

SUMMARY OF TOTAL WORKS

PART D2

Name Of Work : MEP & Interior Civil Works of Chemistry Research Laboratory in DESE/CESE building of Indian Institute of Technology Bombay, Powai, Mumbai - 400076.

NIT NO- IIT(B)/Dean (IPS)/Chemistry Research Lab/DESE-CESE/Tender/2022/01 Date:- 20/06/2022

Summary:-

SR.NO.	BRIEF DESCRIPTION	AMOUNT IN RS.
1	Civil Interior Works	18,31,233
2	Electrical Works	27,72,281
3	ELV Works	16,94,924
4	HVAC Works	1,49,28,898
5	TOTAL OF ABOVE WORKS	2,12,27,336

Amount in Words:- Two Crores Twelve Lakhs Twenty Seven Thousand Three Hundred Thirty Six Only

SUMMARY SCHEDULE OF QUANTITIES FOR ELECTRICAL WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI		
Sr.No.	Description	Amount (Rs.)
	LT BOQ	
A	M.V. SWITCHGEARS AND DISTRIBUTION BOARDS	9,05,261
B	CABLES	6,17,255
C	CABLE TRAYS	21,240
D	EARTHING & LIGHTNING PROTECTION SYSTEM	85,361
E	POINT WIRING	11,14,737
F	SAFETY EQUIPMENT	15,727
G	CONSTRUCTION POWER REQUIREMENT	-
H	Removal, Modifications in existing installed system	10,000
TOTAL LT WORKS (Including Tax)		27,72,281
	Note -	
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ.	
	Vendor to check availability of material with client before procuring.	

SCHEDULE OF QUANTITIES FOR ELECTRICAL LT SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
A	M.V. SWITCHGEARS AND PANEL				
	Design, manufacture, supply, installation, testing and commissioning of following MV switchgear panels suitable for 415 V, 3 phase, 4 wire, 50 Hz power distribution system. The panel shall be Indoor, wall/floor mounting, sheet metal clad, cubicle, dust and vermin proof type compartmentalised design fabricated out of 14 gauge CRCA sheet steel in cubical formation,& 3 mm thick cable gland plate, shall be provided both at the top and the bottom of the panel , complete with aluminium bus bars, separate earth bus bar to be provided through out the length of the panel along with base channel of suitable size.				
	The incoming and outgoing feeders shall be accommodated in a modular multitier arrangement, adequate size cable alley, painting, earthing, numbering, danger plate etc as required as per specifications and drawings. Current density for busbar size shall be designed considering not more than 1.0 A/sq.mm for copper & 0.8 A/sq.mm for aluminium. The switchgear live parts shall be isolated with proper insulation material. The current transformer shall be cast resin type. IP - 54 protection for indoor DB Panel & IP - 65 for outdoor DB panels or as mentioned specifically. DB should have IK09 protection & Anti Insertion marking ACB should have Ics = Icu = Icw (1 sec.). MCCB with thermal release adjustable from 0.7 to 1In & 0.4 to 1In in case of microprocessor release.				
	All measuring instruments (Meters) shall be of digital electronic with LED of approved make and compatible with BMS. All hinged door shall be earthed through minimum 2.5 sq mm tinned braided copper wire, Pad locking for Switch board doors, Pad locking of MCCB's handles in "OFF" Position. The panel shall comply with latest industrial practice including attached SLD / technical specification / I.S .standards .				

	All PTs / control transformer shall be provided with centre tap earth secondary. The breaking capacity of MCCB's are mentioned panel wise. All MCCB's shall be with thermal magnetic releases up to 250 amps and microprocessor based above 250 amps capacity, unless specified otherwise Complete with interconnections and distribution bus bars. Proper bonding to earth. All Panels having ACB & MCCB will be jointly tested in presence of client engineer incharge including primary & secondary injection test.				
1.1	Main LT Panel	Nos	Already Installed for Reference		
a	Incomer				
	400 A, FP, 36kA, MCCB Microprocessor based release with OL,SC,No volt relay and earth fault Relay with RS 485 port with castle lock : 1 Set				
	Phase indicating lamps with SPMCB 3 nos.-1 Set				
	<i>Breaker ON / OFF / TRIP indicating lights with control MCB's - 1 set</i>				
b	Metering & Protection				
	Voltmeter/VSS/Control MCB & phase indicating lamps- 1 Set, 96 x 96 mm sq. 0-500 Volt digital voltmeter with selector switch and shall be protected by 2 amp TP MCB's				
	MFM (meter) with CTs - 1 Set LSIG& VISUAL DISPLAY,(for each set 3 Nos. 96 x 96 sq.mm 0-400 / 5 amps CTR digital ammeter with 3 nos 400 / 5 amps, 15 VA Class I CT's.)				
	Communication port RS 485 - 1 no.				
c	Busbar				
	630 A, TPN, 50 kA Al busbar insulated with colour coded heat shrinkable sleeves. Extension of main busbar with links to be provided.- 1Set				
d	Outgoing				
	125 A, 4P 25kA MCCB :- 2 Sets.				
	63 A, 4P 10kA MCB :- 3 Sets.				
	40 A, 4P 10kA MCB :- 5 Sets.				
	25 A, DP 10kA MCB :- 5 Sets.				
1.2	HVAC PANEL	Nos	Already Installed for Reference		
a	Incomer				
	320 A, FP, 36kA, MCCB Microprocessor based release with OL,SC,No volt relay and earth fault Relay with RS 485 port with castle lock : 1 Set				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
	Phase indicating lamps with SPMCB 3 nos.-1 Set				
	Breaker ON / OFF / TRIP indicating lights with control MCB's - 1				
b	Metering & Protection				
	Voltmeter/VSS/Control MCB & phase indicating lamps- 1 Set, 96 x 96 mm sq. 0-500 Volt digital voltmeter with selector switch and shall be protected by 2 amp TP MCB's				
	MFM (meter) with CTs - 1 Set LSIG& VISUAL DISPLAY,(for each set 3 Nos. 96 x 96 sq.mm 0-320 / 5 amps CTR digital ammeter with 3 nos 320 / 5 amps, 15 VA Class I CT's.)				
	Communication port RS 485 - 1 no.				
c	Busbar				
	500 A, TPN, 50 kA Al busbar insulated with colour coded heat shrinkable sleeves. Extension of main busbar with links to be provided.- 1Set				
d	Outgoing				
	40 A, 4P 300mA ELCB :- 21 Sets.				
	32 A, 4P 10kA MCB :- 09Sets.				

1.3	HVAC PANEL modification	Job	1	78,824	78,824
	Supply, replacement , testing and commissioning of following MV switchgear in existing HVAC panels suitable for 415 V, 3 phase, 4 wire, 50 Hz power distribution system with respective power & control wiring as require.				
	Replacement of 40 A, 4P 300mA ELCB to 63 A, 4P 300mA ELCB - 09 sets				
	Replacement of 40 A, 4P 300mA ELCB to 16 A, 4P 300mA ELCB - 04 sets				
	The rate shall include the control & power wiring , switchgear etc. as required				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
2.0	M.V. SWITCHGEARS AND DISTRIBUTION BOARDS				
	Supply, Installation (recessed / surface), testing and commissioning of following MCCB / MCB type distribution boards as per drawings and specifications fabricated out of 14 / 16 SWG, CRCA sheet steel as per specification and drawings. The surface distribution boards shall be mounted on suitable MS angle / z section angle, C section channel frame work grouted to floor/wall. The rate shall include the iron frame, support, painting, numbering, earthing etc. as required. All Indoor DBs should confirm with IP 43 protection. As per approved make.				
2.1	PDB - 1 (12-way VTPN DB) ref SLD	Nos	1	31,506	31,506
a)	Incomer				
	125A, FP, MCCB 16kA - 1 Nos. With adjustable tripping				
b)	Outgoing				
	32 A, FP, 10kA MCB - 1 Nos.				
	32 A, SP, 10kA MCB - 4 Nos.				
	20 A, SP, 10kA MCB - 19 Nos.				
	25 A, SP, 10kA MCB - 7 Nos.				
2.2	PDB - 2 (8 way VTPN DB) ref SLD	Nos	1	21,240	21,240
a)	Incomer				
	63A, FP, MCB 10kA - 1 Nos.				
b)	Outgoing				
	40 A, SP, 10kA MCB - 2 Nos.				
	32 A, SP, 10kA MCB - 5 Nos.				
	25 A, SP, 10kA MCB - 7 Nos. *				
	25 A, SP, 10kA MCB - 9 Nos.				
2.3	PDB - 3 (8 way VTPN DB) ref SLD	Nos	1	18,408	18,408
a)	Incomer				
	40A, FP, MCB 10kA - 1 Nos.				
b)	Outgoing				
	32 A, FP, 10kA MCB - 1 Nos.				
	25 A, SP, 10kA MCB - 8 Nos. *				
	20 A, SP, 10kA MCB - 13 Nos.				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
2.4	PDB - 4 (12 way VTPN DB) ref SLD	Nos	1	31,506	31,506
a)	Incomer				
	125A, FP, MCCB 16kA - 1 Nos. With adjustable tripping				
b)	Outgoing				
	63 A, SP, 10kA MCB - 2 Nos.				
	32 A, SP, 10kA MCB - 4 Nos.				
	25 A, SP, 10kA MCB - 13 Nos.				
	20 A, SP, 10kA MCB - 17 Nos.				
2.5	LDB 1 (12 way SPN) ref SLD	Nos	1	7,953	7,953
a)	Incomer				
	16A, DP MCB+ ELCB 30 mA 10kA - 1 Nos.				
b)	Outgoing				
	10 A, SP, 10kA MCB - 8 Nos.				
2.6	LDB 2 (12 way SPN) ref SLD	Nos	1	7,953	7,953
a)	Incomer				
	16A, DP MCB+ ELCB 30 mA 10kA - 1 Nos.				
b)	Outgoing				
	10 A, SP, 10kA MCB - 8 Nos.				
2.7	LDB 3 (12 way SPN) ref SLD	Nos	1	7,953	7,953
a)	Incomer				
	16A, DP MCB+ ELCB 30 mA 10kA - 1 Nos.				
b)	Outgoing				
	10 A, SP, 10kA MCB - 8 Nos.				
2.8	EMDB 1 (12 way SPN) ref SLD	Nos	1	7,953	7,953
a)	Incomer				
	16A, DP MCB+ ELCB 30 mA 10kA - 1 Nos.				
b)	Outgoing				
	10 A, SP, 10kA MCB - 8 Nos.				
2.9	2 kVA UPS DB (8 way SPN) ref SLD	Nos	1	6,962	6,962
a)	Incomer				
	25A, DP RCBO 10kA 100 mA - 1 Nos.				
b)	Outgoing				
	16 A, SP, 10kA MCB - 4 Nos.				
2.10	10kVA UPS DB (12way SPN) ref SLD	Nos	1	7,953	7,953
a)	Incomer				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
	63A, DP RCBO 10kA 100 mA - 1 Nos.				
b)	Outgoing				
	40 A, SP, 10kA MCB - 1 Nos.				
	16 A, SP, 10kA MCB - 5 Nos.				
2.11	Common 15 KVA UPS DB (16way SPN) ref SLD	Nos	1	9,204	9,204
a)	Incomer				
	63A, DP MCB+ ELCB 10kA 100 mA - 1 Nos.				
b)	Outgoing				
	25 A, SP, 10kA MCB - 2 Nos.				
	16 A, SP, 10kA MCB - 10 Nos.				
2.12	3kVA UPS DB (12way SPN) ref SLD	Nos	1	7,245	7,245
a)	Incomer				
	25A, DP MCB+ ELCB 10kA 100 mA - 1 Nos.				
b)	Outgoing				
	16 A, SP, 10kA MCB - 8 Nos.				
3.0	Supply, Installation, testing and commissioning of following capacities metal clad sockets, MCCB, MCB, ISOLATOR complete as required.				
3.1	Outdoor type Isolators with IP 65 enclosure with 40A 4P ISOLATER for each VRF ODU	Nos.	19	5,570	1,05,822
3.2	25A Three Pin industrial type metal clad Plug & socket with 25A SP MCB 10 kA.	Nos.	2	5,428	10,856
3.3	32 A FP INDUSTRIAL TYPE SOCKET WITH MCB	Nos.	1	2,360	2,360
3.4	32 A DP ELCB 30 mA 10 kA with plastic enclosure (for fume	Nos.	9	5,428	48,852
3.5	16 A DP MCB 10 kA with metal enclosure (For Inverter)	Nos.	1	1,286	1,286
3.6	63 A FP MCB 10 kA with metal enclosure (For UPS)	Nos.	2	2,926	5,853
3.7	Supply, Installation, testing and commissioning of 800VA inverter input single phase (240 V + 10%) output single phase (240 V + 10%) with sealed maintenance free batteries suitable for 30 minutes backup including providing suitable size of 14 gauge MS battery rack suitably painted.. (for lighting DB)	Nos.	1	1,17,410	1,17,410
3.8	Supply installation, testing and commissioning of 15 KVA Online, UPS with in built isolation transformer 300 mm stand with ITHD≤ 3% & OL Protection upto 110%, input three phase (440 V + 10%) output SINGLE phase (220 V + 10%) with sealed maintenance free batteries suitable for 20 minutes backup including providing suitable size of 14 gauge MS battery rack suitably painted. all battery sizing calculation shall be provided.	Nos.	1	3,68,160	3,68,160

	TOTAL OF 'A' M.V. SWITCHGEARS AND DISTRIBUTION BOARDS				9,05,261
SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
B	CABLES				
4	Supply and laying in existing cable Trays/clamped to wall with suitable clamps saddles and fixing bolts including testing and commissioning of the following 1100 volts grade armoured XLPE insulated and sheathed aluminium/copper conductor cable complete as required. Identification tags shall be provided for all cables. (Make- Polycab/RR/ Finolex)				
	Aluminium Conductor Cables: (Refe SLD)				
4.1	3.5C x 35 Sq. mm A2XFY	RM	50	189	9,440
5	Copper Conductor Cables: (Refe SLD)				
5.1	4C x 16 Sq. mm YWY	RM	350	788	2,75,884
5.2	4 C x 10 Sq. mm YWY	RM	70	486	34,031
5.3	4C x 6 Sq. mm YWY	RM	300	335	1,00,536
5.4	4C x 4 Sq. mm YWY	RM	350	231	80,948
5.5	4C x 2.5 Sq. mm YWY	RM	250	177	44,250
5.6	3 C x 16 Sq.mm YWY	RM	60	139	8,354
5.7	3 C x 4 Sq. mm YWY	RM	120	208	24,922
5.8	3 C x 2.5 Sq. mm YWY	RM	30	142	4,248
5.9	1 C x 16 Sq. mm 2XY (For 15KVA UPS)	RM	100	255	25,488
6	Cable end termination of the following PVC aluminium cables 1100 Volt grade including cost of crimping tinned copper heavy duty bimetallic lugs, double compression glands, insulation tape and all requisite material for completion of joints.				
	Aluminium Conductor Cables (Refe SLD)				
6.1	3.5C x 35 Sq.mm A2XFY	Nos	4	243	972
7	Copper Conductor Cables: (Refe SLD)				
7.1	4C x 16 Sq.mm YWY	Nos	22	291	6,412
7.2	4 C x 10 Sq.mm YWY	Nos	4	224	897
7.3	4C x 6 Sq.mm YWY	Nos	6	211	1,267

7.4	4C x 4 Sq. mm YWY	Nos	14	177	2,478
7.5	4C x 2.5 Sq. mm YWY	Nos	12	143	1,713
7.6	3 C x 16 Sq.mm YWY	Nos	6	143	857
7.7	3 C x 4 Sq.mm YWY	Nos	14	163	2,280
7.8	3 C x 2.5 Sq.mm YWY	Nos	4	123	491
7.9	1 C x 16 Sq.mm 2XY (For 15KVA UPS)	Nos	10	123	1,227
	TOTAL OF 'B' SUMMARY OF CABLES				6,17,255
C	CABLE TRAYS				
8.0	Supply, fabrication and erection Cable Trays & M.S structural steel				
	The cable tray shall be factory built & hot dip galvanised tray equivalent for indoor use. Bidder shall include in his price, required numbers of accessories like Tees, Crosses, Bends, Elbows etc and fabricated supporting MS structure with red oxide and enamelled paint angle supports for laying cable trays on wall or suspended tie rods (Full threaded) for ceiling with horizontal angle / channel as per actual site conditions requirement. Testing and Certification:				
	Cable tray / Ladder, bend, T Bend, cross, and all supports are to be tested for Safe Working Load (SWL), deflections, Impact resistance,. The temperature classification of cable tray system should be - 5 to + 150°C.(Vendor to submit Certificates for SWL from manufacturer)				
8.1	Perforated Type Cable Tray				
8.1.1	150 mm wide x 50 mm Height x 2. mm thick				
		RM	40	354	14,160
8.1.2	Fabrication & Installation of base/mounting frames (excluding for installation of panels, cable tray supports, mounting bracket for trays etc.) from M.S channel, angle, flats as per the requirement with painting of two coats of red oxide and two coat of approved shade of paint.				
		MT	0.10	70,000	7,000

