submit their e-bids well before the e-bid due date. IIT KHARAGPUR shall not be responsible for any delay in submission of e-bids for any reason including server and technical problems.

1.2.9. The Technical and Financial Bid shall be digitally signed by the Authorized Signatory of the bidder & submitted "on-line" only. The authorized signatory of the bidder must be in possession of Power of Attorney before submitting the digitally signed bid. Scanned copies of various documents can be prepared in .pdf file format.

1.2.10. Any tender received without original Earnest Money in the form as specified in clause 1.2.8 of tender documents shall not be considered and shall be summarily rejected.

- 1.2.11. ***IIT KHARAGPUR reserves the right to cancel the tenders before submission/opening of tenders, postpone the tender submission/opening date and to accept/reject any or all tenders without assigning any reasons thereof. IIT KHARAGPUR's assessment of suitability as per eligibility criteria shall be final and binding.***
- 1.2.12. ***Tenderers may note that they are liable to be disqualified at any time during tendering process in case any of the information furnished by them is not found to be true. EMD of such tenderer shall be forfeited. The decision of IIT KHARAGPUR in this regard shall be final and binding.***
- 1.2.13. **The sealed EMDs shall be received at the Office of Superintendent (Electrical),1st Floor, Old Building, IIT Kharagpur, Kharagpur WB 721302, up to 15:30hrs, 16th Sept 2020 or Corrigenda otherwise.** EMD received after the due date and time shall not be considered. The EMDs shall be submitted in a sealed envelope super scribed " SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF AIR CONDITIONING WORK FOR VGSOM BUILDING, IIT KHARAGPUR" with NIT No. IITKGP/IW/RAC/VGSOM/2020-21 as NIT No., clearly super scribed as "EMD "

1.3. EVALUATION OF BIDS AND AWARD OF WORK

- 1.3.1. The Bid of bidder will be opened on the specified date and time. Bids shall, first, be checked for payment of **Earnest Money Deposit**. Only those bids found to have duly paid/ submitted Tender Fee and Earnest Money Deposit shall be considered for evaluation.
- 1.3.2. Evaluation of **Technical Bid**: The bids received will then be assessed on the eligibility criteria mentioned at para 1.3of Notice Inviting Tender. **Bids found not meeting the eligibility criteria shall be considered non-responsive and shall be rejected summarily.**
- 1.3.3. IITKGP retains the right to revert back to individual bidders with further clarifications / queries on the Technical Bid. The bidder has to respond to the queries within the specified time mentioned in the covering letter.
- 1.3.4. On the date & time specified for opening of Financial Bid or the Revised Financial Bids as the case may be will be opened on specified date and time.
- 1.3.5. **EVALUATION OF Financial Bids**: The Financial Bid should contain the complete bid document with duly filled in Schedule of Financial Quote. Financial Bids opened as above will be checked for arithmetical errors.
- 1.3.6. **Letter of Award (Work Order)** shall be issued to the successful bidder only after receipt of the Performance Guarantee, along with Program Schedule, details of Technical Staffs to be deployed for the work and Complaint Redressal Mechanism **as per following para.**

2.4.8 (a) Contractor shall submit Complaint redressal arrangement with name & contact number of the contractor's authorized representative for the purpose.

- 1.3.7. **Agreement (Contract)** consisting of complete tender document including conditions, bill of quantities, technical proposal and specialized services, drawings, if any, and acceptance thereof together with any correspondence leading thereto, shall be drawn and signed with the awardee **within 10 days** of the Letter of Award.
- 1.3.8. **Date of start** of work shall be reckoned from **the 10th day** of the issue of the Work Order.
- 1.3.9. **Defect Liability Period (DLP)**: In partial modification to clause no.16 of General Conditions of Contract (GCC), the Defect Liability Period shall be **12 months** after the certificate final or otherwise of its completion of work or till the final bill has been prepared.

1.3.10. TERMS OF PAYMENT:

- a. 70% towards supply of materials at site.
- b. 20% towards installation.
- c. 5% towards successful commissioning and handing over with all test reports and as-built drawings approved by IIT- Kharagpur.
- d. 5% towards retention amount till the completion of Defects Liability Period.

Period of payment will be minimum 45 days from the date of submission of bills.

1.4. COMPLAINT REDRESSAL MECHANISM

- 1.4.1. All maintenance complaints shall be got addressed by the contractor to the satisfaction of Engineer-in-charge within 3 days from the date of issuance of the "Job Card" from IIT Kharagpur.
- 1.4.2. Complaints requiring completion time more than 3 days shall be responded specifically by the contractor with the scheme, in consultation with Engineer-in-charge, and timeline for compliance, to the Engineer-in-charge within 3 days from the date of issuance of the "Job
- 1.4.3. Any complaint left unattended by the contractor beyond 3 days without specific reasons on record shall attract levy of penalty of Rs 50/- per complaint per day from 4th day to 7th day and Rs 100/- per complaint per day thereafter recoverable from dues to the contractor.

2. UNDERTAKING BY THE BIDDER

UNDERTAKING

I / We have read and examined the Tender document including terms & conditions, specifications, bill of quantities, drawings and designs, general rules & directions, General Conditions of Contract, Special Conditions of Contract and all relevant other documents, publications and rules referred to in the Conditions of Contract and all other contents in the tender documents for the work.

