Central Pollution Control Board
(Ministry of Environment & Forests, Govt. of India)
Parivesh Bhawan, East Arjun Nagar
Delhi – 110032

Corrigendum

The NIT published for "Renovation of Air and Treatability Laboratory" in Central Pollution Control Board, Parivesh Bhawan, on 21.10.2010 is hereby amended as details given below:-

Amended date of sale of all documents	**Amended date of receiving of tender documents**	**Amending date of opening of tender documents**
29.11.2010 to 30.11.2010 from 10.00 a.m. to 5.00 p.m.	02.12.2010 up to 3.00 p.m.	02.12.2010 at 3.30 p.m.

The firm those had already purchased the tender documents needs not to purchase it again and they will submit their offer before 3.00 p.m. on 02.12.2010.

The corrigendum and tender document can be seen on CPCB website www.cpcb.nic.in. The other terms and conditions will remain unchanged.

Member Secretary
Central Pollution Control Board

Central Pollution Control Board
(Ministry of Environment & Forests, Govt. of India)
Parivesh Bhawan, East Arjun Nagar
Delhi – 110032.

Notice inviting Tender

Member Secretary, Central Pollution Control Board invites sealed tenders for the following works:-

Name of Work : - "Renovation of Air and Treatability Laboratory" in Central Pollution Control Board, Parivesh Bhawan,

Description of Tenders	**Estimated cost (Rs.)**	**EMD (Rs.)**	**Cost of tender (Rs.)**
Civil, Electrical and Networking work	97,59,762/-	1,95,195/-	1000/-
Air Conditioning, Exhaust and Ventilation work	94,24,314/-	1,88,486/-	1000/-
Seating system and Modular furniture	33,61,775/-	67,236/-	1000/-
Lab furniture	44,46,240/-	88,925/-	1000/-
Fume Hood	51,24,176/-	1,24,049/-	1000/-
Fire detection system	14,65,736/-	29,315/-	500/-

Cost of tender : - Non refundable demand draft/FDR in favour of Central Pollution Control Board, Delhi as detailed above.

Sale of tender :- 15.11.2010 to 17.11.2010 from 10.00 am to 5.00 p.m in the office of I/c, Building.

Last date of receipt of tender : - 19.11.2010 up to 3.00 p.m.

Opening of tender :- 19.11.2010 at 3.30 p.m.

The eligibility criteria and other details can be seen from CPCB website i.e. www.cpcb.nic.in

Note: The tender will be issued to the firms/contractors those meeting the eligibility criteria laid down in respective tender.

Member Secretary
Central Pollution Control Board

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NOTICE INVITING TENDER

1. The Central Pollution Control Board (CPCB) invites sealed tenders from the manufacturer or authorized dealers for "Renovation of Air and Treatability Lab-ACMV works" at 4th floor in Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi-110032. The total estimated costs of the works is given below:

   Estimated Cost Rs. 92,24,314/-
   Earnest Money Rs. 1,88,486/- (to be submitted as Demand Draft/FDR in favour of the Central Pollution Control Board, Delhi)

2. The tender document will be available for sale from 15.11.2010 to 17.11.2010 from 10.00a.m. to 5.00 p.m. The tenders, which should always be placed in sealed cover with "Renovation of Air and Treatability Lab- ACMV works" written on the envelopes, will be submitted upto 3.00 p.m. on 19.11.2010 in the Tender box lying at Ground floor near reception in Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi - 110 032 and will be opened on the same day at 3.30 p.m. at the same address.

3. The tender will be issued to the authorised dealers/manufacturers fulfilling the following requirements:-

(i) Should have manufacturer or authorised dealer of ACMV units.
(ii) Should have completed atleast one work of similar nature not less than Rs.1.00 crore in the last five year. (list to be enclosed)
Or
Completed two works of similar nature not less than Rs.60 Lakh each during last five years (list to be enclosed).
(iii) Should have authorized service center in Delhi or NCR.
(iv) Should have valid Income Tax Clearance certificate & Sale Tax registration certificate as well as sale tax clearance certificates.

4. The tender document can be seen from CPCB website *www.cpcb.nic.in*.

5. MODE OF SUBMISSION OF TENDER

I. The tender shall be submitted in two separate sealed covers, duly completed in all respects viz. one for "earnest money", the second for "price bid". The name of the work and the words "earnest money" and "price bid only", as the case may be shall be clearly written on the top of the respective sealed covers. All the two bids, along with the letter for submitting tender shall be put in a sealed cover and the name of the work "Renovation of Air and Treatability Lab-ACMV works" shall be clearly written on top of the sealed cover.

II. The technical bid shall be complete in following:-
a) Complete tender document as purchased from CPCB should be duly signed (each page) for acceptance of all terms and conditions.
b) All the documents as mentioned above point 3 (i) to (iii) of the tender document for fulfilling the eligibility criteria.

6. Earnest money amounting to Rs. 1,88,486/- (Rupees One Lacs Eighty Eight Thousand Four Hundred Eighty Six only) as Demand Draft/FDR in favour of the Central Pollution Control Board, Delhi must be accompanied in each tender application.

7. The site for the work is available/or the site for the work shall be made available for inspection on all working days except on Saturday, Sunday and Public Holidays.

III. a) The contractor should quote in figures as well as in words the rate, and amount tendered by them. The amount for each item should be worked out and the requisite totals given.
b) Special care should be taken to write the rates in figures as well as in words, and the amounts in figures only in such a way that interpolation is not possible. The total amount should be written both in figures and in words. In case of figures, "Rs." should be written before the figures of rupees and "P" after the decimal figures, e.g. Rs. 2.15 P and in case of words, the word 'Rupees' should precede and the word "Paise" should be written at the end. Unless the rates is in only rupees and followed by the words 'only' it should invariably be upto two decimal place. While quoting the rate in schedule of quantities, the words 'only' should be written closely following the amount and it should not be written in the next line.
c) Rates quoted by the contractor in item rate tender in figures and works shall be accurately filled in so that there is no discrepancy in the rates figures and words. However, if a discrepancy is found the rates which correspond with an amount worked out by the contractor shall be taken as correct.
d) If the amount of an item is not worked out by the contractor it does not correspond with the rate written either in figure or in words than the rate quoted by the contractor in words shall be taken as correct.

e) Where the rates quoted by the contractor in figures and in words tally but the amount is not worked out correctly the rate quoted by the Contractor will be taken as correct and not the amount.

IV. The contractor, whose tender is accepted (unless exempted) will be required to furnish by way of security deposit for the fulfillment of his contract such sum as will amount at the rate of 10% of the estimated cost put to tender subject to a maximum upto Rs. 10.00 lakhs.

The security deposit will be collected by deductions from the running bills of the contractor at the rate of 10%. The earnest money deposited at the time of tenders will be released after completion of work, no interest will be paid on it.
The security deposit will be released after the 'defects liability period' subjects to verification of defects. However, the security will be released if the firm/contractor submits the FDR of the said security amount in favour of Central Pollution Control Board valid upto defect liability period.

V. The acceptance of a tender rests with the CPCB, which does not bind itself to accept the lowest tender and reserves itself the authority to reject any or all of the tenders received without assigning any reason. All tenders in whom any of the prescribed conditions are not fulfilled or are incomplete in any respect are liable to be rejected.

CPCB reserves itself the right to accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.

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

VII. All rates to be quoted in the proper form in the tender.

VIII. Any item rate tender containing percentage below/above will be summarily rejected. However, where a tenderer voluntarily offers rebate or payment within a stipulated period, this may be considered.

IX. On acceptance of the tender, the name of the accredited representative (s) of the contractor who would be responsible for taking instructions from CPCB shall be communicated to the CPCB.

X. Sales Tax or any other tax or liability in respect of this contract shall be payable by the contractor and CPCB will not entertain any claim whatsoever in this respect.

XI. The tender for works shall remain open for acceptance for a period of 3 months from the date of opening of tenders. If any tenderer withdraws his tender before the said period or marks any modifications in the terms and conditions of the tender which are not acceptable to CPCB, without prejudice to any other right or remedy, CPCB will be at liberty to go for forfeiting the said earnest money absolutely.

XII. It will be obligatory on the part of the tenderer to tender and sign the tender documents for all the components or parts and that after work is awarded, he will have to enter into an agreement for each component or part with CPCB.

XIII. The contractor should see the site and understand the work requirements and in case of doubt, obtain required particulars, which may in any way influence his tender, from the CPCB as no claim whatsoever will be entertained for any alleged ignorance thereof.

XIV. If it is found that the tender is not submitted in proper manner or contains too many corrections or absurd rates or amounts, it would be summarily rejected by CPCB.

XV. Before submitting the tender, the contractor should visit the site and satisfy himself as to the conditions prevalent there.

XVI. The Contractor shall comply with the provision of the Apprentices Act, 1961, and the rules and orders issued there under from time to time. If fails to do so, his failure will be breach of the contract and the CPCB may in his discretion cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the Act.

XVII. The contractor's responsibility for the contract shall commence from the date of issue of orders of acceptance of tender.

XVIII. Unsealed tenders shall be summarily rejected.

XIX. Before tendering, the contractor shall inspect the site to fully acquaint himself about the condition in regard to accessibility of site and nature of ground, working condition including stacking of materials, installations of T & P etc. conditions affecting accommodation and movement of labour etc. required for the satisfactory execution of the work contract. No claim whatsoever on such account shall be entertained by the department in any circumstances.

XX. The contractor shall submit list of works which have been handled by him in the previous financial year and on the works in hand (progress) in the forms given below.

Works Handled in the Previous Financial Year (2009-10)

Name of work	**Name and particulars of place where work was done**	**Value of work**	**Position of works (In progress/completed)**	**Remarks**
1	2	3	4	5

Works in Hand in the Present Financial Year (2010-11)

Name of work	**Name and particulars of place where work was done**	**Value of work**	**Position of works (In progress/ completed)**	**Remarks**
1	2	3	4	5

LETTER SUBMITTING TENDER

To
Member Secretary
Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
Delhi – 110 032

Sir,

With reference to the tender invited by you for "Renovation of Air and Treatability Lab-ACMV works" in 4th floor at the Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi, I/We do hereby offer to execute the works under 'contract at the respective rates' mentioned in the Bill of Quantities. I/We have seen the site and read the articles of agreement, conditions of contract, specifications and special clauses forming part of the Bill of Quantities. I/We agree to finish the whole of the works within two months as specified in the tender.

I/We have deposited as Earnest Money Rs……. (Rupees …….. Only) by a Bank draft in favour of CPCB, which amount is not to bear any interest. I / We do hereby agree that this sum shall be forfeited by you in the event our tender is accepted and I /We fail to commence the contract when called upon to do so, within a period of one month after award of work.

I/We understand that you are not bound to accept the lowest or any tender that you receive.

Yours faithfully,

Name of partners of the firm.

Name of Bankers

Tenders submitted on ……..

FLOOR : 4 TH FLOOR AIR LABORATORY

AIR-CONDITIONING WORK

S.N	Description	Unit	Qty	Rate (Rs)	Rate in Words	Amount (Rs)
	SUPPLY, INSTALLATION, TESTING, COMMISSIONING & HANDING OVER OF THE FOLLOWINGS					
A	**Variable Refrigerant Volume System** Variable Refrigerant Volume modular type air-conditioning system complete with indoor and out door units with individual corded controller and centralized controller with refrigerant piping, control cabling as per detail given in specifications and having following items: The system shall work in cooling & heating operation. The COP of the equipment shall be 4.31 to 5.0 at 35Deg C out door and 27 Deg C Indoor conditions.Each module should have minimum > 50% inverter compressors.					
	Outdoor Unit					
1	Modular type outdoor units equipped with highly efficient scroll compressors, with one inverter & other constant speed type compressor(s),special acryl precoated heat exchanger,low noise condenser fan,auto check function for connection error, auto address					
a	12 HP **24 x 7 Hour Operation** (For the 4th floor air Lab area) with Multi Connecting Piping Kit	Nos	1			
b	40 HP (For the 4th floor air Lab area) with Multi Connecting Piping Kit	Nos	1			
B	**Indoor Units**					
1	Ceiling Mounted Duct type (High static) indoor unit with direct driven sirocco fan coupled with DC fan motor, 2 step speed control, applicable for middle and high external static pressure, in built electronic expansion valve, washable filter, low operation sound level and thermal protector for fan motor.Maximum unit height should be 480 mm. The indoor unit shall be provided with corded remote controls.					
a	6.54 TR/ 1550 cfm, Unit reference : 4IDU-22	Nos	1			
2	Ceiling Mounted Duct type (High static) indoor unit with direct driven sirocco fan coupled with DC fan motor, 3 step speed control, applicable for middle and high external static pressure, in built electronic expansion valve,in built drain pump, washable filter, low operation sound level and thermal protector for fan motor.Unit should have a Maximum height of 300 mm for easy false ceiling installation. The indoor unit shall be provided with corded remote controls.					
a	1.65 TR / 500 cfm, Unit reference 4IDU19	Nos	1			
b	2.0 TR / 650 cfm, Unit reference 4IDU14	Nos	1			
c	2.0 TR / 650 cfm, Unit reference 4IDU15	Nos	1			
d	2.65 TR / 800 cfm, Unit reference 4IDU20	Nos	1			
e	3.3 TR/ 1100 cfm, Unit reference : 4IDU-37	Nos	1			

f	4.12 TR/ 1200 cfm, Unit reference : 4IDU-21	Nos	1			
3	Ceiling mounted Cassette (Round Flow) type indoor units with 360º airflow for uniform temperature distribution, 3-step control turbo fan with whisper quietness, compact cooling coil, electronic expansion valve, suction air grill, in built drain pump coated with silver ions to prevent slime, mould and bacterial growth, air filter with anti-mould and anti bacterial treatment & decorative panel with dirt repellant coating.					
a	0.65 TR / 200 cfm, Unit reference 4IDU30	Nos	1			
b	0.65 TR / 200 cfm, Unit reference 4IDU31	Nos	1			
c	0.65 TR / 200 cfm, Unit reference 4IDU32	Nos	1			
d	0.65 TR / 200 cfm, Unit reference 4IDU36	Nos	1			
e	0.82 TR / 350 cfm, Unit reference 4IDU13	Nos	1			
f	0.82 TR / 300 cfm, Unit reference 4IDU24	Nos	1			
g	0.82 TR / 450 cfm, Unit reference 4IDU25	Nos	1			
h	0.82 TR / 200 cfm, Unit reference 4IDU26	Nos	1			
i	0.82 TR / 200 cfm, Unit reference 4IDU27	Nos	1			
j	0.82 TR / 200 cfm, Unit reference 4IDU29	Nos	1			
k	0.82 TR / 200 cfm, Unit reference 4IDU35	Nos	1			
l	1.33 TR / 500 cfm, Unit reference 4IDU34	Nos	1			
m	1.65 TR / 450 cfm, Unit reference 4IDU28	Nos	1			
n	2.07 TR / 1000 cfm, Unit reference 4IDU23	Nos	1			
o	2.07 TR / 1200 cfm, Unit reference 4IDU33	Nos	1			
p	2.65 TR / 1200 cfm, Unit reference 4IDU11	Nos	1			
q	2.65 TR / 1200 cfm, Unit reference 4IDU12	Nos	1			
r	4.12 TR / 1800 cfm, Unit reference 4IDU18	Nos	1			
4	High wall mounted type with compact design, low noise, electronic expansion valve, drain pan, air filter, washable grille, auto swing operation with 5-steps of discharge angle. The indoor unit shall be provided with corded remote controls.					
a	0.82 TR / 200 cfm, Unit reference 4IDU16	Nos	1			
b	0.82 TR / 200 cfm, Unit reference 4IDU17	Nos	1			
5	Imported REFnet joints to connect copper piping of the indoor unit onto the main circuit line.					
a	12 HP on the connected line (For the 4th floor air Lab area)	Lot	1			
b	40 HP on the connected line (For the 4th floor air Lab area)	Lot	1			
6	Centralized Air conditioning Management system with touch screen panel to monitor and control the VRV system without the use of BMS .The unit should be able to control temperature, can give error codes, ehnced history function, zonal control option able to control upto 128 indoor units.	Lot	2			
7	**Refrigerant Piping**					

	Interconnecting copper refrigerant pipe work duly insulated with elastomeric nitrile rubber type tubular insulation between indoor & outdoor units as per specifications. All piping inside the room shall be properly supported with hanger and all external piping shall run in covered cably tray					
a	Covered cable tray for exposed piping	m	40			
b	41.3 mm O.D.(insulation - 19 mm thick)	m	20			
c	34.9 mm O.D.(insulation - 19 mm thick)	m	40			
d	28.6 mm O.D.(insulation – 19 mm thick)	m	30			
e	25.4 mm O.D.(insulation – 19 mm thick)	m	32			
f	22.2 mm O.D (Insulation--- 19mm thick)	m	20			
g	19.1 mm O.D.(insulation – 13 mm thick)	m	20			
h	15.9 mm O.D.(insulation – 13 mm thick)	m	40			
i	12.7 mm O.D.(insulation – 13 mm thick)	m	30			
j	9.5 mm O.D. (insulation – 13 mm thick)	m	32			
k	6.4 mm O.D. (insulation – 13 mm thick)	m	20			
8	**Transmission & Control Wiring**					
	Supply & laying of					
a	Communication & control cabling between Indoor and outdoor units in PVC conduit (2 core 1.5 sq.mm)	m	120			
b	**Control Cabling** between Indoor & Wall mounted Remote unit (2 core 1.0 sq.mm)	m	400			
c	**Control cabling** between I-touch and outdoor unit (2 core 1.5 sq.mm)		120			
d	Outdoor stand	Nos	3			
9	**Drain Piping**					
	Rigid PVC piping complete with fittings, supports as per specifications and insulated with 6 mm thick closed cell elastomeric nitrile rubber insulation.					
a	25 mm dia	m	120			
b	32 mm dia	m	140			
c	50 mm dia	m	60			
10	Pressure Testing, Vaccumizing, Additional refrigerant charging-(R410 A)& commisioning of all VRF Refrigerant circuits in the system.	Lot	1			
C	**LOW SIDE WORKS**					
1	**SHEET METAL WORK**					
	Factory fabricated ducts, HITECH make, galvanized duct supports etc.. All ducts shall be factory fabricated on CNC machines and all flanges shall be factory fabricated. Provide 20 Gauge 40 x 40mm angle as reinforced frame for Duct. The reinforced frames shall be at every 1200mm.					
	GI Ducting :					
a	24 Gauge	sqm	120			
b	22 Gauge	sqm	20			
c	20 Gauge	sqm	0			