	TOTAL OF 'C' CABLE TRAY				21,240
D	EARTHING & LIGHTNING PROTECTION SYSTEM				
9.0	Supply, installation, testing and commissioning of eco safe 150 mm dia bore type electrical grounding system offering a stable grounding back fill compound for a long period of time. i.e It should be electrically conducting & not dependant on moisture & confirming to ANSI/NSF Standard 60, will not diffuse in to the ground, will not expand or experience any shrinkage but remain in constant contact with earth & should be able to reduce contact resistance to earth significantly(at least 40 %) & create a low steady state impedance for a very long period resulting in faster transient dissipation.				
	The standard earth electrode shall be made of high tensile low carbon steel circular rods, molecularly bonded copper or clad copper on the outer surface to confirm with the requirements of UL467-2007; thus reducing earth resistance(i.e combined resistance of electrode & contact resistance between electrode & soil) as an alternating low impedance path for the dangerously high voltages in the electrical distribution system. Providing masonry enclosure with minimum 10 mm thick C.I. cover plate & 25 tons load bearing capacity (or as advised elsewhere) having locking arrangement and disconnecting/ testing links etc as per IS –3043 complete as required & as follows:				
9.1	With Copper plated electrode of 25 mm dia x 3 mtr.s rod (Main Panel -2 Nos, UPS Earthing -2 Nos, Dedicated Equipment Earthing - 3 Nos) (Vendor to check availability of earthing pit)	Set	1	16,992	16,992
10	Earthing Strip/Wires				
	Supply, installation, testing and commissioning of following sizes of GI/ Copper strip/FRLS wire clamped to walls, cable trays, bus ducts, cables in recess or surface etc for equipment/ System earthing complete as required including inter connection between length at joints, all fixing accessories saddles, clamps etc and other fixing hardware material as <u>required for proper installation</u>				
10.0	G.I. Earthing strip/wire				
10.1	25 x 3 mm strip (for floor panels & with cable Tray)	RM	50	314	15,694
10.2	CU EARTHING WIRES 8 SWG (FOR DBS)	RM	90	153	13,806

10.3	Single core 6 Sq. mm wire through medium gauge FRLS PVC conduit (FOR UPS)	RM	200	104	20,768
10.4	Single core 2.5 Sq. mm wire through medium gauge FRLS PVC conduit (FOR UPS)	RM	200	76	15,104
10.5	Earthing Tap off box with 150 mm long 20 x 3 mm Cu strip with on insulators .	Nos	1	2,997	2,997
	TOTAL OF 'D' EARTHING & LIGHTNING PROTECTION SYSTEM				85,361
E	POINT WIRING				
11.0	Point Wiring				
	Supply, installation, testing and commissioning for lights point using 2 x 1.5 Sqmm stranded copper FRLS wire for phase & neutral + 1 x 1.5 Sq. mm stranded green colour copper FRLS wire for earth, insulated FRLS pvc wires drawn through medium gauge FR PVC conduit including laying of conduits in a concealed/ surface manner using necessary conduit accessories, junction boxes, switch outlet boxes, switch plates, bends, collars, clamps, ceiling roses, with 6A one way / two way modular switches etc. These shall be flush mounted in brick wall or in the built up furniture or on the surface of wall for surface installation as required.				
	Supplying, wiring, testing and commissioning of lights point using 2 x 2.5 Sqmm stranded copper FRLS wire for phase & neutral + 1 x 1.5 Sq. mm earth copper FRLS wire stranded green colour insulated FRLS pvc wires drawn through medium gauge FR PVC conduit including laying of conduits in a concealed/ surface manner using necessary conduit accessories, junction boxes, switch outlet boxes, switch plates, bends, collars, clamps, ceiling roses etc. but without switches. These shall be flush mounted in brick wall or in the built up furniture or on the surface of wall for surface installation as required. These light points will be controlled directly by the MCB of LDB. Cost of MCB not to be included in this item.				
11.3	Primary light Point controlled by MCB	Point	6	640	3,837

11.4	Same as above secondary light points wiring looped with first point or from one light fixture to another	Point	20	340	6,797
11.8	Providing & fixing 1 Nos. 16A Shuttered universal socket with 1 No. 16 A SP switches at one place (For UPS /Maintenance power /other Equip) (SUBMAIN EXCLUDED)	Nos	124	944	1,17,056
11.9	Providing & fixing 2 Nos. 6/16 A Shuttered universal UPS socket with 2 No. 16 A SP switches at one place (For UPS /Maintenance power /other Equip)(SUBMAIN EXCLUDED)	Nos	85	1,562	1,32,797
12.0	Supplying, wiring, testing and commissioning surface / concealed circuit wiring for light/power points with Multistrand Cu. FRLS wires 1100 V gr. in 25mm FR PVC conduit for each point complete with all accessories. (Mains, sub mains shall be considered for switch boards, Power Points, & equipment's etc. under this item head.)				
12.1	2 x 2.5+ 1 x 1.5 Sq.mm.	mtr	2,000	89	1,78,000
12.2	2 x 4.0+ 1 x 2.5 Sq.mm.	mtr	1,000	176	1,76,000
13.0	Supply Installation, testing & commissioning of lighting fixtures / fans / Ex. Fans / Motion Sensors etc. including necessary accessories, lamps wiring connection down drops, supports etc complete as required.				
13.1	36W 600 X 600 MM LED RECESSED LIGHT	Nos	55	5,399	2,96,918
13.2	18W LED DOWN LIGHT	Nos	45	2,850	1,28,237
	Note: Vendor to check availability of light fittings with client before procurement.				
14.0	Communication				
14.1	Supply Installation, testing & commissioning 4-pair Non-plenum enhanced Cat 6 unshielded twisted pair cable with 24 AWG solid copper conductor for data / voice including PVC conduit & require Accessories with ferruling & end termination	mtr	750	71	53,100

14.2	Supplying, fixing, testing and commissioning of plug in type RJ-45 single or duplex information outlet (flush mounted) for data in a recessed galvanized MS box with box, grid plate, face plate ,I/O module & I/Os and as required.				
14.2.1	Data I/O 1 module	Nos	20	585	11,706
14.2.2	Voice I/O 1 module	Nos	20	514	10,290
	TOTAL OF 'E' Point Wiring				11,14,737
F	SAFETY EQUIPMENT				
15.0	Supply & installation of check red rubber matting conforming to IS 5424-1969 complete as required.				
15.1	LT grade 15 mm thick 1200mm length	Nos.	1	2,714	2,714
15.2	Supplying & fixing standard shock treatment charts in English, Hindi and Marathi duly framed and covered with glass.	Nos.	2	1,185	2,369
15.3	Providing & fixing HT danger notice plate 200 mm x 150 mm made of mild steel at least 2mm thick & vitreous enamelled white on both sides and with inscription in signal red colour with human skull & bone on front side as required.	Nos.	2	366	732
	Supplying and erection of the following equipment at suitable locations in the substation building as required and as per specifications.				
15.4	Providing first aid box	Set	1	3,800	3,800
15.5	Providing 650 v tested hand gloves.	Nos.	1	2,572	2,572
15.6	Supply & fixing of approved single line diagram framed in glass frame.	Nos.	2	1,770	3,540
	TOTAL OF 'F' SAFETY EQUIPMENT				15,727

G	CONSTRUCTION POWER REQUIREMENT				
	Note : "Electrical contractor shall ensure that construction power is safely drawn by various contractors, from the above mentioned distribution boards mentioned above. Responsibility for safe usage of construction power rests with Electrical contractor. All MCCBs shall have earth fault protection.				
H	Removal, Modifications in existing installed system				
17	Dismantling of existing installed armoured cable and wires with proper inventory, tagging and details mentioned for each type of cables/wires and hand over the same to the Client	Lot	1	10,000	10,000
	TOTAL OF 'H' CONSTRUCTION POWER REQUIREMENT				10,000
	TOTAL OF A+B+C+D+E+F+G				27,72,28
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ.				
	Vendor to check availability of material with client before procuring.				

SUMMARY SCHEDULE OF QUANTITIES FOR HVAC WORKS FOR CHEMISTRY RESEARCH LABORATORY AT IIT POWAI, MUMBAI.		
		17.01.2020
SR. NO.	DESCRIPTION OF WORKS	AMOUNT (Rs.)
A	TOTAL FOR 'A' - VRF SYSTEM	8,918,374
B	FANS	231,424
C	ELECTRICAL POWER AND CONTROL SYSTEMS	1,348,224
D	REFRIGERANT AND DRAIN PIPING WORKS	1,232,987
E	AIR DISTRIBUTION	2,280,512
F	INSULATION	917,376
	TOTAL	14,928,898
	TOTAL OF EXCISE DUTY	Included
	TOTAL OF SALES TAX	Included
	TOTAL OF SERVICE TAX AMOUNT	Included
	TOTAL OF ANY OTHER TAXES	Included
	TOTAL ALL INCLUSIVE	
	Comprehensive AMC for 1st Year After Warranty (Service Tax Extra at Actual)	
	Percentage increment for subsequent 3 years after 1st AMC (Service Tax Extra At Actual)	
	Any scope related to civil, carpentry, structural, false ceiling, false flooring is excluded from HVAC scope of works.	

SCHEDULE OF QUANTITIES FOR HVAC WORKS FOR CHEMISTRY RESEARCH LABORATORY AT IIT POWAI, MUMBAI.					
Note- Based on GFC layouts issued by HVAC consultant, shop Drawings & Detailing as required for the proper execution of the project shall be the responsibility of HVAC Low Side Works Contractor & these drawings shall be submitted for prior approval from the consultant before execution of works.					
SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
A	VRF SYSTEMS				
1.0	Supply, Lifting, shifting, assembly, installation, testing and commissioning of Out Door Units suitable for VRF / VRV System				
	The system shall comprise of Outdoor Units with Air-cooled condenser suitable for ambient at test conditions should be 35 deg. c and maxm. withstanding temperature as 46 deg. c , high pressure Rotary / Scroll Compressors with hermetic motor, assembled and wired in a single package complete, starting controls, safety controls, operating controls and with full feature microcomputer based controller with real time clock and programming / diagnosis facility. All Compressors shall be invertor type based on manufacturer's technology.				
	The unit is to be given a complete factory operating and control sequence test under load conditions with fluid hooked up, and is to be shipped with full operating charge of refrigerant and oil. Air-cooled Condenser, refrigeration-piping controls, first charge of refrigerant etc.				
	The Outdoor units shall be complete as per technical specifications. Please provide EER values at 100% load @ AHRI conditions of 210/240 conditions in the Data sheets for HVAC equipment's.				
	The Refrigerant used shall be any CFC free gas either R407C/ R410A refrigerant OR any other variant of CFC free refrigerant gas				
	Vendor to include MS fabrication as necessary to install the VRF condensing unit of top discharge type.				
	The Outdoor units shall be complete as per technical specifications				
	Outdoor units suitable for following capacities:				
1.1	20 HP VRF ODU	Set	2	576,000	1,152,000
1.2	18 HP VRF ODU	Set	6	422,400	2,534,400
1.3	14 HP VRF ODU	Set	3	373,760	1,121,280

2.0	AIR HANDLING UNITS				
	Supply, installation, testing and commissioning of Sectionalised, Horizontal Double Skin Treated Fresh Air Handling Units constructed of extruded aluminium hollow sections framework, pre plasticised GS Sheets of 24G (outside) / 22G (inside) with 50 mm thick injected PUF / 40 kg/cu.m + 2 % density and with thermal break, consisting of fan section having belt driven with double grooved pulley DIDW Aerofoil Backward Curved Blowers housed in a single enclosure with TEFC sq. cage motor IP55, vibration isolators. The AHU motors shall be high efficiency type IE-3. Fans shall be selected for higher total efficiency 75% and above. Motor should have insulated bearing housing. Motors shall be IE-3. AHUs shall be approved by VRF Manufacturer and suitable to be connected with Air-cooled VRF ODUs. AHU shall be suitable for outdoor duty application.				
	Coil Section with 8 row-12 fpi DX cooling coil with Cu Tubes / Al.fin Coil headers shall be of copper as specified. Fins and copper tubes with all joints and U-Bends of AHU shall be Coated with Water based DTM Anti Corrosion coating either in factory or at site. Coil should be suitable for connecting with VRF ODU's. Drain tray shall be insulated sandwich type drain tray of SS (inside) / GI (outside) with liberal drain connections on either side shall be provided.				
	The Double skin Sections shall include for Coil Section, with provision for elec. connection to the outside of AHU, Fire retardant double canvass connections, DP ports at each section, damper at AHU outlet, access doors with limit switch, maintenance lamp inside the fan section shall be included. The sections shall be provided in modular construction with enough service space and proper access doors as specified (wherever specified / required).				
	The Prefilters shall be confirming to EU / European standards. The filters shall be with Al. Flange / Frame type with thermally bonded hydrophobic polyolefin fibres [synthetic] washable media. The filters shall be tested for filter efficiency as per EN779 – G4 / EU4 [efficiency of 90% down to 10 microns] & final pressure drop not exceeding 12.5 mm WC. Microvee Filters shall be with Al. flange / Frame type with media and in accordance with EN779- F9 / EU9 [Efficiency of 95% down to 5 microns] & final pressure drop not exceeding 25mm WC.				
	AHU's should be suitable for outdoor duty application, Floor mounted / Ceiling Suspension as Specified. Fan outlet velocity not to exceed 1800 fpm. Coil face velocity not to exceed 500 fpm.				

	Installation of Double Skin Air Handling Units shall include for its installation in place, connections, testing and commissioning. Installation shall mean unloading, lifting-shifting, positioning, levelling assembly& installation in place.				
	AHU Vendor shall be responsible for supply & assembly of floor mounted units at site. HVAC Vendor shall carry out the Unloading, lifting-shifting, connect, test and commission the AHUs in presence and with assistance from AHU vendor.				
	Necessary foundation blocks / structural platform to be				-
2.1	AHU-1, 2 & 3 Horizontal Top Discharge Floor mounted TF AHU / 40 TR / 5000 CFM / 100 mm TSP / 8R-12FPI DX Cooling Coil suitable to connect with VRF Condensing units (18HP+18HP+14HP) / 10 micron Pre-filters (EU4) + 5 micron Microvee Filters (EU9) / Fan section with Backward Curve Aerofoil Fans. (AHU shall be 2working + 1standby basis)	Nos.	3	481,280	1,443,840
2.2	AHU-4 & 5 Horizontal Top Discharge Floor mounted with RA Plenum AHU / 16 TR / 5000 CFM / 100mm TSP / 6R-12FPI DX Cooling Coil suitable to connect with VRF Condensing units (20HP) / 10 micron Pre-filters (EU4) + 5 micron Microvee Filters (EU9) / Fan section with Backward Curve Aerofoil Fans. (AHU shall be 1 working +1 standby basis)	Nos.	2	404,480	808,960
3.0	VRV Accessories				
	Supply, Lifting, shifting, assembly, installation, testing and commissioning VRV Accessories as specified below and in Technical Specifications suitable for VRF operations.				
3.1	Multi Kits	Nos.	3	9,677	29,030
3.1	Supply, Lifting, shifting, assembly, installation, testing and commissioning of Connectivity kits / Distribution Kit for AHUs for hook up /connecting to respective VRF outdoor units				
	Expansion Valve Kit comprising of Electronic Expansion Valve (EEV), check valve and pipe temp, sensors. Control Box comprising of PCB, communication PCB, Power transformer and terminal block and suitable for hook up with VRF remote controller, CRC etc.				
3.1.1	Expansion kit suitable for AHU connectivity of 14 HP cooling coil capacity	Sets	3	120,320	360,960
3.1.2	Expansion kit suitable for AHU connectivity of 18 HP cooling coil capacity	Sets	6	153,600	921,600

3.1.3	Expansion kit suitable for AHU connectivity of 20 HP cooling coil capacity	Sets	2	204,800	409,600
3.2	Supply, Lifting, shifting, assembly, installation, testing and commissioning Master / Central Remote Controller as specified below and in Technical Specifications suitable for automatic operation of all indoor and outdoor units.	Set	1	112,640	112,640
	The central controller shall have a touch screen type display and have the capability of controlling all indoor & outdoor units individually, in groups and unanimously. The central controller shall have the unique capability of arranging indoor units into groups (up to 16 groups per network). Refer technical specifications for further details.				
	The central controller shall be time clocked by the 7-day-Year round programmable timer supplied by the manufacturer or by an external time clock (supplied by others). When used in conjunction with the 7-day programmable timer then different programme on/off times for each group of indoor units shall be available.				
	In case of BMS system not in operation for any reason, the Master Controller / Central Controller shall be capable to work on stand alone basis and should be able to indicate and control all indoor and outdoor units as specified.				
3.3	Controller for sequencing, programming scheduling the DX AHUs for equal run, auto stand-by change over, fault take off etc. as specified. The controller shall be enclosed in an IP-65 Panel. Separate Panel shall be provided for DX AHU set.				
	For chemistry & wet lab 3 AHU shall be provide on (2 working + 1 standby basis) and for other labs 2 AHU shall be provided on (1 working + 1 standby basis)	Set	2	12,032	24,064
	The particular set of Air handling units shall be controlled in sequence when working on working + standby basis.				
4.0	OTHER CHARGES			Included in Above for each equipment	
4.1	Port Clearance	Lot			
4.2	Freight	Lot			

4.3	Insurance	Lot			
4.4	Handling + lifting & shifting	Lot			
4.5	Any other charges the vendor feels is necessary	Lot			
	TOTAL FOR 'A' - VRF SYSTEM				8,918,374