I / We, hereby tender for execution of the work specified for the Indian Institute of Technology Kharagpur within the time specified and in accordance in all respects with the specifications, designs, drawings and instructions in writing.

We agree to keep the tender open for 120 days from the last date of its submission and not to make any modifications in its terms and conditions. A sum of Rs. _____ has been deposited in cash / demand draft of a scheduled bank / Pay order as earnest money. If I / we, fail to furnish the prescribed performance guarantee within prescribed period, I / we agree that the said Director, Indian Institute of Technology Kharagpur or his authorized officer shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I / we fail to commence work as specified, I / we agree that the Director, Indian Institute of Technology Kharagpur shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein.

Further, I / We agree that in case of forfeiture of earnest money or both Earnest Money & Performance Guarantee as aforesaid, I / We shall be debarred for participation in the re-tendering process of the work.

I / We hereby declare that I / We shall treat the tender documents, drawings and other records connected with the work as secret / confidential documents and shall not communicate information derived there-from to any person other than a person to whom I / We am / are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Seal & Signature of Contractor

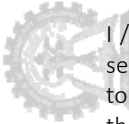
Postal Address

Dated

Witness

Address

Occupation



ANNEXURE-I

TECHNICAL STAFF OF CONTRACTOR

Name of the Work: SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF AIR CONDITIONING WORK FOR PROPOSED RECORDING STUDIOS OF CEP, MAIN BUILDING, IIT KHARAGPUR

DISCIPLINE	NAME	QUALIFICATION	EXPERIENCE	CONTACT NUMBER
Overall Project In-charge				
Engineer - Structure and Civil Works				
Engineer – Electrical & Mechanical Works				
In-charge - Safety, Health & Environment				
In-charge for Maintenance (DLP) period				

Seal & Signature of Contractor



ANNEXURE - II

UNDERTAKING FOR EMD EXEMPTION

UNDERTAKING

We hereby undertake that we shall fulfill all the terms & conditions within the specified time frame, after the acceptance of our offer, in case our offer is accepted; failing which IIT KHARAGPUR may go ahead to take necessary action such as reporting the non-compliance to appropriate Government authorities and barring us from future participation in IIT KHARAGPUR works.

Seal & Signature of Contractor

DATED:



भारतीय प्रौद्योगिकी संस्थान खड़गपुर

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

1. Checklist for Documents to be uploaded on <https://eprocure.gov.in/eprocure/app>

Sl. No.	Documents	Reference
1.	Tender Documents	2.3
2.	EMD	1.2.8
3.	Company registered by Govt. Organisation like CPWD/PWD/MES/Autonomous bodies or Other PSUs	1.3.3
4.	GST Registration Certificate	1.3.3
5.	Permanent Account Number	1.3.3
6.	Completion Certificate during last 07yrs.	1.3.2
7	Updated Electrical Contractor Licence	
8	ANNEXURE-I	



Signature of contractor

ANNEXURE-II

3. PARTICULAR CONDITIONS

Indian Institute of Technology intends air-conditioning of the offices and labs at VGSOM building 1st floor. recommendation

1. AIR-CONDITIONING: DESIGN CRITERIA

1.1 OUTDOOR DESIGN CONDITIONS :

Outdoor Design Conditions for Kharagpur are based on Weather data compiled and published by ISHRAE (WeDCo) for Kolkata and past experience corresponding to 2 % annual cumulative frequency of occurrence and the outdoor design conditions have been considered as follows:

Design Conditions	DRY BULB		Mean Coincident WBT		RH
	Deg F	Deg C	Deg F	Deg C	%
SUMMER	110	43.3	83	28	33
MONSOON	94.4	34.66	82	28	60
WINTER	56	13	48	9	55

1.2 INDOOR DESIGN CONDITIONS

Based on past experience, indoor design conditions for centrally air-conditioned spaces shall be as follows:

SPACE	Temperature Deg C	Relative Humidity %	Remarks
Classroom/ Studio area	26±1.1	60±10 % at full load condition	

Note: Winter Heating is not envisaged.

1.3 MECHANICAL VENTILATION

Area	Air Changes Per Hour(ACH) as per NBC	Remarks
Toilets	15	

1.4 BUILDING CONSTRUCTION DATA

The Building construction data for calculating the building air-conditioning load is as below.

- i. External Wall : $U = 1.81 \text{ Watt / Sqm}^{\circ}\text{C}$ (0.32 Btu / HrSqft^oF)
(230mm thick brick wall)
- ii. Roof (Exposed to sun) : $U = 1.316 \text{ Watt / Sqm}^{\circ}\text{C}$ (0.23 Btu / HrSqft^oF)
- iii. External Glass Specifications : Glass with following details:
 $U = 5.8 \text{ Watt / Sqm}^{\circ}\text{C}$ (1.02 Btu / HrSqft^oF)
Solar heat gain Coefficient: 0.8

1.5 OCCUPANCY AND INTERNAL HEAT GAIN

SPACE	Occupant	Equipment Load	Lighting Load	Fresh Air
Office area	75sft /person	125W/ Person	Average 1 W/sft	Asper ASHRAE 62.1 2004 or ACPH @1.5 , whichever higher

2. COOLING ESTIMATE

Estimated cooling loads are tabulated in table-2.