2	Powder Coated aluminum air terminals of reputed make. The samples shall be submitted and got approved from the project engineer and architect before delivering to site.					
	Extended plate **Supply air diffusers** with VCD and perforated plate cover with air deflectors fitted behind this cover plate.					
a	225mm x 225 mm neck size	Nos	16			
b	300mm x 300mm neck size	Nos	8			
c	375mm x 375mm neck size	Nos	2			
3	Extended plate **Return air diffusers** with perforated plate cover.					
a	225mm x 225 mm neck size	Nos	10			
b	300mm x 300mm neck size	Nos	3			
c	375mm x 375mm neck size	Nos	2			
4	Linear Return Air Grilles					
a	Return air linear grille 50mm	m	32			
b	Return air linear grille 100mm	m	12			
5	**SITCH of MS Volume Control Dampers** with gears for easy operation and locks for locking in position at Unit outlets and in Ducts	sqm	6			
6	**Display unit**					
	Electronic type dual display of Temperature & Relative humidity unit wall mounted or pendent type including Cabinet, in built-sensing element, Battery and Cables etc., the range between 0 ~ 100%RH, -32 ~ 158°F (0 ~ 70°C), the Temperature display have fucntions of Degrees Celsius, Degrees Fahrenheit.The dimensions of unit will be minimum 300x120mm. Most reliable and better repeatablity.	Nos	3			
	Electronic type barometric pressure display unit, wall mounted type, with inbuilt sensors, battery etc., the pressure rangel will be 800-1100 m bar, Display shall hve the functions of pressure output is user selectable in these units: kPa, mbar, mmHg, inHg, inH2O.The dimensions of unit will be minimum 300x120mm. Most reliable and better repeatablity.	Nos	3			
	Magnahelic Gauges across room for differential pressure. This includes S.S. box to mount these units and necessary tubing and other accessories to get these unit functioning.(0 - 6 mm Of W.G.)	Nos	3			
7	**INSULATION WORK**					
	SITCH Thermal insulation of 25kg / m³ Electron Beam (physically) crosslinked polyolefin foam / 50-55 kg / m³ density closed cell nitrile rubber, Duct insulation of with adhesive and aluminum foil..					
a	Ducts run inside the Building 9 mm thickness	sqm	200			
b	Ducts run External building 13 mm thickness	sqm	180			

8	**ACOUSTIC INSULATION- DUCT**					
	SITCH of 10mm thick, 30 KG/ m³ crosslinked closed polyolefin open cell foam / 140-180 kg / m³ density open cell elestomeric nitril rubber acoustic insulation on inner surface of duct. Acoustic insulation shall be fastened and stuck properly.	sqm	50			
9	**ASSOCIATED ELECTRICAL WORKS**					
	Electrical and Control connections from control panel to Indoor unit and air cooled condensing unit with flexible PVC insulated PVC sheathed copper cables of recommended size. Provide isolating switch near each Condensing unit for safety of maintenance staff.	sqm	4			
				TOTAL		
10	**AMC (Annual Maintenance Contract for AC system)**					
	Charges for all inclusive of comprehensive annual maintenance (AMC) after completion of one year warranty period. This shall include replacement of failure parts of the units within one hour. Complete stock of replacement parts to be kept at site.					
a	First Year AMC for all above VRF/ VRV Indoor and Out door units	hp	52			
b	Second Year AMC for all above VRF/ VRV Indoor and Out door units	hp	52			
c	Third Year AMC for all above VRF/ VRV Indoor and Out door units	hp	52			
d	Fourth Year AMC for all above VRF/ VRV Indoor and Out door units	hp	52			
e	Fifth Year AMC for all above VRF/ VRV Indoor and Out door units	hp	52			
				TOTAL		

Notes :-

1.1 The price shall be quoted on works contract basis, delivered, erected, tested, commissioned and handed over at site, All items of work like customs duty excise duty, sales tax, VAT etc., If any shall be deemed to have been included within the quoted price

1.2 Tax on work contract, if applicable, shall be indicated separately, further all details of application of such tax shall be furnished in details

1.3 Prices shall be firm throughout the period the contract is in force

1.4 The tenderes shall furnish without fail item wise break-up of prices as shown in the price schedule.

1.5 The Unit rates shall apply o any variation in items of work like ducting, piping, insulation, cables, cable trays, earthing conductors. Etc,. Prices shall be firm throughout the period the contract is in force

FLOOR : 4 TH FLOOR TREATABILITY LABORATORY

AIR-CONDITIONING WORK **REV-0** **DATE:12.12.**

S.No.	Description	Unit	Qty	Rate (Rs)	Rate in Words	Amount (Rs)
	SUPPLY, INSTALLATION, TESTING, COMMISSIONING & HANDING OVER OF THE FOLLOWINGS					
A	**Variable Refrigerant Volume System** Variable Refrigerant Volume modular type air-conditioning system complete with indoor and out door units with individual corded controller and centralized controller with refrigerant piping, control cabling as per detail given in specifications and having following items: The system shall work in cooling & heating operation. The COP of the equipment shall be 4.31 to 5.0 at 35Deg C out door and 27 Deg C Indoor conditions.Each module should have minimum > 50% inverter compressors.					
	Outdoor Unit					
1	Modular type outdoor units equipped with highly efficient scroll compressors, with one inverter & other constant speed type compressor(s),special acryl precoated heat exchanger,low noise condenser fan,auto check function for connection error, auto address					
a	20 HP (for the 4th floor Treatability area) with Multi Connecting Piping Kit.	Nos	1			
B	**Indoor Units**					
1	Ceiling Mounted Duct type (High static) indoor unit with direct driven sirocco fan coupled with DC fan motor, 2 step speed control, applicable for middle and high external static pressure, in built electronic expansion valve, washable filter, low operation sound level and thermal protector for fan motor.Maximum unit height should be 480 mm. The indoor unit shall be provided with corded remote controls.					
a	8.19 TR/ 3500 cfm, Unit reference :	Nos	0			
2	Ceiling Mounted Duct type (High static) indoor unit with direct driven sirocco fan coupled with DC fan motor, 3 step speed control, applicable for middle and high external static pressure, in built electronic expansion valve,in built drain pump, washable filter, low operation sound level and thermal protector for fan motor.Unit should have a Maximum height of 300 mm for easy false ceiling installation. The indoor unit shall be provided with corded remote controls.					
a	1.65 TR / 600 cfm, Unit reference 4IDU07	Nos	1			
b	2.64 TR / 1000 cfm, Unit reference 4IDU10	Nos	1			
c	2.64 TR / 1100 cfm, Unit reference 4IDU03	Nos	1			

3	Ceiling mounted Cassette (Round Flow) type indoor units with 360º airflow for uniform temperature distribution, 3-step control turbo fan with whisper quietness, compact cooling coil, electronic expansion valve, suction air grill, in built drain pump coated with silver ions to prevent slime, mould and bacterial growth, air filter with anti-mould and anti bacterial treatment & decorative panel with dirt repellant coating. The indoor unit shall be provided with corded remote controls.					
a	1.05 TR / 250 cfm, Unit reference 4IDU01	Nos	1			
b	1.65 TR / 600 cfm, Unit reference 4IDU04	Nos	1			
c	1.65 TR / 600 cfm, Unit reference 4IDU08	Nos	1			
d	2.07 TR / 1200 cfm, Unit reference 4IDU02	Nos	1			
4	High wall mounted type with compact design, low noise, electronic expansion valve, drain pan, air filter, washable grille, auto swing operation with 5-steps of discharge angle. The indoor unit shall be provided with corded remote controls.					
a	1.05 TR / 400 cfm, Unit reference 4IDU05	Nos	1			
b	0.82 TR / 300 cfm, Unit reference 4IDU06	Nos	1			
c	0.82 TR / 300 cfm, Unit reference 4IDU09	Nos	1			
5	REFnet joints to connect copper piping of the indoor unit onto the main circuit line.					
a	20 HP on the connected line (for the entire Treatability Lab area)	Lot	1			
6	Centralized Air conditioning Management system with touch screen panel to monitor and control the VRV system without the use of BMS .The unit should be able to control temperature, can give error codes, ehnced history function, zonal control option able to control upto 128 indoor units.	Lot	1			
7	**Refrigerant Piping**					
	Interconnecting copper refrigerant pipe work duly insulated with elastomeric nitrile rubber type tubular insulation between indoor & outdoor units as per specifications. All piping inside the room shall be properly supported with hanger and all external piping shall run in covered cably tray					
a	Covered cable tray for exposed piping	m	12			
b	41.3 mm O.D.(insulation - 19 mm thick)	m				
c	34.9 mm O.D.(insulation - 19 mm thick)	m	0			
d	28.6 mm O.D.(insulation – 19 mm thick)	m	18			
e	25.4 mm O.D.(insulation – 19 mm thick)	m	12			
f	22.2 mm O.D (Insulation--- 19mm thick)	m	22			
g						
h	19.1 mm O.D.(insulation – 13 mm thick)	m	0			
i	15.9 mm O.D.(insulation – 13 mm thick)	m	22			
j	12.7 mm O.D.(insulation – 13 mm thick)	m	18			
k	9.5 mm O.D. (insulation – 13 mm thick)	m	12			
l	6.4 mm O.D. (insulation – 13 mm thick)	m	22			

8	**Transmission & Control Wiring**					
	Supply & laying of					
a	Communication & control cabling between Indoor and outdoor units in PVC conduit (2 core 1.5 sq.mm)	m	60			
b	**Control Cabling** between Indoor & Wall mounted Remote unit (2 core 1.0 sq.mm)	m	220			
c	**Control cabling** between I-touch and outdoor unit (2 core 1.5 sq.mm)		60			
d	Outdoor stand	Nos	1			
9	**Drain Piping**					
	Rigid PVC piping complete with fittings, supports as per specifications and insulated with 6 mm thick closed cell elastomeric nitrile rubber insulation.					
	25 mm dia	m	30			
	32 mm dia	m	10			
	50 mm dia	m	0			
10	Pressure Testing, Vaccumizing, Additional refrigerant charging-(R410 A)& commisioning of all VRV / VRF Refrigerant circuits in the system.	Lot	1			
C	**LOW SIDE WORKS**					
1	**DX AC SPLIT UNITS**					
	Air cooled factory tested dx packaged unit and shall contain scroll compressor high efficient evaporator coil, hp/lp cut out contactors for the condenser fans sporian expansion valve, high efficient cooling coil etc. Reverse voltage indication with microprocessor based control panel shall be the part of the package. The unit shall comprise high efficient condenser coil fans and fan isolators. The fan motor speed shall not exceed more than 900 rpm and the noise to be below 55 db with out ducting. Microprocessor based control panel with an inter locking arrangement and status indication of the compressor shall be part of the system.					
	the scope will including Installation of the above units with Testing , Commissioning & Gas charging, voltage stabilisers for the above units					
a	1.65 TR Tag No: 4 IDU05a (GC room) work only at night mode.	No	1			
2	**SHEET METAL WORK**					
	Factory fabricated ducts, HITECH make, galvanized duct supports etc.. All ducts shall be factory fabricated on CNC machines and all flanges shall be factory fabricated. Provide 20 Gauge 40 x 40mm angle as reinforced frame for Duct. The reinforced frames shall be at every 1200mm.					
	GI Ducting :					
	24 Gauge	sqm	40			
	22 Gauge	sqm	12			
	20 Gauge	sqm	0			

2	Powder Coated aluminum air terminals of reputed make. The samples shall be submitted and got approved from the project engineer and architect before delivering to site.					
	Extended plate **Supply air diffusers** with VCD and perforated plate cover with air deflectors fitted behind this cover plate.					
a	225mm x 225 mm neck size	Nos	16			
b	300mm x 300mm neck size	Nos	8			
c	375mm x 375mm neck size	Nos	2			
3	Extended plate **Return air diffusers** with perforated plate cover.					
a	225mm x 225 mm neck size	Nos	10			
b	300mm x 300mm neck size	Nos	4			
c	375mm x 375mm neck size	Nos	2			
4	Linear Return Air Grilles					
	Return air linear grille 50mm	m	90			
	Return air linear grille 100mm	m	20			
5	**SITCH of MS Volume Control Dampers** with gears for easy operation and locks for locking in position at Unit outlets and in Ducts	sqm	2			
6	**Display unit**					
a	Electronic type dual display of Temperature & Relative humidity unit wall mounted or pendent type including Cabinet, in built-sensing element, Battery and Cables etc., the range between 0 ~ 100%RH, -32 ~ 158°F (0 ~ 70°C), the Temperature display have fucntions of Degrees Celsius, Degrees Fahrenheit.The dimensions of unit will be minimum 300x120mm. Most reliable and better repeatablity.	No	1			
b	Electronic type barometric pressure display unit, wall mounted type, with inbuilt sensors, battery etc., the pressure rangel will be 800-1100 m bar, Display shall hve the functions of pressure output is user selectable in these units: kPa, mbar, mmHg, inHg, inH2O.The dimensions of unit will be minimum 300x120mm. Most reliable and better repeatablity.	No	1			
c	Magnahelic Gauges across room for differential pressure. This includes S.S. box to mount these units and necessary tubing and other accessories to get these unit functioning.(0 - 6 mm Of W.G.)	No	1			
7	**INSULATION WORK**					
	SITCH Thermal insulation of 25kg / m^3 Electron Beam (physically) crosslinked polyolefin foam / 50-55 kg / m^3 density closed cell nitrile rubber, Duct insulation of with adhesive and aluminum foil..					
a	Ducts run inside the Building 9 mm thickness	sqm	30			
b	Ducts run External building 13 mm thickness	sqm	20			

8	ACOUSTIC INSULATION- DUCT					
	SITCH of 10mm thick, 30 KG/ m^3 crosslinked closed polyolefin open cell foam / 140-180 kg / m^3 density open cell elestomeric nitril rubber acoustic insulation on inner surface of duct. Acoustic insulation shall be fastened and stuck properly.	sqm	18			
9	ASSOCIATED ELECTRICAL WORKS					
	Electrical and Control connections from control panel to Indoor unit and air cooled condensing unit with flexible PVC insulated PVC sheathed copper cables of recommended size. Provide isolating switch near each Condensing unit for safety of maintenance staff.	sqm	2			
10	AMC (Annual Maintenance Contract for AC system)					
	Charges for all inclusive of comprehensive annual maintenance (AMC) after completion of one year warranty period. This shall include replacement of failure parts of the units within one hour. Complete stock of replacement parts to be kept at site.					
a	First Year AMC for all above VRF/ VRV Indoor and Out door units	hp	20			
b	Second Year AMC for all above VRF/ VRV Indoor and Out door units	hp	20			
c	Third Year AMC for all above VRF/ VRV Indoor and Out door units	hp	20			
d	Fourth Year AMC for all above VRF/ VRV Indoor and Out door units	hp	20			
e	Fifth Year AMC for all above VRF/ VRV Indoor and Out door units	hp	20			
				TOTAL		

Notes :-

1.1 The price shall be quoted on works contract basis, delivered, erected, tested, commissioned and handed over at site, All items of work like customs duty excise duty, sales tax, VAT etc., If any shall be deemed to have been included within the quoted price

1.2 Tax on work contract, if applicable, shall be indicated separately, further all details of application of such tax shall be furnished in details

1.3 Prices shall be firm throughout the period the contract is in force

1.4 The tenderes shall furnish without fail item wise break-up of prices as shown in the price schedule.

1.5 The Unit rates shall apply o any variation in items of work like ducting, piping, insulation, cables, cable trays, earthing conductors. Etc,. Prices shall be firm throughout the period the contract is in force

FLOOR : 4 TH FLOOR AIR LABORATORY

MECHANICAL VENTILATION WORK

S.N	Description	Unit	Qty	Rate (Rs)	Rate in Words	Amount (Rs)
	SUPPLY, INSTALLATION, TESTING, COMMISSIONING & HANDING OVER OF THE FOLLOWINGS (Suitable for Outdoor Installation)					
1.0	**SUPPLY AIR FANS**					
	All sheet metal double skin cabinet type Exhaust air unit, Fan section consisting of backward/ forward curved DIDW fan with motor, belt, with belt drive and motor located within casing, vibration isolators, fan outlet flexible connector etc.. The noise level of unit will be 70dB. The capacities and other details are as under:					
	The Unis shall consist of 3 stage of filter on the air entry of Cabinet fans, pre filter 10 micron(grade G3) fine filters of 5 micron (F5). The unit shall quoted with all filters with required all accessories.					
2.0	**Wall Mounted Exhaust fans**					
a	Wall Mounted Aerofoil type Exhaust fans, shall be mounted on the wall, out side should have Auto Louver, Capacity of fan 600 cfm	Nos	1			
3.0	**EXHAUST SCRUBBERS**					
	Horizontal/vertical packed bed wet type fume scrubber, Each scrubber shall have a capacities Listed below in cfm with a minimum acid removal efficiency of 99% for total acid substance of air, each scrubber consist of A bed of spherical packings made of polypropelene (UV resistant) supported with corrosion resistant plastic members designed to reduce solids build up. Spray section comprising liquid distributor, PVC make spray header banks with removable PVC nozzles, PVC (schedule-80) piping and fittings with ball valves to regulate. Polypropelene mesh pad type or PVC chevron blade type mist-eliminator capable of removing 99% of entrained moisture from air stream. Liquid re-circulation system of each scrubber will have 2 nos. stainless steel-316, vertical sump pump (1 running + 1 standby) with high efficiency drive motor, supports, covered external sump made of fiberglass reinforced polyester material, SS-strainer, pressure gauge diaphram type, with valve at inlet and outlet (wetted parts of the gauges shall be made of SS-316),					

	shut off valves (butterfly type) at inlet & outlet, check valves at outlet and other fittings. The piping and fittings shall be of SS 316, schedule 40. All the valves shall be of SS 316. The valves of size as per Unit size. The butterfly valves, check valves and strainers shall be PN-12. Water circulating pump shall be of submercible type with suitable capacity. The internal water sump shall be provided with make up connection with SS-solenoid valve & isolating ball valve, quick fill connection with ball valve, drain connection with solenoid valve, SS-level switches with alarm, overflow connection and interconnecting piping etc.					
a	Supply of Centrifugal Exhaust Blower MS/ FRP construction Using backward curved impeller, belt driven with suitable motor, 1950 cfm capacity at 150 mm WG static pressure Ref: 4E 11.	No	1			
b	Supply of Centrifugal Exhaust Blower MS/ FRP construction Using backward curved impeller, belt driven with suitable motor, 600 cfm capacity at 150 mm WG static pressure ref : 4E 13.	No	1			
c	Supply of Centrifugal Exhaust Blower MS/ FRP construction Using backward curved impeller, belt driven with suitable motor, 300 cfm capacity at 150 mm WG static pressure ref : 4E 12	No	1			
	Note: the pumps & tanks will be in the 3rd floor water lab scope, the crubber piping taping will be tanken from the booster set header					
d	Cpvc Pipes for scrubber connection dia 32mm	m	40			
e	Cpvc Pipes for scrubber connection dia 25 mm	m	20			
f	PP/FRP ducting using 3 mm PP with 3 MM thick FRP lining	sqm	75			
4.0	**SHEET METAL WORK**					
	Factory fabricated ducts, HITECH supports, galvanized duct supports etc.. All ducts shall be factory fabricated on CNC machines and all flanges shall be factory fabricated. Provide 20 Gauge 40 x 40mm angle as reinforced frame for Duct. The reinforced frames					
	GI Ducting :					
a	24 Gauge	sqm	80			
b	22 Gauge	sqm	20			
c	20 Gauge	sqm	0			
4.1	**FLEXIBLE DUCT**					
a	The elephant trunk type flexible pipe connection suitable of connecting to the exhaust duct as per the design drawing. The materiial of flexible duct, PVC / Aluminim with foil complete with canopy type inlet terminal	Nos	2			

b	The ROBO arm thpe flexible pipe suitable of connecting to the exhaust ducts as per the design drawing.	Nos	2			
c	FUME HOOD CONNECTIONS: The fixed hood connection to be made to the proposed exhaust ducts. The connection shall be of GI / Flexible duct with control damper.dia 150mm Each Length will be 1200mm Long	Nos	21			
4.2	**PVC PIPES for Fresh air Supply**					
	FA duct / pipes with out side louvers, mesh with complete arrangements. The PVC pipes shall be of 2.5kg/cm2 class-1.connection from FA GI duct and for all Cassette units dia 100mm					
a	dia 200mm	m	0			
b	dia 150mm	m	28			
c	dia 100mm	m	30			
5.0	**Extruded aluminum power coated Supply and exhaust Louvers.**					
a	Supply air Louver	sqm	7			
b	Exhaust air Louver	sqm	7			
c	450mm x 250mm or 300/450mm Access door (to release the FD by manually)	Nos	5			
d	MS Volume control damper for Ducts	sqm	2			
6.0	**Fire Dampers**					
	SITCH of Slab / Wall mounted Fire dampers of UL 555 Certification with Belimo Actuators actuated with the help of 24 V electric actuator and as per specifications excluding actuator inclusive of interconnection with Control Cable to actuator from Potential Free Contact in Fire Alarm Panel. (The control cable from Potential Free Contact of fire Panel has to be brought up to each AHU room by fire Alarm Contractor)					
	For all ducts crossing the floors / external peripheral wall	sqm	2			
	Linkage complete with Belimo Actuator	Nos	3			
7.0	All related Civil works	Lot	1			
8.0	**ELECTRICAL WORK**					
a	**Panels**					
	Supply, erection, testing, commissioning & handing over of MCCs as per specifications & comprising of MCCB's combination fuse switch units, MCBs, contactors, overload relays, control transformers, current transformers, relays, timers, ammeters, voltmeters, kW hour meter, LED type indicating lamps, push buttons etc,.complete in 16 G MS cubical type panel with horizontal & vertical bus bars, bus bar chamber, earth bus cable alley, hinged doors 75x50mm MS base frame etc,.					
	MCC - 1 (as per specification) for Exhaust fans	set	1			
	MCC - 2 (as per specification) for Scrubber	set	3			