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
B	FANS				
1.0	Smoke Exhaust Fans (SEF):				
	Supply, Installation, Testing and Commissioning of Axial flow fans shall be direct driven, Multiple blade type mounted on a steel mounting plate with orifice ring. The fans shall be of 2 hrs Fire rating and Motors shall be of high temp. resistance (to withstand upto 250 degree C), class H insulation and OUTSIDE the airstream / air passage. Vendor to consider S / I / T / C of starter panel with necessary control, OLP, SPP, ON & OFF push button with ON-OFF indications, Auto-Manual selector switch, 6 nos. non polarised NO-NC contacts for fans operations on signal from Fire Alarm Panel.				
1.1	4000 CFM with 25mm TSP	Nos	1	50,176	50,176
1.2	5000CFM with 15mm TSP	Nos	1	65,536	65,536
2.0	Make up air Fans (In case of fire):				
	Supply, Installation, Testing and Commissioning of Axial flow fans shall be direct driven, Multiple blade type mounted on a steel mounting plate with orifice ring. The fans shall be of 2 hrs Fire rating and Motors shall be of high temp. resistance (to withstand upto 250 degree C), class H insulation and OUTSIDE the airstream / air passage. Vendor to consider S / I / T / C of starter panel with necessary control, OLP, SPP, ON & OFF push button with ON-OFF indications, Auto-Manual selector switch, 2 nos. non polarised NO-NC contacts for fans operations on signal from Fire Alarm Panel.				
2.1	2500CFM with 25mm TSP	Nos	1	42,496	42,496
2.2	5500 CFM with 25mm TSP	Nos	1	73,216	73,216
	TOTAL FOR 'B' - FANS				231,424

C	ELECTRICAL POWER AND CONTROL SYSTEMS				
1.0	POWER DISTRIBUTION PANEL				
	Supply, Installation, Testing & Commissioning of Power Distribution Panel for VRF ODU comprising of fully compartmentalised cubicle type panel, as per specifications and complete with :				
	(Incoming Power with earthing shall be provided to each of the distribution panels by Elec. Contractor)				
	i) Tinned Al. Busbars				
	ii) 7 tank pre-treatment, Panel with IP 65 construction & suitable for outdoor duty				
	iii) Oven baked epoxy paint finish or powder coated				
	iv) Incoming and outgoing feeders				
	v) Indicating and measuring instruments				
	vi) Interconnections, interlocking, earthing etc.				
	vii) Starters & control panel				
	Panel Cost should include also OLP, SPP, On/ Off push buttons with On / Off / Trip indications, 3nos. non polarised NO-NC contacts tripping on signal from fire alarm panel & BMS.				
	d) Suitable for 20 HP # 2 nos (with ELCB)- Spare				
	e) Suitable for 14 kW # 1 nos (with ELCB) - Spare				
	(This Item is considered as part of Electrical scope of				
1.1	Starter & Control Panel for AHU & FAN				
	Supply, Installation, Testing and Commissioning of Starter and control panel suitable for 415 V, 3 phase, 50 Hz power distribution system. The panel shall be with IP 65 protection and should be fabricated for wall mounting compartmentalised design as per specifications.				
	Starter & Control Panel comprising of incoming 4 pole MCB, Voltmeter, Ammeter, Phase indicating lamps etc. Outgoing feeders as DOL / Star Delta starter for AHU / FAN motor. Vendor to provide suitable capacity 2 nos spare feeders for AHU / FAN motor.				

	Starter and control panel shall be complete with necessary control, including OLP, SPP, ON/OFF push buttons with ON & OFF indications, 3 nos. non polarised NO-NC contacts for tripping of Motorised Dampers, Fire Dampers and AHU / FAN motor on signal from Fire Alarm Panel. Also, vendor necessary interlocking for AHU / FAN operations including toggle switch for PSU & pumping down etc to be included as part of Starter and Control panel. Panel should be suitable to house the VFD.				
	Vendor should consider power & control cabling from Starter panel upto respective AHU / FAN .				
	The units shall be suitable for operation on 400/440 Volts, 3 ph., 50 Hz, 4 wire A.C. supply.				
1.1.1	Fresh Air Handling Units Horizontal Top Discharge Floor mounted 40 TR - 5000 CFM / 100mm TSP.	Nos.	3	47,360	142,080
1.1.2	Air Handling Units Horizontal Top Discharge Floor mounted 10 TR - 5000 CFM / 100mm TSP.	Nos.	2	47,360	94,720
1.2	Variable Frequency Drive for AHUs and FANs				
	Supply, Installation, Testing and Commissioning of variable speed drives for AHU Fan Motor(s) with 1 no. dedicated microprocessor based controller with software duly downloaded, Adjustable frequency drives, differential pressure sensor/ transmitters as necessary and as described in the specifications and complete with:				
	a) Duct pressure sensor / transducer (DP sensor shall be placed in SA duct upstream - 1no. Per SA duct). The VFD shall be capable to intake upto 3 inputs from DP sensor / AHU and operate the VFD based on average / lowest reading available.				
	b) Integration with bypass mode for Normal starter operation.				
	The VFD vendor shall include necessary integrator, convertor, software, hardware, license's etc. as applicable for the VFDs to interact & be controllable thru' central BMS. Necessary protocol for connecting with MODBUS RTU, BACNET, LONWORKS etc. shall also be included. VSDs Compliance with LEED requirement and Core Performance Section 2.10 is required.				

1.2.1	VFD for AHUs having motors above 7.5 kW & upto 11 kW for AHUs	Sets	5	96,000	480,000
1.3	Outdoor type Isolators with IP 65 enclosure with ELCB for each VRF ODU	Nos.	11	5,760	63,360
1.4	Power & Control cabling:				
	Electrical contractor shall terminate power in individual switch socket for each IDU as per requirement. For VRF ODU incoming power shall be provided at the PDB, from there to each VRF ODU the cabling shall be carried out by HVAC contractor.				
1.5.1	Power and Control cabling with copper conductor min. 2 core x 1.5 sq.mm. Cu. Shielded control cabling shall be with PVC conduit as per specs. cable with end termination for Indoor units with Plug Top, Earthing connection, BMS connectivity etc. (from indoor to outdoor & interconnecting control cabling between ODU and CRC)	RMT	2,000	133	266,240
1.5.4	4C X 6 sq.mm Cu. Armoured conductor cable, as per specs	RMT	100	458	45,824
2.0	CONTROL SYSTEM				
2.1	Pressure Balancing System comprises Logic controller with inbuilt algorithm, set of DP sensors, with necessary control wiring between sensor and controller and upto set of Motorised Modulating Damper Actuator. Controller should provide signal to motorised Damper Actuator based on differential pressure values. The controller shall be enclosed in an IP-54 Panel. Separate Panel shall be provided for each lab .				
2.2	System-1 (3 # DP Sensors + 1 # Controller + 2 # Actuators)	Set	1	116,480	116,480
2.3	System-2 (4 # DP Sensors + 1 Controller + 4 # Actuators)	Set	1	139,520	139,520
	TOTAL FOR 'C' - ELECTRICAL POWER AND CONTROL SYSTEMS				1,348,224
D	REFRIGERANT AND DRAIN PIPING WORKS				
1.0	Refrigerant piping				

	Hard Copper refrigerant piping of required sizes for pair of gas (suction) & liquid, with 19 mm Closed Cell Insulation material class O / 60 kg/m ³ density for wrapping the copper pipe lines. The piping system must be supported at 1.75 m distance. Rates to include special damping and supporting system including installation of factory made joints as required.				
	Pressure Testing of VRF piping shall be as per VRF Manufacturer's requirements.				
	Vendor to include G.I. Ready made Ladder type Cable Tray with cover for refrigerant piping, Power / Control cable for ODU and AHU.				
1.1	41.3 mm dia	RMT	270	1,536	414,720
1.2	28.6 mm dia	RMT	234	1,272	297,723
1.3	19.1 mm dia	RMT	270	1,023	276,342
1.4	15.9 mm dia	RMT	216	1,006	217,313
2.5	12.7 mm dia	RMT	18	961	17,289
2.0	Drain piping in hard PVC with all fittings, supports and clamps including drilling hole in wall chipping wall etc to conceal and to route the drain pipe. The piping shall be suitably insulated with 19 mm thk Closed Cell foam Class O (Nitrile Rubber) stuck with approved adhesive compound. The insulation shall be covered with glass cloth and painted with rubberised paint.				
2.1	50 mm dia	RMT	50	192	9,600
	TOTAL FOR 'D' - REFRIGERANT AND DRAIN PIPING WORKS				1,232,987
E	AIR DISTRIBUTION				
1.0	SHEET METAL DUCTING				
	Rectangular Ducting in Galvanised Steel				

	Supply, fabrication, installation and testing of GSS metal ducts as per IS-277 (120 GSM both sides, LFQ & confirming to Class VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/ supports, volume control duct dampers, accessories, vanes, 3 mm neoprene rubber gasket etc. complete as per specifications in accordance with the approved shop drawings. No slip joints shall be allowed. Flanges shall be Rolamate or equivalent and ducts shall be with rigid supports as per technical specifications.				
	Ducts to be sent in Factory Fabricated and Fully Boxed Form at the jobsite. The factory fabricated ducts shall be as per approved make list only.				
	The quoted costs should include:				
	i) Ducts with reinforcement/ strengthening				
	ii) Air tight joints				
	iii) Accessories such as splitter, damper, guide vane etc.				
	iv) Hangers and supports.				
	v) Painting with Black colour paint for duct sides behind the grills.				
	vi) The gasket used in case for all ducts shall be fire retardant				
	vii) Ducts shall be fully sealed with Silicon Sealant for leak tight installation.				
1.1	0.63 mm (24 SWG) GSS ducting	Sq.M.	400	1,121	448,512
1.2	0.80 mm (22 SWG) GSS ducting	Sq.M.	300	1,341	402,432
1.3	1.00 mm (20 SWG) GSS ducting	Sq.M.	150	1,498,	224,640
2.0	SHEET METAL DUCTING				
	Rectangular Ducting in Galvanised Steel				

	Supply, fabrication, installation and testing of GSS metal ducts as per IS-277 (120 GSM both sides, LFQ & confirming to Class VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/ supports, volume control duct dampers, accessories, vanes, 3 mm neoprene rubber gasket etc. complete as per specifications in accordance with the approved shop drawings. No slip joints shall be allowed. Flanges shall be Rolamate or equivalent and ducts shall be with rigid supports as per technical specifications.				
	Ducts to be fabricated to suit at site.				
	The quoted costs should include:				
	i) Ducts with reinforcement/ strengthening				
	ii) Air tight joints				
	iii) Accessories such as splitter, damper, guide vane etc.				
	iv) Hangers and supports.				
	v) Painting with Black colour paint for duct sides behind				
	vi) The gasket used in case for all ducts shall be fire				
	vii) Ducts shall be fully sealed with Silicon Sealant for				
2.1	0.63 mm (24 SWG) GSS ducting	Sq.M.	40	1,029	41,165
2.2	0.80 mm (22 SWG) GSS ducting	Sq.M.	30	1,262	37,862
2.3	1.00 mm (20 SWG) GSS ducting	Sq.M.	20	1,382	27,648
3.0	Spiral G S Ducting				
	Supply, fabrication, installation and testing of GSS metal spiral ducts as per IS-277 (120 GSM & complying to Class-VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/supports, volume control duct dampers, accessories, vanes complete as per Technical Specifications in accordance with the approved shop drawings. but ducts shall be preformed with Machine made 4-ply lock seam spiral ducts complete with special supporting, elbows, bends, reducers fittings and flange connections, rubber gasket at every 1.2mtr as specified.				
SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)

	The supports etc. shall be painted with 2 coats of red oxide and 2 coats of enamel paint of approved colour. The Ducts shall be painted at site as per approved colour / shade. The painting shall be limited to roller paint & shall attain good & even finish.				
4.0	<u>FLEXIBLE DUCTS</u>				
	Supply, Installation, Testing and Commissioning of insulated flexible ducts. The insulated flexible duct shall have inner core made of double lamination of metalized polyester film permanently bonded to a coated spring steel wire helix. Fibreglass insulation of minimum 14 kg.cu.m. density having a R-value 4.2oF-Ft2-hr/btu and 25 mm thk shall be wrapped over the inner core and covered with stronger outer jacket cum vapor barrier made of fibreglass reinforced metalized polyester film laminate. The insulated flexible duct should be fire retardant type.				
4.1	Insulated Flexible ducts of 200 mm dia	RMT	20	538	10,752
4.2	Insulated Flexible ducts of 300 mm dia	RMT	15	645	9,677
5.0	Charges for Duct Leak Pressure Testing for Pressure Testing as per specifications to demonstrate minimum acceptable leakages to the satisfaction of the HVAC consultant. Duct pressure testing may be carried out in zones to enable initiate further clearances.				
		Lot	1	57,600	57,600
6.0	<u>ACCESSORIES</u>				
	Supply, fabrication, assembling, installation, and testing of air distribution accessories of assorted size as specified and shown on the drawing:				
6.1	VOLUME CONTROL DAMPER - MANUAL				
	Supply, Installation and adjusting of GSS Volume Control Damper within ducts complete with suitable links, levers. Blades should be double skinned aerofoil construction and opposed blades should be at 50mm pitch centres. The blades should be mounted in nylon bushes operated by an interior wheel gear system. Manual quadrant control with position indicator to be provided to enable adjust volume of air as required.	sqm	3	8,448	25,344

6.2	VOLUME CONTROL DAMPER - MOTORISED ACTUATOR				
	Supply, Installation and adjusting of GSS Volume Control Damper within ducts complete with suitable links, levers. Blades should be double skinned aerofoil construction and opposed blades should be at 50mm pitch centres. The blades should be mounted in nylon bushes operated by an interior wheel gear system. Manual quadrant control with position indicator to be provided to enable adjust volume of air as required.	sqm	5	9,062	45,312
6.3	MOTORISED ACTUATOR (MODULATING TYPE)				
	The Actuator shall be in line with the Technical Specifications and shall be maintenance free direct coupled suitable to work on 24 V electric supply. The torque rating of the actuator shall exceed at least by 15% over torque required to modulate the damper. The selection of actuator size shall be the responsibility of the manufacturer. Power on indicating lamps with 230 V / 24 V transformer, damper close & open indication, reset push button, push button for manual running of actuator for periodic inspection, auxiliary contacts 24V & 230 V, contact points to receive signal from DP Sensor Controller should be provided.	Nos	6	13,005	78,023
6.4	MOTORISED ACTUATOR (ON-OFF TYPE)				
	The Actuator shall be in line with the Technical Specifications and shall be maintenance free direct coupled suitable to work on 24 V electric supply. The torque rating of the actuator shall exceed at least by 15% over torque required to modulate the damper. The selection of actuator size shall be the responsibility of the manufacturer. Power on indicating lamps with 230 V / 24 V transformer, damper close & open indication, reset push button, push button for manual running of actuator for periodic inspection, auxiliary contacts 24V & 230 V, contact points to receive signal from AHU Starter Panel should be provided.	Nos	9	13,005	117,043
6.5	FIRE AND SMOKE DAMPERS:				

	Supply, Installation, Testing & Commissioning of Fire and Smoke Dampers (FSD) shall be installed in supply air duct when they pass through AHU room walls as shown in the drawings & as per specifications. The Dampers shall be motor operated with at least 90 minutes fire rating as per UL 555S -Class II for fire and smoke management rated for 90 min.as tested by CBRI Roorkee, India. Each FSD shall be of multi leaf type, low leakage and shall be tested in the factory and will be certified by the manufacturer in form of the test certificate. The Actuator shall be direct coupled spring return type & motorised. Each FSD shall be supplied with matching sleeve (factory supply) and set of retaining angles for installation on wall / slab as indicated on drawings.				
	The Actuator shall be in line with the Technical Specifications and shall be maintenance free direct coupled spring return type suitable to work on 24 V electric supply.				
	Dampers as per specifications mentioned above.	sq.m	15	9,933	148,332
6.6	Motorised ON/OFF Actuators for above FSD.				
	The Actuator shall be in line with the Technical Specifications and shall be maintenance free direct coupled spring return type suitable to work on 24 V electric supply. The torque rating of the actuator shall exceed at least by 15% over torque required to open / close the damper. Shall have manual over ride facility. The selection of actuator size shall be the responsibility of the manufacturer. Power on indicating lamps with 230 V / 24 V transformer, damper close & open indication, reset push button, push button for manual running of actuator for periodic inspection, auxiliary contacts 24V & 230 V, contact points to receive signal from smoke detector / fire alarm panel etc. should be provided. (fire dampers provided at AHU inlet, outlet shall be closed & fire dampers at smoke extraction fans shall be open in case of fire)	nos	11	14,336	157,696
7	Diffusers				

