



**CENTRE OF EXCELLENCE IN MOLECULAR BIOLOGY (CEMB),
CEMB-87-West Canal Bank Road,
Thokar Niaz Baig, Lahore**

Tender Notice No: AO/14080
Date: 10-08-2026

TENDER DOCUMENT
FOR
CONSTRUCTION OF CLEAN ROOM/BIOTECH LABORATORY



AUGUST 2026



CENTRE OF EXCELLENCE IN MOLECULAR BIOLOGY (CEMB),
CEMB-87-West Canal Bank Road,
Thokar Niaz Baig, Lahore

TENDER NOTICE

Tenders under rule 36 (b) of PPRA rules (2004) through e-procurement (EPADS) are invited from interested Civil, Mechanical, Contractors/bidder for " CONSTRUCTION OF CLEAN ROOM/BIOTECH LABORATORY " as mentioned vide Lot-1, 2 , 3, 4, 5, 6 & 7 respectively as follow.

Lot 1	HVAC SYSTEMS FOR BIOTECH / CLEAN ROOMS, PRODUCTION LINE 1 & 2, GROUND FLOOR	Estimated price: Rs 31.20 Million Bid security: 2% of above Estimated price (to be attached with technical bid)
Lot 2	CLEAN ROOMS PANELS	Estimated price: Rs 5.5 Million Bid security: 2% of above Estimated price (to be attached with technical bid)
Lot 3	ELECTRICAL WORKS	Estimated price: Rs 2.90Million Bid security: 2% of above Estimated price (to be attached with technical bid)
Lot 4	FIRE FIGHTING WORKS	Estimated price: Rs 0.80 Million Bid security: 2% of above Estimated price (to be attached with technical bid)
Lot 5	PROCESS / UTILITIES WORKS	Estimated price: Rs 13.3 Million Bid security: 2% of above Estimated price (to be attached with technical bid)
Lot 6	CIVIL, PLUMBING WORKS	Estimated price: Rs 1.80 Million Bid security: 2% of above Estimated price (to be attached with technical bid)
Lot 7	FURNITURE AND MECHANICAL WORKS	Estimated price: Rs 4.50 Million Bid security: 2% of above Estimated price (to be attached with technical bid)

Interested bidders can submit bids for all Lots (1–7) as a single package, for any single Lot, or for multiple Lots. All bids must be accompanied by a Bid Security (2% package wise as specified or 2% of total amount in case of single package) in the amount stated above in the shape of CDR in the Name of “Director, Centre of Excellence in Molecular Biology (CEMB)” and must be delivered at Purchase Section CEMB, on or before **10.09.2026** at 10:00 AM in sealed envelopes. Technical Bids will be opened at 10:30 AM on the same day in the presence of bidder’s representatives who choose to attend at the same address. **All the technical and financial bids must be uploaded on e-procurement portal (EPADS).**

The Director CEMB reserves the right to reject any or all tenders. Tender documents will be also available on centre website (www.cemb.edu.pk). If there is a public holiday announced by the Government on the tender opening date, then the tender will be opened on the next working day. It is to be noted that technical tender documents may please upload in the same sequence as demanded in the tender document.

HEAD (Admin), CEMB
Email: admin@cemb.edu.pk
Phone: +92 (42) 35293145,
Cell: 0300-4525194



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TERMS AND CONDITIONS OF TENDER:-

- 1) Sealed tenders should be submitted by **filling in the rate** and amount in the BOQ given in the tender document along with the total tender cost. Each page of the tender should be signed & stamped by the contractor. Incomplete, part or conditional tenders will not be accepted.
- 2) **Earnest money** at the rate of 2% of the total tender cost in the shape of deposit at call in the name of Director CEMB, Lahore must accompany the tender, failing which the tender will be rejected.
- 3) Bid validity period after opening of the bid is **90 Days**.
- 4) **Time of Commencement:** Within 07 days from the date of receipt of the letter of acceptance.
- 5) **Time of Completion:** 90 days after commencement of the work.
- 6) Amount of **liquidated damages** at the rate of 0.1% of contract Price Per Day maximum deduction 10% of the contract price in case of delay in the completion of the project.
- 7) **Defect Liability Period:** 6 months from the date of Completion certificate
- 8) Percentage of **retention money:** 10% of gross value of Work done.
- 9) Only **registered Contractors**, who are on active tax payers list (ATC) of FBR are eligible to participate in tender competition.
- 10) The values of amount should not be filled **handwritten** in the tender documents, it must be filled through typing.
- 11) Income **Tax**/Punjab Sales Tax: Taxes will be deducted as per Government Rules.