	Units					
b	**Push button station:**					
	Supply, fixing testing & commissioning of pushbutton station complete with 1 no. ON push button & 1 No.OFF push button with key etc,. Complete, housed in 16G MS / CI box grouted to brick wall for fan motors	Nos	6			
c	**LT Power cables**					
	Supply & laying of 1100 V, medium voltage, PVC insulated multicore copper conductor cables conforming to IS 694 /1990. The cables shall be laid on cable trays.					
	3 C 6 Sqm copper cable	m				
	3 C 4 Sqm copper cable	m	50			
	3 C 2.5 Sqm copper cable	m	50			
	3 C 1.5 Sqm copper cable	m	50			
d	**Control cables:**					
	Supply & laying of copper conductor control cables as per specification. The cable shall be laid as indicated above for remote Push Button stations. The cable shall be laid indoor / outdoor on cable tray / wall.					
	4 C 2.5 Sqm	m	600			
e	**LT Cable End Terminations:**					
	Supply & providing cable end terminations for power & control cables using tinned copper lugs, compressed brass glands, taping, griping, individual earthing of glands etc,. Complete for the listed cables:					
	Power cable 3 C 6 Sqm	Nos	4			
	Power cable 3 C 1.5 Sqm	Nos	4			
	Control cable 4 C 4 Sqm	Nos	1			
	Control cable 4 C 2.5 Sqm	Nos	1			
f	**Earthing Conductors :**					
	Supply & providing Electrolytic copper earth conductors along with cables on cable trays / wall. All joints shall be brazed. Equipment earthing shall be through earthing sockets.					
	25 x 3 mm copper flat	m	50			
g	Supply end erection of profab or equivalent make perforated GI slotted ladder type cable trays of the following sizes. The rate quoted shall included bends, offsets, Tees, etc,.					
	150mm Wide x 75 mm high	m	30			
	300mm Wide x 50mm high	m	40			
h	MS supports for cable Trays using angles, Channels, Tees, Flats. Etc,. All MS supports shall be of synthetic enamel paint of approved colour.	sqm	80			
				TOTAL		
9	**AMC (Annual Maintenance Contract for VENTILATION & SCRUBBER system)**					

	Charges for all inclusive of comprehensive annual maintenance (AMC) after completion of one year warranty period. This shall include replacement of failure parts of the units, belts, Filters etc. Complete stock of replacement parts to be kept at site.					
a	First Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
b	Second Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
c	Third Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
d	Fourth Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
e	Fifth Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
				TOTAL		

Notes :-

1.1 The price shall be quoted on works contract basis, delivered, erected, tested, commissioned and handed over at site, All items of work like customs duty excise duty, sales tax, VAT etc., If any shall be deemed to have been included within the quoted price

1.2 Tax on work contract, if applicable, shall be indicated separately, further all details of application of such tax shall be furnished in details

1.3 Prices shall be firm throughout the period the contract is in force

1.4 The tenderes shall furnish without fail item wise break-up of prices as shown in the price schedule.

1.5 The Unit rates shall apply o any variation in items of work like ducting, piping, insulation, cables, cable trays, earthing conductors. Etc,. Prices shall be firm throughout the period the contract is in force

FLOOR : 4 TH FLOOR TREATABILITY LABORATORY

MECHANICAL VENTILATION WORK **REV-0**

S.N.	Description	Unit	Qty	Rate (Rs)	Rate in Words	Amount (Rs)
	SUPPLY, INSTALLATION, TESTING, COMMISSIONING & HANDING OVER OF THE FOLLOWINGS (Suitable for Outdoor Installation)					
1.0	**SUPPLY AIR FANS**					
	All sheet metal double skin cabinet type Exhaust air unit, Fan section consisting of backward/ forward curved DIDW fan with motor, belt, with belt drive and motor located within casing, vibration isolators, fan outlet flexible connector etc.. The noise level of unit will be 70dB. The capacities and other details are as under:					
	The Unis shall consist of 3 stage of filter on the air entry of Cabinet fans, pre filter 10 micron(grade G3) fine filters of 5 micron (F5). The unit shall quoted with all filters with required all accessories.					
a	Air Quantity of 1700 CFM, 40mm WG ESP, for Lab Equipment room	No	1			
2.0	**EXHAUST FANS**					
	All sheet metal double skin cabinet type Exhaust air unit, Fan section consisting of backward/ forward curved DIDW fan with motor, VFD to suit the motor HP, belt, with belt drive and motor located within casing, vibration isolators, fan outlet flexible connector etc.. The noise level of unit will be 70dB. The capacities and other details are as under:					
a	Air Quantity of 300 CFM, 40mm WG ESP, for Cylinder Room (with out VFD)	No	1			
3.0	**EXHAUST SCRUBBERS**					
	Horizontal/vertical packed bed wet type fume scrubber, Each scrubber shall have a capacities Listed below in cfm with a minimum acid removal efficiency of 99% for total acid substance of air, each scrubber consist of A bed of spherical packings made of polypropelene (UV resistant) supported with corrosion resistant plastic members designed to reduce solids build up. Spray section comprising liquid distributor, PVC make spray header banks with removable PVC nozzles, PVC (schedule-80) piping and fittings with ball valves to regulate. Polypropelene mesh pad type or PVC chevron blade type mist-eliminator capable of removing 99% of entrained moisture from air stream. Liquid re-circulation system of each scrubber will have 2 nos. stainless steel-316, vertical sump pump (1 running + 1 standby) with high efficiency drive motor, supports, covered external sump made of fiberglass reinforced polyester material, SS-strainer, pressure gauge diaphram type, with valve at inlet and outlet (wetted parts of the gauges shall be made of SS-316),					

	shut off valves (butterfly type) at inlet & outlet, check valves at outlet and other fittings. The piping and fittings shall be of SS 316, schedule 40. All the valves shall be of SS 316. The valves of size as per Unit size. The butterfly valves, check valves and strainers shall be PN-12. Water circulating pump shall be of submercible type with suitable capacity. The internal water sump shall be provided with make up connection with SS-solenoid valve & isolating ball valve, quick fill connection with ball valve, drain connection with solenoid valve, SS-level switches with alarm, overflow connection and interconnecting piping etc.					
a	Supply of Centrifugal Exhaust Blower MS/ FRP construction Using backward curved impeller, belt driven with suitable motor 2000 cfm capacity at 150 mm WG static pressure ref: 4 TR E 01	No	1			
b	PP/FRP ducting using 3 mm PP with 3 MM thick FRP lining	sqm	20			
c	Cpvc pipes dia 25mm dia water line to connetct the scrubber	m	30			
4.0	**SHEET METAL WORK**					
	Factory fabricated ducts, HITECH supports, galvanized duct supports etc.. All ducts shall be factory fabricated on CNC machines and all flanges shall be factory fabricated. Provide 20 Gauge 40 x 40mm angle as reinforced frame for Duct. The reinforced frames					
	GI Ducting :					
a	24 Gauge	sqm	20			
b	22 Gauge	sqm	0			
c	20 Gauge	sqm	0			
4.1	**FLEXIBLE DUCT**					
a	The elephant trunk type flexible pipe connection suitable of connecting to the exhaust duct as per the design drawing. The materiial of flexible duct, PVC / Aluminim with foil complete with canopy type inlet terminal	Nos	0			
b	The ROBO arm thpe flexible pipe suitable of connecting to the exhaust ducts as per the design drawing.	Nos	0			
c	FUME HOOD CONNECTIONS: The fixed hood connection to be made to the proposed exhaust ducts. The connection shall be of GI / Flexible duct with control damper.dia 150mm Each Length will be 1200mm Long	Nos	0			
4.2	**PVC PIPES for Fresh air Supply**					
	FA duct / pipes with out side louvers, mesh with complete arrangements. The PVC pipes shall be of 2.5kg/cm2 class-1.connection from FA GI duct and for all Cassette units dia 100mm					
a	dia 200mm	m	0			
b	dia 150mm	m	8			
c	dia 100mm	m	20			

5.0	**Extruded aluminum power coated Supply and exhaust Louvers.**					
a	Supply air Louver	sqm	3			
b	Exhaust air Louver	sqm	3			
c	450mm x 250mm or 300/450mm Access door (to release the FD by manually)	Nos	4			
d	MS Volume control damper for Ducts	sqm	2			
6.0	**Fire Dampers**					
	SITCH of Slab / Wall mounted Fire dampers of UL 555 Certification with Belimo Actuators actuated with the help of 24 V electric actuator and as per specifications excluding actuator inclusive of interconnection with Control Cable to actuator from Potential Free Contact in Fire Alarm Panel. (The control cable from Potential Free Contact of fire Panel has to be brought up to each AHU room by fire Alarm Contractor)					
	For all ducts crossing the floors / external peripheral wall	sqm	2			
	Linkage complete with Belimo Actuator	Nos	4			
7.0	**All related Civil works**	Lot	1			
8.0	**ELECTRICAL WORK**					
a	**Panels**					
	Supply, erection, testing, commissioning & handing over of MCCs as per specifications & comprising of MCCB's combination fuse switch units, MCBs, contactors, overload relays, control transformers, current transformers, relays, timers, ammeters, voltmeters, kW hour meter, LED type indicating lamps, push buttons etc,.complete in 16 G MS cubical type panel with horizontal & vertical bus bars, bus bar chamber, earth bus cable alley, hinged doors 75x50mm MS base frame etc,.					
	MCC - 1 (as per specification) for Exhaust fan	set	1			
	MCC - 2 (as per specification) for Scrubbers unit	set	1			
b	**Push button station:**					
	Supply, fixing testing & commissioning of pushbutton station complete with 1 no. ON push button & 1 No.OFF push button with key etc,. Complete, housed in 16G MS / CI box grouted to brick wall for fan motors	Nos	1			
c	**LT Power cables**					
	Supply & laying of 1100 V, medium voltage, PVC insulated multicore copper conductor cables conforming to IS 694 /1990. The cables shall be laid on cable trays.					
	3 C 6 Sqm copper cable	m				
	3 C 4 Sqm copper cable	m	0			
	3 C 2.5 Sqm copper cable	m	40			
	3 C 1.5 Sqm copper cable	m	80			
d	**Control cables:**					

	Supply & laying of copper conductor control cables as per specification. The cable shall be laid as indicated above for remote Push Button stations. The cable shall be laid indoor / outdoor on cable tray / wall.					
	4 C 2.5 Sqm	m	120			
e	**LT Cable End Terminations:**					
	Supply & providing cable end terminations for power & control cables using tinned copper lugs, compressed brass glands, taping, griping, individual earthing of glands etc,. Complete for the listed cables:					
	Power cable 3 C 6 Sqm	Nos	1			
	Power cable 3 C 1.5 Sqm	Nos	1			
	Control cable 4 C 4 Sqm	Nos	0			
	Control cable 4 C 2.5 Sqm	Nos	0			
f	**Earthing Conductors :**					
	Supply & providing Electrolytic copper earth conductors along with cables on cable trays / wall. All joints shall be brazed. Equipment earthing shall be through earthing sockets.					
	25 x 3 mm copper flat	m	20			
g	Supply end erection of profab or equivalent make perforated GI slotted ladder type cable trays of the following sizes. The rate quoted shall included bends, offsets, Tees, etc,.					
	150mm Wide x 75 mm high	m	15			
	300mm Wide x 50mm high	m	0			
h	MS supports for cable Trays using angles, Channels, Tees, Flats. Etc,. All MS supports shall be of synthetic enamel paint of approved colour.	sqm	80			
				TOTAL		
9	**AMC (Annual Maintenance Contract for Ventilation & Scrubber system)**					
	Charges for all inclusive of comprehensive annual maintenance (AMC) after completion of one year warranty period. This shall include replacement of failure parts of the units, belts, Filters etc. Complete stock of replacement parts to be kept at site.					
a	First Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
b	Second Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
c	Third Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
d	Fourth Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
e	Fifth Year AMC for all above Mechanical Ventilation + Scrubber system	Lot	1			
				TOTAL		

Notes :-

1.1 The price shall be quoted on works contract basis, delivered, erected, tested, commissioned and handed over at site, All items of work like customs duty excise duty, sales tax, VAT etc., If any shall be deemed to have been included within the quoted price

1.2 Tax on work contract, if applicable, shall be indicated separately, further all details of application of such tax shall be furnished in details

1.3 Prices shall be firm throughout the period the contract is in force

1.4 The tenderes shall furnish without fail item wise break-up of prices as shown in the price schedule.

1.5 The Unit rates shall apply o any variation in items of work like ducting, piping, insulation, cables, cable trays, earthing conductors. Etc,. Prices shall be firm throughout the period the contract is in force

The drawings are attached with the tender document and will be issued at the time of purchase of tender. However, interested bidder can see the drawings in the office of I/c, building before purchase of tender.

SECTION- 1

GENERAL

About Project:

This CPCB (PARIVESH BHAWAN) building is renovation project from existing building, the location of the building is New Delhi. This covers complete air-conditioning and mechanical ventilation services. This project will be taken up in phases and the phases are planned 3 rd floor, 4th floor Air lab and 4th floor Treatability lab. The existing building is GF+5+Terrce floors and the ceiling height is approximately 3.5 to 3.2 m. Total building height is16m.

- All commercial floors are occupied by CPCB- Government of INDIA.The Purposes of the building is official and related Laboratories.

- The First phase of this project will be 3rd floor water Laboratory, where Fresh water Laboratory , Waste water laboratory, department heads and workstations for staffs. The area of 3 rd floor laboratory is 621 sqm. The dimensions is 54m x 11.5m

- At 4th Floors have few of rooms Split / Window Air conditioners. Which are old and delivering poor efficiencies. The contractor shall take all old units and the price discounts to be shown on the price bid.

GENERAL

- All workmanship and materials used in the installation shall be of the highest quality and, where not fully covered by this Specification, shall conform with best modern practice, as determined by the Engineer.

- The entire installation shall comply fully with all relevant requirements of governmental and local authorities and the equipment provided for the installation shall comply in all respects.

- All electrical work associated with the installation shall comply with the requirements of the Municipal Authorities and be carried out in accordance with the "Standard Regulations".

- Alternative equipment, materials or apparatus from those that are noted or required on the drawings and/or in the Specifications, may only be offered and supplied on the written approval of such equipment, material or apparatus by the Engineer.

- In cases where all the necessary information is not supplied by the tendered, then the Engineer's decision shall be final.

- The materials and works shall be in accordance with the following standards and codes of practice where applicable:

It is renovation project from existing building, the location of the building is New Delhi. This covers complete air-conditioning and mechanical ventilation services. This project will be taken up in phases and the phases are planned 3 rd floor, 4th floor Air lab and 4th floor Treatability lab. The existing building is GF+5+Terrce floors and the ceiling height is approximately 3.5 to 3.2 m. Total building height is16m.

In the first phase only 3 rd floor water laboratory, where Fresh water laboratory , Waste water laboratory, department heads and workstations for staffs. The area of 3 rd floor laboratory is 621 sqm. The dimensions is 54m x 11.5m.

BASIS OF DESIGN

1. Ambient Design Condition

Summer	43.3 deg C
	23.9 deg C
Monsoon	35.0 deg C
	26.7 deg C
Winter	7.2 deg C
	5.0 deg C

2. Inside summer 24±1°C DB / 50 % RH

Ventilation Area 36+2 °C

3. HEAT GAIN

Occupancy load (Office or Residence)	67 / 35 W per person Sensible / Latent
Lighting - Office or Residential	20 W / m^2
Equipment Load	150 W / Personal Computer in Office

4. Structures

Roof "U" value	0.44 W / m^2.K	
Walls "U" value	0.57 W / m^2.K	
Glass "U" value	(10-40% of	(Over 40% of

	net wall area)	net wall area)
	3.18 W/m^2.K,	2.1 W/m^2.K
Glass shading		
Coefficient factor	0.4	0.35

5. Infiltration

Corridor / Service Cores	0.3 Air Changes per Hour
Lab/ office	0.3 Air Changes per Hou

6. Ductwork System

Ductwork Section	Design Velocity
Main Risers	7.0 m/s – 10 m/s
Sub branch	5.0 m/s – 6.0 m/s
Terminal Branch	3.5 m/s
Terminal Unit	2.5 m/s

Note : The friction rate should be the range of 0.05 to 0.09 friction per100ft duct length

7. Noise Levels.

Maximum noise levels (Room Criteria Neutral – RCN) generated by the operation of building services installation in various areas shall be.