	Supply, fabrication, assembling and installation of aluminium powder coated diffusers as indicated in the drawings and as per specifications. (Colour to match as per architects requirements)				
	The 4-way square supply air terminal should be in Al powder coated construction with easily removable central core with 4-way fixed deflection grill, Volume control damper to be of opposed blade, nylon geared with aerofoil blades & black matt powder coated. (Out to Out Size shall be 24"x24" suitable for modular false ceiling with flush / triangular type construction (as per approved layouts) & as per approved sample. (Colour to match architect's requirements.)				
7.1.1	Neck size of Grilles with VCD (SAG) 500 x 500	No.	12	5,274	63,283
7.1.2	Neck size of Grilles with VCD (SAG) 400 x 400	No.	18	4,890	88,013
7.2	Supply / Return Air Grill-Diffuser for Gypsum FC				
	The 4-way square supply air terminal should be in Al powder coated construction with easily removable central core with 4-way fixed deflection grill, Volume control damper to be of opposed blade, nylon geared with aerofoil blades & black matt powder coated. (Out to Out Size shall be as per Neck size and suitable for gypsum false ceiling with flush / tagular type construction (as per approved layouts) & as per approved sample. (Colour to match architect's requirements.)				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
7.3	Supply /Return / Exhaust Air L-bar Grill				
	In extruded aluminium construction, powder coated. One way/2 way fixed deflection with end flanges - 0 / 15deg.as required and as shown in the drawings.	Sq.M	5	7,104	35,520
7.4	Box Type Dampers:				
	Aluminium Box type collar damper with nylon - geared control & with aerofoil blades for above grills in black matt powder coated finish.				
	Box type dampers for S. A. collar	Sq.M	2	6,784	13,568
7.5	Supply, installation and adjusting of GSS Back draft Damper within ducts complete with suitable links, levers. Blades should parallel type The blades should be mounted in nylon bushes operated by an interior wheel gear system based on air pressure.	sqm	3	7,040	21,120
7.6	Flexible Canvas Connection: Supply, fabrication & installation of double canvass (fire retardant) flexible connection for Inline Fans & Duct able Indoor Units as per drawings& specifications.	sqm.	8	786	6,144
7.7	Al. Louvers for Fresh Air / Exhaust				
	Supply, installation, testing & commissioning of Fresh Air /Exhaust Air Louvers - constructed in Extruded Aluminium Anodised finish. Blades inclined at 45deg. on 40mm pitch complete with:	Sq. m.	1	12,288	12,288
	a) Sheet steel enclosure cowl				
	b) Opposed Blade Volume Control Damper				
	c) Bird wire guard in galvanised steel with front flanged				

7.8	Testing, Adjustment, Balancing & Commissioning of complete Air side for the HVAC System installed (Limited to LAB area) which would involve: Involvement of 1 Engineer, 1 Technicians, 1 helper shall be treated as 1 team-day. # total 3 team days. (The air balancing activity with digital flow measuring hoods of appropriate size, pitot tube, anemometers, digital thermometers, sling psychrometers, pitot tubes etc. is part of scope of low side vendor deliverables and not to be included as part of this item) The scope would also include demonstration of the test readings in random in presence of the HVAC Consultant & Client for final review and sign-off.	Lot	1	Lot	To be included on overall basis by the HVAC contractor
7.9	Full set of Filters (as per above specs.) as required for each AHU & to be provided & installed after Testing, Commissioning activity and before handover of the system to Client. Filter sizes and qty shall match respective AHU requirements. All testing to be carried out with Pre filters and Microvee filters which are provided along with the AHU.	Lot	2	103,936	207,872
	One set shall be after installed after Testing, Commissioning activity and before handover of the system to Client and one set shall be for spare set which needs to be hand over to client.				
	TOTAL FOR 'E' - AIR DISTRIBUTION				2,280,512

F	INSULATION				
1.0	Thermal Insulation of Ducts - for External Ducts				
	Supply, fabrication & Installation of thermal insulation on GI ducts complete with Closed Cell foam with minimum density of 60 Kg/m ³ with minimum R Value 4.1/inch & thermal conductivity -0.035 w/mok confirming to Class 'O' & the inner side stuck to the outer facia of the GI ducts with recommended / Proprietary Synthetic adhesive bonding (SR998 or equivalent) & installed as per manufacturers recommendation and finished with vapour barrier with Lagging and covered with glass cloth with mechanical protection for ducting without puncturing the vapour barrier complete as per specifications. Lag coating AF5590 shall be used as vapour barrier and as protective covering on glass cloth and shall be UV protected.				
1.1	16 mm thick Insulation	Sq.M	50	1,093	54,656
1.2	19 mm thick Insulation	Sq.M	150	1,265	189,696

2.0	Thermal Insulation with Factory Backed Alu Foil for				
	Supply, fabrication & Installation of thermal insulation on GI ducts complete with Closed Cell foam with minimum density of 60 Kg/m ³ with minimum R Value 4.1/inch & thermal conductivity -0.035 w/mok confirming to Class 'O' & the inner side stuck to the outer facia of the GI ducts with recommended / Proprietary Synthetic adhesive bonding (SR998 or equivalent) & installed as per manufacturers recommen-dation. The insulation joints shall be sealed with 3" wide Tape.				
2.1	9 mm thick Insulation + Factory backed Al.foil	Sq.M	150	768	115,200
2.2	13 mm thick Insulation + Factory backed Al.foil	Sq.M	350	886	310,016
3.0	Acoustic Lining of Ducts				
	Supply, fabrication and installation of acoustic lining of supply and return air ducts as specified and shown on the drawing complete with 10 mm thick acoustic insulation with Open Cell Foam Insulation - Microban antimicrobial product protection with Thermal conductivity 0.045 W/m deg.K / density 140~180 kg/m ³ , with manufacturer recommended adhesive 520 bonding. All adhesives, sealants, paints, resins etc.	sqm	200	1,239	247,808
	TOTAL FOR 'F' - INSULATION				917,376
	GRAND TOTAL FOR HVAC				14,928,898

SUMMARY SCHEDULE OF QUANTITIES FOR SECURITY SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI		
SR. NO.	DESCRIPTION OF WORKS	AMOUNT (Rs.)
A	SPRINKLER SYSTEM	383,131.00
B	FIRE ALARM SYSTEM	296,680.00
C	PUBLIC ADDRESS SYSTEM	114,900.00
D	ACCESS CONTROL SYSTEM	3,04,321.00
E	CCTV SYSTEM	357,060.00
F	FIRE EXTINGUISHER	238,832.00
	TOTAL OF SECURITY SYSTEMS (Including Taxes)	16,94,924.00

SCHEDULE OF QUANTITIES FOR SPRINKLER SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
A	SPRINKLER SYSTEM				
1	GI Pipe class 'C' (heavy duty) conforming to IS:1239 including all accessories such as grooved joints, flanges, tees, reducers, dead flange etc. including lift to all heights, jointing, painting and inserted rubber gaskets, nuts, bolts etc. as required. G.I threaded fitting, fixing with clamps to M.S. brackets / hangers including testing to 15 kgs/cm ² pressure. Pipes shall be painted with two coats of primer & two coats of post office red enamel paint and shall be fixed in ceiling, walls, columns for all heights with hangers/supports and fasteners all as per drawing including chasing of walls/columns /ceiling etc. and making good the same as required. Sprinkler piping system should be FM compliant.				
Note :	Fittings shall be forged ASTM A 105 3000# socket weld type below & upto 50 mm and Seamless ASTM A 234 butt weld type for 65 mm and above. Flanges shall be forged A 105 150#				
1.1	100 mm dia	rmt	20	1,888	37,760
1.2	80 mm dia	rmt	15	1,652	24,795
1.3	65 mm dia	rmt	10	1,416	14,160
1.4	50 mm dia	rmt	40	1,121	44,840
1.5	40 mm dia	rmt	40	826	33,040
1.7	25 mm dia	rmt	50	472	23,600
3.1	Pendent Sprinkler	nos	50	708	35,400
3.2	Normal Upright Sprinkler	nos	50	767	38,350
4.2	1000 mm	nos	25	2,006	50,150
4.3	1500 mm	nos	25	2,596	64,900

6	Providing and fixing of FM Approved electrically operated Flow Switch with threaded connection with flexible full bore paddle & NO/NC contact terminals as specified complete with all accessories and necessary wiring.				
6.1	100 mm dia.	nos	1	6,136	6,136
14	Dismantling Cutting of branch, relocating the sprinkler location as per the new scheme, carting away the dismantled unwanted material and handing over the same to the Client with proper tagging or detail of material. Complete in term of everything				
		Lot	1	10,000	10,000
	TOTAL OF SPRINKLER SYSTEM				383,131
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ.				
	Vendor to check availability of material with client before procuring.				
	Vendor to consider NEWAGE make				

SUMMARY SCHEDULE OF QUANTITIES FOR FIRE ALARM SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
B	ADDRESSABLE FIRE ALARM SYSTEM				
1.0	Supply, Installation, Testing and Commissioning of Analogue addressable Intelligent Photoelectric type Smoke Detectors with mounting base, address switch complete as required for proper functioning for installation above & below false ceiling with base & MS Powder coated Junction Box, cable glands complete with ferrules etc.	Nos	34	3,776	128,384
2.0	Supply, Installation, Testing and Commissioning of Remote response indicator having twin LED flush mounted on false ceiling/wall along with MS Powder coated Junction Box, cable glands complete with ferrules etc.	Nos	17	236	4,012
3.0	Supply, Installation, Testing and Commissioning of Addressable Manual Pull station with Reset Lock & Key arrangement with back box along with MS Powder coated Junction Box, cable glands complete with ferrules etc.	Nos	3	4,012	12,036

4.0	Supply, Installation, Testing and Commissioning of Analogue addressable Horn cum Strobe with address switch complete as required for its functioning with its own intelligent communicable with FRP / FAP, power supply unit. Raw power to this PSU will be provided by others & this PSU shall contain all necessary circuits to monitor and charge its own batteries etc., control & supervise internal and external circuits, sources & devices. The PSU shall its own enclosure for housing interface modules, batteries, etc. ceiling suspended / wall mounted Horn cum Strobe shall produce 90dBA sound pressure..	Nos	3	1,888	5,664
5.0	Supply, Installation, Testing and Commissioning of Monitor Modules in suitable MS Powder coated Junction Box, cable glands complete with ferrules etc. (MM for sprinkler flow status / Fire exit door & Builder FAS integration)	Nos	1	3,068	3,068
6.0	Supply, Installation, Testing and Commissioning of Control/Relay Modules in suitable MS Powder coated Junction Box, cable glands complete with ferrules etc. (CM for AHU/Fire damper/ACS control/Main electrical breaker tripping/Builder FAS integration)	Nos	15	3,658	54,870

SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
7.0	Supply, installation laying & commissioning of Fault isolator Module in suitable MS Powder Coated Junction Box, Cable Glands complete with ferrules etc	Nos	3	2,242	6726
8.0	Supply, installation laying & commissioning of following size Copper cable on readymade trench / tray including cable laying hardware suitable for FAS with RED colour Outer sheath.				
8.1	2 C x 1.5 Sq. mm YWY FRLS Armoured cable including end terminations in RED colour.	RMT	500	130	65,100
9.0	Removal of installed detectors in case of not valid as per the new scheme/design with all the accessories and cables and handover the same to the client with proper tagging and details	Lot	1	10,000	10,000
10.1	Modification or relocating the installed detectors as per the new design/scheme after checking the feasibility	Lot	1	10,000	10,000
	TOTAL FOR FIRE ALARM SYSTEM				299,860
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ				
	Vendor to check availability of material with client before procuring				
	Vendor to consider APOLO make				

SUMMARY SCHEDULE OF QUANTITIES FOR PUBLIC ADDRESS SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
C	PUBLIC ADDRESS SYSTEM				
1	Supply, Installation, Testing and Commissioning of Metallic Grill, high quality type music speakers to be fixed flushed with false ceiling with line matching transformer for direct connecting to 100/70 V output line.				
1.1	6 Watt Output Speakers without fire dome (Make - Ahuja)	Nos	14	2,950	41,300
2	Supply, Installation, Testing and Commissioning of Control Cables : 2C x 1.0 mm ² , Stranded Copper conductor, Type A ST1 PVC insulated, FRLS flexible Cable 650 V as per IS 1554, with FRPVC conduit & accessories , terminals, Ferruling complete.	Mtr	600	106	63,600
3	Removal of installed speakers in case of not valid as per the new scheme/design with all the accessories and cables. Handover the same to the client with proper tagging and details	Lot	1	5,000	5,000
4	Modification or relocating the installed speakers as per the new design/scheme after checking the feasibility	Lot	1	5,000	5,000
	TOTAL OF 'C' PA SYSTEM				114,900
	Note -				

	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ Vendor to check availability of material with client before procuring Vendor to consider AHUJA make				

SUMMARY SCHEDULE OF QUANTITIES FOR ACCESS CONTROL SYSTEM FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Total Rate (with	Total Amount (with Tax)
D	ACCESS CONTROL SYSTEM				
1	Supply, Installation, Testing and Commissioning of Master & Slave (DRI) architecture the Vendors shall quote Master suitable for 64 Readers or 32 DRI Modules as under in lieu of above item.				
1.1	Reader Master Controller in Tamper proof enclosure with Power supply	Set	1	56,050	56,050
1.2	Door Reader Modules in Tamper proof enclosure with Power supply	Set	1	37,524	37,527
2	Supply, Installation, Testing and Commissioning of Proximity Card Reader with read range of 3"	Nos	4	8496	33,984
	(To include 1 set of Biometric enrolling kit complete)				
3	Supply, Installation, Testing and Commissioning of Electromagnetic Lock with built-in Magnetic contacts Doors. 600 lbs capacity - L & Z bracket as required	Nos	8	5664	45,312
4	Supply, Installation, Testing and Commissioning of Egress Switch	Nos	4	1274	5,096
4.1	8 c x 0.75 Sq.mm	RMT	300	157	47,100
4.2	4c x 0.75 Sq.mm	RMT	600	128	78,800

	By Developer				
	TOTAL OF 'D' ACCESS CONTROL SYSTEM				3,04,321
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ				

	Vendor to check availability of material with client before				
	Vendor to consider ESSL make				

**SUMMARY SCHEDULE OF QUANTITIES
FOR CCTV SYSTEM WORKS
FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI**

SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Total Rate (with Tax)	Total Amount (with Tax)
1	Supply, Installation, Testing and Commissioning of IP Fixed Dome camera with 1/3" CCD/CMOS, Progressive/De-interlace, Very High Definition resolution (1920 x 1080), min. Dual streaming, 25 FPS, H.264 / JMPEG compression support, 2.8 mm fixed focal lens, 0 lux with IR, Tamper detection, Wide dynamic Range, PoE power input, IP 66, as per detailed specifications and shall be compactable for existing CCTV System.	Nos	16	17,700	283,200
	Independent LAN for IP CCTV System :-				
2	Supply, Installation, Testing and Commissioning of 24 port layer 2 switch with 10/100/1000 POE Web Semi-Managed Switches, mounted in 6 U Rack and with 2 additional combo SFP ports and all related termination accessories as per site specific System requirement. (Rack price also to be included)	Nos	1	31,860	31,860
3	Supply, Installation, Testing and Commissioning of Cat-6 cable with FRPVC conduit & accessories, terminals, Ferruling complete.	RMT	500	83	41,500

4	Removal/dismantling of the cables installed at site after checking the feasibility of the same as per the New design and hand over the material to the client with proper inventory, tagging and details	Lot	1	500	500
	TOTAL				357,060
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ Vendor to check availability of material with client before procuring				

SCHEDULE OF QUANTITIES FOR FIRE EXTINGUISHER SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
1	Supply & Fixing of Co2 type Fire Extinguisher of 4.5 kgs capacity, made from brand new seamless drawn steel cylinder as per IS: 7285 with ISI mark and Chief of controller of explosives approval, fitted with wheel valve as per IS: 3224 with ISI mark, with discharge hose and horn and supplied complete with initial charge as per IS: 15683 with ISI mark and wall bracket.	EA	2	11,092	22,184
2	Supply & Fixing of ABC Stored pressure type Fire Extinguisher of 4 kgs capacity, fitted with discharge control valve (Squeeze grip type) CE marked and pressure gauge, filled with FE 36 gas variants with open nozzle and supplied complete with initial charge as per IS: 15683 with ISI mark and wall bracket.	EA	9	24,072	216,648
	TOTAL OF 'C' EXTINGUISHERS SYSTEM				238,832.00

SCHEDULE OF QUANTITIES FOR CIVIL WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
Sl. No.	Description of Items of work	Unit	Quantity	Rate	Amount (Rs.)
	<u>SH: 1 EARTH WORK</u>				
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge.				
1.1	All kinds of soil	cum	5	170.40	852.00
2	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	cum	3	170.13	510.39
3	Carriage of Excavated earth including rock & debris of constructional materials by mechanical transport including loading, unloading and stacking beyond 50 metres and average up to 1 km lead within the campus including dressing in required area and shape complete as per direction of Engineer-in-charge.	cum	5	133.04	665.20
4	Chlorpyrifos/ Lindane mollifiable concentrate of 20%	litre	12	251.57	3018.84
5	With Chlorpyrifos/ Lindane E.C. 20% with 1% concentration	metre	104	32.88	3419.52
	<u>SH: 2 CONCRETE WORK</u>				
6	Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor, for flooring beds laid in panels etc., up to floor five level, excluding the cost of cantering, shuttering and finishing :				
6.1	1:2:4 (1 Cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size).	cum	12	8858.38	106300.56