TABLE -2
PRELIMINARY COOLING ESTIMATE FOR VGSOM BUILDING AREA – KHARAGPUR

COOLING CAPACITY WITH EQUIPMENT SELECTION FOR VGSOM FRONT BUILDING													
Sr. No	Floor	Description	Room No	Area (Sq Ft)	Occupancy	Heat Load (TR)	Type of Indoor Unit	IDU Cap (TR)	Qty	Total IDU (TR)	Total IDU (HP)	ODU HP	Avg Diversity %
1	Ground Floor	Faculty Room	GF-01	170	1	1.35	Hi-Wall Split	1.5	1	1.5	1.8	32.0	118 %
2		Visible Room	GF-02	1070	30	10.82	Hi-Wall Split	2.0	5	10.0	12.1		
3		Computer Room											
4		Seminar Room	GF-03	800	60	9.10	Cassette	1.5	5	7.5	9.1		
5		VDO conference	GF-05	306	8	3.87	Hi-Wall Split	1.5	2	3.0	3.6		
6		Placement	GF-06	340	15	3.22	Hi-Wall Split	1.5	2	3.0	3.6		
7		Library	GF-07	800	25	6.97	Hi-Wall Split	1.5	4	6.0	7.3		
1	First Floor	Guest Prof-1	1F-03	260	2	1.53	Hi-Wall Split	1.5	1	1.50	1.8	24.0	124 %
2		Guest Prof-2	1F-04	260	2	1.58	Hi-Wall Split	1.5	1	1.50	1.8		
3		HOD/ Meeting room	1F-05	400	30	2.40	Hi-Wall Split	1.5	2	3.00	3.6		
4		Office	1F-06	380	15	2.32	Hi-Wall Split	1.5	2	3.00	3.6		
5		Staff	1F-07	280	15	1.90	Hi-Wall Split	1.5	2	3.00	3.6		
6		Server Room	1F-08	120		1.60	Hi-Wall Split	1.5	2	3.0	3.6		
7		Faculty Room-203	1F-09	170	2	1.37	Hi-Wall Split	1.5	1	1.50	1.8		
8		Faculty Room-204	1F-10	170	2	1.35	Hi-Wall Split	1.5	1	1.50	1.8		
9		Faculty Room-205	1F-11	170	2	1.35	Hi-Wall Split	1.5	1	1.50	1.8		
10		Faculty Room-206	1F-12	170	2	1.35	Hi-Wall Split	1.5	1	1.50	1.8		
11		Faculty Room-207	1F-13	170	2	1.35	Hi-Wall Split	1.5	1	1.50	1.8		
12		Faculty Room-202	1F-14\A	120	2	1.35	Hi-Wall Split	1.0	1	1.00	1.2		
13		Faculty Room	1F-14\B	120	2	1.35	Hi-Wall Split	1.0	1	1.00	1.2		
1	Second Floor	Class Room-311	2F-01	540	40	5.74	Hi-Wall Split	2.0	3	6.00	7.3	30.0	103%
2		Class Room-309	2F-02,2F-03	1,080	60	5.74	Hi-Wall Split	2.0	6	12.00	14.5		
3		Class Room-310				5.74	Hi-Wall Split						
4		Faculty Room-306	2F-09	170	2	1.61	Hi-Wall Split	1.5	1	1.50	1.8		
5		Faculty Room-305	2F-08	170	2	1.61	Hi-Wall Split	1.5	1	1.50	1.8		



6		Faculty Room-304	2F-07	170	2	1.61	Hi-Wall Split	1.5	1	1.50	1.8		
7		Faculty Room-303	2F-06	170	2	1.61	Hi-Wall Split	1.5	1	1.50	1.8		
8		Faculty Room-302	2F-05	170	2	1.42	Hi-Wall Split	1.5	1	1.50	1.8		
									50	81	98.2	86	
COOLING CAPACITY WITH EQUIPMENT SELECTION FOR VGSOM ANNEX BUILDING- IIR KHARAGPUR													
Sr. No	Floor	Description	Room No	Area (Sq Ft)	Occupancy	Heat Load (TR)	Type of Indoor Unit	IDU Cap (TR)	Qty	Total IDU (TR)	Total IDU (HP)	ODU HP	Avg Diversity %
1	Ground Floor	Computer lab	E.B.-01	1800	70	13.5	Hi-Wall Split	1.5	10	15	18.18	36.0	118%
2		Server room		110		1.2	Hi-Wall Split	1.5	2	3	3.64		
3		Class room	E-101	1500	120	12.25	Hi-Wall Split	1.5	8	12	14.55		
4		Faculty room	E-102A	130	2	1	Hi-Wall Split	1	1	1	1.21		
5		Faculty room	E-102B	130	2	1	Hi-Wall Split	1	1	1	1.21		
6		Faculty room	E-102C	130	2	1	Hi-Wall Split	1	1	1	1.21		
7		Faculty room	E-104A	130	2	1	Hi-Wall Split	1	1	1	1.21		
8		Faculty room	E-104B	130	2	1	Hi-Wall Split	1	1	1	1.21		
1	First Floor	Class room	E-201	1500	120	12.25	Hi-Wall Split	1.5	8	12	14.55	18.0	115%
2		Faculty room	E-202	130	2	1	Hi-Wall Split	1	1	1	1.21		
3		Faculty room	E-203	130	2	1	Hi-Wall Split	1	1	1	1.21		
4		Faculty room	E-204	130	2	1	Hi-Wall Split	1	1	1	1.21		
5		Faculty room	E-207	130	2	1	Hi-Wall Split	1	1	1	1.21		
6		Faculty room	E-208	130	2	1	Hi-Wall Split	1	1	1	1.21		
1	Second Floor	Class room	E-301	600	40	5.1	Hi-Wall Split	1.5	4	6	7.27	20.0	127%
2		Faculty room	E-302	200	2	1.2	Hi-Wall Split	1.5	1	1.5	1.82		
3		Class room	E-303	600	40	5.1	Hi-Wall Split	1.5	4	6	7.27		
4		Faculty room	E-304A	130	2	1.2	Hi-Wall Split	1.5	1	1.5	1.82		
5		Faculty room	E-303B	130	2	1.2	Hi-Wall Split	1.5	1	1.5	1.82		
6		Faculty room	E-304C	130	2	1.2	Hi-Wall Split	1.5	1	1.5	1.82		
7		Faculty room	E-306	130	2	1.2	Hi-Wall Split	1.5	1	1.5	1.82		
8		Faculty room	E-307	130	2	1.2	Hi-Wall Split	1.5	1	1.5	1.82		
									52	73	88.48	74.0	