Laboratories	30 - 35
Office Area	35- 40
Corridors / service core	35-45

Floor : 4 th floor (AIR LAB) Date : 10.02.2010			Rev-1																
R. N O	Room Description	AHU/ SPLIT TAG No.	L (m)	W (m)	Ht. to F/c (m)	Area (m^2)	Vol. (m^3)	Lighting Load (W)	Eqpt load (kW)	Eqpt (HP)	Human Load (Nos)	FA qtty	TR - Summer	De-Supply (cfm)S	TR - Monsoon	De-Supply (cfm)M	Selected TR	Selected CFM	Inside Tem C
	AIR CONDITIONING																		
1	GC-FID-HS (24HR AC)																		
2	GC-MS-ATD (24HR AC)																		
3	Scientist-C	**4 IDU13**	3.11	2.83	3.00	8.80	26.40	132	0.00	0.00	3	60	0.57	192.13	0.57	152	0.82	350	24
4	Conditoning Room																		
5	Data centre (24HR AC)																		
6	Sodar room (24HR AC)																		
8	Tool Room	**4 IDU15**	4.10	2.83	3.00	11.60	34.81	174	0.00	0.00	0	0	0.27	175	0.48	129	2	650	
9	Work station		2.73	3.75	3.00	10.24	30.71	154	0.00	0.00	6	120	1.10	357	0.87	315			24
10	Work station		4.65	3.00	3.00	13.95	41.85	209	0.00	0.00	3	60	0.44	108	0.49	103			
11	Scientist	**4 IDU16**	2.81	2.92	3.00	8.21	24.62	123	0.00	0.00	3	60	0.75	312	0.76	275	0.82	200	24
12	Scientist	**4 IDU17**	2.81	3.00	3.00	8.43	25.29	126	0.00	0.00	3	60	0.73	296	0.73	259	0.82	200	24
13	Calibration & ring test room	**4 IDU18**	7.00	6.82	3.00	47.74	143.22	716	8.00	10.72	2	190	3.64	1887	3.07	1790	4.12	1800	24
14	Head-air labs	**4 IDU19**	3.62	3.60	3.00	13.03	39.10	195	0.00	0.00	4	80	0.93	367	0.84	319	1.65	500	
39	Secretary room		3.66	3.17	3.00	11.60	34.81	174	0.00	0.00	3	60	0.43	99	0.48	93			24
15	Scientist	**4 IDU20**	2.55	2.92	3.00	7.45	22.34	112	0.00	0.00	3	60	0.72	292	0.73	258			
16	Scientist		2.55	2.92	3.00	7.45	22.34	112	0.00	0.00	3	60	0.40	84	0.45	79			24
40	Work station		6.22	3.12	3.00	19.41	58.22	291	1.34	1.80	4	80	0.95	379	0.87	337	2.64	800	
17	Ion chromatography	**4 IDU21**	2.50	2.70	3.00	6.75	20.25	101	0.00	0.00	0	0	0.38	244	0.61	216	4.12	1200	
18	Sample Store		2.00	2.22	3.00	4.44	13.32	67	0.00	0.00	0	0	0.11	45	0.38	45			
19	Sample analysis		4.38	5.00	3.00	21.90	65.70	329	0.30	0.40	1	470	2.52	499	0.92	406			24
20	Work room-BAL		2.29	2.22	3.00	5.08	15.25	76	0.00	0.00	4	80	0.51	93	0.48	85			
21	Chemical store room	**4 IDU22**	5.78	3.82	3.00	22.08	66.24	331	4.00	5.36	0	600	4.12	1246	1.94	1082	6.54	1550	
22	Material room		2.34	6.20	3.00	14.51	43.52	218	0.00	0.00	0	450	2.16	325	0.61	214			24
23 +24	Cianister area+GC SPT (24HR AC)																		
25	Sample Store	**4 IDU24**	3.02	2.79	3.00	8.43	0.00	126.39	0.00	0.00	0	150	0.77	142	0.43	97	0.82	300	24
26	Calibration room (24HR AC)																		
27	Scientist	**4 IDU26**	2.48	3.52	3.00	8.73	26.19	131	0.00	0.00	3	60	0.57	194	0.56	149	0.82	200	24
28	Scientist	**4 IDU27**	2.48	3.52	3.00	8.73	26.19	131	0.00	0.00	3	60	0.57	194	0.56	149	0.82	200	24
29	Committee room	**4 IDU28**	3.02	4.64	3.00	14.01	42.04	210	0.50	0.67	10	200	1.63	463	1.06	392	1.65	450	24
30	EC/OC (24HR AC)																		
31	UPS Store	**4 IDU30**	2.77	3.07	3.00	8.50	25.51	128	0.00	0.00	0	0	0.18	120	0.41	0	0.65	200	24
32	Equipment store room	**4 IDU31**	3.00	1.65	3.00	4.95	14.85	74	0.00	0.00	0	0	0.24	61	0.34	85	0.65	200	24
33	Glass ware & wash store	**4 IDU32**	3.02	3.00	3.00	9.06	27.18	136	0.00	0.00	0	0	0.30	101	0.38	63	0.65	200	24
34	Organics calibration room	**4 IDU33**	2.48	2.98	3.00	7.39	22.17	111	6.00	8.04	0	0	1.94	1264	2.17	1230	2.07	1200	24
35	Support staff	**4 IDU34**	2.48	2.34	3.00	5.80	17.41	87	0.00	0.00	4	80	0.61	157	0.54	123	1.33	500	
36	Support staff		2.48	2.34	3.00	5.80	17.41	87	0.00	0.00	4	80	0.61	157	0.54	123			24
37	scientist-B	**4 IDU35**	2.48	2.98	3.00	7.39	22.17	111	0.00	0.00	3	60	0.51	155	0.51	116	0.82	200	24

38	Scientist-B	**4 IDU36**	3.02	2.55	3.00	7.70	23.10	116	0.00	0.00	3	60	0.48	132	0.48	98	0.65	200	24
41	Gen corridor	**4 idu37**	19.00	3.60	3.00	68.40	205.20	1026	0.00	0.00	2	40					3.3	1100	24
															TOTAL		**34.46**		
	24 HR OPERATION VRV SYSTEM																		
Room. NO	**Room Description**	**AHU/ SPLIT TAG No.**	**L (m)**	**W (m)**	**Ht. to F/c (m)**	**Area (m^2)**	**Vol. (m^3)**	**Lighting Load (W)**	**Eqpt load (kW)**	**Eqpt (HP)**	**Human Load (Nos)**	**FA qtty**	**TR - Summer**	**De-Supply (cfm)S**	**TR - Monsoon**	**De-Supply (cfm)M**	**Selected TR**	**Selected CFM**	**Inside Temp C**
	AIR CONDITIONING																		
1	GC-FID-HS	**4 IDU11**	2.63	2.83	3.00	7.44	22.33	112	6.00	8.04	1	20	2.07	1288	2.23	1256	2.64	1200	24
2	GC-MS-ATD	**4 IDU12**	3.10	2.83	3.00	8.77	26.32	132			2	40	2.24	1338	2.31	1300	2.64	1200	24
5	Data centre	**4 IDU14**	4.08	2.68	3.00	10.93	32.80	164	1.60	2.14	4	80	1.21	546	1.11	493	2	650	24
6	Sodar room		4.08	1.93	3.00	7.87	23.62	118	0.00	0.00	0	0	0.30	97	0.42	93			
23+24	Cianister area+GC SPT	**4 IDU23**	2.34	2.91	3.00	11.88	35.64	178	4.00	5.36	2	40	1.76	1003	1.87	967	2.07	1000	24
26	Calibration room	**4 IDU25**	2.48	3.02	3.00	7.49	#REF!	112.34	1.60	2.14	1	20	0.78	449	0.99	413	0.82	450	24
30	EC/OC	**4 IDU29**	2.77	3.65	3.00	10.11	30.33	152	0.50	0.67	0	0	0.49	256	0.62	213	0.82	200	24
															TOTAL	**10.99**			

BOD of 4 TH FLOOR TREATABILITY LAB

Room O	Room Description	AHU/ SPLIT TAG No.	L (m)	W (m)	Ht. to F/c (m)	Area (m^2)	Lighting Load (W)	Eqpt load (kW)	Human Load (Nos)	FA qtty	Selected TR	Selected CFM	Type of Indoor units
	AIR CONDITIONING												
1	Cylinder room	**vent**	3.33	3.10	3.00	10.32	155	0.00	0	0			only Ventilation sys
2	Lab-in-charge	**4 IDU01**	3.25	2.83	3.00	9.20	138	0.00	3	60	1.05	250	Cassette
3	Bio reactor room	**4 IDU02**	3.00	2.83	3.00	8.49	127	5.55	1	20	2.07	1200	Cassette
4	Culture room & Laminor Flow.	**4 IDU03**	3.86	2.98	3.00	11.50	173	10.90	1	20	2.64	1100	
5	Chemical store		1.50	2.92	3.00	4.38	66	0.00	1	20			Ducted unit
6	Lab equipment room (Heat area)	**vent**	3.77	2.92	3.00	11.01	165	25.80	2	40			only Ventilation sys
7	Lab equipment room (Cold area)	**4 IDU04**	4.08	6.85	3.00	27.95	419	1.96	1	20	1.65	600	Cassette
8	GC room	**4 IDU05**	3.08	2.27	3.00	6.99	105	0.67	1	20	1.05	400	HI WALL
9	Sample processing room	**4 IDU06**	3.17	2.27	3.00	7.20	108	1.96	1	20	0.82	300	HI WALL
10	Work station + Carridor	**4 IDU07**	6.33	3.00	3.00	18.99	285	0.00	3	60	1.65	600	Ducted unit
11	Anaerobic digestion	**4 IDU08**	3.10	3.40	3.00	10.54	158	4.05	1	20	1.65	600	Cassette
12	Chmical store & Balance room	**4 IDU09**	3.10	3.34	3.00	10.35	155	0.45	1	20	0.82	300	HI WALL
13	Staff seating	**4 IDU10**	4.06	6.90	3.00	28.01	420	2.25	7	140	2.64	1000	
14	Work station + Carridor		2.18	3.50	3.00	7.63	114	0.00	3	60			Ducted unit
	24 hour Operation												
15	GC room	**4 IDU05a**	3.08	2.27	3.00	6.99	105	0.67	1	20	1.05	400	DX-TYPE HI WALL

Note : all Room design condition will be 24 + - 1 deg C & Rh 50-55%.

SECTION- 2

SCOPE OF WORK

The Contract shall consist of the complete supply installation, setting to work, testing and one year maintenance of the air-conditioning and ventilation systems as indicated on the drawings.

All services must be fully co-ordinated by the Contractor to provide a complete, working installation.

The Contractor shall furnish all labour, materials, equipment, tools, appurtenances, services, temporary work and storage necessary to install the systems in perfect working order in accordance with the specification and drawings.

The work shall include but may not be limited to:

Ductwork for all systems requiring same including all casings, dampers, grilles, registers diffusers fixtures and fittings.

1) Ductwork for all systems requiring same including all casings, dampers, grilles, registers diffusers fixtures and fittings.

2) Thermal insulation for all ductwork (wherever applicable for ventilations ducts) and acoustic insulation for ductwork as indicated on the drawings or as necessary to maintain the desired noise levels within the building.

3) Thermal insulation to all refrigerant pipe work including all valves, fixtures and fittings as specified.

4) Controls and control wiring for all systems including all electric and thermostatic elements.

5) Testing and commissioning of all systems to demonstrate the entire installation is in perfect working order.

6) Electrical work including the motor control center and the wiring of all specified equipment from the nearest source of electrical current

8) All builders work drawings as required.

All equipment shall be brand new bearing stamped ratings as required and must be approved by the Engineer and endorsed by the Architect prior to their use.

All steel work in connection with supports for equipment ductwork, pipe work, etc. shall be painted with two coats of an approved rust preventative paint.

Internal surfaces of grilles, diffusers ducts, etc. visible to occupants shall be painted with two coats of a suitable mat black or other color as directed by the Engineer.

The Contractor, in quoting for equipment or apparatus whether specified by name or whether of a make selected by the Contractor, shall be deemed to guarantee its satisfactory performance under all working conditions.

Extent of Contract

The work under this section of the specification shall include for the supply, delivery to site, installation, testing and commissioning and setting to work the new Air conditioning and Ventilation systems for the proposed Communications Complex.

- All air conditioning and ventilation system complete with all accessories and controls, as per specifications, schedules and drawings;
- Complete air distribution system, return air collecting system, fresh air and ventilation system as shown on the drawings and as specified; and
- Various controls, instruments and their connections, electrical works related to air conditioning and ventilation systems as detailed in the specifications.

The Contractor shall provide all the materials, labour, cartage, plant and appliances necessary for the supply, installation, testing and commissioning of the work and all other minor and incidental works necessary for the system.

The specifications and drawings are intended to indicate the nature and scope of the project. The Contractor shall be responsible for the installation of plant of the correct capacity and shall guarantee the efficient performance of the equipment.

Exclusions

Items necessary for the completion of the plant but not included in the tender are to be listed as exclusions. It will be assumed that The Contractor will provide any items or services necessary to the air conditioning plant and not specifically excluded even if not mentioned in the tender.

SECTION – 3

CODES REGULATION AND STANDARDS

The complete services installation &components shall, unless stated other wise, comply with the Bureau of Indian Standards, National Building code of India, as a minimum requirement. The design shall comply with all statutory obligations where applicable, including but not limited to, the followings.

- ASHRAE: American Society of Heating, Refrigeration and Air conditioning Engineers;
- The National Building Code of India
- Indian Standards (IS)
- Public Health and Safety Requirements
- ASME: American Society of Mechanical Engineers;
- ARI: Air conditioning Refrigeration Institute (USA);
- ASTM: American Society of Testing and Materials;
- AWS: American Welding Society;
- DW142: Specification for Sheet metal ductwork;
- SMACNA: Sheet Metal and Air conditioning Contractor's National Association, Vienna;
- Local Building Regulations;
- Local Bye-Laws and/or Regulations;
- Health & Safety works act;
- Equipment & Supplier Specifications and
- Government specifications.

The workmen employed must be accustomed to the highest class of air conditioning installation.

A competent Engineer must be in regular attendance throughout the whole contract. The whole of the installation shall be executed in conformity with the drawings, specifications, internationally accepted codes of practice and local regulations.

SECTION 4

GENERAL REQUIREMENT

Quality of Equipment and Materials

All equipment and materials shall be brand new, of a quality accepted by The Engineer and presenting no dent, damage or breakage during transportation or installation. All metal parts shall be protected on site from rust, corrosion and dirt by properly storing, packing and covering. All rusted parts of metal, subject to The Engineer's approval shall be cleaned of corrosion products and given two coats of anti-rust paint before installation.

Instructions for Operation and Routine Maintenance

The Contractor shall provide written instructions both in Arabic and English languages as to the method of operation of equipment and the routine maintenance works (cleaning of air filters etc.). Six copies of such instructions shall be handed over to The Engineer.

Painting, Tags, Nameplates

All steel works in connection with supports for pipes, cable trays etc., exposed to the elements are to be painted with two coats of an approved rust preventive paint, preferably zinc rich primer and two coats of enamel paint of grey colour or as approved by The Engineer.

All exposed metal surfaces of refrigeration and electrical apparatus, motors, guards, insulated pipe work etc., must be painted with one coat of under-coat and two coats of enamel paint finish to approved colour. Identification bands, colour codes (refer BS 1710 : 1975) and directional flow arrows shall be painted on piping or insulation at frequent intervals indicating the unit services and the fluid conveyed. Lettering shall be in English.

Identification of ductwork, colour codes, directional flow arrows and application of symbols shall be carried out in accordance with SMACNA. Internal surfaces of ducts at the grille or diffuser terminals and connections visible to occupants in rooms shall be painted with two coats of dull black paint.

All power supply switches shall be tagged identifying the area served, the capacity of switching and equipment they feed. Same identification must appear on the wiring diagram submitted with the operating instructions. All wires shall bear identification numbered tags corresponding to the same wiring diagram mentioned above.

TEST AT SITE

General

The Contractor shall submit to The Engineer, one month prior to the date of commencement of the tests, six (6) copies of the complete test procedures to be used. The procedure, method of calculation etc., shall be

approved by The Engineer before any test is carried out. Six (6) copies of the test results shall be furnished to The Engineer for his approval.

The Contractor shall supply skilled staff and all necessary instruments and carry out tests of any kind on a piece of equipment, apparatus, part of system or a complete system if The Consultant requests such a test, for determining specified or guaranteed data as given in the specifications or in the schedule of equipment filled in by The Contractor.

Any damage resulting from the tests shall be repaired and/or damaged material replaced, all to the satisfaction of The Engineer. In the event of any repair or adjustment required to be made, other than the normal running adjustment, the tests shall be void and shall be recommended after the adjustments or repairs have been completed. The tests shall not be void due to circumstances beyond The Contractor's control.

All testing, balancing and final adjustment shall be in accordance with the provision of the applicable 'ASHRAE' standards.

Condensate Piping

Installation of approved Copper piping, sized as per same opening for the Packaged unit drain provision and properly sloped as well as gravity test shall be applied to piping only before connection to equipment. In no case shall, piping, equipment or appliances be subjected to pressure exceeding their rating. If necessary, piping shall be taken down and reassembled and no make-shift method of temporarily repairing leaks etc., will be permitted.

Tests shall be completed and approved before any insulation is applied or pipes and fittings have been concealed. Tests shall be performed in the presence of and to the satisfaction of the Engineer. Any leaks or defects uncovered by the tests shall be repaired and the system retested as above, at no additional cost to The Consultant.

Equipment

All air handling and ventilating equipment, ductwork and air outlets shall be adjusted and balanced to deliver the specified air quantities indicated at each inlet and outlet on The Drawings.

Where the equipment or systems depend upon controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system during tests.

If air quantities cannot be delivered without exceeding the speed range of the sheaves or the available horse-power, The Engineer shall be notified before proceeding with the balancing of air distribution system.

Other tests as specified under the specific equipment headings are to be completed to the satisfaction of The Engineer.

Electrical Equipment

All electrical equipment shall be cleaned and tested on site before application of power as mentioned below:

Wire and cable tests;
Insulation resistance test, phase to phase and phase to earth on all circuits and equipment's using a 1000 volt megger. The insulation resistance shall not be less than 500 meg.ohm;
Earth resistance between conduit system and earth must not exceed three (3) ohms;
Phasing out and phase rotation tests;
Operating tests on all protective relays to prove their correct operation before energizing the main equipment;
Operating tests on all starters, circuit breakers etc; and
Any other test required as per Kahra-maa regulations.

Test on Completion

After finishing the above tests and adjustments, The Contractor shall be responsible for running a reliability trial test for the whole plant installed. The whole of the trial of the plant shall take place during the appropriate seasons when design conditions are met or approximated. The trial shall take place at any reasonable time subject to the approval of The Engineer. The trial shall last for a period of thirty one (31) consecutive days during which time the whole of the plant shall operate continuously without readjustments or repair to the satisfaction of The Engineer.

During the reliability trial test, performance tests shall be conducted on the refrigerating and air conditioning equipment. The test data shall not deviate by more than three percent from the guaranteed capacity data. Temperature readings shall be taken for the entering and leaving air of each air handling unit. Should any part of the apparatus or system fail to meet with the specification requirements, it shall be adjusted, repaired or replaced to the satisfaction of The Engineer. The complete performance test shall then be repeated. The date of commencement of the above said tests shall be subject to agreement with The Engineer. As soon as all tests prescribed in this clause are carried out satisfactorily in the opinion of The Engineer, a formal letter of completion shall be drawn up in three (3) copies and signed by The Engineer.

During the maintenance period, The Contractor shall demonstrate that all equipment and apparatus fulfill the requirements of the specifications and he shall operate all fans, refrigeration and air conditioning equipment for a sufficient time to adjust all dampers, thermostats and controls and shall provide The Engineer with a complete log and report indicating air quantities, fan speed etc., throughout each of the various systems for the operating seasons.

Maintenance Test

During 400 days maintenance period, the operation and day to day routine maintenance of the plant and equipment shall be carried out by the owner's staff whereas the defects / failure in the plant and equipment not as a result of inadequate maintenance, shall be part of The Contractor's responsibility and shall be rectified free of cost by The Contractor. After testing and commissioning, first set of filters for all the Packaged Units shall be provided by The Contractor. During the last month of the Maintenance period, The Contractor shall demonstrate to The Engineer that all equipment and systems are operating according to the capacities and the manner set down in the specifications. On completion of these tests, The Engineer shall issue a formal letter of acceptance for the equipment and system or parts of the system satisfactorily tested and approved.

The Maintenance Certificate will not be issued to the Contractor by The Engineer until all plant has received the above mentioned letter of acceptance and/or unless a bank guarantee is provided by The Contractor for the performance of that part of the plant and equipment not formally tested and accepted.