7	centring and shuttering including strutting, propping etc. and removal of form :				
7.1	Foundations, footings, bases of columns, etc. for mass concrete	sqm	48	262.39	12594.72
	<u>SH: 3 BRICK WORK</u>				
8	Providing and laying autoclaved aerated cement blocks masonry with all thick AAC blocks of specified grade in super structure above plinth level up to floor V level with RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortar all complete as per direction of Engineering-Charge. (The payment of RCC band and reinforcement shall be made for separately).	cum	2	7694.08	15388.16
	<u>SH : 4 WOOD WORK</u>				
9	Providing & fixing 8mm thk. back painted glass panelling of approved colour, back painting should be from factory to have finished look. Glass should be free from any patches. The glass shall be machine polished chamfered corner as per architects instruction. The glass shall be fixed on 12mm thk. commercial plywood backing. All required hardware, fixtures, adhesives shall be considered while quoting for the same. Make: Saint gobain, code: extra white)	sqm	3	6569.00	19707.00
10	Providing & fixing Electrical DB cover made out of 9" deep side verticals of 18mm thk. fire rated ply and shutter made out of 18mm thk. fire rated ply framing with ply louvers on shutter, shutter mounted on butterfly hinges . Shutter, louvers and verticals finished with approved laminate and s.s handle with all necessary hardware's. Refer drawing for the design.	sqm	5	13081.00	65405.00
11	Providing & fixing 10mm thk. Toughened glass shelves fixed with s.s 'D' brackets. D brackets directly fixed on walls with necessary hardware . Size: 1500mm (L) x 230mm (B)	nos.	3	2457.00	7371.00
12	Providing & fixing 12mm thk. ply boxing (flush to column & cabinets) with 25mm x 25mm hardwood framing support. Boxing finished with approved laminate (matching to wall paint). Rate shall be inclusive of all necessary hardware required as per drawing.	sqm	5	4933.00	24665.00

13	Providing & fixing 18mm thk. Plywood foldable ledge fixed on wall with MS powder coated L brackets. Ledge finished with approved laminate. Rate shall be inclusive of all necessary hardware's required as per drawing. Size: 600mm (L) x 450mm (D)	nos.	1	2500.00	2500.00
14	Providing & fixing 100mm deep pin up notice board with clear glass shutter, made out of 18mm thk. Commercial plywood carcass with pin up/soft board panelling on 6mm thk. Plywood back. Plywood carcass finished with approved laminate with 10mm thk. clear toughened glass shutter with 25mm thk. aluminium frame on all four sides and pin up board finished with approved fabric. All exposed edges having pvc lipping matching to approved laminate colour. Rate shall be inclusive of all necessary hardware's required as per drawing	sqm	6	13636.00	81816.00
	SH : 5 FLOORING & WALL LINING WORKS				
15	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved makes, in all colours and shades, laid on 20mm thick/suitable thickness for existing flooring cement mortar 1:4 (1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. (Note; the existing tile of make & shade to be provided)				
15.1	vitrified tiles of nominal size 600x600 mm Matt finished in dark/ light shades or in combination in required pattern as per architectural drawings and as per direction of Engineer-in-charge.	sqm	20	1232.74	24654.80
15.2	Full Body Homogeneous Vitrified Tiles of size 600x600 mm	sqm	1	1528.99	1528.99
16	Providing & laying on floor surface, the 1.5 mm thk. Pure PVC / Vinyl antistatic grade flooring in roll form of approved make, colour & shade on flooring & skirting including fixing with adhesives and all necessary equipment's etc. Complete as per manufacturer's specifications & directions. (make: of Responsive/Nora /Armstrong)				
16.1	For flooring	sqm	240	2386.00	572640.00

16.2	For coving / skirting of 75mm high.	RM	171	350.00	59850.00
	<u>SH : 6 ROOFING</u>				
17	Providing & fixing false ceiling & vertical fascia of 150mm height as shown in drawing at all height including providing & fixing of framework made of special section, power pressed from M.S. sheets and galvanised with zinc coating of 120 gms/ sqm (both side inclusive) as per IS : 277 and consisting of angle cleat of size 25mm wide x 1.6mm thick with flanges of 27mm and 37mm, at 1200mm c/c, one flange fixed to the ceiling with dash fastener 12.5mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25 x10 x0.50mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I channels 45 x15 x 0.90mm running at the spacing of 1200 mm c/c, to which the ceiling section 0.5mm thick bottom wedge of 80mm with tapered flanges of 26 mm each having lips of 10.5mm, at 450mm c/c, shall be fixed in a direction perpendicular to G.I intermediate channel with connecting clip made out of 2.64mm dia x 230mm long G.I wire at every junction, including fixing perimeter channels 0.50mm thick 27mm high having flanges of 20mm and 30mm long, the perimeter of ceiling fixed to wall/ partitions with the help of Rawl plugs at 450mm centre, with 25mm long dry wall screws @ 230mm interval,				
17.1	8 mm thick Calcium Silicate Board made with Calcareous & Siliceous materials reinforced with cellulose fibre manufactured through autoclaving process.	sqm	180	1240.27	223248.60
17.2	Extra for providing 3mm thk. Clean groove in calcium silicate board ceiling	RM	8	225.00	1800.00
17.3	Providing & fixing calcium silicate board pelmets 150mm (W) x 300mm (H) Finished in paint	RM	34	1508.00	51272.00
18	Providing & fixing modular ceiling panel- saint gobain make (celotex fine fissured) of panel size 595mm x 595 mm with GI ceiling frame work as per manufactures specifications. Cost includes cost of frame work & fixing fixtures. The light fixtures shall not be fixed directly on tiles. Washable vinyl latex paint finish with light reflectance of LRI<0.85 without any content of asbestos, regular etc. complete in all respect as per drawing & directions. Cut outs for smoke detectors, sprinklers, light fixtures etc. will not be deducted while measuring finished ceiling area.	sqm	162	1680.00	272160.00
	<u>SH : 7 FINISHING</u>				0.00

Sl. No.	Description of Items of work	Unit	Quantity	Rate	Amount (Rs.)
19	Providing and applying 12 mm thick (average) premixed formulated one coat gypsum lightweight plaster having additives and light weight aggregates as vermiculite/ perlite respectively conforming to IS: 2547 (Part - 1 & II) 1976, applied on hacked / uneven background such as bare brick/ block/ RCC work on walls and similar locations etc. at all floors and locations, finished in smooth line and level etc. complete.	sqm	30	294.05	8821.50
20	Finishing walls / ceilings with premium acrylic emulsion paint of "Apolite Super Acrylic emulsion paint" of Asian Paints or "Dulux Acrylic Emulsion" of ICI Dulux for interior works to give even shade, in required colours and shades as approved by the Engineer-in-Charge :				
20.1	Two or more coats on new work .	sqm	514	114.25	58724.50
	SH : 8 WATER PROOFING				
21	20 mm. thick in two coats for block / concrete surfaces (internal) (under layer of 12mm thck cement plaster 1:3 (1 cement : 3 coarse sand) and finished with top layer of 8 mm. thick cement plaster 1:3 (1 cement : 3 coarse sand)) with waterproofing agent @ 2% by weight of cement. (up to 10 mtr Depth) (Below sink & safety shower)	sqm	13	850.00	11050.00
	SH: 9 MISCELLANEOUS WORKS				
22	Room door name plate - Providing & Fixing of room door name plate SS finished with black engraving.3mm thick, brush steel finish. Rate shall be inclusive of all required fixing application to complete the same. Plate size 200mm x 75mm.	nos.	8	1228.00	9824.00
23	Emergency signage's - Providing & fixing of Emergency Exit signage in Auto Flow. Rate shall be inclusive of all required fixing application to complete the same. Size: 150 mm x 100 mm (ht.)	nos.	12	1599.00	19188.00
24	Push Pull - Providing & Fixing of Push pull pairs plate SS finished with black engraving.3mm thick, brush steel finish. Rate shall be inclusive of all required fixing application to complete the same. Plate size 50mm x 50mm.	nos.	12	421.00	5052.00

Sl. No.	Description of Items of work	Unit	Quantity	Rate	Amount (Rs.)
25	Providing & fixing 5mm thk Floor protection UV sheet roll form water resistant, reusable very light in weight environment friendly etc. The same shall be done once the tiling is completed and before starting the above flooring work is to start to keep the flooring clean and protected from any damage.(Make: floorguard, cello, bubble guard & equivalent)	sqm	326	215.00	70090.00
26	Providing & fixing 12 mm thk. Toughened glass vertical . The glass shall be machine cut with all edges polished as per required. The glass shall be fixed directly on floor with U channel and fixed on wall with 50 x 50 mm s.s finish glass connector . all required hardware, fixtures, adhesives shall be considered while quoting for the same. Make: Ozone, Dorma, Enox or equivalent				
26.1	Glass size: 900 mm (L) x 2250 mm (H)	nos.	2	19500.00	39000.00
27	Providing & fixing 900mm x 900mm x 15mm thk. Drainage rubber matting for safety shower. Make: 3M, Duramat & equivalent	nos.	2	4180.00	8360.00
28	Providing & fixing 38mm x38mm thk. aluminium angle section for column guard . Finish in white colour powder coated. Fixed directly on exposed column edges with tapping mirror screws. Make: ramco, jindal & equivalent	rmt	23	1390.00	31970.00
29	Providing & fixing 15 x 15 mm thk. aluminium L profile (angle profile) between vinyl flooring & rubber matting. Make: ramco, jindal & equivalent	rmt	4	400.00	1600.00
	SH: 10 Demolition & dismantling				
30	Demolishing cement concrete/ RCC/Block masonry work manually / mechanically including stacking of servable material & disposal of serviceable material within 50 meters lead as direction of engineer inch arch	cmt	10	1454.55	14545.50
31	Dismantling the existing flooring including removing the base cement mortar including stacking of servable material & disposal of serviceable material within 50 meters lead as direction of engineer	sqm	15	1640.25	1640.25
Total				18,31,233.53	

RO Means: Rate only

Note 1: If any RO items are operated, each item will be paid as per the rates mentioned (i.e. after considering plus or minus percentage quoted in the Main work tender)

Note 2: For some items, Rate and quantity not mentioned i.e., kept blank. These items will be paid as per the Market rate, if operated.

SCHEDULE OF QUANTITIES FOR ELECTRICAL LT SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
A	M.V. SWITCHGEARS AND PANEL				
	Design, manufacture, supply, installation, testing and commissioning of following MV switchgear panels suitable for 415 V, 3 phase, 4 wire, 50 Hz power distribution system. The panel shall be Indoor, wall/floor mounting, sheet metal clad, cubicle, dust and vermin proof type compartmentalised design fabricated out of 14 gauge CRCA sheet steel in cubical formation,& 3 mm thick cable gland plate, shall be provided both at the top and the bottom of the panel , complete with aluminium bus bars, separate earth bus bar to be provided through out the length of the panel along with base channel of suitable size.				
	The incoming and outgoing feeders shall be accommodated in a modular multitier arrangement, adequate size cable alley, painting, earthing, numbering, danger plate etc as required as per specifications and drawings. Current density for busbar size shall be designed considering not more than 1.0 A/sq.mm for copper & 0.8 A/sq.mm for aluminium. The switchgear live parts shall be isolated with proper insulation material. The current transformer shall be cast resin type. IP - 54 protection for indoor DB Panel & IP - 65 for outdoor DB panels or as mentioned specifically. DB should have IK09 protection & Anti Insertion marking ACB should have Ics = Icu = Icw (1 sec.). MCCB with thermal release adjustable from 0.7 to 1In & 0.4 to 1In in case of microprocessor release.				
	All measuring instruments (Meters) shall be of digital electronic with LED of approved make and compatible with BMS. All hinged door shall be earthed through minimum 2.5 sq mm tinned braided copper wire, Pad locking for Switch board doors, Pad locking of MCCB's handles in "OFF" Position. The panel shall comply with latest industrial practice including attached SLD / technical specification / I.S .standards .				

	All PTs / control transformer shall be provided with centre tap earth secondary. The breaking capacity of MCCB's are mentioned panel wise. All MCCB's shall be with thermal magnetic releases up to 250 amps and microprocessor based above 250 amps capacity, unless specified otherwise Complete with interconnections and distribution bus bars. Proper bonding to earth. All Panels having ACB & MCCB will be jointly tested in presence of client engineer incharge including primary & secondary injection test.				
1.1	Main LT Panel	Nos	Already Installed		
a	Incomer				
	400 A, FP, 36kA, MCCB Microprocessor based release with OL,SC,No volt relay and earth fault Relay with RS 485 port with castle lock : 1 Set				
	Phase indicating lamps with SPMCB 3 nos.-1 Set				
	<i>Breaker ON / OFF / TRIP indicating lights with control MCB's - 1 set</i>				
b	Metering & Protection				
	Voltmeter/VSS/Control MCB & phase indicating lamps- 1 Set, 96 x 96 mm sq. 0-500 Volt digital voltmeter with selector switch and shall be protected by 2 amp TP MCB's				
	MFM (meter) with CTs - 1 Set LSIG& VISUAL DISPLAY, (for each set 3 Nos. 96 x 96 sq.mm 0-400 / 5 amps CTR digital ammeter with 3 nos 400 / 5 amps, 15 VA Class I CT's.)				
	Communication port RS 485 - 1 no.				
c	Busbar				
	630 A, TPN, 50 kA Al busbar insulated with colour coded heat shrinkable sleeves. Extension of main busbar with links to be provided.- 1Set				
d	Outgoing				
	125 A, 4P 25kA MCCB :- 2 Sets.				
	63 A, 4P 10kA MCB :- 3 Sets.				
	40 A, 4P 10kA MCB :- 5 Sets.				
	25 A, DP 10kA MCB :- 5 Sets.				
1.2	HVAC PANEL	Nos	Already Installed		
a	Incomer				

	320 A, FP, 36kA, MCCB Microprocessor based release with OL,SC,No volt relay and earth fault Relay with RS 485 port with castle lock : 1 Set				
	Phase indicating lamps with SPMCB 3 nos.-1 Set				
	Breaker ON / OFF / TRIP indicating lights with control MCB's -				
b	Metering & Protection				
	Voltmeter/VSS/Control MCB & phase indicating lamps- 1 Set, 96 x 96 mm sq. 0-500 Volt digital voltmeter with selector switch and shall be protected by 2 amp TP MCB's				
	MFM (meter) with CTs - 1 Set LSIG& VISUAL DISPLAY,(for each set 3 Nos. 96 x 96 sq.mm 0-320 / 5 amps CTR digital ammeter with 3 nos 320 / 5 amps, 15 VA Class I CT's.)				
	Communication port RS 485 - 1 no.				
c	Busbar				
	500 A, TPN, 50 kA Al busbar insulated with colour coded heat shrinkable sleeves. Extension of main busbar with links to be provided.- 1Set				
d	Outgoing				
	40 A, 4P 300mA ELCB :- 21 Sets.				
	32 A, 4P 10kA MCB :- 09Sets.				
B	CABLES				
1	Supply and laying in existing cable Trays/clamped to wall with suitable clamps saddles and fixing bolts including testing and commissioning of the following 1100 volts grade armoured XLPE insulated and sheathed aluminium/copper conductor cable complete as required. Identification tags shall be provided for all cables. (Make- Polycab/RR/ Finolex)				
	Aluminium Conductor Cables: (Refe SLD)				
1.1	3.5C x 240 sq. mm A2XFY	RM	RO	951	
1.2	3.5C x 185 sq. mm A2XFY	RM	RO	746	
1.3	3.5C x 150 sq. mm A2XFY	RM	RO	592	
1.4	3.5C x 120 sq. mm A2XFY	RM	RO	555	
1.6	3.5C x 95 sq. mm A2XFY	RM	RO	394	
1.7	3.5c x 70 sq. mm A2XFY	RM	RO	493	
1.8	3.5C x 50 Sq. mm A2XFY	RM	RO	373	
1.9	3.5C x 25 Sq. mm A2XFY	RM	RO	175	

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
2	Copper Conductor Cables: (Refe SLD)				
2.1	4C x 1.5 Sq. mm YWY	RM	RO	139	
2.2	3 C x 6 Sq.mm YWY	RM	RO	264	
3	Cable end termination of the following PVC aluminium cables 1100 Volt grade including cost of crimping tinned copper heavy duty bimetallic lugs, double compression glands, insulation tape and all requisite material for completion of joints.				
	Aluminium Conductor Cables (Refe SLD)				
3.1	3.5C x 240 sq.mm A2XFY	Nos	RO	761	
3.2	3.5C x 185 sq.mm A2XFY	Nos	RO	696	
3.3	3.5C x 150 sq.mm A2XFY	Nos	RO	633	
3.4	3.5C x 120 sq.mm A2XFY	Nos	RO	460	
3.5	3.5C x 95 sq.mm A2XFY	Nos	RO	389	
3.6	3.5c x 70 sq.mm A2XFY	Nos	RO	303	
3.7	3.5C x 50 Sq.mm A2XFY	Nos	RO	289	
3.8	3.5C x 25 Sq.mm A2XFY	Nos	RO	225	
4	Copper Conductor Cables: (Refe SLD)				
4.1	4C x 1.5 Sq.mm YWY	Nos	RO	116	
4.2	3 C x 6 Sq.mm YWY	Nos	RO	177	
	TOTAL OF 'B' SUMMARY OF CABLES				
C	CABLE TRAYS				
1.0	Supply, fabrication and erection Cable Trays & M.S structural steel				
	The cable tray shall be factory built & hot dip galvanised tray equivalent for indoor use. Bidder shall include in his price, required numbers of accessories like Tees, Crosses, Bends, Elbows etc and fabricated supporting MS structure with red oxide and enamelled paint angle supports for laying cable trays on wall or suspended tie rods (Full threaded) for ceiling with horizontal angle / channel as per actual site conditions requirement. Testing and Certification:				
	Cable tray / Ladder, bend, T Bend, cross, and all supports are to be tested for Safe Working Load (SWL), deflections, Impact resistance,. The temperature classification of cable tray system should be - 5 to + 150°C.(Vendor to submit Certificates for SWL from manufacturer)				