PLANT SELECTION

Air conditioning of VGSOM building shall be done with VRF system. All the areas shall be air conditioned with energy efficient inverter scroll compressor in air cooled VRF units. The scroll compressor can operate efficiently on part load and there by substantial energy is saved. Multiple all inverter scroll compressor in the VRF units shall be grouped together to get the benefit of overall part load operation at of peak hours, seasonal & daily temperature variation.

- a) The rooms at each floor are to be air-conditioned by air cooled all inverter type VRF outdoor unit and Hi-wall/cassette type indoor units as described in the table-2. The outdoor unit to be placed roof/ ground lvl. of the building as per the suit at site condition. The outdoor units shall be grouped together and shall modulate to get the benefit of overall part load operation at of peak hours, seasonal & daily temperature variation. The ODU units shall be top discharge type. The multiple indoor units shall be connected with the outdoor units through insulated hard drawn copper pipes. The copper pipes shall be UV protected in the outdoor area.

Additional scope need to be considered by AC vendor:

- a. Opening /Closing / Making hole in existing Masonry wall/ Concrete / Glass structure to facilitate entry and exit of duct / pipe work and finishing it good.
- b. Supply & Installation of decorative pelmets if required to install the IDUs.
- c. Drain to be terminated to the nearest drain point.
- d. Any type of painting related to HVAC work if required.

Notes on Electrical Scope:

- All materials to be used after prior approval of Engineer in charge.
- Suitable connectors are to be used for making connections of the neutral and earth wire in the switch boards.
- No electrical wiring is allowed to lay on the false ceiling.
- No joints are allowed in the wiring.
- Suitable Al or Cu lugs are to be used during any connection, connections without using lugs are not allowed.
- Suitable brass glanding of the cables are to be done for cable end termination.
- GI anti rust screws are to be used during fixing of pipes, cables, conduits, light fittings etc on the wall.
- Valid challans and test/guarantee certificates of all the materials supplied by the contractor are to be submitted before execution of work.

All signal/control/power wiring/ Earthing (from nearest existing earthing) related to HVAC system are included in HVAC scope of works including their terminations.

TEST READINGS

<u>ITEM</u>	<u>TEST READINGS TO BE TAKE AT THE TIME OF COMMISSIONING</u>
AIR-COOLED VRF OUTDOOR UNIT	Refrigerant pressures Oil pressure BHP consumed at 100%, 75% & 50% Load Ambient Temp
MOTOR	Voltage & Amperage
INDOOR UNITS	Entering/leaving Air Temperatures DBT/WBT Air flow rates
SUPPLY & RETURN AIR GRILLES	Air flow rates Supply air DBT/WBT
SPACE TEMPERATUTRES	DBT/WBT/RH



Technical specification of VRF unit

1.0 Scope

Scope of this section comprises of design, supply, erection, testing and commissioning of ALL Inverter Scroll Scroll/ Rotary or Twin rotary VRF type system. The VRF product must be manufactured at ISO 9001-2008 certified factory.

2.0 OUTDOOR UNITS: INVERTER VRF SYSEM

The Air cooled direct expansion type Full Inverter VRF outdoor unit shall be factory assembled, powder coated GI sheet metal cabinets, all hardware of **anti-rust quality**, conformal coating on PCB to protect from duct & humidity, hydrophilic blue fin material for better corrosion resistance, top discharge type with Brushless DC Motor only.