REFRIGERATION PIPEWORK

Refrigeration piping shall be carried out in seamless, bright, clean refrigeration quality copper tubing and recessed solder joint fittings. Fittings shall be wrought copper or tinned cast brass. Soft annealed tubing shall be used on all pipe sizes below 19mm O.D. whilst hard drawn tubing shall be utilised on all larger sizes. All pipe cuts shall be neatly reamered and cleaned prior to making joints. Silver solder shall be used and tubing shall be protected against oxidation during silver soldering by use of dry nitrogen flowing through the tubing.

Liquid refrigerant lines shall incorporate the following components:-

Bypass flow replaceable type filter driers, of angle type and rated for the full refrigeration duty of the system.
Y - type full flow strainers.
Isolating valves of the diaphragm type.
Moisture indicating type liquid sight glasses.
Angle type, backseating, capped liquid charging valves with flare charging connections fitted with flare-fitting cap nuts.
Liquid line solenoid valves.
Thermostatic expansions valves of the external Equaliser type.

Suction lines shall be vapour proof insulated with 25mm thick preformed insulation. The insulation lengths shall be applied to the piping as and when the joints are being soldered in order to reduce the joints in the insulation to a minimum. Once the piping has been tested for leaks the insulation joints shall be glued and taped.

All visible refrigeration piping and/or exposed to the weather shall be housed within galvanized or ultra violet resistant P.V.C. trunking.

Refrigeration pipe work shall be supported at not exceeding 2,4mm centres. Pipes shall be securely clamped to points of support using suitable holderbats. Insulated piping shall have molded cork inserts of 25mm thickness and 50mm width in place of normal insulation where supports occur, vapour proofing at such points being carefully executed. Vibration eliminators shall be installed where indicated on the drawings and the piping shall be supported immediately after such vibration eliminator.

All refrigeration pipe work passing through walls and concrete floor slabs shall have P.V.C. sleeves of minimum 3mm thickness for the full depth of the wall and/or floor.

The sensing bulb of the thermostatic expansion valves shall be securely fastened to the suction line using copper strip and brass screws.

Care shall be taken to ensure that pipework is neatly run in straight lines, this applying especially to soft copper tubing. Pipes shall pitch 25mm in 6m in the direction of flow to ensure oil return.

REFRIGERANT CHARGE

Refrigerant pipework systems shall be charged with refrigerant after evacuation and testing for leaks as outlined below:-

Complete refrigeration circuits shall be tested by means of dry Nitrogen to a pressure of at least 50% above working pressure. With the system under the pressure of the Nitrogen, brush all possible points of leakage with a solution of soap and water to which a few drops of Glycerine have been added. All soldered joints shall be tapped with a hammer to break possible flux seals. Any leaks which may be found by bubbling of the soapy water should be made good after the Nitrogen has first been released. When a leaking joint is detected, the fitting shall be taken out, cleaned and re-soldered into the pipe work again.

Systems should next be charged with Refrigerant to a minimum pressure of 200 kPa and then brought to a pressure of at least 50% above working pressure with dry Nitrogen. A **"HALIDE"** or Electronic leak detector shall at this stage be used to detect any further leaks.

Systems found to be free of leaks shall be allowed to remain under pressure for a 24 hour period. If no pressure drop is observed after this period, taking into account ambient air temperatures, the Nitrogen mixture shall be discharged to atmosphere.

The system shall then be evacuated by means of a suitable vacuum pump to a vacuum of 2,5mm of Mercury, allowed to stand for 12 hours and, if no pressure rise has occurred , shall be charged with refrigerant via the charging valve.

CONTRACT DRAWINGS

The drawings for services works are performance drawings, diagrammatic, and intended to convey the scope of work and indicate general arrangement and approximate locations of apparatus, fixtures, pipe and duct runs, etc.. The drawings do not intend to indicate architectural or structural details, nor do they show any fabrication or installation details.

Do not scale drawings. Obtain accurate dimensions to structure and architectural items from drawings of those trades. Confirm by site measurement. Verify location and elevation of all services (Water, Electrical, Telephone, Sanitary, Storm Drainage, Gas etc.) before proceeding with the work.

9.3 Make at no extra cost, any changes or additions to materials, and/or equipment necessary to accommodate structural conditions (pipes or ducts around beams, columns etc.).

Alter, at no additional cost, the location of materials and /or equipment as directed, provided that the changes are made before installation and do not necessitate additional material.

Install all ceiling mounted components (Diffusers grilles, detectors, light fixtures, emergency lights, fire detectors, loudspeakers, camera points etc.) in accordance with the reflected ceiling drawings, which are to be prepared by the Contractor and co-ordinated with all trades. These must be submitted for approval and be approved before any work commences on site.

Leave space clear and install all work to accommodate future materials and/or equipment as indicated and/or supplied by another division of work of the contract. Install all pipe runs, conduit runs,

cable trays, etc., to maintain maximum headroom and clearances, and to conserve space in shafts and ceiling spaces and under floors, and to provide adequate space for service and maintenance.

Confirm on the site the exact location of outlets and fixtures. Confirm also location of outlets and fixtures provided by any other division of work under the contract.

CONSTRUCTION DRAWINGS

Prepare drawings in conjunction with all trades concerned, showing sleeves and openings for all passages through structure and all insert sizes and locations.

Prepare composite construction drawings, fully dimensioned, of piping and equipment in tunnels, shafts, mechanical equipment rooms and areas, and all other critical locations to avoid a conflict of trades.

Base equipment drawings upon shop drawings and include but do not necessarily limit to, all details pertaining to access, cleanouts, tappings, sleeves, electrical connections, drains, location and elevation of pipes, ducts, conduits, etc., obtained from consultation with, and agreement of, all trades involved.

Prepare drawings of equipment bases, pump pits, anchors, inertia slabs, floor and roof curbs, wall openings, trenches, pertaining to mechanical work.

Prepare all drawings to scales and dimension. Forward these drawings, approved by all trades concerned to the Consultant for his records. Provide transparencies and provide printed copies in a number as specified elsewhere in the Contract but not less than four sets.

Bind one complete set of construction drawings showing "as built" conditions in each operating and maintenance instruction manual. The extent of these drawings will be indicated to the Contractor in advance by the Consultant.

SHOP DRAWINGS

Submit shop drawings and samples for materials and equipment as listed in this and in each subsequent section.

Provide transparencies wherever possible and provide printed copies in a number as specified elsewhere in the contract documents. The Consultant may retain the sample of each item at his/her discretion until the completion of the contract.

Present a schedule of shop drawings after award of the contract and not later than what is specified in the contract documents, indicating the anticipated date when the drawings will be submitted for review. Assume full responsibility for timely submission of all drawings. Allow a minimum of three weeks for the Consultant's review. At time of submission indicate order deadlines and cost implications, etc., otherwise the Consultant will advise the Owner that cost and completion date will be unaffected.

Drawings production and presentation is a contractual matter and any delay on the MEP Package Contractor's behalf in making these submissions will be considered a Contractual delay and may be subject to Contractual penalties and other remedies as determined by the Consultant.

The Consultant will only consider shop drawings bearing the stamp of the MEP Package Contractor. Check for all pertinent information such as physical dimensions, make, performance, electrical characteristics and indicate the intended use and location before submitting these drawings. Use reference symbols or enumeration to correspond to the design drawings.

Assume responsibility for accuracy of equipment dimensions related to space available, accessibility for maintenance and service, compliance with inspection

authorities codes. Ensure that shop drawings indicate the shipping and working weights of all equipment.

The submission of samples will be subject to the same procedure as that of shop drawings.

The Consultant will mark the drawings "resubmit specified item", "rejected", "no exception taken", or "make correction noted". In the last case all revisions will be clearly marked on the returned print and corrected prints may be issued for manufacture and construction.

Make the revisions shown on the "make corrections as noted" prints onto the tracings as soon as practicable and forward copies to the Consultant for his records. The time allocation for this shall be within two weeks. Failure to resubmit in this time frame will cause the drawings to be treated as "revise and resubmit" and the MEP Package Contractor will be responsible for any delays so caused.

Make the changes on the "revise and resubmit" drawings onto the tracings and resubmit within two weeks.

The Consultant is not responsible for any delays caused by the inadequacy of the MEP Package Contractor's drawings or his failure to obtain initial or subsequent approval. Any time taken by the MEP Package Contractor to obtain approval after the originally scheduled date will be considered as a delay to the contract caused by the MEP Package Contractor.

When drawings are marked "resubmit specified item", the MEP Package Contractor is to resubmit the item as originally specified or as may be determined to be equivalent by the Consultant. The Consultant is the sole arbiter of whether any item is satisfactory or equivalent.

When drawings are marked "rejected" a complete resubmission of the particular drawing is necessary, subject to the same conditions as outlined above.

The Consultant's review shall not relieve the MEP Package Contractor from responsibility for deviations for the Consultant's drawings and specifications, unless he has, in writing, called the Consultant's attention to such deviations at the time of submission of drawings. The Consultant's review shall be construed to apply to, and only to, general arrangements and shall not relieve the Contractor from the entire responsibility. Any approval by the Consultant shall be on the understanding that any item submitted shall be ordered with options and modifications to fully meet the specification. Any fabrication, erection, setting out or other work done in advance of receipt of stamped drawings shall be done entirely at the MEP Package Contractor's risk and cost.

Furnish prints of the reviewed details to all other parties who may require them for proper coordination of their work, and furnish all information necessary for the work as a whole.

Obtain Manufacturers' installation directions to aid in the proper execution of the work. Submit two copies of such directions to the Consultant prior to installation, for use in inspecting the work.

Bind one complete set of checked shop drawings into each operating and maintenance manual.

Shop drawings and samples shall be submitted in batches as indicated in the documents, but at not more than four (4) separate times. Liquidated damages will be deducted from the Contractor for each additional submission which is or becomes necessary, unless such is a result of a design change or similar Consultant's instruction. The amount of deduction for each such liquidated damage occurrence shall be decided by the Consultant and shall be deducted from any payments or amounts due to the Services Contractor and shall be paid by the General Contractor direct to the Consultant upon receipt of his payment.

MANUALS

The Contractor shall make provision for the supply of three (3) copies of the Instruction Manual before issue of Practical Completion Certificate. This manual shall include the following items:

- Complete list of all items of equipment, controls and accessories as actually supplied including serial nos. and all name plate details"
- A set of 'As-built' drawings showing equipment layout foundation details, ducting layout and details, electrical wiring and drain piping. The Drawings shall show plans and sections necessary to show all required information correctly;
- A set of manufacturer's catalogues, wiring diagram and installation drawings relevant only to the particular item of air conditioning and ventilation equipment concerned. General catalogues will not be acceptable;
- Manufacturer's printed spare parts list for all items of equipment;
- Operational description of the air conditioning plant including starting, stopping and seasonal shut-down;
- Preventive maintenance routine at weekly, monthly and yearly intervals and maintenance procedures for all plant and equipment;
- Manufacturer's full name and address together with telephone, fax numbers; and
- Name, address, telephone and fax numbers of local agents / suppliers.

TEST HOLES

The test holes shall be provided in the horizontal side of the duct and shall be of 22 mm diameter fitted with an effective removable seal. The test holes shall be located at the following locations:

- At fans (in the straight section of duct near to fan outlet);
- At cooling coils;
- At main branches after regulating dampers;
- At any other position as per Engineer's requirements; and
- Location of test holes shall be marked on the duct surface or on the insulation.

SECTION 5

TECHNICAL SPECIFICTION

VARIABLE REFRIGERANT VOLUME SYSTEM WITH REFRIGERANT R410A

SCOPE

The scope of this section comprises the supply, erection testing and commissioning of Variable Refrigerant Volume System conforming to these specifications and in accordance with the requirements of Drawing and Schedule of Quantities

TYPE

Units shall be air cooled, variable refrigerant volume air conditioner consisting of one outdoor unit and multiple indoor units, each indoor unit having capability to cool independently for the requirement of the rooms.

It shall be possible to connect multiple indoor units on one refrigerant circuit. The indoor units on any circuit can be of different type and also controlled individually. Following type of indoor units shall be connected to the system:

- Ceiling mounted cassette type (Double flow)
- Ceiling mounted cassette type (Round flow)
- Slim Ceiling mounted duct type
- Ceiling mounted built-in type
- Ceiling mounted duct type
- Ceiling suspended type
- Wall mounted type
- Floor standing type
- Concealed floor standing type
- Ceiling mounted cassette corner type

Compressor installed in outdoor unit shall be equipped with at least one inverter compressor up to 18HP, two inverter compressors up to 36 HP and above this, three inverter compressors. The system shall be capable of changing the rotating speed of inverter compressor by inverter controller in proportion to variations in cooling 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 extended up to 165m with maximum 50m level difference **without any oil traps.**

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

OUTDOOR UNIT

The outdoor unit shall be factory assembled, weather proof casing, constructed from heavy gauge mild steel panels and coated with baked enamel finish. The unit should be completely factory wired tested with all necessary controls and switch gears:

- All outdoor units above 8HP shall have minimum two scroll compressors and be able to operate even in case one of compressor is out of order.
- In case of outdoor units above 18HP (MULTI MODULAR), the outdoor unit shall have at least 2 inverter compressor so that the operation is not disrupted with failure of any compressor.
- It should also be provided with duty cycling for automatically switching starting sequence of multiple outdoor units/compressors.
- The noise level shall not be more than 60-65 dB (A) at normal operation measured horizontally 1m away and 1.5m above ground level.
- 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 microprocessor control panel.

The outdoor unit should be fitted with low noise, aero spiral design fan with large airflow and should be designed to operate compressor-linking technology. The outdoor unit fan should also be capable to deliver 70 Pa or external static pressure to meet long exhaust duct connection requirement.

The condensing unit shall be designed to operate safely when connected to multiple fan coil units, which have a combined operating nominal capacity up to 130 % of indoor units.

COMPRESSOR

The compressor shall be highly efficient scroll type operating on R410a environmental friendly refrigerant and capable of inverter control. It shall change the speed in accordance to the variation in cooling load requirement:

- The inverter shall be IGBT type for efficient and quiet operation.
- All outdoor units shall be designed for automatic capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed.
- Oil heater shall be provided in the compressor casing.

*: IGBT represents Insulated Gate Bipolar Transistor.

HEAT EXCHANGER

The e-Pass heat exchanger shall be constructed with copper tubes mechanically bonded to aluminum fins to form a cross fin coil.

- The aluminum fins shall be provided with special coating.
- The unit shall be provided with necessary number of direct driven low noise level propeller type Aero spiral fans with DC motor arranged for vertical discharge. Each fan shall have a Aero fitting grille resulting in reduced pressure loss.

REFRIGERANT CIRCUIT

The refrigerant circuit shall include liquid & gas shut-off valves and a solenoid valves at condenser end.

All necessary safety devices shall be provided to ensure the safely operation of the system.

The new SCe-bridge Circuit (sub-cool) feature prevents the flash gas from long piping and reducing the refrigerant volume required and there by reduction in piping size.

SAFETY DEVICES

All necessary safety devices shall be provided to ensure safe operation of the system.

Following safety devices shall be part of outdoor unit; high pressure switch, fuse, crankcase heater, fusible plug, over load relay, protection for inverter, and short recycling guard timer.

OIL RECOVERY SYSTEM

Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigeration piping lengths.

ENVIRONMENTALLY AWARE

R410A is a new mixed refrigerant that exhibits superior safety characteristics .Even with zero coefficient of ozone layer depletion; R410A offers a better performance to the conventional R22.

Further lead free PC Boards making its use even more environmentally conscious.

Galbarium a material that requires no coating is used for the bottom plate for easy recycling.

INDOOR UNIT

This section deals with supply, installation, testing, commissioning of various type of indoor units confirming to general specification and suitable for the duty selected. The type, capacity and size of indoor units shall be as specified in detailed Bill of Quantities

GENERAL

Indoor units shall be either ceiling mounted cassette type, or ceiling mounted ductable type or floor standing type or wall mounted type or other as specified in BOQ. These units shall have electronic control valve to control refrigerant flow rate respond to lead variations of the room.

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

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

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

The cooling coil shall be made out of seamless copper tubes and have continuous aluminum fins. The fins shall be spaced by collars forming an integral part. The tubes shall be staggered in the direction of airflow. The tubes shall be hydraulically/ mechanically expanded for minimum thermal contact resistance with fins. Each coil shall be factory tested at 21kg/sqm air pressure under water.

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

Each indoor unit shall have computerized PID control for maintaining design room temperature. Each unit shall be provided with electronic expansion valve & should have microprocessor thermostat for cooling.

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 flat individually as per requirement.

CEILING MOUNTED CASSETTE TYPE UNIT (MULTI FLOW TYPE)

The unit shall be ceiling mounted type. The unit shall include pre-filter, fan section and DX-coil section. The housing of the unit shall be powder coated

Galvanized steel. The body shall be light in weight and shall be able to suspend from four corners.

Unit shall have an external attractive panel for supply and return air. Unit shall have 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 MOIUNTED DUCTABLE TYPE UNIT

Unit shall be suitable for ceiling mounted type. The unit shall include pre filter, fan section & DX coil section .The housing of unit shall be light weight powder coated galvanized steel. The unit shall have high static fan for Ductable arrangement.

CEILING SUSPENDED TYPE

Unit shall be suitable for ceiling suspended arrangement below false ceiling.

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

Unit shall have an attractive external casing with sophisticated design and compact casing harmonized in any interior décor.

CEILING MOUNTED BUILT-IN TYPE

Unit shall be suitable for Highly flexible for various arrangement with complete line-up of optional kits to satisfy various needs such as design concept ,interior decoration and so on . The unit includes

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

Each unit shall have optional high lift drain pump.

CENTRALIZED TYPE REMOTE (TOUCH SCREEN TYPE) CONTROLLER

(Option if specified in BOQ)

A multifunctional compact centralized controller shall be provided with the system.

The Graphic Controller must act as an advanced airconditioning management system to give complete control of VRV airconditioning Equipment, It should have ease of use for the user through its touch screen, icon display and color LCD display.

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

functions :-

a) Starting/stopping of Airconditoners as a zone or group or individual unit.

b) Temperature settling for each indoor unit or zone.

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

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

e) Display of air conditioner operation history.

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

The controller shall have wide screen user friendly color LCD display and can be wired by a non polar 2 wire transmission cable to a distance of 1 km. away from indoor unit.

UNIFIED ON/OFF CONTROLLER (OPTION IF SPECIFIED IN BOQ)

Unified ON/OFF controller shall be supplied as optional accessory.

The controller shall be able to control minimum 15 groups (each group containing maximum 16 indoor units) or 128 nos. of indoor units with the following functions:

a) On/Off as a zone or individual unit.
b) Indication of operation condition of each group.
c) Select one of 4 operation modes.

SCHEDULE TIMER (OPTION IF SPECIFIED IN BOQ)

A schedule timer shall be supplied as an optional accessory.

a) The timer shall be able to set operation schedule for all indoor units.
b) The timer shall be able to set 8 pattern of schedule combined with centralized controller.

REFRIGERANT PIPING

All refrigerant piping for the air conditioning system shall be constructed from soft seamless up to 19.1mm and hard drawn copper refrigerant pipes for above 19.1mm with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and are to include charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits.

All joints in copper piping shall be sweat joints using low temperature brazing and or silver solder. Before jointing any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while constructing the joints through nitrogen bleeding at 1.0kg/sqcm and subsequently, it shall be thoroughly blown out using nitrogen.