1.1	Perforated Type Cable Tray				
1.1.1	750 mm wide x 75 mm Height x 2.5 mm thick	RM	RO	1,008	
1.1.2	400 mm wide x 75 mm Height x 2 mm thick	RM	RO	776	
1.1.3	300 mm wide x 50 mm Height x 2 mm thick	RM	RO	571	
1.1.4	200 mm wide x 50 mm Height x 2. mm thick	RM	RO	463	
1.1.5	100 mm wide x 50 mm Height x 2. mm thick	RM	RO	149	
D	EARTHING & LIGHTNING PROTECTION SYSTEM				
1	Earthing Strip/Wires				
	Supply, installation, testing and commissioning of following sizes of GI/ Copper strip/FRLS wire clamped to walls, cable trays, bus ducts, cables in recess or surface etc for equipment/ System earthing complete as required including inter connection between length at joints, all fixing accessories saddles, clamps etc and other fixing hardware material as required for proper installation.				
1.1	G.I. Earthing strip/wire				
E	POINT WIRING				
1.0	Point Wiring				
	Supply, installation, testing and commissioning for lights point using 2 x 1.5 Sqmm stranded copper FRLS wire for phase & neutral + 1 x 1.5 Sq. mm stranded green colour copper FRLS wire for earth, insulated FRLS pvc wires drawn through medium gauge FR PVC conduit including laying of conduits in a concealed/ surface manner using necessary conduit accessories, junction boxes, switch outlet boxes, switch plates, bends, collars, clamps, ceiling roses, with 6A one way / two way modular switches etc. These shall be flush mounted in brick wall or in the built up furniture or on the surface of wall for surface installation as required.				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
1.1	Primary light Point controlled by switch Board	Point	RO	885	
1.2	Same as above secondary light points wiring looped with first point or from one light fixture to another	Point	RO	531	
1.3	Supplying, wiring, testing and commissioning of lights point using 2 x 2.5 Sqmm stranded copper FRLS wire for phase & neutral + 1 x 1.5 Sq. mm earth copper FRLS wire stranded green colour insulated FRLS pvc wires drawn through medium gauge FR PVC conduit including laying of conduits in a concealed/ surface manner using necessary conduit accessories, junction boxes, switch outlet boxes, switch plates, bends, collars, clamps, ceiling roses etc. but without switches. These shall be flush mounted in brick wall or in the built up furniture or on the surface of wall for surface installation as required. These light points will be controlled directly by the MCB of LDB. Cost of MCB not to be included in this item.				
1.4	Fan electronic step Regulator (2 module 120 W modular).	Point	RO	885	
1.5	Providing & fixing 1 Nos. 6 A Shuttered universal socket with 1 No. 6 A SP switches at one place (SUBMAIN EXCLUDED)	Nos	RO	696	
1.6	Providing & fixing 2 Nos. 6/16 A Shuttered universal socket with 1 No. 16 A SP switches at one place (SUBMAIN EXCLUDED)	Nos	RO	1,227	
1.7	Supply Installation, testing & commissioning of lighting fixtures / fans / Ex. Fans / Motion Sensors etc. including necessary accessories, lamps wiring connection down drops, supports etc complete as required.				
	Note: Vendor to check availability of light fittings with client before procurement.				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
2.0	Communication				
2.1	Supplying, fixing, testing and commissioning of plug in type RJ-45 single or duplex information outlet (flush mounted) for data in a recessed galvanized MS box with box, grid plate, face plate ,I/O module & I/Os and as required.				
2.2	Data / voice I/O 2 module	Nos	RO	939	
F	SAFETY EQUIPMENT				
1.0	Supply & installation of check red rubber matting conforming to IS 5424-1969 complete as required.				
1.1	Supplying and erection of the following equipment at suitable locations in the substation building as required and as per specifications.				

SR NO	DESCRIPTION OF WORKS	UNIT	QTY.	Unit Rate (with Tax)	Total Amount (with Tax)
G	CONSTRUCTION POWER REQUIREMENT				
1	Supply, installation, maintenance & replacement charges for arranging temporary lighting for the complete period of execution of work, 100 nos. 1 x 36 W FTL fitting, 10 nos. 500 W halogen light, 10 nos. of 250 W Metal Halides, 1 No. main distribution panel consisting of energy meter, 160 A MCCB and 6 nos. of sub distribution DBs comprising ELMCB, fuses, switches. 20 nos. 20 A single phase metal clad socket and 30 nos. 5 / 15A switch socket at the locations as guided by PMC / Client representative at site. The item shall include the necessary cabling, wiring, related accessories as per the electrical safety norms. 3 phase, 4 wire Energy meter shall be inclusive.	JOB	RO	59,000	
	Note : "Electrical contractor shall ensure that construction power is safely drawn by various contractors, from the above mentioned distribution boards mentioned above. Responsibility for safe usage of construction power rests with Electrical contractor. All MCCBs shall have earth fault protection.				
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ.				
	Vendor to check availability of material with client before procuring.				

SCHEDULE OF QUANTITIES FOR HVAC WORKS FOR CHEMISTRY RESEARCH LABORATORY AT IIT POWAI, MUMBAI.					
Note- Based on GFC layouts issued by HVAC consultant, shop Drawings & Detailing as required for the proper execution of the project shall be the responsibility of HVAC Low Side Works Contractor & these drawings shall be submitted for prior approval from the consultant before execution of works.					
SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
A	VRF SYSTEMS				
1.0	Supply, Lifting, shifting, assembly, installation, testing and commissioning of Out Door Units suitable for VRF / VRV System				
	The system shall comprise of Outdoor Units with Air-cooled condenser suitable for ambient at test conditions should be 35 deg. c and maxm. withstanding temperature as 46 deg. c , high pressure Rotary / Scroll Compressors with hermetic motor, assembled and wired in a single package complete, starting controls, safety controls, operating controls and with full feature microcomputer based controller with real time clock and programming / diagnosis facility. All Compressors shall be invertor type based on manufacturer's technology.				
	The unit is to be given a complete factory operating and control sequence test under load conditions with fluid hooked up, and is to be shipped with full operating charge of refrigerant and oil. Air-cooled Condenser, refrigeration-piping controls, first charge of refrigerant etc.				
	The Outdoor units shall be complete as per technical specifications. Please provide EER values at 100% load @ AHRI conditions of 210/240 conditions in the Data sheets for HVAC equipment's.				
	The Refrigerant used shall be any CFC free gas either R407C/ R410A refrigerant OR any other variant of CFC free refrigerant gas				
	Vendor to include MS fabrication as necessary to install the VRF condensing unit of top discharge type.				
	The Outdoor units shall be complete as per technical specifications				
	Outdoor units suitable for following capacities:				
1.1	60 HP VRF ODU (20 HP # 3 nos)	Set	RO	1,600,000	
1.2	54 HP VRF ODU (18 HP # 3 nos)	Set	RO	1,408,000	

1.3	40 HP VRF ODU (20 HP # 2 nos)	Set	RO	1,344,000	
1.4	36 HP VRF ODU (18 HP # 2 nos)	Set	RO	960,000	
SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
1.5	24 HP VRF ODU	Set	RO	793,600	
1.6	16 HP VRF ODU	Set	RO	407,040	
1.7	12 HP VRF ODU (Side Discharge)	Set	RO	307,200	
1.8	10 HP VRF ODU (Side Discharge)	Set	RO	257,280	
1.8	8 HP VRF ODU	Set	RO	207,360	
1.9	6 HP VRF ODU	Set	RO	179,200	
2.0	AIR HANDLING UNITS				
	Supply, installation, testing and commissioning of Sectionalised, Horizontal Double Skin Treated Fresh Air Handling Units constructed of extruded aluminium hollow sections framework, pre plasticised GS Sheets of 24G (outside) / 22G (inside) with 50 mm thick injected PUF / 40 kg/cu.m + 2 % density and with thermal break, consisting of fan section having belt driven with double grooved pulley DIDW Aerofoil Backward Curved Blowers housed in a single enclosure with TEFC sq. cage motor IP55, vibration isolators. The AHU motors shall be high efficiency type IE-3. Fans shall be selected for higher total efficiency 75% and above. Motor should have insulated bearing housing. Motors shall be IE-3. AHUs shall be approved by VRF Manufacturer and suitable to be connected with Air-cooled VRF ODUs. AHU shall be suitable for outdoor duty application.				
	Coil Section with 8 row-12 fpi DX cooling coil with Cu Tubes / Al.fin Coil headers shall be of copper as specified. Fins and copper tubes with all joints and U-Bends of AHU shall be Coated with Water based DTM Anti Corrosion coating either in factory or at site. Coil should be suitable for connecting with VRF ODU's. Drain tray shall be insulated sandwich type drain tray of SS (inside) / GI (outside) with liberal drain connections on either side shall be provided.				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
	The Double skin Sections shall include for Coil Section, with provision for elec. connection to the outside of AHU, Fire retardant double canvass connections, DP ports at each section, damper at AHU outlet, access doors with limit switch, maintenance lamp inside the fan section shall be included. The sections shall be provided in modular construction with enough service space and proper access doors as specified (wherever specified / required).				
	The Prefilters shall be confirming to EU / European standards. The filters shall be with Al. Flange / Frame type with thermally bonded hydrophobic polyolefin fibres [synthetic] washable media. The filters shall be tested for filter efficiency as per EN779 – G4 / EU4 [efficiency of 90% down to 10 microns] & final pressure drop not exceeding 12.5 mm WC. Microvee Filters shall be with Al. flange / Frame type with media and in accordance with EN779- F9 / EU9 [Efficiency of 95% down to 5 microns] & final pressure drop not exceeding 25mm WC.				
	AHU's should be suitable for outdoor duty application, Floor mounted / Ceiling Suspension as Specified. Fan outlet velocity not to exceed 1800 fpm. Coil face velocity not to exceed 500 fpm.				
	Installation of Double Skin Air Handling Units shall include for its installation in place, connections, testing and commissioning. Installation shall mean unloading, lifting-shifting, positioning, levelling assembly& installation in place.				
	AHU Vendor shall be responsible for supply & assembly of floor mounted units at site. HVAC Vendor shall carry out the Unloading, lifting-shifting, connect, test and commission the AHUs in presence and with assistance from AHU vendor.				
	Necessary foundation blocks / structural platform to be				
3.0	VRV Accessories				
	Supply, Lifting, shifting, assembly, installation, testing and commissioning VRF Accessories as specified below and in Technical Specifications suitable for VRF operations.				
3.1	Wired Controllers	Sets	RO	7,040	
3.2	Remote Controllers (to be included for cassette's and hi-walls in respective item rates)	Sets	RO	3,216	

3.3	Supply, Lifting, shifting, assembly, installation, testing and commissioning of Connectivity kits / Distribution Kit for AHUs for hook up /connecting to respective VRF outdoor units				
	Expansion Valve Kit comprising of Electronic Expansion Valve (EEV), check valve and pipe temp, sensors. Control Box comprising of PCB, communication PCB, Power transformer and terminal block and suitable for hook up with VRF remote controller, CRC etc.				
3.3.1	Expansion kit suitable for AHU connectivity of 10 HP cooling coil capacity	Sets	RO	64,000	
3.3.2	Expansion kit suitable for AHU connectivity of 12 HP cooling coil capacity	Sets	RO	102,400	
	The central controller shall have a touch screen type display and have the capability of controlling all indoor & outdoor units individually, in groups and unanimously. The central controller shall have the unique capability of arranging indoor units into groups (up to 16 groups per network). Refer technical specifications for further details.				
	The central controller shall be time clocked by the 7-day-Year round programmable timer supplied by the manufacturer or by an external time clock (supplied by others). When used in conjunction with the 7-day programmable timer then different programme on/off times for each group of indoor units shall be available.				
	In case of BMS system not in operation for any reason, the Master Controller / Central Controller shall be capable to work on stand alone basis and should be able to indicate and control all indoor and outdoor units as specified.				
3.4	Supply, Lifting, shifting, assembly, installation, testing and commissioning BACnet gateway with required control cabling to Central BMS with suitable software and accessories. Necessary integrator, convertor, software, hardware, license's etc. as applicable for the VRF / VRVs / SETFREE / MMS to interact & be controllable thru' central BMS. Necessary protocol for connecting with MODBUS RTU, BACNET, LONWORKS etc. shall also be included.	Set	RO	2,88,000	

3.5	Controller for sequencing, programming scheduling the DX AHUs for equal run, auto stand-by change over, fault take off etc. as specified. The controller shall be enclosed in an IP-65 Panel. Separate Panel shall be provided for DX AHU set.				
	The particular set of Air handling units shall be controlled in sequence when working on working + standby basis.				
4.0	OTHER CHARGES			Included in Above for each equipment	
4.1	Port Clearance	Lot			
4.2	Freight	Lot			
4.3	Insurance	Lot			
4.4	Handling + lifting & shifting	Lot			
4.5	Any other charges the vendor feels is necessary	Lot			

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
B	FANS				
1.0	Smoke Exhaust Fans (SEF):				
	Supply, Installation, Testing and Commissioning of Axial flow fans shall be direct driven, Multiple blade type mounted on a steel mounting plate with orifice ring. The fans shall be of 2 hrs Fire rating and Motors shall be of high temp. resistance (to withstand upto 250 degree C), class H insulation and OUTSIDE the airstream / air passage. Vendor to consider S / I / T / C of starter panel with necessary control, OLP, SPP, ON & OFF push button with ON-OFF indications, Auto-Manual selector switch, 6 nos. non polarised NO-NC contacts for fans operations on signal from Fire Alarm Panel.				
2.0	Make up air Fans (In case of fire):				
	Supply, Installation, Testing and Commissioning of Axial flow fans shall be direct driven, Multiple blade type mounted on a steel mounting plate with orifice ring. The fans shall be of 2 hrs Fire rating and Motors shall be of high temp. resistance (to withstand upto 250 degree C), class H insulation and OUTSIDE the airstream / air passage. Vendor to consider S / I / T / C of starter panel with necessary control, OLP, SPP, ON & OFF push button with ON-OFF indications, Auto-Manual selector switch, 2 nos. non polarised NO-NC contacts for fans operations on signal from Fire Alarm Panel.				
3.0	Inline Ducted Exhaust Air Fans: (for Normal Exhaust System)				
	Supply, Installation, Testing and Commissioning of Inline circular / Rectangular ducted fan for Exhaust Fans as per Technical Specifications, Fan summary sheet and drawings.				
	FAN	CFM	TSP (mm)		
3.1	NEXF-1	1000	18	Nos	
3.2	NEXF-2	500	18	Nos	

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
C	ELECTRICAL POWER AND CONTROL SYSTEMS				
1.0	POWER DISTRIBUTION PANEL				
	Supply, Installation, Testing & Commissioning of Power Distribution Panel for VRF ODU comprising of fully compartmentalised cubicle type panel, as per specifications and complete with :				
	(Incoming Power with earthing shall be provided to each of the distribution panels by Elec. Contractor)				
	i) Tinned Al. Busbars				
	ii) 7 tank pre-treatment, Panel with IP 65 construction & suitable for outdoor duty				
	iii) Oven baked epoxy paint finish or powder coated				
	iv) Incoming and outgoing feeders				
	v) Indicating and measuring instruments				
	vi) Interconnections, interlocking, earthing etc.				
	vii) Starters & control panel				
	Panel Cost should include also OLP, SPP, On/ Off push buttons with On / Off / Trip indications, 3nos. non polarised NO-NC contacts tripping on signal from fire alarm panel & BMS.				
1.1	PDB 1 (For Ground Floor) Panel with IP 65 construction.	Set	RO	108,800	
	(i) Incomer suitable for VRF ODU - approx. 261 kW				
	(ii) Outgoing				
	a) Suitable for 14 HP # 3 nos (with ELCB)				
	b) Suitable for 18 HP # 6 nos (with ELCB)				
	c) Suitable for 20 HP # 2 nos (with ELCB)				
	d) Suitable for 20 HP # 2 nos (with ELCB)- Spare				
	e) Suitable for 14 kW # 1 nos (with ELCB) - Spare				
	(This Item is considered as part of Electrical scope of works.)				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
1.2	Starter & Control Panel for AHU & FAN				
	Supply, Installation, Testing and Commissioning of Starter and control panel suitable for 415 V, 3 phase, 50 Hz power distribution system. The panel shall be with IP 65 protection and should be fabricated for wall mounting compartmentalised design as per specifications.				
	Starter & Control Panel comprising of incoming 4 pole MCB, Voltmeter, Ammeter, Phase indicating lamps etc. Outgoing feeders as DOL / Star Delta starter for AHU / FAN motor. Vendor to provide suitable capacity 2 nos spare feeders for AHU / FAN motor.				
	Starter and control panel shall be complete with necessary control, including OLP, SPP, ON/OFF push buttons with ON & OFF indications, 3 nos. non polarised NO-NC contacts for tripping of Motorised Dampers, Fire Dampers and AHU / FAN motor on signal from Fire Alarm Panel. Also, vendor necessary interlocking for AHU / FAN operations including toggle switch for PSU & pumping down etc to be included as part of Starter and Control panel. Panel should be suitable to house the VFD.				
	Vendor should consider power & control cabling from Starter panel upto respective AHU / FAN .				
	The units shall be suitable for operation on 400/440 Volts, 3 ph., 50 Hz, 4 wire A.C. supply.				
1.3	Variable Frequency Drive for AHUs and FANs				
	Supply, Installation, Testing and Commissioning of variable speed drives for AHU Fan Motor(s) with 1 no. dedicated microprocessor based controller with software duly downloaded, Adjustable frequency drives, differential pressure sensor/ transmitters as necessary and as described in the specifications and complete with:				
	a) Duct pressure sensor / transducer (DP sensor shall be placed in SA duct upstream - 1no. Per SA duct). The VFD shall be capable to intake upto 3 inputs from DP sensor / AHU and operate the VFD based on average / lowest reading available.				
	b) Integration with bypass mode for Normal starter operation.				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
	The VFD vendor shall include necessary integrator, convertor, software, hardware, license's etc. as applicable for the VFDs to interact & be controllable thru' central BMS. Necessary protocol for connecting with MODBUS RTU, BACNET, LONWORKS etc. shall also be included. VSDs Compliance with LEED requirement and Core Performance Section 2.10 is required.				
1.3.1	VFD for AHUs having motors above 3.7 kW & upto 7.5	Set	RO	76,800	
1.3.2	VFD for AHUs having motors above 15 kW & upto 20	Sets			
1.4	Power & Control cabling:				
	Electrical contractor shall terminate power in individual switch socket for each IDU as per requirement. For VRF ODU incoming power shall be provided at the PDB, from there to each VRF ODU the cabling shall be carried out by HVAC contractor.				
1.4.1	2C x 2.5 sq.mm Cu. Armoured conductor cable, as per specs.	RMT	RO	243	
1.4.2	4C X 4 sq.mm Cu. Armoured conductor cable, as per specs	RMT	RO	346	
1.4.3	4C X 10 sq.mm Cu. Armoured conductor cable, as per specs	RMT	RO	538	
1.4.4	4C X 16 sq.mm Cu. Armoured conductor cable, as per specs	RMT	RO	614	
	(This Item is limited between starter panel / isolator and AHU / Condensing units respectively)				
1.5	Double Earthing with CU wire as required min. 8 SWG for Outdoor Units and Indoor Units as required.	LOT	RO	19,200	
	(This Item is considered as part of Electrical scope of works.)				
1.6	Cable Trays				
	Supply and installation of GI perforated type cable trays of the following sizes fabricated out of perforated hot dip galvanised MS sheets of minimum 2 mm thick with 75 mm flange to be installed horizontally or vertically.				