- I. The Top Discharge type VRF ODU must have bigger condenser coil face area with higher CFM fan resulting in improved efficiency, less deration due to higher ambient temperatures.
- II. The ODU to be selected to deliver actual capacity at 42 degC and it should be operational upto 50degC.
- III. The Outdoor unit must consist of Inverter Scroll/twin rotary inverter Compressor only. Tender BOQ specified VRF ODU must be having All Inverter Scroll/twin rotary compressors. There should not be any fixed compressor or Partial inverter, if found Bidder will be rejected at any stage of Project.
- IV. The VRF system must compatible with R410A green Refrigerant only. System must be pre-charged at Factory. If required additional, based on the site, then it will be charged additional at site.
- V. Condenser Heat exchanger made of copper tubes, are inner grooved for high heat transfer. The condenser fans are fitted with high efficiency BLDC motor that regulate air flow depending on demand resulting more power saving.
- VI. The VRF system must be designed to operate across a WIDE Voltage range from 320V to 460V resulting in high uptime even in such erratic power conditions.
- VII. ALL Inverter VRF must be designed with the new generation Refrigerant Cooled PCB, which helps maintain the drive within allowable temperature range. It enhances the reliability of the system when it is working under very high ambient conditions otherwise vendor has to confirm that the machine shall be operable upto 50degC ambient condition.
- VIII. VRF (Full Inverter Type) must be designed with twin large accumulator & and an efficient oil recovery management system, hence allow the system to be set up with long & flexible piping.
The equipment must be suitable for:
 - a. Max. actual piping length - 180 Rmt
 - b. Max. total piping length - 1000 Rmt
 - c. Max. Level difference between ODU-IDU - 90 Rmt
 - d. Max. level difference between IDUs - 40 Rmt
- IX. Each Indoor units must be connected (with VRF Outdoor unit) by means of individual Copper Refrigerant network or Y distribution joints only. The mentioned "Y" joint or refnet joints must factory make & tested by OEM. The individual size, of refnets or "Y" joints , connecting to individual indoor units, to be calculated & supplied by OEM / Bidder only.
- X. All Inverter VRF should have emergency back operation. In-case of double compressor ODU, it must operate or function even if there is a failure or maintenance downtime of one compressor.
- XI. In modular VRF, where multiple units have been combined to run, as one larger unit, the system must operate even in case of failure or maintenance downtime or shutdown of one VRF ODU. It will help to ensure that cooling/heating remains LARGELY unaffected even during servicing.
- XII. As all the Indoor units are interconnected by the communication cable, if there is any break in any communication cable, subsequent IDUs are affected and must not function. By activating the IDU emergency operation on the Next Generation All Inverter VRF, the other IDUs must function despite of such break.



3.0 INDOOR UNITS:

General:

All indoor units (Hiwall Split, Cassette) as specified under this item shall have, in general, noise levels shall be less than 45 db. For critical application noise levels below these limits may, however, be specified during design stage.

- I. Each Unit shall have electronic control refrigerant flow rate respond to load variation of the room.
- II. The address of the indoor unit shall be set automatically in case of individual and group control.
- III. In case of centralized control system, it shall be possible to set the address of individual indoor unit through a liquid crystal remote controller.
- IV. The Ductable Indoor unit fan shall be high static, 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 support from housing.
- V. The Evaporator cooling coil shall be made out of seam less copper tubes and have continuous aluminium fins. The fins shall be spaced by collars forming an integral part. The tubes shall be staggered in the direction of airflow. The tubes shall be hydraulically/mechanically expanded for minimum thermal contact resistance with fins. Each coil shall be factory tested at 21 kg/sq.mtr air pressure under water.
- VI. Indoor unit shall have cleanable type filter to an integrally moulded / moulded plastic frame. The filter shall be slide in and neatly insertable type. It shall be possible to clean the filters either with compressed air or water.
- VII. Each unit shall have computerized PID control for maintaining designed room temperature. Each unit shall be provided with microprocessor thermostat for cooling.
- VIII. Each ductable unit shall have with corded remote controller and each high wall & cassette type indoor unit shall be with cordless remote controller as standard features. The remote controller shall memorize the latest malfunction code for easy maintenance. The controller shall have self-diagnostic features for each and quick maintenance and service. The controller shall be able to change fan speed and angle of swing flap (for high wall unit & Cassette) individually as per requirement.

Place of Installation : Kharagpur

Constructional details	As per bid drawings and documents.
Power Supply	The power supply variation limits for 230V and 415V shall be as following. All electrical equipment shall perform satisfactorily under these conditions Voltage variation +/- 10% Frequency variation +/-5% Control wiring – 220V, 1Ph, 2 wire, 50Hz
Others	Dust filters action level 20 Microns. The noise level within the air conditioned space shall be restricted to 45 dB NC Level for Hiwall& Cassette unit & 50db for Ductable indoors. Not more than that.

4.0 Installation

- 4.1 The outdoor unit shall be installed as decided by the Indian Institute of Technology- Kharagpur. The room unit shall be either ceiling or wall/ floor mounted as shown on drawings/ as per the requirement of client.
- 4.2 Refrigerant lines shall be inconspicuously and generally as shown in the drawings and as directed on site. The suction and liquid lines shall be bonded together and insulated with elastomeric tubing. The joints of insulation need to be sealed by joint tape of same material. UV protection for outdoor piping is required. All power wiring shall be drawn from the nearest socket outlet and shall include the control wiring, power wiring, on-off switch with speed controller.



- 4.3 All pipe sizing shall be done taking into account the length and rise.
- 4.4 A 12mm insulated drain pipe shall be provided as shown on the drawing and as directed on site.