After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at pressure of 30Kg per sq. cm. Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to minimum vacuum if 700mm hg.

The air-conditioning system supplier shall be design sizes and erect proper interconnections of the complete refrigerant circuit.

The thickness of copper piping shall not be less than 20gauge for pipes up to 19.1mm and 18guage for bigger sizes

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

To protect nitrile rubber insulation of exposed copper piping from degrading due ultra violet rays & atmospheric condition, it shall be

covered with M.S Type / G.I.Type protection tray.

PIPE INSULATION

a. **Refrigerant Pipe Insulation**

The whole of the liquid and suction refrigerant lines including all fittings, valves and strainer bodies, etc. shall be insulated with 19mm /13 mm thick elastomeric nitrile rubber as specified in BOQ.

b. **PVC Drain Pipe Insulation**

Drain pipes carrying condensate water shall be insulated with 6 mm thick elastomeric nitrile rubber insulation.

For proper drainage of condensate, U Trap shall be provided in the drain piping (wherever required). All pipe supports shall be of pre fabricated & pre painted slotted angle supports, properly install

SHEET METAL WORK :

1 Sheet metal ducting required for the project is shown in drawings forming part of these specifications. These drawings indicate the duct size and configuration required to meet design flow requirement and also to provide the contractor with necessary data for bidding; they are not meant to serve as working drawings which will have to be prepared by the successful contractor, giving due attention to the structural future of the building and to the site requirements. Drawings so prepared shall be subject to the approval of the consultants /owners. No extra charges shall be

payable to the contractor for changes from tender drawings necessitated by above factors or for any other reasons whatever.

2 Sheet metal used for ducting shall be plain galvanized sheets conforming to class VIII Grade. Only new, fresh, clean (unsoiled) and bright GI sheet shall be used. The owners / Consultants reserve the right to reject summarily the sheets not meeting these requirements.

3.0 Rectangular Ducting:

3.1 The thickness of sheet metal used for rectangular ducting shall be as shown in the table below on next page.

Dimension of longest side of duct	**Sheet Thickness**
Up-to 500mm(20")	0.63mm (24G)
501mm to 750mm	0.63mm (24G)
751mm to 1500mm	0.80mm (22G)
1501mm to 2250mm	1.00mm (20G)
2251mm and above	1.25mm (18G)
All plenums and filter boxes etc	1.25mm (18G)

3.2 The fabrication of the ducting included details of transverse joint connections, bracing, seams, etc., for longitudinal joints, etc., will be generally as per IS-655-1963, the intent being to obtain duct pieces that are robust and rigid enough to preclude, flutter, buckling, etc., and to minimize air leakage's.

3.3 Elbows, bends, offsets, etc., should be fabricated with a width to radius ratio of not less than 1.0 to 1.5. Alternatively, turning vanes should be provided at so chosen that the aspect ratio of the varies section so formed by the vanes will be at least five.

4.1 All duct joint shall be made tight and interior surface shall be smooth. Necessary gaskets of felt or rubber or similar material shall be used to secure tightness of joints.

4.2 All supports for ducting shall be provided by the air conditioning contractor; MS angles, rods and other section shall be used as required for the purpose. The supports shall be taken independently to the building structure; in other words, they should not be tied on to supports for light fixtures.

4.3 All angles, rods and such other MS members, materials, components, etc., used for support shall be provided with a coat of red-oxide primer, both before and after being placed in position.

5 Where ducting is required to be supported from ceiling /roof slab, Anchor grip bolts shall be used to fasten the suspension rods (for duct supports) to the ceiling / roof slab.

6 All civil work involved including drilling, chipping (for fixing grip bolts) and redoing, grip-bolting and other related work shall be within the scope of the contractor's work. The contractor shall furnish to the consultants / owners for their approval co-ordination drawings indicating all support required.

7 Dimension of duct sections are inside dimensions of bare ducts. Where ducts required to be lined or insulated on the inside, these dimension will have to be enlarged so that the cross sectional area is not reduce as comrade to those shown in the drawings. The longitudinal dimension shown are normal and approximate and do not take into account reduction due to the turning of the sheet metal to provide flanges, seams, etc..

8 All MS supports & hangers shall be supplied with a coat of primer paint. Vendor shall apply further 2 coats of synthetic enamel. The color of the paint shall conform to the choice of the consultants / owners / Engineer-in-charge.

9 Damper shall be placed in duct and at every branch supply or return air duct connection whether or not indicated on the drawings for the proper volume control and balancing the system.

10 All duct dampers shall be louvered dampers of robust construction and tightly fitted. They shall be provided with suitable links, levers and quadrants as required for their proper operation, control or setting in any desired position. Dampers and their operating devices shall be made robust, easily operable, and accessible through suitable access doors in the ducts. Every damper shall have an indication device clearly showing the damper position at all times.

11 All duct dampers shall be louvered dampers of robust construction and tightly fitted. They shall be provided with suitable links, levers and quadrants as required for their proper operation, control or setting in any desired position. Dampers and their operating 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.

12 Turning vanes shall be provided at branch take-offs and collars wherever possible. Similarly, straightening vanes shall be provided in all the collars unless and except in cases where conditions at site do not permit their installation.

13 Supply air grilles shall be of powder coated extruded aluminum sections and shall incorporate both horizontal and vertical louvers. The louvers shall be of adjustable type. Supply air grilles shall also incorporate volume control dampers. The vanes at the front shall be horizontal while those at the rear shall be vertical. The width of the perimeter flanges shall be 32 mm. The vanes shall be 3 mm thick & 25 mm deep. The pitch of the vanes shall be 20 mm.

14 Return air grilles shall be of powder coated extruded Aluminum. Return air grilles shall have only horizontal louvers and these shall be of fixed type. The perimeter flanges shall be 32 mm wide. The vanes shall be 3 mm thick & 25 mm deep. The pitch of the vanes shall be 20 mm.

15 Wherever Supply / Return air grilles are of continuous type they shall be of powder coated extruded aluminum sections. The continuous grilles shall incorporate MS volume control dampers at supply air outlets.

16 All supply air diffusers shall be of powder coated extruded aluminum sections and removable core type. Volume control dampers shall be provided for all diffusers.

17 Return air diffusers shall be identical to supply air diffusers except that they do not incorporate volume control dampers.

18 All supply and return air grilles and diffusers shall be CARYAIRE / Air Master make. The grille shall be provided with powder-coated paint of approved colour. Further, the successful contractor shall submit a sample grille and diffuser for the approval of the owners, before undertaking the manufacture of the total required number of pieces.

19 Where sheet metal ducts or sleeves terminate in woodwork, brick or masonry openings, tight joints shall be made by means of closely fitted heavy flanged collars.

20 Connection of ducts to fans shall be with canvas.

FRESH AIR INTAKES AND OUTLET LOUVERS

All fresh air inlets shall be fitted with double skin opposed blade volume control dampers, sand traps, insect wire mesh and filter as indicated on the drawings.

All fresh air inlets shall be fitted with aluminium mesh bird screens and louvres in addition to 50 mm thick washable synthetic fibre filters. Filter media thickness shall not be less than 45 mm, having same efficiency as filters for PACU.

Fresh air louvres shall be of extruded aluminium having colour / finish as approved by the Engineer.

Louvre blade extrusion shall be of a design to prevent ingress of rain and shall be approved by the Engineer.

Exhaust air outlets shall be fitted with aluminium mesh bird screens.

FLEXIBLE CONNECTIONS

Flame proof flexible connections shall be fitted on all intake and discharge connections of fans and air conditioning units for preventing the transmission of vibration through the ducts to occupied spaces.

Flexible connections shall also be provided where ductwork passes across building expansion joints.

Flexible connections shall be factory fabricated from chemically impregnated canvas.

Connections shall fit closely and be secured in airtight fashion to connections to ductwork, fans and apparatus.

The material shall have a penetration time of at least fifteen minutes when tested in accordance with BS 476 and shall remain flexible and without strain or distortion. Flexible connections shall be 150 mm minimum and 250 mm maximum in length.

FIRE DAMPERS:

Fire dampers shall be of the galvanized steel curtain type. The steel blades of the damper curtain shall fold completely upon themselves and be stacked at one end of the damper outside the air stream. The dampers shall be arranged for vertical or horizontal operation as detailed on The Drawings.

The damper fusible links shall be rated at 72°C.

The fire dampers shall be constructed generally to the same standards of air tightness as the rest of the system. Both the curtain and the fusible link shall be accessible for servicing through air tight inspection doors placed up and down stream wherever possible.

Each access door shall be of a minimum size of 450 mm square or full duct width on ducts less than 450 mm.

Each damper shall be rated at 2 hours fire resistance.

Dampers shall be fitted in all fire-break walls and other fire barriers as indicated on the contract drawings.

Ducting dampers and casings are to be manufactured in strict compliance with BS 476 Part 8 and appropriate fire and other statutory regulations for fire damper specifications where such exist (otherwise to HVAC specifications DW/142). The fire damper frame shall not be less than 18 G thick.

Any necessary fixing framework shall be supplied and installed by The Contractor.

GRILLES, REGISTERS AND DIFFUSERS

Air distribution shall be effected by means of ceiling diffusers or grilles of the sizes, types and having the discharge patterns as indicated on the Drawings.

Ceiling Diffusers and grilles shall be fixed to spigots extending not less than 100mm from the ducting, unless otherwise indicated on the Drawings, and shall be securely fixed so that no screws or other fixing devices are visible.

Supply air diffusers shall be of steel construction and shall consist of an inner core which shall be easily removable from the outer section to facilitate access to the volume control damper located behind the diffuser. The inner core shall consist of concentric rectangular collars and the outer section shall consist of a single rectangular or bevel collar provided with a concealed spigot for attaching the diffuser to the supply ductwork.

The rear backing including the disc of all supply air diffusers for coastal projects, shall be lagged with minimum 3mm thick life care - fire and heat resistant foam.

Supply air diffusers shall be equal to model AJANTA, AIRMASTER (RICKARD) CCD or VCD & BEST CHOICE as indicated on the drawings complete with dampers, and shall be finished in an epoxy powder coating in a colour to suit Architects requirements. Alternatively fibreglass or aluminium diffuser casings will be acceptable.

Supply air grilles shall be of the double deflection type consisting of two rows of individually adjustable aerofoil section vanes, the front vanes being horizontal and the rear vanes vertical. The vanes shall be housed in a surrounding fixing flange with neat mitred joints at the corners. The entire grille assembly shall be of extruded aluminium construction and shall be finished in plain anodised aluminium unless otherwise noted on the Drawings.

Supply air grilles shall be equal to **TROX, TECNALCO, AIRMASTER (RICKARD)CCD or VCD & BEST CHOICE** complete with factory fitted opposed blade dampers.

The multivane opposed blade dampers provided with supply air diffusers and grilles shall be finished in matt black lacquer. The dampers shall be attached to the rear of the grilles and fitted into the spigot connections or the diffusers and shall be adjustable, by means of a key or a lever, from the front of the installed diffusers and grilles.

Return air grilles shall consist of aluminium grid core housed in an extruded aluminium fixing flange with neat mitred corners and finished in plain anodised aluminium unless other noted on the Drawings.

Door grilles shall be of extruded aluminium construction equal to **AIRMASTER & BEST CHOICE** suitable for fitting into doors of varying thickness and shall be finished in a colour to suit Architects requirements. Door grilles shall be fixed to doors by means of countersunk screws with a colour to match the door grille.

Outside air intake sand traps shall have a double deflection inlet route so as to separate the sand particles from the incoming air. A vermin proof screen on the rear side shall be included.

The Louvre shall have an efficiency of not less than 90% at a face velocity of 1m/sec, & an efficiency of 70% at a face velocity of 2 m/sec.

Pressure drop at 2 m/sec shall not exceed 120 pascels.

The louvre shall be supplied with a powder coated finish with the colour to the Architects approval.

Rubber gaskets shall be glued to the rear of the fixing flanges of all diffusers, grilles and louvres to ensure airtight seals and prevent smudging.

Door Grilles/Undercuts

Door grilles shall be of the inverted 'V' blade type, not permitting vision through the grille blades and not more than 12 mm apart. Minimum free area shall be at least 50%. Louvres shall be of the double frame type with a frame on each side of the door.

Undercuts shall be provided on doors wherever indicated on The Drawings.

Note:

All diffusers, grilles, registers, linear diffusers etc., shall be powder coated including the pattern adjustment and volume control elements in linear diffusers to match the interior finish or as advised by The Engineer.

Access Doors

Wherever necessary, the Contractor shall provide suitable access openings to permit inspection, operation and maintenance of all filters, controls, dampers, fire dampers, bearings or other apparatus. Doors shall be of double skin construction of not less than 20 gauge metal sheet and shall have sponge rubber gaskets around their entire perimeter. On insulated ductwork, the space between the inner and outer door sheets shall be insulated as specified for ductwork and insulation thickness be equal to duct insulation. All access doors in sheet metal shall be air tight and shall be hinged or lift-off type and secured in the closed position by means of cam latches.

AIR FILTERS

Air filters shall be installed before the coils in the packaged air conditioning units and the air handling units and shall be minimum 50mm thick high performance washable pleated panel filters. The filters shall be manufactured by AAF or approved equal.

The filter media shall be a random leveled, non woven, synthetic, polyester fibre which has been saturation bonded.

The media shall be pleated between two layers of 25mm x 25mm 22 gage coated wire mesh. Both layers of wire must conform to the profile of the pleats. The pleat shall be evenly spaced, must not touch one another and shall be open both back & front to allow maximum dust holding and ease of cleaning.

The filter frame shall not be thinner than 26gage (0,5mm) galvanized mild steel.

The filter cartridge shall be sealed into the enclosing frame by means of a media pack and frame.

Long life air filters installed in independent air filter banks in Plant rooms or before the coils in packaged air conditioning units and air handling units, where indicated on the Drawings, shall be extended surface air filters with filter media having an arrestance of 90% (ASHRAE). Each filter cell shall be suitable for the manufacturer's recommended air flow of 0,833 m^3/s at an initial resistance of 20Pa. Manometers to be used in conjunction with these filters shall be set for a final resistance of 150 Pa.

Fresh air filters shall be of the same make, type and size as the return air filters fitted in the units and shall be fitted into the holding frames installed on the rear of the outside air intake weather louvre so as to be easily removable from inside the plant room area or building.

Air filters shall be fitted into holding frames which shall be so designed to allow a negligible quantity of air to bypass the filters.

All filter banks shall be mounted in easily accessible positions and shall be reachable with a normal 1.8m long ladder.

Bag filters shall be of a approved disposable type. The filter will be a high performance filter and consist of high density glass micro fibre media with a chemically bonded backing and individual pockets with a galvanized steel frame with corrosion free properties.

EXHAUST FANS

GENERAL

Exhaust fans shall be supplied and installed by The Contractor as shown on the drawings. Capacity, type and rating of the fans shall be as indicated in the schedule. The fan motors and switches shall be in

accordance with this specification regarding electrical works. Fixing details shall be in accordance with manufacturer's recommendations.

Wall Mounted Fans

The wall mounted extract fans shall be sheet metal propeller type having totally enclosed, Class B insulation, shaded pole/capacitor, start/run motor in aluminum alloy casing protected by thermal overload cut out having he following components:

- Box enclosure including electrical terminal box;
- Non lubricating ball bearing;
- Fan casing, fan impeller and tightly sealed dust proof fan motor;
- Automatic shutter and outer grille; and
- Fans shall be low speed for silent operation.

As an alternative, heat resistant plastic fans, if offered shall have the above components except for the fan casing and impeller construction, the contractor shall also produce a certificate of approval from Qatar Fire Department and further it shall be subject to the approval of The Engineer.

In line Fans

Supply, exhaust or return air plastic inline fans shall be of the centrifugal, direct-driven type.

Construction

Fan housing shall be constructed of heavy-duty engineered thermoplastic that is durable, corrosion resistant and flame retardant. Internal air turning vanes shall be provided for maximum air performance. Motor shall be class B insulation, totally enclosed with permanent split capacitor. Motor shall be a permanently sealed self-lubricating ball bearing type. Motor shall be equipped with automatic reset thermal overload protection. Motor shall be acceptable for continuous duty. Sufficient service factor shall be provided to ensure long maintenance-free operation over maximum load conditions. Motor shall be balanced as one integral unit to provide for vibration free performance.

Specifications

The unit shall be BEAB approved and rated at IPX5. The fan shall conform to Building Regulations for use in toilets, bathrooms and utility rooms. The fan shall incorporate an automatic air operated backdraught shutter. The housing and stylish air inlet shall be moulded in high gloss white ABS. The front cover shall be held in position by the retaining clips to facilitate removal and adjustment. The motor shall be totally enclosed, fitted with sealed self aligning maintenance free bearings and include thermal overload protection

DRAINS

Condensate drains shall be provided in copper pipes to BS 2871 Part 1 Table 'X' above ground and in UPVC to BS 5255 for vertical drops buried in the walls, in floors or below ground and shall be adequately supported along their length. All condensate drains shall

be fitted with 75 mm deep trap with dirt pocket and removable plug provided and extended to the nearest drains/soakaways as shown on the drawings. Removable plugs shall be provided at every change in direction to allow rodding access.

All surface mounted condensate drains within the building shall be insulated with 10 mm thick rubber foam and weather proofed to the satisfaction of the Engineer. All exposed pipes external to the building shall be painted with two coats of paint matching with the building colour.

All drains from cooling coil pans for condensate disposal shall be fitted with proprietary U-traps to prevent backflow or non-drainage due to negative air pressures.

Drainage pipework of longer than 4,5m run shall be provided with cleaning eyes on all bends to facilitate maintenance.

BUILDER'S WORK

The Contractor shall carry out the cutting of holes and making them good where pipes, conduits, cable and cable trays are passing through the walls, floor and roof slabs as measured in the Bill of Quantities.

Two sets of builders work drawings shall be submitted to the Engineer for his approval.

Pipes / Ducts Cross Over Bridges

The Contractor shall provide cross-over bridges as shown on the drawings. Pipe cross over bridges shall be fabricated from G.I. angle / channel frame with G.I. checkered plate and hand rail etc. Bridges details shall be agreed with The Architect and The Engineer before fabrication.

PAINTING AND FINISHING

After completion of the installation, the entire work shall be checked for finish and appearance. Any portion of work found damaged, unpainted or not finished to the satisfaction of the Engineer shall be rectified, painted and finished satisfactorily.

CLEANING AND FLUSHING

Each system shall be thoroughly flushed and all extraneous material removed from the ducts to The Engineer's satisfaction prior to the pressure test as the case maybe.

Upon the completion of pressure tests in any case, and prior to putting the system into operation.

The ductwork shall be thoroughly cleaned. This operation should be carried out strictly in

accordance with the manufacturer's recommendations.

Any ductwork, fittings or accessories which may be prone to damage during the cleaning and flushing operation should be isolated or removed and subsequently refitted upon completion.