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Evaluation Criteria of Bidders

Sr. No.	Parameters	Detail	Maximum Marks	Remarks															
1	Past Performance (Within previous 3 years)	(a) Major Institutions Served (<i>Form A1</i>): (15 marks) <table><tr><td colspan="3">No. of institutions served</td></tr><tr><td>i</td><td>1 to 3</td><td>5</td></tr><tr><td>ii</td><td>4 to 6</td><td>10</td></tr><tr><td>iii</td><td>7 & Above</td><td>15</td></tr></table>	No. of institutions served			i	1 to 3	5	ii	4 to 6	10	iii	7 & Above	15	15	Institutions mean government institutions / Public Sector organizations / Public Sector Universities / Government Agencies / Autonomous Bodies etc. Copies of relevant work orders / completion certificate must be attached.			
No. of institutions served																			
i	1 to 3	5																	
ii	4 to 6	10																	
iii	7 & Above	15																	
2	Relevant Experience	<table><tr><td colspan="3">General Experience</td></tr><tr><td>i</td><td>1 year</td><td>2</td></tr><tr><td>ii</td><td>2 years</td><td>4</td></tr><tr><td>iii</td><td>Above 2 years</td><td>5</td></tr></table>	General Experience			i	1 year	2	ii	2 years	4	iii	Above 2 years	5	5	Contractor has completed at least 3 projects of similar nature in last five years			
General Experience																			
i	1 year	2																	
ii	2 years	4																	
iii	Above 2 years	5																	
3	Enlistment record with Government Organizations & other agencies	1 Mark for each enlistment up to maximum of five enlistments	5	Enlistment Certificate															
4	Financial Status	<table><tr><td colspan="3">Financial Status</td></tr><tr><td>i</td><td>Tax Returns (Last 3 years). (1 marks each year)</td><td>3</td></tr><tr><td>ii</td><td>Bank Certificate*</td><td>2</td></tr><tr><td>iii</td><td>Bank Statement (Previous 12 months)</td><td>2</td></tr><tr><td>iv</td><td>Balance above the amount of quoted items.</td><td>3</td></tr></table>	Financial Status			i	Tax Returns (Last 3 years). (1 marks each year)	3	ii	Bank Certificate*	2	iii	Bank Statement (Previous 12 months)	2	iv	Balance above the amount of quoted items.	3	10	All provided documents can be verified by the Department.
Financial Status																			
i	Tax Returns (Last 3 years). (1 marks each year)	3																	
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5	Technical Staff (Overall) (Form B1)	(Form-B) <table><tr><th colspan="3">Technical Staff</th></tr><tr><td>i</td><td>Less than 2 persons</td><td>0</td></tr><tr><td>ii</td><td>3 -5 persons and above</td><td>02</td></tr><tr><td>iii</td><td>6 persons and above</td><td>04</td></tr></table>	Technical Staff			i	Less than 2 persons	0	ii	3 -5 persons and above	02	iii	6 persons and above	04	4	Qualification marks will be awarded on the final degree. Complete supporting documents be attached.			
Technical Staff																			
i	Less than 2 persons	0																	
ii	3 -5 persons and above	02																	
iii	6 persons and above	04																	
6	Good Reputation Certificate from any Govt. Institution / Private Sector in Connection with Services	<table><tr><th colspan="3">Good Reputation Certificate</th></tr><tr><td>i</td><td>No certificate provided</td><td>0</td></tr><tr><td>ii</td><td>1 to 2</td><td>1</td></tr><tr><td>iii</td><td>3 to 5</td><td>3</td></tr><tr><td>iv</td><td>6 and above</td><td>5</td></tr></table> Appreciation Certificates / Satisfactory letters etc. must be attached.	Good Reputation Certificate			i	No certificate provided	0	ii	1 to 2	1	iii	3 to 5	3	iv	6 and above	5	5	Institutions mean government institutions / Public Sector organizations / Public Sector Universities / Government Agencies / Autonomous Bodies Private Institute etc.
Good Reputation Certificate																			
i	No certificate provided	0																	
ii	1 to 2	1																	
iii	3 to 5	3																	
iv	6 and above	5																	
7	Blacklisting from any agency	In case the firm is blacklisted, no Marks will be given and 15 points will be added in case affidavit by the company that it has not been black listed is attached.	15																
8	Litigation History in which Decision has been given against the firm(s)	In case the firm is involved in any litigation, no marks will be given and 10 points will be added in case affidavit of no litigation is attached.	10																
9	End User Satisfaction	<table><tr><th colspan="3">End User Satisfaction</th></tr><tr><td>i</td><td><i>Excellent</i></td><td>10</td></tr><tr><td>ii</td><td><i>Good</i></td><td>07</td></tr><tr><td>iii</td><td><i>Satisfactory</i></td><td>03</td></tr></table>	End User Satisfaction			i	<i>Excellent</i>	10	ii	<i>Good</i>	07	iii	<i>Satisfactory</i>	03	10				
End User Satisfaction																			
i	<i>Excellent</i>	10																	
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10	Registration with income tax department	No points will be given if income tax certificate is not attached and 6 points will be added in case of valid certificate	6																



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11	Project Schedule	Project Work Plan and Completion Schedule	15	
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Total Marks: 100

Qualifying Marks: 65%

Note: Marks will be awarded only if the comprehensive and complete concerned supporting documents are enclosed.

The financial bids of technically accepted bidders will be opened publicly at a time to be announced by the Procuring Agency. The financial bids of the bidders found technically non-responsive shall be returned un-opened to the respective Bidders.