5.0 Testing

- 5.1 The unit shall be tested for establishing the capacity and power consumption. Tests shall be carried out in accordance with IS 5141 – 1969 (revised upto date) computed results shall tally with specified capacity and power consumption figures furnished with the tender offer.
- 5.2 On completion of piping the system and the piping shall be tested using Nitrogen gas by raising the pressure to 1.5 times the working pressure and holding the test pressure for 3 hours.
- 5.3 Tests shall be carried out on
- The compressor and drive motor side
 - condenser side for heat rejection
 - Cooling coil for cooling capacity
 - Evaporator air volume
- 5.4 A test certificate from prototype factory tests will be acceptable.

6.0 Mode of Measurement

- 6.1 Each unit shall be measured as one item of work which shall consist of:
- Outdoor unit
 - Indoor unit
 - Refrigerant and drain piping (with insulation)
 - Electrical power control wiring, room thermostat and control panel
 - Refrigerant charge & oil
 - Erection
 - Commissioning and testing

7. REFRIGERENT PIPING

7.1 Scope.

The scope of this section covers supply, installation of refrigerant piping & drain piping with insulation as specified here & as shown in the drawings.

7.2 Refrigerant copper Piping

- 16/18 gauge copper tubing shall be used to make connections to equipment's wherever required.
- Flare fittings e.g. flare nuts; tees, elbows, reducers etc. shall be of brass.
- The pipes and fittings shall be connected by means of welded joints. The connections to gauges, controls etc. (if any) shall be with soft copper tubing and flare fittings.
- Refrigerant piping routing shall be decided by Engineer – in – Charge.
- The refrigerant piping installation shall be as per drawing.

7.3 Drain Piping.

- All condensation drainage shall be pitched in the direction of flow to ensure adequate drainage with an adequate trap seal to prevent leakage / infiltration.
- Provide pitch of 20 mm per meter for a smooth drainage of condensate.
- Condensate drain piping fixing shall be as per drawing.
- The routing of Drain Piping shall be decided by Architect/ Engineer – in – Charge.
- The material for the drain pipe is CPVC.
- Drain piping supporting shall be as per drawing.



7.4 Suction Line Insulation

The Suction Line shall be insulated with 19/25 mm thk. Nitrile Rubber Insulation covered with aluminium foil (As per Specified with K Value of 0.027-0.029 K Cal/Hr.MDeg C at 0-16 Deg C)

7.5 Drain Piping Insulation

The drain pipes shall be insulated with 6mm thick Nitrile Rubber Insulation.

7.6 Mode of Measurement

- Refrigerant pipes with insulation shall be in linear measure along the center line of the pipe including accessories, supports etc and paid for per RMT.
- Condensate drain pipes with insulation shall be in linear measure along the center line of the pipe including accessories, supports etc and paid for per RMT.

8. ELECTRICALS

8.1 Scope.

The scope of this section covers supply, installation & Testing of cables connecting Indoor Unit & Outdoor Unit as per specification.

8.2 Electrical.

- The supply should be complete with appropriate earthing as per IE Rules.
- Depending on the number and capacity of units to be installed, each unit should have separate control through a main incoming switch with adequate capacity of approved makes.
- Each ODU should have separate SFU adjacent to the unit / within the unit and visible from the unit.
- Electrical cabling should be done with **armoured copper cable** of approved makes only.
- Fuse switches should be HRC cartridge type with visible indication.
- The cabling shall be done as per drawings or instruction from Engineer – in –charge.
- The cabling supporting shall be done as per drawing.

9. Bidder need to submit the following data along with the technical bid:

VRF Indoor Unit Technical Data sheet

Sl No	Details of Technical Requirement	
1	Make	
2	Model	
3	Type of VRF Indoor	
4	Nominal Cooling Capacity (TR)	
5	Input Power (KW)	
6	Net weight (kg)	
7	Sound pressure level (db)	
8	Air Flow (CFM) in high / med / Low	
9	External Static Pressure (Pa)	



VRF Outdoor Unit Technical Data Sheet:

Sl. No	Details of Technical Requirement	
1	Make	
2	Model	
3	Combination of Base Model (if Any)	
4	Actual Cooling Capacity at 42Deg C (HP)	
5	Total Power Consumption at 42 DegC (KW)	
6	Power Supply	
7	Overall Dimension (w x d x h in mm)	
8	net weight (kg)	
9	Type of Refrigerant	
10	Pre charged refrigerant Qty (kg)	
11	Number of Accumulator	
12	Type of Expansion Valve	
13	Type of Compressor	
14	Make & model number of individual compressor	
15	Compressor quantity	
16	Total Qty of Inverter Compressor- for individual model	
17	Input Power of Inverter Compressor motor (kw)	
18	Input Power of Fixed Compressor motor (kw)	
19	Type of Condenser coil	
20	Type of Condenser Fan	
21	Type of Condenser Fan- Motor	
22	Total Number of Fans for specified capacity ODU	
23	Power input of individual Cond Fan - Motor (kw)	