SECTION – 6

Exhaust Fume Scrubber

Horizontal/vertical packed bed wet type fume scrubber, Each scrubber shall have a capacities Listed below in cfm with a minimum acid removal efficiency of 99% for total acid substance of air, each scrubber consist of A bed of spherical packings made of polypropelene (UV resistant) supported with corrosion resistant plastic members designed to reduce solids build up. Spray section comprising liquid distributor, PVC make spray header banks with removable PVC nozzles, PVC (schedule-80) piping and fittings with ball valves to regulate. Polypropelene mesh pad type or PVC chevron blade type mist-eliminator capable of removing 99% of entrained moisture from air stream. Liquid re-circulation system of each scrubber will have 2 nos. stainless steel-316, vertical sump pump (1 running + 1 standby) with high efficiency drive motor (Eff-1) as per IS 12615 (latest amendments) suitable for 415±10% V, 50±5% Hz, 3 Phase, supports, covered external sump made of fiberglass reinforced polyester material, stainless steel strainer, pressure gauge with valve at inlet and outlet (wetted parts of the gauges shall be made of SS-316), shut off valves (butterfly type) at inlet & outlet, check valves at outlet and other fittings. The piping and fittings shall be of SS 316, schedule 40. All the valves shall be of SS 316. The valves of size as per Unit size. The butterfly valves, check valves and strainers shall be PN-16 rated and the ball valves shall be rated at 300 PSI. Casing made of fiberglass reinforced polyester material (fire resistant) complete with water sump, supports, inlet and outlet connections with flanges and gaskets, transparent access panels. The water sump (external) shall be provided with make up connection with solenoid valve & isolating ball valve, quick fill connection with ball valve, drain connection with solenoid valve, level switches with alarm, overflow connection and interconnecting piping etc.

General Specifications:

All equipment shall be heavy duty type suitable for continuous and trouble free operation. The equipment shall be designed to permit interchangeability of parts and ease of access during inspection, maintenance and repair. SCL will provide power through MCC. Further distribution/connections to VSD and other drives shall be under the scope of vendor. Supply and installation of all the controls /

instruments, power & control cables, aluminum cable trays, glands, lugs, supports, hangers etc and the terminations of cables (supplied and installed under this scope) in MCC, VSD, instruments/controls and the motors etc are under the scope. All the instruments shall be terminated into the junction box for each system complete with gliding, ferruling etc for onward transmission of the signals.

Pumps & Make up tank

Syntax make tanks of capacity 500 liters complete with level switch, make up

connection with float valve and isolating ball valve, quick fill connection with ball valve

and the GI (class-C) piping with required fittings, supports etc up to scrubbers.

Instruments & Controls. The entire scrubber water system will be connected one set of booster pumps set as per required capacity

Control Philosophy:

Each Scrubber set shall work in normal 12 hours during CPCB office hours. The control panel shall have the option of auto mode / manual mode with emergency button. The system load will be vary from 40 % to 80 %. The scrubber should take part load automatically. The power consumption of the unit will be less at partload.

Warranty:

The vendor shall submit a written warranty for a period of two years from the date of Commissioning for successful / trouble free running of the entire system under scope. Any breakdown during guarantee period shall be attended by the vendor free of cost within 24 hours of information including replacement of the parts, if any, at his (vendor's) own cost. Vendor shall submit a written guarantee from the manufacturer of the equipments for availability of spare parts of all the machines for at least 15 years of operation of the plant.

Annual Maintenance Contract:

The exhaust fans, VFDs and the instruments& controls etc. under scope of this work shall be covered under Comprehensive Maintenance Contract for a period of 5 years after expiry of guarantee / warranty period. There shall be minimum four quarterly services (four preventive visits) per year and unlimited number of emergency/ breakdown calls, which shall be attended within 24 hours of the information. All the spares including instrument & controls etc. shall be in the scope of the contractor.

Acceptance Procedure:

The equipments will be run continuously for 7 days to check their satisfactory operation. If, during the trial run, the system is found not meeting the specifications, necessary replacement/rectification will be carried out by the vendor and the system will be put back to trial run again for 7 days before the acceptance is given.

General Conditions:

1. The required test certificates of the material in the scope as well as equipments tested at manufacturers works shall be supplied by the vendor.

2. All the civil works for erection and commissioning of the equipments shall be done by vendor. However, necessary drawings and other details shall be provided by the vendor. The machines shall be adequately isolated against transmission of vibrations to the building structure.

3. Necessary foundation bolts, nuts, leveling-screws vibration pads etc. wherever required, for mounting the machines, shall be provided by the vendor as per manufacturer's drawings/recommendations. Making suitable modification/trimming of the foundation(s) and usage of ISMB 250 base frame or as required for better ground clearance shall be included in the bidder's scope.

4. Necessary power supply is available near the plant room. The vendor shall bring KWH meter, ELCB and Switch fuse unit with proper earthing system and necessary wires/cables for drawing power supply. The power drawn will be charged at departmental rates.

5. Any item not specifically mentioned but required to complete the system shall also be included.

DESIGN DATA:

CAPACITY : To be designed for 20 – 25 Kg / hr of HCL gas.

SHELL : 3 mm PPGL + 3 mm FRP

SHELL TANK : 5 mm PPGL + 3 mm FRP with Steel reinforcement.

The tank should consist of an inlet nozzle for liquid, bottom drain, an overflow nozzle with flanges and a man hole.

SPRAY NOZZLE : Spiral Jet Spray Nozzle (Imported)

BAFFLE PLATE : 20 mm PP Perforated

RASCHING RINGS : 25 mm Dia x 25 mm long PP

WATER SPRAY : PP

WATER INLET PIPE : PP with PP standard Flanges.

MIST ELIMINATOR : PP Demister pad type with PP grid.

HEIGHT OF PACKING : As per manufacturer size

DIAMETER OF THE COLUMN : " * "

SCRUBBER BLOWER :

TYPE : Centrifugal

CAPACITY : 1950 CFM, 600CFM, 300 CFM,

STATIC PRESSURE : 150 mm wg

DRIVE : DIRECT / BELT DRIVE

R P M : as per spec

M O C :

FAN CASING : 5 mm PPGL + 3 mm FRP

IMPELLER : MS Lined with FRP Coating

FAN PEDESTAL : MS Epoxy painted

DUCTING & PIPING :

MAIN HEADER DUCT : PP FRP (Thickness – ' * ')

BRANCH DUCT : PP FRP (Thickness – ' * ')

DAMPER : PP FRP

FLEXIBLE DUCTS : PVC

SCRUBBER PUMP :

CAPACITY :

HEAD :

FLUID : ALKALINE SOLUTION

TEMPERATURE : 0°C to 50°C

NPSH REQUIRED :

NPSH AVAILABLE :

IMPELLER DIAMETER :

IMPELLER TYPE : Semi open

MIN. / MAX. IMPELLER DIAMETER :

EFFICIENCY :

kW WATER / FLUID :

DRIVE kW :

SPEED (rpm) : 2900

PUMP MODEL & TYPE : Back suction centrifugal

SUCTION x DISCHARGE (mm) : *

SEAL / PACKING : Gland Packing

MATERIAL OF CONSTRUCTION : SS 316

QUANTITY : 1 No.

STANDARD ACCESSORIES: Pump should be complete with **flame proof motor**, base frame(SS304), spacer coupling, coupling guard and any other accessories as required.

Recommended makes: (Only scrubber system)

1 Fan	Subarban/Flakt/Batliboi
2 Pump	Tour & Anderson /Grundfos /Armstrong / Johnson
3 Pump motor	Kirloskar/Crompton/Bharat Bijlee
4 Butterfly & Ball Valve	Audco
5 Check valve	Advance/Intervalve
6 Pipes, SS	Nikka / Ratnamani
7 Pressure/Temp Gauges	Ashcroft / Mass /A.N. Instruments / Bells / Waree
8 Flow Meter	Siemens/Sauter/GE-Sontay
9 sensors/ actuators / level switches etc.	Siemens/Sauter/Johnson Controls
10 Kilowatt Hour Meter	ENECON/Siemens/L&T
11 Solenoid valve	ASCO/Rotex/Avcon
12 Pump coupling	Fenner/Lovejoy
13 Fasteners	Unbrako/Bossard
14 VSD	ABB/Siemens/Rockwell
15 Scrubber	Flakt/Batliboi/Colasit/Harrington/Equivalent

SECTION - 7

Technical data sheet

Sl. No.	Description	Unit	Tenderer Confirmation
1.	Variable Refrigerant Volume Aircooled units		
1.1	Outdoor units (Heat Pump Type)		
1.1.1	Make and model	:	
1.1.2	HP of Outdoor Unit (ODU)	:	
1.1.3	Capacity (each) TR (Nominal)	:	
1.1.4	Quantity (nos.)	:	
1.1.5	Type	:	

1.1.6 Permissible length of

Refrigerant piping from

ODU to farthest IDU. :

1.1.7 Type of compressor :

1.1.8 No. of compressor (each outdoor unit) :

1.1.9 No. of inverter compressor (each Outdoor unit) :

1.1.10 Air entering temp. On Condenser (Deg C) :

1.1.11 Dimension of Machine (H x W x D-mm) :

1.1.12 Are bigger machines (Above 18 HP) provided :

With 2 separate inverter compressors for

proper duty cycling and higher reliability.

1.1.13 Confirm if dedicated Intelligent touch controller(with : touch screen functions) with colored graphic LED display

provided to act as BMS for VRV system.

1.1.14 Confirm if inverter scroll compressor is DC inverter :
1.1.15 External static pressure available in ODU :
1.1.16 Is anticorrosion (PE) treatment available on fins of outdoor unit :

1.1.17 Type of Heat exchanger in outdoor machine : (Optimized E pass or some other type)

1.1.18 Set up available for Night time quiet operation :

1.1.19 Confirm feature available for reduction of fan noise and pressure loss on outdoor unit :

1.1.20 Is it possible to have automatic address setting of : each indoor on Outdoor unit? Otherwise what

alternate function available?

S.No.	**Description**	**Unit**	**Condition of Services**
1.2	Indoor Units		**1 2 3**
			(Give detail for each type)
1.2.1	Manufacturer	--	
1.2.1.1	Type	--	
1.2.1.1	Capacity	--	Tons

1.2.1.3 Airflow Min/Max. -- Cfm

1.2.2 Sound level -- Hi/Lo

1.2.3 Overall Dimensions -- l x w x h

1.2.4 Unit weight KG -- kg

1.2.5 Is remote controller (corded) provided for each indoor unit - Yes/No.

SECTION - 8

1. DESIRED MAKE OF MATERIALS ACMV SYSTEM

Sl.No.	Description	Manufacturer
1.	VRF SYSTEM	Daikin/TOSHIBA
2.	Air-cooled SPLIT Units	Daikin/TOSHIBA
3.	COLD ROOM	RINAC / Blue star
4.	SCRUBBERS	Flakt / Batliboi / Colasit / Harrington / Equivalent
5.	T RH Display unit	CAREL / IRA / IE / HTA
6.	Filters	AAF / EMU / THERMODYNE
7.	Blower / Fans	KRUGER / SYSTEM AIR
8.	GI Sheets	Sail / Jindal
9.	Grilles and Diffusers	AJANTA / Air Master
10.	Volume Control Dampers	AJANT / AIR MASTER
11.	Fire – Dampers /dampers	Caryaire / Air master
12.	Actuator	Belimo / Siemens
13.	Fresh air / Exhaust air Louver	AJANT / AIR MASTER
14.	Flexible hood pipe-Robo arm type	Nutech / Alsident
15.	Thermal / Acoustic insulations	Thermobreak / K-flex
16.	Condensate drain pipes	Finolex / supreme / PRINCE

NOTE:

Contractors intending to supply other makes of materials / equipments than those listed above, shall indicate the makes in their offer. Contractors shall clearly indicate the make of equipments considered by them for that particular project in their tender / offer

2. DESIRED MAKES OF MATERIALS (AC associated Electrical work)

Sl.No.	Description	Manufacturer
1	M C C B	: ABB / MERLIN GERIN / SIEMENS
2	M C B	: SIEMENS / INDOASIAN
3	Push Button & Selector Switch	: SIEMENS / TECHNIK

4	Power Capacitors	: ASIAN / EPCOS / HAVELS
5	Over Load Relays	: SIEMENS
6	3- Phase Energy Meter with MD Indicator	: CIMMCO /CONSERVE
7	P F Meter & Relay	: BELUK / DUCATI
8	Cables	: CCI / GLOSTER
9	Cables Trays	: PROFAB
10	Digital Ammeters & Voltmeters	: CONZERV
12	Contactors	: SIEMENS
13	Indicating Lamps (LED)	: SIEMENS / TEKNIC
14	Connectors	: PHOENIX
15	M C C Fabricators	: ELINS / PRAGATHI / LOTUS POWERGEAR.

Note:

Consultants & Owner will have an option for selecting any one of the make listed above & will inform at the time of ordering.

Contractors intending to supply other makes of materials than those listed above, shall take prior approval of the Consultant's / Client's before ordering on materials

SECTION – 9

LIST OF DRAWINGS

Sl.No.	Drawing No.	Description	Drawing Scale	Remarks
1	NT/CPCB/-09 AC-11	Std construction details	NTS	
2	NT/CPCB/-09 AC-12	4 th floor Air Laboratory A/C system	1:100 @ A1	
3	NT/CPCB/-09 AC-13	4 th floor Air Laboratory ventilation system	1:100 @ A1	
4	NT/CPCB/-09 AC-14	4th floor Air Lab piping Layout	1:100 @ A1	
5	NT/CPCB/-09 AC-15	4th floor Air Lab ACMV co-ordinated Layout	1:100 @ A1	
6	NT/CPCB/-09 AC-16	Terrace layout of 4th Floor Air Lab ACMV equipment Layout	1:100 @ A1	

ARTICLES OF AGREEMENT

Made at …….. this …….. day of …….. between…….. ……..(hereinafter referred to as the Employer which expression shall include his, Executors, Administrators and Assigns) of the other part WHEREAS the employer is desirous of "Renovation of Air Lab-ACMV works" in C.P.C.B building.
WHEREAS the said drawings and the specifications and the priced schedule of quantities have been signed by or on behalf of the parties hereto and WHEREAS the contractor has agreed to execute upon and subject to the conditions at forth herein (hereinafter referred to as 'the said conditions") the work shown upon "the said Drawings" and described in "the said specifications" and the said "

Priced Schedule of Quantities"

At the respective rates mentioned in the priced Schedule of quantities attached.
and WHEREAS the contractor has deposited Rs…… Rupees …… .....……..) with the Employer for the performance of the Agreement.

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. In consideration of the payments to be made to the contractor as hereinafter provided he shall upon and subject to the said conditions execute and complete the works shown upon the said drawings and such further detailed drawings as may be furnished to him by the said Architects and described in the specifications and the said priced schedule of quantities.
2. The employer shall pay the contractor such sums as shall become payable hereunder at the time and in the manner specified in the said conditions.
3. the plans, agreements and documents mentioned above shall form the basis of this contract and the decision of the said Employer as mentioned in the conditions of contract with reference to all matters of dispute as to the material, workmanship or account and as to the intended interpretation of clauses of this agreement or any other document attached hereto shall be final and binding on both parties and shall be made a rule of court.
4. The said contract comprises the above mentioned buildings and all subsidiary works connected there within the same site as may be ordered to be done from time to time by the said Employer even though such works may not be shown on the drawings or described in the said specifications or the priced schedule of quantities.
5. The said conditions and special conditions, specifications, schedule of quantities, wage schedule of labour and schedule of materials to be supplied by the employer and guarantee bond shall be read with construed forming part of this agreement and the parties hereto will respectively abide by and submit themselves to the conditions and stipulation and perform the agreements on their parts respectively in such conditions contained.
6. The Employer reserves to himself the right of altering the drawings and nature of the work and of adding to or omitting any items of work or of having portions of the same carried out departmentally or otherwise and such alternations or variations shall be carried out without prejudice to this contract.
7. All disputes arising out of or in any way connected with this Agreement shall be deemed to have arisen in Delhi and courts in Delhi shall have jurisdiction to determine the same.

8. The several parts of this contract have been read by us and fully understood by us. As witness our hands this ……. …….. day of ……

Signed by the said

_____ _____
in the presence of witnesses EMPLOYER

1. Signed by the said

_____ _____

2. In the presence of

SPECIAL CONDITIONS

1. Sealed tenders superscripted with "Renovation of Air and Treatability Lab-ACMV works" should be submitted at the office of the Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi - 110 032. The tender documents will be received upto 3.00 p.m. on 19.11.2010.

2. The bids will be opened on 19.11.2010 at 3.30 p.m. at the same address.

3. No tender will be received after 3.00 p.m. on 19.11.2010 under any circumstances whatsoever.

4. Tender shall remain valid for a period of 3 months from the date of opening the tender.

5. CPCB does not bind itself to accept the lowest or any tender and reserves to itself the right to accept or reject any or all the tenders, either in whole or in part without assigning any reasons for doing so.

6. (a) Each page of tender documents is required to be signed by the person or persons submitting tender in token of his /their having acquainted himself/ themselves with General conditions of contract, General Specification, special conditions, etc., as laid down. Any tender with any of the documents not so signed will be rejected. This also applies in respect of limited and private limited companies.

   (b) the tender submitting on behalf of a firm shall be signed by all the partners of the firm or by a partner who has the necessary authority on behalf of the firm to enter into the proposed contract, otherwise the tender is liable to be rejected.

7. (a) The tender form must be filled in English or Hindi language and all entries must be made by hand written in ink. If any of the documents is missing, or unsigned, the tender will be considered invalid.

   (b) The tender shall also submit along with his tender in respect of items wherein make is not specified a list mentioning the names of manufacturers specialized items which he proposes to use in the work if his tender is accepted.

8. All erasures and alternations made while filling the tender must be attested by initials of the tenderer. Overwriting of figures is not permitted. Failure to comply with either of these conditions will render the tender void. No advice of any change in rate of conditions after opening of the tender will be entertained.

9. Intending tenderers shall pay as Earnest Money a sum of Rs 1,88,486/- by demand draft/FDR in favour of CPCB, Delhi.

   A tender which is not accompanied by earnest money will not be considered. The earnest money will be returned without any interest to the tenderer if his tender is not accepted.

10. Within fourteen days of issue of letter of intent from the CPCB of the acceptance of its tender the successful tenderer shall be bound to execute the contract by signing in accordance with the draft agreement and schedule of conditions but written acceptance by the Employer of a tender will constitute a binding contract between the employer and the tenderer whether such formal contract is subsequently entered into or not.

11. All compensation or other sums of money payable by the contractor to the employer under the terms of this contract shall be deducted from its earnest money and the security deposit if the amount to permits and contractor shall unless such deposit has become otherwise payable, within ten days after such deduction make good in cash the amount so deducted.

12. The contractor shall not assign or sublet any portion of the contract. He must not sublet any portion of the contract except with written consent of the Employer, failing which the employer may serve a notice in writing rescinding the contract where upon the security deposit shall stand forfeited at the absolute disposal of the employer.

13. A schedule of probable quantities in respect of such work and specification accompany these special conditions. The schedule of probable quantities are liable to alterations omission, deductions or additions at the discretion of the Employer. Each tender should contain not only the rates but also the value of each item of work entered in a separate column and all the items should be totaled up in order to show the aggregate value of the entire tender. All corrections in the tender rates shall be duly attested by the dated initials of the tenderer. Corrections which are not attested may entail the rejection of the tender. Rates should be quoted both in figures and words in columns specified. In case of discrepancy in the rates in figures and words the rates in words shall be deemed to be correct.

14. The tenderer must obtain for itself on its own responsibility and his own expense all the information which may be necessary for the purpose of making a tender and for entering into a contract and must examine the drawings and must consider and inspect the site of the work and acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto and influencing its rates for the work.