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**HVAC SYSTEMS FOR BIOTECH / CLEAN ROOMS,
PRODUCTION LINE 1 & 2, GROUND FLOOR**

**“PHARMA GRAD HYGIENIC AIR HANDLING UNIT
AIR FILTRATION, CONTROLS, GAUGES, MONITORING
DISPLAY SYSTEM”**

**SUPPLY & COMMISSIONING OF
MODULAR TYPE DOUBLE SKIN**

AIR HANDLING UNITS

**WITH VFD BASED PLUG FANS, D’X & ELECTRIC REHEAT
TYPE COILS, WITH HIGH QUALITY FILTER SECTIONS**



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DETAIL SPECIFICATION OF D'X COIL & ELECTRIC REHEAT BASED AIRHANDLING UNITS (Hygienic type)													
BIOTECH / CLEAN ROOM FACILITY (CLASS 1,000 TO 100, 000)-GROUND FLOOR													
Sr. No.	AHU No.	Service	D'X COOLING COIL CONDITIONS							ELECTRIC REHEAT COIL DATA			
			COIL EAT		COIL LAT		Coil Total Capacity (TH)	Coil Sensible Capacity (SH)	SCREW/SCROLL TYPE COMPRESSORS	Capacity	NO. OF STAGES	COIL EAT	COIL LAT
			DB	WB	DB	WB							
			°F	°F	°F	°F	MBTUH	MBTUH	HP	KW	NO.	°FDB	°FDB
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	DX COIL-1	115.0	83.0	51.2	49.8	225.0	191.3	2x12	8.0	2	51.2	53.8
2	2	DX COIL-2	115.0	83.0	51.2	49.8	270.0	229.5	2x14	9.0	2	51.2	54.2
3	3	DX COIL-3	85.5	65.5	52.5	50.1	66.0	56.0	1x7.5	5.0	2	52.5	55.5
4	4	DX COIL-4	74.5	62.3	53.5	51.4	48.0	41.0	1x6	4.0	1	53.5	54.8
5	5	DX COIL-5	75.8	63.0	54.5	51.9	48.0	40.0	1x6	4.0	1	54.5	55.4
LEGENDS:							NOTES						
							1. ELECTRIC REHEAT COIL SHALL BE OPERATE WITH CLEAN ROOM HUMIDITY SENSOR TO MAINTAINED RH UPTO 60%.						
TH = COIL TOTAL HEAT							2. THE COIL & DRAIN PAN SHALL BE READILY REVERSIBLE AS PER SITE CONDITIONS.						
SH = COIL SENSIBLE LOAD							3. FOR "MAKE" AND "COUNTRY OF MANUFACTURE" SEE SCHEDULE-I TO BID						
EDB = COIL ENTERING DRY BULB							"LIST OF APPROVED MANUFACTURERS FOR ITEMS / MATERIALS / EQUIPMENTS						
EWB = COIL ENTERING WET BULB							OF HVAC WORKS"						
EAT = ENTERING AIR TEMPERATURE													
LAT = LEAVING AIR TEMPERATURE													
EWT = ENTERING WATER TEMPERATURE													
LWT = LEAVING WATER TEMPERATURE													
AMBIENT OUTDOOR CONDITION:													
INDOOR DESIGN CONDITIONS:													
AHU-1, 2 & 4		22±2 °CDB & NMT 50% RH											
AHU-3 & 5		23±2 °CDB & NMT 50% RH											

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TECHNICAL SPECIFICATION

General: Air handling units as shown on the drawings, low velocity (low pressure or high pressure single zone draw - thru or multi zone blow-thru) type shall be provided for various areas of the Building and shall be of capacities under the specified conditions of operation as given in the Schedule of Equipment. All components to be heavy duty type and suitable for continuous operation.

The Units installed outdoors to have weatherproof construction.

The unit shall be complete with cooling/heating coil(s), fan(s), fan motor(s), Motorized dampers (VCDs) as specified, internal face and bypass dampers for single zone Units if specified in the Schedule, multi-zone units to have segmented zone face and bypass dampers, perforated plate in the heating or bypass section to balance air resistance across the cooling coil, filter sections(s) suitable for filters specified elsewhere, access plenum sections for high efficiency filters, eliminators SS 304, mixing box with VCDs as show in drawings, drain pan and all other components and accessories to complete the unit.

The casing shall be modular type, panels of best quality not less than 1.2mm thick sheet steel, Properly reinforced and braced for maximum rigidity, with smooth internal and external surfaces and to have removable panels and access doors for easy access to all internal parts.

The casing and access doors to be insulated with at least 50mm thick min. 74kg / cum density fiberglass or 100-120kg / cum density mineral wool rigid board type or equivalent insulation, with face coating to resist erosion with air velocities up to 20 m / sec., properly fastened to the panels.

The integrity of the insulation shall be maintained at the unit panel joints to avoid sweating at the joints.

The unit sections thru which air at ambient temperature only is flowing may not be insulated.

Double Skin Construction (DSC) Unit. Where specified, units of double skin construction shall be Supplied. DS units shall have insulation sandwiched between two steel sheets, internal to be min. 0.6mm thick and external 1.2mm thick. The casing panels and access doors to be formed by sheets folded together at edges with smooth internal and external surfaces. The panels to be supported between sturdy aluminum corners/frame work or equivalent arrangement. Internal/external sheets may be of material other than steel as specified in the Schedule.

Thermal barrier shall be provided between internal and external metal surfaces to prevent sweating. Units of up to 2 cum/sec (4000cfm) capacity may have 40 mm thick panels, larger capacity units with 50mm thick panels. The insulation may be min. 75kg/cum density rigid board type or foamed in place polyurethane, 40 & 50mm.



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Unit sections thru which air at ambient temperature only is flowing may not be insulated and be of single skin construction.

The type and thickness of insulation to ensure that the panels and casing joints do not sweat with ambient dew point up to 28 oC.