LIST OF APPROVED VENDORS

Sl No	Item	Manufacturer
1.	Inverter type VRF Outdoor Units & Indoor Units	O-general / Hitachi/Mitsubishi (Heavy)/ Daikin/ Toshiba/ Mitsubishi (Electric)
2.	Control Cables	Finolex/ Polycab/ Havells /KEI.
3.	Power Cables	Finolex/ Polycab/ Havells /KEI.
4.	CU Pipe	Rajco/ Nippon/ Mandev
5.	Thermal insulation	Armaflex/ K-flex/ Armacell
6.	Conduit	Precesion/AKG/POLYCAB
7.	Cable tray	Legrand/OBO/MK-Honeywell/Profab/Asian
8.	Electrical Starter Panel / DB	L&T/ Schneider/ Honeywell/ EAP/ Power and Control /Rayco/System Dynamic/ TTS Systematics
9.	PVC Pipe	Supreme/ Oriplast/ Utkarsh

Note: For items not covered in the above list or in case of non-availability of preferred make of any item listed above, the make / brand to be used in the work, should have prior approval from the Engineer-In-Charge.



APPROVED MAKES / MANUFACTURERS OF BUILDING MATERIALS

Sr#	Description of materials	List of Manufacturers
Civil Items		
1	Ordinary Portland Cement of Grade 43	ACC, Birla Rajshree, Ultratech, Narmada, Ambuja
2	White Cement	J.K. Cement & Birla White
3	Wall Putty	JK / Birla / Sika
4	Lime	Janatacem, Asian Paint
5	Neeru	More (Peacock), Kamal
6	HYSD Bars (TMT Bars)	TISCO, SAIL, RINL
7	Structural Plates and Steel Sections	TISCO, SAIL, RINL
8	Lighter Structural sections not manufactured by TATA/SAIL/RINL	Shyam Steel / SRMB / Jindal (Hissar)
9	Pressed steel doors & fire resistant steel doors	Godrej, Windoors, Strategic Building Systems & Kutty Flush Doors
10	Mild Steel Rolling Shutters, GI Rolling	SWASTIC, Windoors. Dodia,
11	Shutters, Stainless steel & aluminum rolling shutters	Trupti, Bharath & Larsen Engineering
12	Aluminium Extruded Sections	Jindal, Indal, Hindalco & Bhoruka
13	Aluminium Grills	M/s Alurniprofiles, Decogrills
14	Hardware Fittings & fixtures	M/s Jayant Metal, Shalimar hardware, Everite, Garnish, Diamond, Navbharat, SAIF Enterprises, Hardwin Traders, Godrej, DE Lock Industries, Explore Engineers, Garg Hinges
15	Aluminium Powder Coated Curtain rods	Bilmate, Elite
16	Anodized Aluminium fittings	Allen / Metco / N.L.C.O.
17	SS Railing Sections	Ozone / D-Line / Jindal
18	Stainless steel D-handles	Godrej, Hettich, D-line, Dorma, Dorset, Ozone
19	Door Locks	Godrej, Dorma
20	Door Closer/Floor spring	Godrej, Ozone, Hettich, Dorma, Hardwyn
21	False Ceiling	Gyprock / Armstrong
22	Aluminium Cladding sheets	Alstrong, Alpolic, Alucobond, Alstone International, Aludecor Lamination
23	Asbestos Roofing Sheets	Everest, Charminar & Asbestos Cement Ltd.
24	Colour Coated Steel / Zinc-alu alloy roofing sheets	Kirby, Steelfah & Colour Roof India Ltd.
25	Anti-Termite treatment	M/s PARAGON, PEECOPP, Express Pesticides Corporation, Elite Corporation, Pest Control (I) Ltd. & NOCIL Chemicals,
26	Terrazzo Tiles	M/s NITCO, BHARAT, G.K. BANSAL, Acme Tiles & Super Tiles
27	Ceramic Tiles	H.R. Johnson (I) Ltd., Sornany, Kajaria
28	Glazed Tiles	M/s H.R. Johnson (I) Ltd., Somany, Kajaria
29	Vitrified Floor Tiles	M/s H.R. Johnson, RAK Ceramics, Bell Granito
30	Interlocking Paver Tiles	Hindustan Tiles / Wonder / Ultra Tiles
31	Cement Based Paint	M/s Snowcem India Ltd. (Super snowcem, Sandex Matt), NITCO (Nitcocom) Paints, Hindustan Colour Chemical, Jayant colour, Surfa coat, Terraco, Berger-Rabiacem, ApporvaBuildcare&Decocem
32	Distemper & Paints	Asian Paints, Kansai Nerolac Paints Ltd., ICI Paints, Noble Paints, Berger Paints India Ltd., Jenson Nicholson, Garware Paints & Shalimar Paint
33	Anti-corrosive water proofing paint with Aluminium finish	SIKA / Shalimar
34	Waterproofing Compound, Sealants	Sunanda Chemicals, Mc-Bauchemie, FOSROC, Pidilite, Roffe, BASF, Sika
35	Adhesive for wood	Fevicol, Vamicol, Dunlop, Araldite