	The cable tray shall be complete including cost of bends, elbows, cross, tees, reducers etc as per drawings/ site condition and rate shall include cost of anchor fasteners, screws, nuts, bolts and misc. other fixing hardware painting of support structure etc as required				
	i) Structural steel such as ISMC, ISA, flats, rods etc to be used for support shall be included in this item.				
	ii) The cable tray shall be factory built. Bidder shall include in his price, required numbers of Tees, Crosses, Bends, Elbows etc as required as per actual site conditions.				
	Perforated Type G.I. Cable Tray with GI Supports :				
1.6.1	600 mm wide	RMT	RO	1,536	
1.6.2	450 mm wide	RMT	RO	1,408	
1.6.3	300 mm wide	RMT	RO	1,216	
1.6.4	200 mm wide	RMT	RO	896	
1.6.5	150 mm wide	RMT	RO	768	
1.6.6	100 mm wide	RMT	RO	640	
1.6.7	(This Item is considered as part of Electrical scope of works.)				
2.0	CONTROL SYSTEM				
2.1	Timer Controller for programming scheduling the normal Exhaust Fans System for lab areas. This system should operate the exhaust fans for 10 mins in each 30 minutes time duration. This system should be functional only during non operating hours of main HVAC System. The controller shall be enclosed in an IP-54 Panel. Separate Panel shall be provided for each lab.				
	FAN CFM TSP (mm)				
2.1.1	NEXF-1 1000 18	Nos	RO	32,000	
2.1.2	NEXF-2 500 18	Nos	RO	32,000	
3.1	Pressure Balancing System comprises Logic controller with inbuilt algorithm, set of DP sensors, with necessary control wiring between sensor and controller and upto set of Motorised Modulating Damper Actuator. Controller should provide signal to motorised Damper Actuator based on differential pressure values. The controller shall be enclosed in an IP-54 Panel. Separate Panel shall be provided for each lab .				

D	REFRIGERANT AND DRAIN PIPING WORKS				
1.0	Refrigerant piping				
	Hard Copper refrigerant piping of required sizes for pair of gas (suction) & liquid, with 19 mm Closed Cell Insulation material class O / 60 kg/m ³ density for wrapping the copper pipe lines. The piping system must be supported at 1.75 m distance. Rates to include special damping and supporting system including installation of factory made joints as required.				
	Pressure Testing of VRF piping shall be as per VRF Manufacturer's requirements.				
	Vendor to include G.I. Ready made Ladder type Cable Tray with cover for refrigerant piping, Power / Control cable for ODU and AHU.				
1.2	38.1 mm dia	RMT	RO	1,464	
1.3	34.9 mm dia	RMT	RO	1,396	
1.4	31.7 mm dia	RMT	RO	1,336	
1.6	25.4 mm dia	RMT	RO	1,229	
1.7	22.2 mm dia	RMT	RO	1,139	
2.1	9.5 mm dia	RMT	RO	891	
2.2	6.4 mm dia	RMT	RO	755	
2.0	Drain piping in hard PVC with all fittings, supports and clamps including drilling hole in wall chipping wall etc to conceal and to route the drain pipe. The piping shall be suitably insulated with 19 mm thk Closed Cell foam Class O (Nitrile Rubber) stuck with approved adhesive compound. The insulation shall be covered with glass cloth and painted with rubberised paint.				
2.1	65 mm dia	RMT	RO	288	
2.3	40 mm dia	RMT	RO	192	
2.4	32 mm dia	RMT	RO	192	
2.5	25 mm dia	RMT	RO	192	

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
3.0	GI 'B' class make up / drain piping with elbows, bends, tees, cleanouts etc. from pipe sizes 19mm upto 40mm dia (without insulation) complete as per Technical Specifications. The piping shall be suitably insulated with The piping shall be suitably insulated with 19mm thk Closed Cell foam insulation Class 'O' (Nitrile Rubber) stuck with approved adhesive compound. The insulation shall be covered with glass cloth and painted with rubberised paint.	RMT	RO	832	
E	AIR DISTRIBUTION				
1.0	SHEET METAL DUCTING				
	Rectangular Ducting in Galvanised Steel				
	Supply, fabrication, installation and testing of GSS metal ducts as per IS-277 (120 GSM both sides, LFQ & confirming to Class VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/ supports, volume control duct dampers, accessories, vanes, 3 mm neoprene rubber gasket etc. complete as per specifications in accordance with the approved shop drawings. No slip joints shall be allowed. Flanges shall be Rolamate or equivalent and ducts shall be with rigid supports as per technical specifications.				
	Ducts to be sent in Factory Fabricated and Fully Boxed Form at the jobsite. The factory fabricated ducts shall be as per approved make list only.				
	The quoted costs should include:				
	i) Ducts with reinforcement/ strengthening				
	ii) Air tight joints				
	iii) Accessories such as splitter, damper, guide vane etc.				
	iv) Hangers and supports.				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
	v) Painting with Black colour paint for duct sides behind the grills.				
	vi) The gasket used in case for all ducts shall be fire retardant				
	vii) Ducts shall be fully sealed with Silicon Sealant for leak tight installation.				
2.0	SHEET METAL DUCTING				
	Rectangular Ducting in Galvanised Steel				
	Supply, fabrication, installation and testing of GSS metal ducts as per IS-277 (120 GSM both sides, LFQ & confirming to Class VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/ supports, volume control duct dampers, accessories, vanes, 3 mm neoprene rubber gasket etc. complete as per specifications in accordance with the approved shop drawings. No slip joints shall be allowed. Flanges shall be Rolamate or equivalent and ducts shall be with rigid supports as per technical specifications.				
	Ducts to be fabricated to suit at site.				
	The quoted costs should include:				
	i) Ducts with reinforcement/ strengthening				
	ii) Air tight joints				
	iii) Accessories such as splitter, damper, guide vane etc.				
	iv) Hangers and supports.				
	v) Painting with Black colour paint for duct sides behind the grills.				
	vi) The gasket used in case for all ducts shall be fire retardant				
	vii) Ducts shall be fully sealed with Silicon Sealant for leak tight installation.				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
3.0	Spiral G S Ducting				
	Supply, fabrication, installation and testing of GSS metal spiral ducts as per IS-277 (120 GSM & complying to Class-VIII) for GS Sheets and IS-655 for fabrication of following thicknesses including necessary G.I. hangers/supports, volume control duct dampers, accessories, vanes complete as per Technical Specifications in accordance with the approved shop drawings. but ducts shall be preformed with Machine made 4-ply lock seam spiral ducts complete with special supporting, elbows, bends, reducers fittings and flange connections, rubber gasket at every 1.2mtr as specified.				
	The supports etc. shall be painted with 2 coats of red oxide and 2 coats of enamel paint of approved colour. The Ducts shall be painted at site as per approved colour / shade. The painting shall be limited to roller paint & shall attain good & even finish.				
3.1	24 gauge (0.63mm) - 1"-24"	Sq.M.			
3.2	22 gauge (0.8mm) - 25" - 36"	Sq.M.			
3.3	20 gauge (1.0mm) - 38"-50"	Sq.M.			
4.0	<u>FLEXIBLE DUCTS</u>				
	Supply, Installation, Testing and Commissioning of insulated flexible ducts. The insulated flexible duct shall have inner core made of double lamination of metalized polyester film permanently bonded to a coated spring steel wire helix. Fibreglass insulation of minimum 14 kg.cu.m. density having a R-value 4.2oF-Ft2-hr/btu and 25 mm thk shall be wrapped over the inner core and covered with stronger outer jacket cum vapor barrier made of fibreglass reinforced metalized polyester film laminate. The insulated flexible duct should be fire retardant type.				
4.1	Insulated Flexible ducts of 100 mm dia	RMT	RO	384	
4.2	Insulated Flexible ducts of 150 mm dia	RMT	RO	461	
5.0	<u>ACCESSORIES</u>				
	Supply, fabrication, assembling, installation, and testing of air distribution accessories of assorted size as specified and shown on the drawing:				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
5.1	<u>GRILLES & DIFFUSERS</u>				
	Supply, fabrication, assembling and installation of				
	(colour to match as per architects requirements)				
6	Diffusers				
	Supply, fabrication, assembling and installation of aluminium powder coated diffusers as indicated in the drawings and as per specifications. (Colour to match as per architects requirements)				
7.	Supply / Return Air Grill-Diffuser for Modular FC	No.	RO	3,200	
	The 4-way square supply air terminal should be in Al powder coated construction with easily removable central core with 4-way fixed deflection grill, Volume control damper to be of opposed blade, nylon geared with aerofoil blades & black matt powder coated. (Out to Out Size shall be 24"x24" suitable for modular false ceiling with flush / triangular type construction (as per approved layouts) & as per approved sample. (Colour to match architect's requirements.)				
7.1	Neck size of Grilles with VCD (SAG) 450 x 450				
7.2	Neck size of Grilles with VCD (SAG) 350 x 350				
7.3	Neck size of Grilles with VCD (SAG) 350 x 350				
7.4	Neck size of Grilles with VCD (SAG) 300 x 300				
7.5	Neck size of Grilles with VCD (SAG) 250 x 250				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
7.2	Supply / Return Air Grill-Diffuser for Gypsum FC				
	The 4-way square supply air terminal should be in Al powder coated construction with easily removable central core with 4-way fixed deflection grill, Volume control damper to be of opposed blade, nylon geared with aerofoil blades & black matt powder coated. (Out to Out Size shall be as per Neck size and suitable for gypsum false ceiling with flush / tagular type construction (as per approved layouts) & as per approved sample. (Colour to match architect's requirements.)				
7.2.1	Neck size of Grilles with VCD (SAG) 500 x 500	No.			
7.2.2	Neck size of Grilles with VCD (SAG) 450 x 450	No.			
7.2.3	Neck size of Grilles with VCD (SAG) 400 x 400	No.			
7.2.4	Neck size of Grilles with VCD (SAG) 350 x 350	No.			
7.2.5	Neck size of Grilles with VCD (SAG) 350 x 350	No.			
7.2.6	Neck size of Grilles with VCD (SAG) 300 x 300	No.			
7.2.7	Neck size of Grilles with VCD (SAG) 250 x 250	No.			
7.3	Supply, installation, testing and commissioning of 16 G GSS Butterfly dampers (spigot) with brass bush and operating handle. The damper shall have multiple controlling option and should have provision to lock at any point.				
7.3.1	100mm dia.	No.	RO	1,024	
7.3.2	150mm dia.	No.	RO	1,152	
7.3.3	200mm dia.	No.	RO	1,280	
7.3.4	250mm dia.	No.	RO	1,536	
7.3.5	300mm dia.	Nos.	RO	1,664	
7.3.6	350mm dia.	Nos.	RO	1,920	
7.3.7	400mm dia.	No.	RO	2,048	

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
7.4	Testing, Adjustment, Balancing & Commissioning of complete Air side for the HVAC System installed (Limited to LAB area) which would involve: Involvement of 1 Engineer, 1 Technicians, 1 helper shall be treated as 1 team-day. # total 3 team days. (The air balancing activity with digital flow measuring hoods of appropriate size, pitot tube, anemometers, digital thermometers, sling psychrometers, pitot tubes etc. is part of scope of low side vendor deliverables and not to be included as part of this item) The scope would also include demonstration of the test readings in random in presence of the HVAC Consultant & Client for final review and sign-off.	Lot	1	Lot	To be included on overall basis by the HVAC contractor
F	INSULATION				
1.0	Thermal Insulation of Ducts - for External Ducts				
	Supply, fabrication & Installation of thermal insulation on GI ducts complete with Closed Cell foam with minimum density of 60 Kg/m ³ with minimum R Value 4.1/inch & thermal conductivity -0.035 w/mok confirming to Class 'O' & the inner side stuck to the outer facia of the GI ducts with recommended / Proprietary Synthetic adhesive bonding (SR998 or equivalent) & installed as per manufacturers recommendation and finished with vapour barrier with Lagging and covered with glass cloth with mechanical protection for ducting without puncturing the vapour barrier complete as per specifications. Lag coating AF5590 shall be used as vapour barrier and as protective covering on glass cloth and shall be UV protected.				
1.1	9 mm thick Insulation	Sq.M.	RO	640	
1.2	13 mm thick Insulation	Sq.M.	RO	896	
1.5	25 mm thick Insulation	Sq.M.	RO	1,344	

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
2.0	Thermal Insulation with Factory Backed Alu Foil for				
	Supply, fabrication & Installation of thermal insulation on GI ducts complete with Closed Cell foam with minimum density of 60 Kg/m ³ with minimum R Value 4.1/inch & thermal conductivity -0.035 w/mok confirming to Class 'O' & the inner side stuck to the outer facia of the GI ducts with recommended / Proprietary Synthetic adhesive bonding (SR998 or equivalent) & installed as per manufacturers recommen-dation. The insulation joints shall be sealed with 3" wide Tape.				
2.1	6 mm thick Insulation + Factory backed Al.foil	Sq.M.	RO	640	
2.2	16 mm thick Insulation + Factory backed Al.foil	Sq.M.	RO	1,088	
2.3	19 mm thick Insulation + Factory backed Al.foil	Sq.M.	RO	1,178	
2.4	25 mm thick Insulation + Factory backed Al.foil	Sq.M.	RO	1,280	
3.0	Acoustic Insulation of Walls / Partition of AHU / DSU Trap Door				
	Supply, fabrication and installation of Acoustic insulation on walls of AHU rooms and partition / trap door of ceiling suspended AHUs as specified and shown on the drawing complete with:				
3.1	50 mm thick acoustic insulation [2 layers x 25mm thk]				
	a) Aluminium frame work 1.2 m x 0.6m				
	b) Synthetic adhesive bonding				
	c) 48 kg/cu.m Resin bonded Fibre Glass (Glass Wool) with RP tissue / Glass cloth				
	d) 24 G Perforated Aluminium cladding	sqm	RO	806	

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
4.0	Acoustic Lining of Ducts				
Fume hood vendor scope					
SITC of following items shall be in the Fume Hood contractor's scope based on design given in the DBR (NOT IN MEP OR CIVIL CONTRACTOR SCOPE)					
1.0	EXHAUST AIR FAN				
	Fume hood exhaust system should consist of:				
	Supply, installation, testing and commissioning of Floor mounted double / single skin, inhouse belt drive assembly, with DIDW Aerofoil Backward Curved Blowers with TEFC sq. Cage motor IP65 isolated from main air stream, vibration isolators. The FAN motors shall be high efficiency type IE-3/IE-4. Fans shall be selected for higher total efficiency 75% and above. Motors shall be IE-3.				
	Centrifugal fan in Polypropylene (PP) + FRP construction with PP impeller and suitable for outdoor duty with suitable IP-65 TEFC squirrel cage Induction motor and a belt drive package. Assembly should be suitable for floor mounting at the outside.				

SR. NO.	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
	The assembly should be dynamically and statically balanced and selected for low noise complete with motor, belt drive package, base frame, safety guard and all other accessories as required. Fan with belt / direct drive & SISW Backward curve blower & suitable for connecting to ducting on either side, complete with all accessories etc. & suitable for outdoor duty application. Motor shall be out of airstream.				
	A Vessel as per specifications with inlet, outlet & drain with isolation valve to be provided. A vessel should be made of PP + FRP construction. Required arrangement for Supporting at designated location to be provided.				
1.1	Exhaust Air Fan Unit EXFU-1 Horizontal Top / Side Discharge Floor mounted of capacity 11000 cfm / 100mm TSP.	Nos	2		
2.0	Starter & Control Panel for AHU & FAN				
	Supply, Installation, Testing and Commissioning of Starter and control panel suitable for 415 V, 3 phase, 50 Hz power distribution system. The panel shall be with IP 65 protection and should be fabricated for wall mounting compartment aliased design as per specifications.				
	Starter & Control Panel comprising of incoming 4 pole MCB, Voltmeter, Ammeter, Phase indicating lamps etc. Outgoing feeders as DOL / Star Delta starter for AHU / FAN motor. Vendor to provide suitable capacity 2 nos spare feeders for AHU / FAN motor.				