To provide easy access to all internal parts, the casing shall have access doors or inspection panels of same construction, with inner surface flush and smooth with adjoining surfaces, tightly sealed with sealing gasket and easy to open or close, provided with handles may have removable type panels/doors with hand grip bolts and larger size with hinged type access doors.

The casing panel sheets and supporting frame work to be corrosion protected, boundaries and powder paint coated or baked enamel finished, or as specified in the Schedule of Equipment.

Multi leaf opposed blade type air volume control dampers (VCDs) shall be provided in the mixing box and other sections as specified in the Schedule or shown in the drawings. Damper bearing (preferably of nylon construction) and linkages to be of construction and design to be easily movable with minimum force and suitable for operation by automatic damper actuators. Open to close position indicators to be provided. The damper blades to be interlinked with gear wheels at one end to ensure simultaneous smooth movement of all blades. Damper blades fitting within the frame to allow minimum air leakage from sides. The blades to interlock on closure for effective air seal.

The unit section requiring draining (coils, humidifiers) shall be installed on a common base frame to act as a drain pan with drain outlet connection on both sides. The construction shall be SS 304 OR sandwich type completely insulated with at least 15mm thick foamed in place insulation with out any joint.

The different components of each unit section to be fixed through the casing to two external base channels so that the unit is not in contact with floor.

The design of the unit should make site assembly work quick and easy. The assembly will be only with nuts and bolts and clamps. The assembled panels shall form a strong and rigid casing.

The casing shall be tested to be air tight against negative or positive pressure of 200mm WG (2000 Pascal) or higher if specified

The unit to be mounted on rubber in shear or similar approved vibration isolators to isolate it from the Building structure.



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CENTRIFUGAL BACKWARD OR PLUG TYPE FAN

General: The Contractor shall supply fans of the type specified below, the Contractor shall be responsible for the proper selection of the fans so that the specified operating conditions are obtained. Motors shall conform to specification under MOTOR and shall be sized to provide the required BHP for meeting the specified conditions without overloading.

Centrifugal Fans: Shall be single width, single inlet or double width double inlet, class I, II or III as required or indicated.

Fan Housing: Housings shall be of heavy gauge steel, continuously welded construction with rigid reinforcement. In class I & II construction size 12 inches through 27 inches shall have 12 gauge sides and 14 gauge scrolls, while sizes 30 inch through 66 inches shall have 10 gauge sides and 12 gauge scrolls. All fan housings shall be equipped with flanged discharge and removable spun inlet cones designed for smooth airflow. Single-inlet, single-width fans shall be provided with extended inlet collars for slip-on type duct connections. Inlet collars shall be of heavy gauge round design.

Fan Wheels: shall be rigidly constructed, accurately balanced both statically dynamically on precision electronic balancers, and shall be free from objectionable noise and vibration. Each wheel shall be designed for critical speed of at least 1.25 times the maximum class speed. Up to 27 inches fan blades may be forward curved, backward curved or airfoil design. Fan blades over 27 inches shall have backward curved or airfoil design, unless otherwise specified under EQUIPMENT & MATERIAL SCHEDULE. Forward or backward curved wheel shall be of steel plate, while aerofoil wheels shall be of cast-aluminum, or formed steel with cavity filled.

Bearing: Fans shall have heavy duty, grease lubricated, precision anti-friction ball or roller, self-aligning, pillow block type bearings, selected for minimum average bearing life of 125,000 hours when operating at maximum catalogued class conditions. Bearings shall be provided with suitable arrangements for re-lubrication.

Mounting & Drive: The fan and motor drive shall be mounted on heavy steel framing. Motor shall be mounted on slide rails. Drive arrangement shall be as specified, or as recommended by AMCA for the condition of operation. Drive shall be selected for minimum 1.2 BHP. Fans up to & including 50 HP shall be with variable pulley & suitable for adjustment within + 10% of specified RPM. Provide complete belt guard on fan and motor pulley, constructed of heavy steel framing and expanded metal mesh screening.

Painting & Coating: Each fan component shall be thoroughly degreased, phosphatized and provided with two coats of special anti-rust primer and two coats of stove enameled paint.



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Installation: Fans shall be rigidly secured so that they operate without vibration and transmission of vibration to structure shall be isolated. Connection to ducting shall be through flexible connectors. Ducting connection to fan shall ensure lowest turbulence and smooth transition of sides. All supporting arrangement of the fans shall be drawn up by this contractor and submitted to the consultant for approval. Floor mounted fan shall be installed as a 100mm high concrete foundation with edges provided with 25x 25 x 3 mm angle iron.

Commissioning and Testing: The fans shall be commissioned and tested by this contractor. Test forms, supplied by the consultants shall be filled in and the consultant's approval obtained.

The fans to be double inlet type and statically and dynamically balanced and tested in the factory. The fan bearings must be quiet in operation, self-aligning type and to prevent leakage of oil grease, preferably permanently sealed and prefabricated otherwise to require infrequent lubrication and oil grease cups must be provided in external accessible positions for easy lubrication.

Fan to be selected for quiet operation, max. 2000-rpm, fan outlet velocity not to exceed 10 m / s (2000 fpm) or as specified, fan outlet connected to the casing with short flexible collar of heavy duty air tight canvas properly sewn and clamped, max. 1400-rpm electric motor, direct drive, fan speed +5-10% of the design selected speed to balance the air systems after commissioning of the unit. The fan motor shall be equipped with VF DRIVE of protection Class IP54 or IP55 and selected so as not to be loaded more than 90% of net rated hp under specified operating conditions. The fan motor to be mounted on a sturdy adjustable base. The fan motor may be located inside or outside the unit casing. If located inside, both fan and motor shall be installed on a common sturdy base mounted on rubber in shear or similar vibration isolators and isolated from the unit casing.