15. The rates quoted in the tender shall include all charges for double scaffoldings, marking out and clearing of site, Airing etc., as mentioned in the specifications. The rates quoted shall be deemed to be for the finished work. Tenderer must include in their rates royalty, sales tax, excise duty, octroi and any other tax and duty, or other levy levied by the central government or any state government or local authority if, applicable, no claim in respect of royalty, sales tax, excise duty, octroi or other tax, duty or levy shall be entertained by the Employer.

16. Time shall be considered as the essence of the contract. The entire work must be completed in 3 (three) calendar months. The attention of the tenderer is drawn to clause 10 of the conditions of contract referring to damage for non-completion. The tenderer shall before commencing work prepare a detailed work programme which shall be approved by the employer.

17. The contractor shall not be entitled to any compensation for any loss suffered by him on account of delay in commencing or executing the work whatever the course of delays may be, including delay arising out of modification of the work entrusted to him or any sub-contracts connected therewith or delays in awarding contracts for other trades of the project or in commencement or completion of such works or in procuring government controlled or other building materials or in obtaining Air and power connections for construction purposes or for any other reason, whatsoever and the employer does not accept liability for any sum besides the tender amount subject only to such variations as may be provided for herein.

18. The successful tenderer is bound to carry out any items of work necessary for the completion of job even though such items are not included in the quantities and rates. Schedule and instructions in respect of such additional items and their quantities will be issued in writing by the Employer.

19. If the Head quarters of the successful tenderers are elsewhere than Delhi he shall have a duly authorized agent in Delhi from the commencement of the work until the building is occupied by the employer. Such agent shall be authorized to act on behalf of the successful tenderer to accept service of notice of contract and to agree to extras, omissions and varied item of work and rates for the same. Such agent shall maintain on his staff a qualified Engineer approved by the Employer and such office personnel as may be required for the efficient execution of works. Any notice under the contract shall be deemed to have been served on the successful tenderer if served upon such agent or sent by registered letter to address. Such agent shall not be changed and shall not leave during the duration of the contract, unless the consent of the Employer shall have been previously obtained. If the Employer shall order the tenderer to carry out any rectifications under the terms of the contract after the building is completed, the successful tenderer shall have the same or another duly authorized agent while such rectifications are being carried out.

20. The successful tenderer must co-operate with the CPCB and its decisions so that the work shall proceed without any delay and to the satisfaction of the employer.

21. The contractor shall be supplied Air and electrical connection free of cost.

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

- On completion of the work, the contractor shall clear away and remove from the site all surplus materials, rubbish and temporary works of every kind and leave the whole of site and permanent works clean and in a workman like condition into the satisfaction of employer.

- The contractor shall also submit the wage schedule for all classes of labourers required in the work, for information of the department and necessary action in case the department desires to engage its labour for minor works to be done departmentally.

S.N.	**Classification of Labour**	**Unit**	**Rate/day in figures words**
1	**Diploma holder**	**Each**	
2	Foremen Ist grade	Each	
3	Electrician Ist grade	Each	
4	Fitter Ist grade	Each	
5	Khalasi	Each	
6	Mason	Each	

CONDITIONS OF CONTRACT

1. Interpretations

In Construing these conditions, the specifications, the priced schedule of quantities, tender and agreement, the following words shall have the meanings herein assigned to them except where the subject or contact otherwise required:-
"Employer" shall mean ……..
…….. And his (their) heirs, legal representatives, assigns and successors.
" Contractor" shall mean ……..
…….. and his (their) heirs, legal representatives, assigns and successors.
"Site" shall mean the site of the contract works as shown bounded on the site plan attached hereto including any buildings and erections thereon and any other land adjoining thereto (inclusively) as aforesaid allotted by the Employer for the Contractor's use.
"This Contract" shall mean the Articles of Agreement, special conditions, these conditions, the priced schedule of quantities, the specifications, and the appendix and the drawings, additional instructions issued till the receipt of the tender and subsequently correspondence if any till the date of acceptance of tender, and the letter of acceptance of contract.
"Act of Insolvency" shall mean any act of Insolvency as defined by the Presidency town Insolvency Act, or the provincial act or any amending statute.
"Notice in writing" or written notice shall mean a notice typed or printed characters sent (unless delivered) personally or otherwise provide to have been received by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered.
"Virtual completion" shall mean that building is in the opinion of Employer fit for occupation.
"Words imputing persons" include firms and corporations. Words imputing the singular only also include plural and vice versa where the context so required.

2. Scope of work

The contract in brief covers civil works for the "Renovation of Air Lab-ACMV works" in CPCB at Parivesh Bhawan, East Arjun Nagar, Delhi – 110 032.
The contractor shall carry out and complete the works in every respect in accordance with this contract and in accordance with the directions and to the satisfaction of the employer. The employer in their absolute discretion from time to time issue further drawings and / or written instructions, details, directions and explanations which are hereafter collectively referred to as the "Employer's Instructions" in regard to:-

a) The variation or modification of the design, quality of works or the additions or omission or substitution of any work.
b) The removal from the site of any materials brought there on by the contractor and the substitution of other materials therefore.
c) The removal and/or re-execution of any works executed by the contractor.
d) The dismissal from the works of any persons thereupon.
e) The opening up for inspection of any work covered up.
f) The amending and making good of any defects under clause (10)

1. Authorities, Notice and Patents

The contractor shall confirm to the provisions of any acts of the legislature relating, to the works and to the regulations and bye-laws of any authority, and of any Air, lighting and other companies and /or authorities with whose system the structure is proposed to be connected, and shall, before making any variations from the drawings or specifications that may be necessitated by so confirming give to the Employer written notice, specifying the variation proposed to be made and the reason for making it, and apply for instructions, thereon. In case the contractor shall not within in seven days receive such instruction he shall proceed with the work confirming with the provisions, regulations or bye-laws in question.
The contractor shall arrange to give all notice; required by the said acts, regulations or bye-laws to be given to any authority, and to pay to such authority, or to any public officer all fees that may be properly chargeable in respect of the works, and lodge the receipts with the employer.
The contractor shall identify the Employer against all claims in respect of patent rights and shall defend all actions arising from such claims unless he has informed the employer before any such infringement received their permission to proceed and shall himself pay all royalties license fees, damages, coasts and charge of all and every sort that may be legally incurred in respect thereof.

2. Access

The employer, their representative shall at all reasonable times have free access to the work and / or to the workshop factories, or other places where materials are being prepared or construct the contract and also to any other place where

the materials are lying or from which they are being obtained, and the contractor shall give every facility to Employer and their representative necessary for inspections and examinations and tests of the materials and workmanship. Except the representatives of public authorities no person shall be allowed on the works at any time without the written permission of the employer.
If any work is to be done at the place other than the site of works, the contractor shall obtain the written permission of the employer for doing so. The work during the progress / on completion can also be inspected by the employer.

3. Dismissal of workmen

The contractor shall on the request of the employer immediately dismiss from the works any person employer thereon who may, in the opinion of the employer, be unsuitable or incompetent or who may misconduct himself, and such person shall not be again employed or allowed on the work without the permission of Employer.

4. Date of Commencement and completion

The contractor shall be allowed admittance to the site on the "Date of commencement" stated in the Appendix, and he shall thereupon and forthwith begin the works and shall regularly proceed with and complete the same on or before the "Date of Completion" stated in the Appendix subject nevertheless to provisions for extension of time hereinafter contained.
The time being the essence of contract, the contractor will adhere to time and progress chart and will give proportionate progress in proportionate time i.e. 1/8th of work in 1/4th of the time, 3/8th of the work in ½ of the time and 3/4th of the work in 3/4th of the time and commensurate with the progress as envisaged in the bar chart based on the analogy had accepted by the employer. In case of failure on the part of the contractor to give proportionate progress in proportionate time then the employer may recover by way of liquidated damages the amount calculated as described in the appendix shall however be refunded in case the individual items and the entire works are completed by the target dates, as decided by the employer, whose decision shall be binding.

5. Assignment

The whole of the works included in the contract shall be executed by the contractor and the contractor shall not directly or indirectly transfer, assign or underlet the contract or any part, share interest therein nor shall be take a new partner without the written consent of the employer, and no subletting shall relieve the contractor from the full and entire responsibility of the contractor or from active superintendence of the work during its.

6. Schedule of quantities

The schedule of quantities unless otherwise stated shall be deemed to have been prepared in accordance with the method of measurement mentioned in the specifications and shall be considered to be approximate and no liability shall attach to the employer for any error that may be discovered therein.

7. If in the opinion of the employer the work be delayed

a) By force of nature such as incessant rain, flood, fire and like natural calamities or
b) Reason of any exceptionally inclement of weather or
c) By reason of proceeding taken or threatened by or dispute with adjoining or neighboring owners or public authorities or
d) By the works or delays of other contractor or tradesman engaged by the employer and not referred to in the schedule of quantities and /or specification or
e) By reason of employer's instructions as per clause No.2 or
f) By reason of civil commotion, local combination of workmen or strike of lockout affecting any of the building trades or
g) By consequence of the contractor not having received in due time necessary instructions from the employer for which he shall have specially applied in writing or
h) From other causes which the employer may certify as beyond the control of the contractor or
i) In case of strike or lock out the contractor shall give written notice thereof to the employer, but the contractor shall nevertheless constantly use his endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of employer to proceed with the work. The employer shall make a fair and reasonable extension of time for the completion of the contractor work.

8. Damage for non-completion

If the contractor fails to complete the work by the date of completion stated in the appendix or within any extended time under clause 9 thereof and the employer certify in writing that in their opinion the same ought reasonably so to have been completed, the contractor shall pay or allow the employer the sum named in the appendix as "liquidated Damaged"

for the period during which the said works shall so remain incomplete and the employer may deduct such damage from any moneys due to the contractor.

9. Failure by Contractor to comply with employer's instructions

If contractor after receipt of written notice from the employer requiring compliance, with such further drawings and / or employer's instructions fails within seven days to persons to execute any such work whatsoever may be necessary to give effect thereto and all costs incurred in connection therewith shall be recoverable from the contractor by the employer as a debt or may be deducted by him from any moneys due to the contractor.

10. Certificate and payment

The contractor shall be paid by the employer from time to time by installments under interim certificates to be issued by the employer to the contractor on account of the works carried when in the opinion of the employer work to the approximate value named in the appendix as value of works for interim certificates (less at the reasonable discretion of the employer) has been executed in accordance with this contract, subject however to a retention of the percentage of such value named in appendix hereto as "Retention percentage of interim certificates". The employer may in their discretion include in the interim certificate such amount as per standard CPWD procedure on account of material delivered upon the site by the contractor for use in the works.
And when the works have been virtually completed and the employer shall have certified in writing that they have been so complete the contractor shall be paid by the employer in accordance with the certificate to be issued by the employer the sum of money named in the appendix as 'Installment after virtual completion' and the contractor shall be entitled to the payment of the final balance in accordance with the final certificate to be issued in writing by the employer at the expiration of the period referred to as "Defects Liability period" in the appendix hereto from the date of virtual completion or soon after the expiration of such period as the works shall have been finally completed and all defects made good according to the true intent and meaning hereof whichever shall last happen. Provided always that the issue of the employer of any certificate during the progress of the work set or after their completion shall not relieve the contract or from his liability in case of fraud, dishonesty or fraudulent concealment relating to the works or materials or to any matter dealt. Within the certificate and in case of all defects and insufficiencies in the works or materials which a reasonable examination would not have disclosed. No certificate of the employer shall of itself be conclusive evidence that any works or materials to which it relates are in accordance with the contract.
The employer shall have power to withhold any certificate if the works or any parts thereof are not being carried out to their satisfaction.
Payments on interim certificate shall be made within the period named in the appendix "Period of honoring Certificate" after such certificate have been delivered to the employer and vetted by the CPCB.

11. Certificate of Virtual completion

The works shall not be considered as completed until the employer have certified in writing that they have been virtually completed and the defects liability period shall commence from the date of such certificate.

12. Employer delay in progress

The employer may delay the progress of the works without vitiating, the contract and grant such extension of time for the completion of contract as they may think proper and sufficient in consequence of such delay, and the contractor shall not make any claim for compensation of damages in relation thereto.

13. Restriction of work to be carried out

if at any time after commencement of the work, the employer shall for any reason what so ever not require the whole work or part thereof as specified in the tender to be carried out, the contractor shall have no claim to any payment of compensation whatsoever on account of any profit / advantage / on which he might have derived from the execution of the work in full but which he did not derive in consequence of the full amount of the work not having been carried out nor shall be have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.
Provided that the contractor shall be paid the charges on the cartage only of materials actually and bonafide brought to the site of work by the contractor and tendered surplus as result of abandonment or curtailment of the work or any portion thereof and then taken back by the contractor, provided however, that the employer shall have in such cases the option of taking over all or any such materials at their purchase price or at local current rates which ever may be less.
In case of such stores having been issued from employer stores and returned by the contractor to employer stores, credit shall be given to the contractor at rates not exceeding those at which they were originally issued to him after taking in to consideration and deduction for claims on account of any deterioration or damage while in custody of the contractor and in this respect the decision of the employer shall be final.

14. Suspension

If the contractor except on account of any legal restraint upon the employer preventing the continuance of work shall suspend the works or in the opinion of the employer shall neglect or fail to proceed with due diligence in the performance of his part of the contract or if he shall more than once make default in respect of clause No.2 the employer shall have the owner to give notice in writing to the contractor requiring that the work be proceeded within reasonable manner and with reasonable dispatch, such notice shall purport to be a notice under this clause. After such notice shall have been given the contractor shall not be at liberty to remove from the site of the work or from any ground contiguous thereto any plant and materials belonging to him which will have been placed there on for the purpose of the works and the employer shall have a lien upon all such plant and materials subsist from the date of such notice being given until the notice shall have been compiled with. If the contractor shall fail for seven days after such notice have been given to proceed with the works as therein prescribed the employer may proceed as provided in clause No.17.

15. Termination of contract by employer

Termination of contractor (being an individual or a firm) commit any "Act of insolvency" or shall be adjudged insolvent, shall make an assignment or composition for the benefit of the greater part in number or amount of his creditors or shall enter into a deed of assignment with his creditors or (being an incorporated company) shall have an order made against him or pass an effective resolution of winding up either compulsorily or subject to the supervision of the court or voluntarily or if the official assignee of the contractor shall repudiate the contractor if the official assignee or the days after notice to him requiring him to do so, to show to the reasonable satisfaction of the employer that he is able to carry out and fulfill the contract and if required by the employer to give security therefore or if the contractor (whether an individual, firm or incorporated company) shall suffer execution to be issued, or if the contractor shall suffer any payment contractor shall assign or sublet the contract, without the consent in writing of the Employer first obtained, or any payments due or which may become due to the contractor there under, of if the employer shall certify in writing that in their opinion the contractor;

I. Has abandoned the contract.
II. Has failed to commence the work, or has without any lawful excuse under these conditions suspended the progress of the work for fourteen days after receiving from the employer written notice to proceed, or
III. Has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or
IV. Has failed to remove materials from the site or to pull down and replace works within seven days after receiving from the employer written notice that the said materials or work were condemned and rejected by the employer under these conditions, or
V. Has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this contract to be observed and performed by the contractor to observe perform the same, or

Any other decision, opinion, direction, certificate or valuation of the employer to give any of the same shall be subject to the right of Arbitration and review in the same way in all respects (including the provision as to opening the reference) as if it were a decision of the employer.

16. Deposit

The amount deposited by the contractor along with his tender shall be retained with the employer and it shall be returned to the contractor on the virtual completion of the works. In case of default in any of the foregoing conditions the deposit amount shall be forfeited the employer.

20. The contractor undertakes to ensure due and complete compliance with all laws, regulations, rules etc. whether of the central government or the state government or of any other competent authority applicable to the workmen employed or whose services, are otherwise availed of by the contractor whether in connection with the construction work at the site or otherwise. The employer shall have the right to inspect the records maintained by the contractor concerning such workmen from time to time and contractor shall whenever required by the employer produce such records as the employer's may call upon the contractor produce for the employer inspection in order to ascertain whether or not the requirement of all such laws, regulations, rules etc., have been compiled by the contractor. In the event of any contravention of such laws, regulations, rules etc., coming to light as a result of such inspection or otherwise the employer shall have the right to require the contractor effect such.

21. The employer shall not be responsible if any accident or death is caused during the continuer of work the contractor shall be responsible to pay the compensations.

Settlement of Dispute and Arbitration

I. All disputes and differences arising out of or in connection with the contract and works of any nature assigned under the same (whether during the progress of the works or after their completion), determination, abandonment or breach of the contract shall be referred to a team of three men arbitrator appointed by the Chairman, CPCB. The arbitrators shall elect an umpire among them. In case of conflicting findings by the arbitrators, the decision of the umpire shall be final and binding. It will not be an objection to any such appointment that the arbitrators are the government servants and had any interest in the board or the contract entered into directly or indirectly. In all cases, the arbitrators shall state their decision in writing and if amount of claims in dispute is Rs.50,000/- and above, the arbitrators shall give reasons for award.
Subject as aforesaid the provisions of the arbitrations cancellation act or any statutory modification or re-enactment thereof and the rules made there under and for the time being inforce shall apply to the arbitration proceeding under this clause.

II. It is a term of the contract that the party involving the arbitration shall specify the dispute or dispute to be referred to the arbitrator under this clause together with the amount or amounts claimed in respect of each such dispute.

III. It is also a term of the contract that if the contractor's do not make any demand for arbitration in respect of any claims in writing within 90 days of receiving the intimation from the CPCB that final bill is ready for payment, the claim of the contractor's will be deemed to have been waived and absolutely barred and the board will be discharged and released of all liabilities under the contract in respect of these claims.

IV. The decision of the employer regarding the quantum of reduction as well as justification thereof in respect of rates for sub-standard work which may be decided will be final and would not be open to arbitration. Provided always that no compensation shall be payable for any loss in always that no compensation shall be payable for any loss in consequence of hostilities or war-like operation (a) unless the contractor had taken all such precautions against Air raid as are deemed necessary by A.R.P officers or the Engineers In Charge, (b) for any materials etc., not on the site of work or for any tools and plant, machinery, scaffolding temporary buildings and other things not intended for the work.
In the event of the contractor having to carry out reconstruction as aforesaid, he shall be allowed such extension of time for its completion as is considered reasonable by the employer compliance within such time as the employer may prescribe in that behalf and in the event of the contractor failing to effect such compliance within the time prescribed by the employer then the employer shall without prejudice to his other rights be entitled to withhold from the amount payable to the contractor any amount payable to the workmen under any such laws, regulations or rules and to make payment thereof to the workmen. The employer shall also have in that event the right to terminate the contract with immediate effect and to exercise powers reserved to their employer under the contract as a result of termination.

_____ _____

CPCB CONTRACTOR

Witnesses

1.

2.

APENDIX

1.	Date of Commencement	10th day from the date of issue of letter of award.
2.	Date of completion	4 months from the date of commencement.
3.	Insurance	As directed.
4.	Liquidated damages	1% of the contract value per week subject to a maximum of 10% of the contract value.
5.	Period of final measurements	Within 03 months from the date of completion.
6.	Value of work for Interim Certificate	Two running payment of 80% of the work completed
7.	Security deposit	10% of the contract amount subject to a maximum upto Rs. 10.00 lakhs. The security deposit will be collected by deductions from the running bills of the contractor at the rate of 10%.
8.	Defects liability period	One year

TENDER DOCUMENT

Renovation of Air Lab and Treatability Lab ACMV works

At

Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
Delhi – 110 032

Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
Delhi – 110 032