36	Water stops	M/s Omai Plastics, BaseconPask, Asian Engineering Products, Caprihans India Ltd., R.C. Enterprises, Kanta Polymers (Kanta flex) & Fixopan
37	APP Membrane	SIKA / PIDILITE / FOSROC / TIKIDAN
38	Expansion Joint Boards & Tarfelts	M/s Shalitek, S.T.P. Ltd., Lloyd Insulation, Tiki Tar Industries
39	Expansion Joint Filters	M/s Shalitek, S.T.P. Ltd., Lloyd Insulation & BASF Chemicals
40	Concrete Admixtures	Sunanda Chemicals, Mc-Bauchemie, FOSROC, Pidilite, Roffe, BASF
41	Bitumen (grade VG30)	IOCL
42	P V C flooring	M/s Premier Vinyl Flooring Ltd., Royal Cushion Vinyl Product Ltd., Armstrong, Responsive Industries Ltd.
43	P.V.C. Shutters	Sintex / Raunaq / Duroplast
44	P.V.C. Pipes	Oriplast / Supreme / Finolex
45	P.V.C. Cistern	Parryware / Hindware / Cera
46	P.V.C. Closet Seat Cover	Parryware / Hindware / Cera / Prayag
47	P.V.C. Connector Pipe	Prayag
48	P.V.C. Ball Cock	Prayag
49	P.V.C. Bib Cock / Stop Cock/ Angular Stop Cock / Pillar Cock	Prayag
50	P.V.C. Waste & Sanitary Fittings	Prayag
51	Polycarbonate Sheets	GE / Macrolux / Polytechno / Danpalon
52	UPVC Doors / Windows	Fenesta, Aluplast, Lingel, Shuco, Winpro, Rehau
53	Factory made panel door shutter	Wooden Design — Bangalore, Shankar Ramchandra & Joinery Manufacturer
54	Masonite Wooden Panel Doors	Kutty flush doors, Sejpal & others
55	FRP Door Shutter	Advance FRP & House of Doors
56	Block Board	Wood India — Calcutta, Sejpal & others Pioneer Timber Products, Chandigarh, Northern Door
57	Ply Wood	Indian Plywood Mfg. Ltd., Kitply, Century Plywood, Nuboard & Nashik Plywood Industries
58	Flush Door	Green Ply, Century Ply
59	Pre Laminated & Plain Particle Boards	NOVAPAN, Anchor
60	Glass for Doors / Windows	Modi Guard, Continental, Emirates, Saint Gobain, Asahi & Sejal
61	Plain Glass Mirror	M/s Modi Float Glass, Eagle, Atul, Saint Gobain, Asahi
62	Sanitary Wares	M/s Parryware, Hindustan, Cera, Neycer
63	C.P. Brass Fittings & Fixtures	GEM, Techno, Lalsons KINGSTON, JAGUAR, Metro, ESSCO, MARC
64	C.P. Brass Coupling and Bottle Trap	ESSCO, GEM, Kingston, Jaguar, Metro, Marc
65	C.I. Flushing Cistern	Mis A-1 (J.S.), HJN, JAMCO, Neco, HIF
66	C.I. Pipe & Fittings	NECO / BIC / D.N.Sinha / AMC / ALC
67	Gun Metal Wheel Valve	Zoloto / Alto / Leader
68	C.P. BRASS Urinal Waste & Flush pipes	Orient, PARKO, Elite, Jaguar & Metro
69	Plastic Sheet & Cover	M/s Commander, Diplomat, Admiral, Patel, Champion, Parryware & Hindvware
70	S.S. Sink	Diamond, Nirali, Parryware / Cera
71	G.I. Pipes	TATA, Jindal
72	G.I. Finings	PEG, MJM, Sims!, R-Brand, UNIK, Plumb Well, HB / R
73	G.M. Gate / Globe Valves	Nets, SANT, M/s Leader Valves, Zoloto
74	Copper ball Valve	Techno, M/s GEM, ESSCO, Leader, A-1 JS
75	Air Valve	Leader, Sant, HAWN M/s Kirloskar

76	Water Meter	Capstan, Keycee, Paramount
77	Sluice Valves	Kirloskar, Minoti, ESSCO & Burn, Hawa
78	Cl water quality pipes	Deem) steel castings, Jindal, Lanco
79	Cast Iron Valves	Kirloskar, Leader, HAWA
80	C.1. Soil Quality pipes	NECO, BC, RIFCO ₃ ASP, A-1, PARAS, HIF,

		Kajeriwal
81	S.W. Pipes & Gully Trap	Perfect, Kashrnira, BURN, RK, ANAND, ISI marked
82	RCC Hume Pipes	Mis Indian Hume Pipes, Pranali, Cement pipe, Ghambir, Kore Cement confirm to ISI
83	HDPE Pipes & HDPE fittings	Prince, Gautam M/s Hastil, Sangir pipes, Supreme
84	RCC frame, covers & SFRC	M/s Pratibha, Bharath, Vikrant
85	PIG LEAD	M/s Hindustan Zinc Ltd.
86	CL frame & covers	RIFCO, NECO, PARAS, A-1, M/s. Ashok Iron, Foundry, HIF
87	CPVC, UPVC, SWR Pipes	Finolex, Prince & Supreme
88	Poly Propylene — R Pipes	Supreme & Sakthi Polymers
89	PVC Plastic High / Low level cistern	Commander, Elite Dual, Champion, Parryware-similine, Hindware
90	PVC Inlet connection & Waste Pipes	Kohinoor, ECCSO, GEM & Elite
91	CP Brass towel rods and accessories	Elite, GEM, Jacquar, ESSCO