5. Coil (s) Section:

The water-cooling or heating coil(s) shall be of heavy gauge seamless copper tubes with mechanically bonded aluminum fins, tested with at least 20 bar air pressure in a water tank. Unless otherwise specified the cooling and heating coils shall have not more than fins/cm (10 fins/inch) and face velocity not to exceed 2.6 m/s (500 fpm) and heating coils to have not more than 5 fins/cm (12 fins/inch) and face velocity not to exceed 5.1m/s (100 fpm). The air flow to be uniform across the coil face.

The steam / electrical heating coil(s) where specified shall be of copper tubes with mechanically bonded aluminum fins, tested for twice the operating pressure but for at least 3.5 bar and having the steam supply and condensate return connections on the same end. The coil shall have accurately sized steam distribution header and tubes with evenly spaced orifices to discharge steam in the direction of condensate flow to ensure even distribution of steam over the full length of each tube and to provide uniform supply air temperature with full load or any degree of steam modulation.



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Where the steam coil is installed in an air duct, the casing shall be of at least 1.6mm thick sheet forming and supports and top and bottom channels with holes for fastening to duct work. Unless otherwise specified, the coil shall not have more than 5 fins/cm (12 /inch) and face velocity not to exceed 2.1m / s (550 fpm).

If specified, the coils to have protective coating for corrosion protection against sea air. The tendered to furnish details of the protective coating. Each coil to have automatic air vent at highest point and drain valve with plug at the lowest point.

Units for the areas requiring humidification shall be equipped with humidifiers of the type as specified in the Schedule. For water spray type humidifier, water supply point shall be arranged by the Employer from the Building water supply system. Pumps, automatic controls, valves, heat exchangers, pipe and fittings, etc. required to complete the humidifier system shall be provided by the Contractor unless specified otherwise.

The steam grid humidifiers where specified, shall be suitable for the steam supply Pressure and to ensure uniform air humidification.

The conditions of operation for the units, coil capacities, water pressure drop through the coil, steam supply pressure, etc. shall be as given in the Schedule Equipment. Coil capacity ratings shall be ARI certified for units of USA origin.

6. Filters:

Provide filter section (s) with filters. Each AHU shall be provided with out Filters as indicated in CONDITION OF OPERATIONS. Filters sections shall confirm to specifications and sizes given under SELECTION DATA OF AHUS

7. Mixing Box:

Mixing box shall be furnished for all air handling units where indicated in Schedule of EQUIPMENT & MATERIALS or shown on drawings. Damper arrangement at top & side, or bottom & side, shall be parallel type and set up for merging of air streams inside the box. Damper blade rods shall rotate on rustproof bushings and shall be air tight. Each box shall be equipped with duct connection flanges and necessary fastener holes. Mixing box shall be the manufacturer s standard product. Access doors shall be hinged & removable type. Dampers shall be low leak airfoil type with a leakage rate of less than 2%. In selecting the units, the Supplier shall carefully check and confirm that the units can be installed and conveniently serviced and maintained within the respective spaces indicated on the drawings for unit installation.



8. FAN MOTORS

Motors shall be of the type and sizes as specified for all air-conditioning equipment and shall comply with rules of electrical machines as stated in VDE 0530/59 and BS 2613. Adjustment in motor HP or speed shall be allowed to meet the system requirements, and site conditions. Generally, all motors shall be constant speed, 3 phase, squirrel-cage induction type unless otherwise specifically noted.

The motors offered shall be of the 400V, 3-phase, 50 Hz AC system type and shall be suitable for operation at 400V + 10%.

The motors shall be suitable and able to give required output under site conditions i.e. maximum ambient temperature of 120°F. (50°C) and altitude 1700 feet (518 meters).

The motors where specified to be single phase should be suitable for operation at 230 + 10% volts, 50 Hertz, AC System.

The motors shall be tropicalized, Class insulated and fungus proof, unless otherwise specified. The motors shall have a totally enclosed fan-cooled (TEFC) construction. All motors should be arranged for quiet operation and guaranteed to give the required output and fulfill the requirements of the machineries without producing any sound outside the machine room.

Motors rated 25HP and above shall be fitted with thermostats in the three phase windings, along with a suitable relay in the MCC to trip the starter if the motor overheats.

Motors being started with Variable Frequency Drives (VFD) shall be confirmed by the manufacturer not to devote or otherwise be adversely affected on being operated through a VFD.

Magnehalic Gages: At Filters: Each bank of high efficiency filter and HEPA filter shall be provided with an appropriate station to determine pressure drop, consisting of Magnehalic gage, probes, flexible tubes and mounting arrangement.

The tendered to supply the following information:

Unit construction details.

The overall unit dimensions and operating weight.

Coil(s) constructions, face area, number of fins per cm (or inch), face air velocity, air resistance, water pressure drop.

Type of fan, fan rpm, air velocity at fan outlet, unit noise level rating in dB, fan HP requirement, fan motor HP & rpm, cum/ hour (or cfm) air flow capacity and total static pressure at which the fan selected.