	Starter and control panel shall be complete with necessary control, including OLP, SPP, ON/OFF push buttons with ON & OFF indications, 3 nos. non polarised NO-NC contacts for tripping of Motorised Dampers, Fire Dampers and AHU / FAN motor on signal from Fire Alarm Panel. Also, vendor necessary interlocking for AHU / FAN operations including toggle switch for PSU & pumping down etc to be included as part of Starter and Control panel. Panel should be suitable to house the VFD.				
	Vendor should consider power & control cabling from Starter panel upto respective AHU / FAN .				
	The units shall be suitable for operation on 400/440 Volts, 3 ph., 50 Hz, 4 wire A.C. supply.				
2.1	Exhaust Air FAN Units Horizontal Top Discharge Floor mounted 11000 cfm / 125 mm TSP.	Nos.	2		
3.0	Variable Frequency Drive for AHUs and FANs				
	Supply, Installation, Testing and Commissioning of variable speed drives for AHU Fan Motor(s) with 1 no. dedicated microprocessor based controller with software duly downloaded, Adjustable frequency drives, differential pressure sensor/ transmitters as necessary and as described in the specifications and complete with:				
	a) Duct pressure sensor / transducer (DP sensor shall be placed in SA duct upstream - 1no. Per SA duct). The VFD shall be capable to intake upto 3 inputs from DP sensor / AHU and operate the VFD based on average / lowest reading available.				
	b) Integration with bypass mode for Normal starter operation.				
	c) EMC & Harmonic Filters shall be provided as necessary for compliance to IEEE 519. Proper care to be taken to avoid EMI.				

	The VFD vendor shall include necessary integrator, convertor, software, hardware, license's etc. as applicable for the VFDs to interact & be controllable thru' central BMS. Necessary protocol for connecting with MODBUS RTU, BACNET, LONWORKS etc. shall also be included. VSDs Compliance with LEED requirement and Core Performance Section 2.10 is required.				
3.1	VFD for AHUs having motors above 11 kW & upto 15 kW for AHUs	Sets	2		
4.0	Sequential Controller for sequencing, programming scheduling the common Hood Exhaust Fans System for lab areas for equal run, auto stand-by change over, fault take off etc. as specified. The controller shall be enclosed in an IP-54 Panel.				
	The particular set of Fan System shall be controlled in sequence when working on working + standby basis. Incase of failure of one of the system during its working cycle, automatically second system, (which is in OFF cycle) should start ON automatically.				
	Exhaust Fans (11000 cfm (11 kW) # 2 nos- 1 working + 1 stand-by)	Set	1		
5.0	Fume Hood Exhaust Ducting				
	Fume hood exhaust ducting in 3mm Polypropylene and coated with 3mm FRP as per Technical Specifications and to be installed as per drawings and with elbows, reducers, bends, tees, air control valve etc. as required.				
	The duct joints shall be of flanged connections with rubber gasket in between and with required supporting arrangement. The rubber gasket should be able to withstand the exhaust fumes and shall be selected accordingly.				
	The supports etc. shall be painted with 2 coats of red oxide and 2 coats of enamel paint.				
	Necessary wall/slab openings, making and redoing for erection of equipment, ducts and piping, cabling to be in HVAC Contractors scope whether specifically excluded/not mentioned elsewhere.	sqm	350		

SCHEDULE OF QUANTITIES FOR SPRINKLER SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
A	SPRINKLER SYSTEM				
1	GI Pipe class 'C' (heavy duty) conforming to IS:1239 including all accessories such as grooved joints, flanges, tees, reducers, dead flange etc. including lift to all heights, jointing, painting and inserted rubber gaskets, nuts, bolts etc. as required. G.I threaded fitting, fixing with clamps to M.S. brackets / hangers including testing to 15 kgs/cm ² pressure. Pipes shall be painted with two coats of primer & two coats of post office red enamel paint and shall be fixed in ceiling, walls, columns for all heights with hangers/supports and fasteners all as per drawing including chasing of walls/columns /ceiling etc. and making good the same as required. Sprinkler piping system should be FM compliant.				
Note :	Fittings shall be forged ASTM A 105 3000# socket weld type below & upto 50 mm and Seamless ASTM A 234 butt weld type for 65 mm and above. Flanges shall be forged A 105 150#				
1.2	32 mm dia	rmt	RO	590	
2	Providing, fixing, testing and commissioning of 100 mm dia Bourden type, Stainless Steel Dial type Pressure Gauges for sprinkler system including ball valve and pipe having calibration of 0-15 Kg/sq cm. (FM Approved)	nos	RO	3,186	
3	Providing, fixing, testing and commissioning of 15 mm dia quartzoid bulb type GM sprinkler head suitable to operate at 68 deg.C with K 80, and adjustable escutcheon plate (FM Approved)				
3.1	Extended coverage Pendent Sprinkler	nos	RO	1,239	
3.2	Concealed Sprinkler	nos	RO	590	

3.3	Horizontal Side Wall Sprinkler	nos	RO	1,121	
3.4	Pendent type sprinkler of 15 mm dia, 93 deg. C with K 80.	nos			
4.5	750 mm	nos			
4	FM Approved grooved end BFV, ductile iron body (ASTM A-536, Grade 65-45-12). Ductile iron disc, synthetic rubber encapsulated suited for the intended service, with integrally cast stem. Complete with weatherproof actuator and pre-wired supervisory switches. Victaulic Series 705 Firelock. Butterfly valve should be with Tamper Switch stating feedback of each of above Butterfly Valve for their ON/OFF status, including signal cable of 2 C x 1.5 Sq. mm YWY.				
4.1	150 mm dia.	nos	RO	15,340	
4.2	100 mm dia.	nos	RO	12,980	
4.3	80 mm dia.	nos	RO	10,970	
5	Providing and fixing of FM Approved electrically operated Flow Switch with threaded connection with flexible full bore paddle & NO/NC contact terminals as specified complete with all accessories and necessary wiring.				
5.1	150 mm dia.	nos	RO	6,490	
5.2	80 mm dia.	nos			
6	Test and drain assembly with Drain valve with sight glass & inspectors Test Valve with sight Glass arrangement complete with union. (FM Approved)				
6.1	50 NB	Set	RO	11,446	
6.2	25 NB	Set	RO	9,086	
7	Providing, fixing, testing & commissioning 100 mm diameter cast steel Pressure Reducing Valve with all fitting & accessories for reducing variable inlet pressure to fixed outlet pressure of 4~6 kg/cm ² (g). (FM Approved)				
7.1	100 mm dia.	nos			
7.2	80 mm dia.	nos			
8	Providing, fixing, testing & commissioning single acting air release valve with screwed inlet 25 mm dia including all fitting & accessories. (FM Approved)	nos	RO	1,794	
8.1	150 mm dia.	nos	RO	6,018	

8.2	100 mm dia.	nos			
8.3	80 mm dia.	nos			
9	Providing and fixing 25 mm dia inspection & testing assembly with gun metal ball valve, gun metal sight glass, by-pass valve & connection to drain. (FM Approved)	nos	RO	2,242	
10	Fabrication and erection of MS angle (50x50x6mm) steel supports with 2 coats of zinc primer & 2 coats of black enamel paint with stud type anchor supports	Kgs	RO	83	
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ.				
	Vendor to check availability of material with client before procuring.				
	Vendor to consider NEWAGE make				

SUMMARY SCHEDULE OF QUANTITIES FOR FIRE ALARM SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
B	ADDRESSABLE FIRE ALARM SYSTEM				
1.0	Supply, Installation, Testing and Commissioning of Analogue addressable Intelligent type rate of rise cum fixed temperature Thermistor type Heat Detectors with mounting base, address switch complete as required for proper functioning with base & MS Powder coated Junction Box, cable glands complete with ferrules etc.	Nos	RO	4,130	
2.0	Supply, Installation, Testing and Commissioning of Projected Beam Detector (transmitter + receiver) with monitor module, control relay module & its Power Supply Unit complete as required for proper functioning.	Nos	RO	17,700	
3.0	Supply, installation laying & commissioning of following size Copper cable on readymade trench / tray including cable laying hardware suitable for FAS with RED colour Outer sheath.				
4.2	6 C x 1.5 Sq. mm YWY FRLS Shielded Armoured cable including end terminations in RED colour.	RMT	RO	283	
	Note -				

	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ				
	Vendor to check availability of material with client before procuring				
	Vendor to consider APOLO make				

<p align="center">SUMMARY SCHEDULE OF QUANTITIES FOR PUBLIC ADDRESS SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI</p>					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
C	PUBLIC ADDRESS SYSTEM				
1	Supply, Installation, Testing and Commissioning of Metallic Grill, high quality type music speakers to be fixed flushed with false ceiling with line matching transformer for direct connecting to 100/70 V output line.				
1.1	6 Watt Output Speakers with fire dome	Nos	RO	3,540	
2	Supply, Installation, Testing and Commissioning of Volume control - cum - ON - OFF switch flush mounted on wall along with other electrical switches with size & regulating knob matching the electrical fittings, upto 25 Watts	Nos			
3	Supply, Installation, Testing and Commissioning of Set of Digital Amplifiers fully monitored speaker circuits dual Channel + One redundant suitable to meet the speaker wattage with 230 VAC networkable with all interconnecting Cables.	Lot			
	Note - Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ Vendor to check availability of material with client before procuring Vendor to consider AHUJA make				

SUMMARY SCHEDULE OF QUANTITIES FOR ACCESS CONTROL SYSTEM FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Total Rate (with	Total Amount (with Tax)
D	ACCESS CONTROL SYSTEM				
1	Integrating, Testing and commissioning of proposed Access Control System with Existing System.				
	Intelligent embedded network device for access control and alarm monitoring				
	Firmware stored in flash memory that is easy to update on LAN Network				
	Multiple card reading technologies supported, Proximity, Smart card, Biometric				
	Variable card formats supported				
	Multiple facility codes supported				
	Remote database administration				
	Remote alarm monitoring				
	Inbuilt database backup to facilitate offline use				
	Local, Global, Soft, Hard Anti-pass back supported				
	Automatic locking & unlocking of the doors	Lot			
2	Supply, Installation, Testing and Commissioning of Master & Slave (DRI) architecture the Vendors shall quote Master suitable for 64 Readers or 32 DRI Modules as under in lieu of above item.				
3	Supply, Installation, Testing and Commissioning of fingerprint Biometric cum card Reader, Power supply with Wiegand output fully networkable.	Nos	RO	51684	
	(To include 1 set of Biometric enrolling kit complete)				
4	Supply, Installation, Testing and Commissioning of Magnetic contacts for Fire Exits	Nos	RO	566	
8	Supply, Installation, Testing and Commissioning of Panic bar for Fire Exits				
8.1	Single Door Panic Bar	Nos	RO	18,408	
8.2	Double Door Panic Bar	Nos	RO	36,816	

5	Supply, Installation, Testing and Commissioning of Piezo sounders for Fire Exits	Nos	RO	1274	
6	Supply, Installation, Testing and Commissioning of Door lock - Electric door strike with all necessary accessories for Server, HUB and UPS Rooms.	Nos	RO	11,328	
7	Supply, Installation, Testing and Commissioning of Access Control Enterprise version Server Software + Access Control Enterprise version Client License loaded on Client machines	Set			
	By Developer				
8	Supply, Installation, Testing and Commissioning of Emergency Release Switch in Green Polycarbonate housing, push to break glass type.	Nos	RO	1133	
9	Supply, Installation, Testing and Commissioning of Panic button (For Handicap Toilet each floor)	Nos	RO	850	
10	Supply, Installation, Testing and Commissioning of Proximity cards	Nos	RO	355	
11	Supply, Installation, Testing and Commissioning of Annealed Tinned Copper flexible Cable PVC insulated, shielded FRLS Sheathed including PVC conduit & all Accessories				
12	2c x 0.75 Sq.mm	RM	RO	101	
13	Supply, Installation, Testing and Commissioning of Fully closed Al trunking of 16 Gauge with GI supports at every 3 mtrs, and Aluminium Junction Boxes @ every 6 mtr				
13.1	50 x 50 mm	Mtr	RO	238	
13.2	63 x 38 mm	Mtr	RO	398	
13.3	83 x 38 mm	Mtr	RO	474	
13.4	100 x 40 mm	Mtr	RO	601	

14	Supply, Installation, Testing and Commissioning of Medium Grade - 25 mm FRPVC Conduit with fittings ISI Marked with GI saddle & spacers at every 0.3 Mtr and flexible conduits for all drops above false ceiling.	Mt	RO	56	

15	Integration, Testing and commissioning with Visitor Management System with Built in adjustable Web Camera, Printer, with Client license and database sharing with Access control complete with operating system.	Set	RO	84,960	
	By Developer				
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ				
	Vendor to check availability of material with client before				
	Vendor to consider ESSL make				

SUMMARY SCHEDULE OF QUANTITIES FOR CCTV SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Total Rate (with Tax)	Total Amount (with Tax)
E	IP CCTV Surveillance System				
	Supply, Installation, Testing Commissioning of Network (IP) Based CCTV Surveillance System comprising of following:				
1.1	Integrating, testing and commissioning of proposed CCTV system with Main CCTV System manager.	Set			
2.0	Any additional items required to complete fully functional above system to be included along with technical details.	Lot			
	Note -				
	Vendor to cross check the existing work executed at site w.r.t new requirement. It is proposed to retained the existing work as suitable w.r.t. new requirement. Necessary modification / extension works / new works (if required) to be considered as part of this BOQ Vendor to check availability of material with client before procuring				

SCHEDULE OF QUANTITIES FOR FIRE EXTINGUISHER SYSTEM WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
SR NO	DESCRIPTION OF WORKS	UNIT	QTY	Unit Rate (with Tax)	Total Amount (with Tax)
1.0	Supply & Fixing of Water Stored pressure type Fire Extinguisher of 9 lit capacity, fitted with discharge control valve (Squeeze grip type) CE marked and pressure gauge, with discharge hose and open nozzle and supplied complete with initial charge as per IS: 15683 with ISI mark and wall bracket.	EACH	RO	4,661	
2.0	Supply & Fixing of ABC Stored pressure type Fire Extinguisher of 2 kgs capacity, fitted with discharge control valve (Squeeze grip type) CE marked and pressure gauge, filled with FE 36 gas variants with open nozzle and supplied complete with initial charge as per IS: 15683 with ISI mark and wall bracket.	EACH	RO	14,573	
3.0	Supply & fixing of Dry Chemical Powder Extinguisher capacity 10 Kg with gun-metal cap. and nozzle and complete in all respects including initial fill and wall suspension bracket.	EACH	RO	9,263	
4.0	Supply & Fixing of Foam Stored pressure type Fire Extinguisher of 9 lit capacity. Fitted with discharge control valve(Squeeze grip type) CE marked and pressure gauge, filled with AFFF liquid of 540 ml as per IS: 4989 with ISI mark with discharge hose and air induction nozzle and supplied complete with initial charge as per IS: 15683 with ISI mark and wall bracket.	EACH	0	5,015	
5.0	Supply & Fixing of Fire Bucket 9 lit capacity, made from galvanized iron sheet, round bottom, white enamel paint inside and red outside and lettered 'FIRE" with side handle and wall mounting bracket.	EACH	0	5,133	

SCHEDULE OF QUANTITIES FOR CIVIL WORKS FOR CHEMISTRY RESEARCH LAB AT IIT MUMBI					
Sl. No.	Description of Items of work	Unit	Quantity	Rate	Amount (Rs.)
	<u>SH: 1 EARTH WORK</u>				
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge.				
2	Diluting and injecting chemical emulsion for POST-CONSTRUCTION anti-termite treatment (excluding the cost of chemical emulsion) :				
2.1	Along the external wall below concrete or masonry apron using chemical emulsion @ 2.25 litres per linear metre including drilling and plugging holes etc.:				
	<u>SH: 2 CONCRETE WORK</u>				
3	Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor, for flooring beds laid in panels etc., up to floor five level, excluding the cost of cantering, shuttering and finishing :				
	<u>SH : 5 FLOORING & WALL LINING WORKS</u>				
4	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved makes, in all colours and shades, laid on 20mm thick/suitable thickness for existing flooring cement mortar 1:4 (1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. (Note; the existing tile of make & shade to be provided)				

Sl. No.			Quantity	Rate	Amount (Rs.)
5	Finishing walls / ceilings with premium acrylic emulsion paint of "Apolite Super Acrylic emulsion paint" of Asian Paints or "Dulux Acrylic Emulsion" of ICI Dulux for interior works to give even shade, in required colours and shades as approved by the Engineer-in-Charge :				
6	Providing & fixing 12 mm thk. Toughened glass vertical . The glass shall be machine cut with all edges polished as per required. The glass shall be fixed directly on floor with U channel and fixed on wall with 50 x 50 mm s.s finish glass connector . all required hardware, fixtures, adhesives shall be considered while quoting for the same. Make: Ozone, Dorma, Enox or equivalent				