Manufacturer s performance guarantees certificate and technical bulletins including coil capacity tables and fan performance curves. Type and construction of D X & Reheat Coils (As mentioned)



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The unit shall have a collar for fixing supply air duct or grille. Ceiling suspend units shall have suspension brackets and floor mounted units bottom supports. In either case the unit shall have not transmit vibrations to the building structure.

All units shall have one thick viscous oil permanent cleanable type air filter of aluminum media.

Refrigerant should be providing by the supplier at their factory premises or at the time of commissioning of all units including F.A. D X Units (If required).

SPARE PARTS

The supplier / contractor shall include the price of complete set of spare parts for all items Required for one-year operation for the specified operating hours. Amongst other spare parts, the supplier / tenderer shall include the Following with limitation:

One set each of fan-motors of same capacity, minimum one motor should be quoted as spare.

(1 20HP)

Silicon Sealant & rubber gasket should be providing, so sufficient for one unit as spare.

Similarly, one set of all type of FILTERS should be providing, so sufficient for one-year application as spare.



SPECIFICATIONS HVAC VALVES, RUBBER JOINTS, GAUGES, THERMOMETERS

GATE VALVES: DN65 & ABOVE:

Handwheel Operation: Rising Stem OS&Y or Non-Rising Stem (NRS), (as specified in design)
Flange to Flange: EN558-1(3) comply to EN1171, API 600
Body & Bonnet Material: Cast Iron ENGJL250, Bolted Bonnet
Seats & Stems Material: Bronze & must be renewable
End Connection: Flange Type
Flange Holes Drilling: PN16 EN 1092
Painting: Epoxy or Polyurethane Paint, minimum 100 microns thickness
Pressure Rating: Minimum PN16 (232 Psi)

GATE VALVES: DN15 TO DN50:

End to End: EN 12288-1, BS 5154 or equal
Body & Bonnet Material: Bronze
End Connection: Threaded Type
Pressure Rating: Minimum PN20 (290 Psi)

GLOBE VALVES: DN65 & ABOVE:

Body & Bonnet Material: Cast Iron ENGJL250, Bolted Bonnet Bolted Bonnet
Handwheel Operation: Rising, (as specified in design)
Flange to Flange: EN558-1(1) comply to EN13789
Seats & Stems Material: Bronze & must be renewable
End Connection: Flange Type
Flange Holes Drilling: PN16 EN 1092
Painting: Epoxy or Polyurethane Paint, minimum 100 microns thickness
Pressure Rating: Minimum PN16 (232 Psi)

GLOBE VALVES: DN50 & BELOW:

Body & Bonnet Material: Bronze
End to End: BS 5154 or equal
End Connection: Threaded Type
Pressure Rating: Minimum PN20 equal to (290 Psi)

NON-RETURN OR CHECK VALVES: SWING TYPE, DN65 & ABOVE:

Body & Bonnet Material: Cast Iron ENGJL250, Bolted Bonnet
Flange to Flange: EN558-1(10) comply to EN12334, ANSI 16.10
Disc Seat Rings Material: Bronze & must be renewable
End Connection: Flange Type
Flange Holes Drilling: PN16 EN 1092
Painting: Epoxy or Polyurethane Paint, minimum 100 microns thickness
Pressure Rating: Minimum PN16 (232 Psi)



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NON-RETURN OR CHECK VALVES: SWING TYPE, DN50 & BELOW:

End to End: BS 5154 or equal
Body & Bonnet Material: Bronze
End Connection: Threaded Type
Pressure Rating: Minimum PN20 (290 Psi)

STRAINERS Y-TYPE: DN65 & ABOVE

Body & Bonnet Material: Cast Iron ENGJL250, Bolted Bonnet
Flange to Flange: EN558-1(1) comply to EN13789
Perforated Mesh: Stainless Steel 304 - Stainless Steel 316
End Connection: Flange Type
Flange Holes Drilling: PN16 EN 1092
Painting: Epoxy or Polyurethane Paint, minimum 100 microns thickness
Pressure Rating: Minimum PN16 (232 Psi)

STRAINERS Y-TYPE: DN50 & BELOW

Body & Bonnet Material: Bronze
End to End: BS 5154 or equal
Perforated Mesh: Stainless Steel 304 - Stainless Steel 316
End Connection: Threaded Type
Pressure Rating: Minimum PN20 (290 Psi)

BALL VALVES / DRAIN COCKS: DN50 & BELOW Used for all type of drains
WATER & DOMESTIC GAS APPLICATION

Body & Bonnet Material: Bronze or DZR Forged Brass (Dezincification Resistant Brass)
Thread Standard: BS21
End Connection: Threaded Type
Ball: 304 stainless steel / Copper
Lever: Aluminum
Seat: Reinforced Teflon
Pressure Rating: Minimum PN20 equal to (290 Psi) & maximum Class PN32 equal to (460 Psi)

RUBBER EXPANSION JOINTS / RUBBER BELLOWS: DN65 & ABOVE

Body: EPDM / Neoprene Rubber
Sphere: Single
Fabric: Nylon
Flanges: Mild Steel Galvanized
Wire: Steel Wire – Galvanized
End Connection: Flange Type
Flange Holes Drilling: PN16 EN 1092
Pressure Rating: Minimum PN16 232 Psi)



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RUBBER EXPANSION JOINTS / RUBBER BELLOWS: DN50 & BELOW:

Body: EPDM / Neoprene Rubber
Sphere: Single
Fabric: Nylon
End Connection: Threaded Type
Pressure Rating: Minimum PN10 (150 Psi) Maximum PN16 (232 PSI)

STAINLESS STEEL FLEXIBLE HOSES (FOR USER POINT) DN50 & BELOW

Body: Stainless Steel 304
Length: 1200mm (4 Feet Long)
Braided: Yes
Pressure Rating: Minimum PN16 232 Psi)
End Connection: Female Threaded

BALANCING VALVES OR CIRCUIT SETTERS: DN65 & ABOVE:

Body & Bonnet Material: Cast Iron ENGL250, Bolted Bonnet
Flange to Flange: EN558-1(1) comply to EN13789
Disc & Disc Rings: Ductile Iron Disc, PTFE Disc Rings, or EPDM Coated
O Ring: EPDM or PTFE Teflon
Indicator: ABS
Bushing: Bronze
End Connection & Drill: Flange Type, PN16 EN 1092
Painting: Epoxy or Polyurethane Paint, minimum 100 microns thickness
Pressure Rating: Minimum PN16 equal to (232 Psi)

BALANCING VALVES OR CIRCUIT SETTERS: DN50 & BELOW:

Body & Bonnet Material: Bronze
Pressure Rating: Minimum PN25 equal to (360 Psi)
Indicator: ABS / PVC
End Connection: Threaded Type
Pressure Rating: Minimum PN25 equal to (360 Psi)

FCU TERMINAL KIT / BY PASS ASSEMBLY: DN50 & BELOW

Built In Ball Valves, Strainers, PICV with Modulating Actuator, Complete with Insulation Box.

For Higher GPM in PICV, without Insulation is acceptable.

Static Pressure: 2500 kPa / 360 ps
Media Temperature: -20°C to +120°C / -4°F to +248°F
Housing & Cover: Forged brass DZR ASTM CuZn36Pb2As (CW602N)
O-rings: EPDM
By-Pass ball valves: Chemically Nickel-Plated Brass
By Pass Handle: Painted Aluminum
Strainer Mesh: 420µ (=40 mesh) stainless steel
Drain Valve: Brass DZR ASTM CuZn36Pb2As (CW602N)
Drain Ball Valve: Chemically Nickel-Plated Brass
Insulation: EPP



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End Connection: Female ISO
Housing Tags: 1/4" ISO

ACTUATOR SPECS

Supply Voltage: 24V AC/DC $\pm 10\%$, 50/60 Hz
Type: Electrical, bi-directional synchronous motor
Power Consumption: AC: 2.5VA operating (4.7VA max) DC: 1.2W operating (2.2W max)
Control Signal: Analog 0(2)-10V DC, $<0.5\text{mA}$
Feedback: Yes
FailSafe Feature: No (otherwise as required)
Auto Stroke: Yes
Operating Time: Maximum 22 Seconds
Humidity Rating: 0..85% rH, no condensation
Protection: IP54 including upside-down, class III, indoor use only
Closing Adjustment: In operation, actuator will self-adjust according to the closing point of the valve

PRESSURE INDEPENDENT CONTROL VALVE: 15MM to 40MM:

Static Pressure 2500 kPa / 360 psi
Ambient Temperature: $+1^{\circ}\text{C}$ to $+50^{\circ}\text{C}$ / $+34^{\circ}\text{F}$ to $+122^{\circ}\text{F}$
Media Temperature -20°C to $+120^{\circ}\text{C}$ / -4°F to $+248^{\circ}\text{F}$
Material
Insert Glass-reinforced PSU/POM/PPS
Diaphragm Insert 20mm: EPDM
Insert 40mm: Hydrogenated acrylonitrile-butadiene-rubber
Internal Metal Components Stainless steel
O-Rings EPDM
Cone PPS
Maximum Close off Pressure 600 kPaD / 87 psid
Maximum Operational ΔP : 400 kPaD / 58 psid
Shut-off leakage: ANSI / FCI 70-2 2006 / IEC 60534-4 - Class IV
Flow rate range: Insert 20mm: 0.0103-0.308 l/sec / 0.163-4.89 GPM
insert 40mm: 0.240-1.29 l/sec / 3.81-20.4 GPM

VALVE MATERIAL:

Body: Forged brass ASTM CuZn40Pb2 / DZR brass CW602N
Ball valve: End connections ABV: Chemically nickel-plated brass ball
End Connection Female Threaded

PRESSURE INDEPENDENT CONTROL VALVE: 40MM to 50MM

Static Pressure 2500 kPa / 360 psi
Ambient Temperature: $+1^{\circ}\text{C}$ to $+50^{\circ}\text{C}$ / $+34^{\circ}\text{F}$ to $+122^{\circ}\text{F}$
Media Temperature -20°C to $+120^{\circ}\text{C}$ / -4°F to $+248^{\circ}\text{F}$
Material
Flow Regulation Unit Internal: Glass-reinforced PSU/POM/PPS
Internal Metal Components Stainless steel
Diaphragm Hydrogenated acrylonitrile-butadiene-rubber
Housing & Covers Forged brass ASTM CuZn40Pb2 / DZR brass CW602N



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End Connection	Female Threaded
Maximum Close off Pressure	600 kPaD / 87 psid
Maximum Operational ΔP :	400 kPaD / 58 psid
Shut-off leakage:	ANSI / FCI 70-2 2006 / IEC 60534-4 - Class IV
Flow rate range:	0.528-3.79 l/sec / 8.36-60.0 GPM

PRESSURE INDEPENDENT CONTROL VALVE: 50MM to 250MM

Static Pressure	4000 kPa / 580 psi
Ambient Temperature:	-20°C to +120°C / -4°F to +248°F
Media Temperature	-10°C to +50°C / +14°F to +122°F
Material	
Diaphragm	Hydrogenated acrylonitrile-butadiene-rubber
Body	Ductile iron ASTM A395 Grade 60-40-18
O-Rings	EPDM
Internal Metal Components	Stainless steel
End Connection	Universal flange connections which can be used with both
ISO and ANSI	
Bosy Tapings:	1/4" ISO
Maximum Close off Pressure	700 kPaD / 100 psid
Maximum Operational ΔP :	600 kPaD / 87 psid
Shut-off leakage:	ANSI / FCI 70-2 2006 / IEC 60534-4 - Class IV
Flow rate range:	1.48-76.8 l/sec / 23.4-1220 GPM

PRESSURE GAUGE WITH SIPHON & GAUGE COCK:

Body:	Stainless Steel 304
Dial Size:	4" or 4.5"
Window:	Plastic
Rating:	0-160 (11 Bar) or 0-230 PSI (16 Bar)
Connection:	1/2" BSP Threaded
Internals	Copper
Filling	Glycerine Filled or Fillable
IP Code	IP65 or Above
Siphon Type:	Ring Type
Siphon Material	Black Steel
Gauge Cock	Known as Ball Valve

THERMOMETER WITH THERMOWELL:

Case Material:	Polypropylene or Painted Aluminum
Pocket Material:	Brass
Case Size:	200mm minimum
Window:	Plastic
Rating:	0-120C
Filling:	Blue / Red Spirit
Connection:	1/2" BSP Threaded
Thermowell Material	Forged Brass (from Forged Brass Rod, Not Casted)
Thermowell Length:	1/2"



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SPECIFICATIONS FOR VALVES, STEAM / DIESEL / GAS / OIL APPLICATION

GATE VALVES: DN50 & ABOVE

Handwheel Operation: Rising Stem OS&Y, (as specified in design)
Flange to Flange: API 600
Body & Bonnet Material: Cast Steel A216 WCB, Bolted Bonnet
Seats & Stems Material: Stainless Steel Cr13%
End Connection: Flange Type, Raised Face
Flange Holes Drilling: ANSI 16.5 Class 150 (as specified in design)
Painting: Temperature Resistant, Corrosion Resistant Paint
Working Parameters: 150 LBS at 350 Celsius degrees

GATE VALVES: DN50 & BELOW

End to End: API 602 / BS EN ISO 15761:2002
Body & Bonnet Material: Forged Steel ASTM A105
End Connection: Threaded / Socket / Butt Weld Type (as specified in design)
Working Parameters: 300 LBS at 350 Celsius degrees
DN50 in Forged Steel: Only to use where high pressure or temperature is required, otherwise to follow as in A216 WCB

GLOBE VALVES: DN65 & ABOVE

Handwheel Operation: Rising Stem OS&Y, (as specified in design)
Flange to Flange: ANSI 16.34 / ANSI 16.10
Body & Bonnet Material: Cast Steel A216 WCB, Bolted Bonnet
Seats & Stems Material: Stainless Steel Cr13%
End Connection: Flange Type, Raised Face
Flange Holes Drilling: ANSI 16.5 Class 150 (as specified in design)
Painting: Temperature Resistant, Corrosion Resistant Paint
Working Parameters: 150 LBS at 350 Celsius degrees

GLOBE VALVES: DN50 & BELOW

Body & Bonnet Material: Forged Steel ASTM A105
End Connection: Threaded / Socket / Butt Weld Type (as specified in design)
Working Parameters: 300 LBS at 350 Celsius degrees

DN50 in Forged Steel: Only to use where high pressure or temperature is required, otherwise to follow as in A216 WCB

NON-RETURN OR CHECK VALVES (SWING TYPE): DN65 & ABOVE

Body & Bonnet Material: Cast Steel A216 WCB, Bolted Bonnet
Flange to Flange: ASME 16.34 / ANSI 16.10
Disc Seat Rings Material: Stainless Steel Cr13%
End Connection: Flange Type, Raised Face
Flange Holes Drilling: ANSI 16.5 Class 150 (as specified in design)
Painting: Temperature Resistant, Corrosion Resistant Paint
Working Parameters: 150 LBS at 350 Celsius degrees

NON-RETURN OR CHECK VALVES (SWING TYPE): DN50 & BELOW



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End to End: ASME 16.34 / BS EN ISO 15761:2002
End Connection: Threaded / Socket / Butt Weld Type (as specified in design)
Working Parameters: 300 LBS at 350 Celsius degrees
DN50 in Forged Steel: Only to use where high pressure or temperature is required,
otherwise to follow as in A216 WCB

STRAINER, Y-TYPE: DN65 & ABOVE

Body Material: Cast Steel A216 WCB, Bolted Bonnet
Flange to Flange: BS 5152 / Y Type / Basket Type / Manufacturer Standard
Mesh Material: 304 stainless Steel
End Connection: Flange Type, Raised Face
Working Parameters: 300 LBS at 350 Celsius degrees
DN50 in Forged Steel: Only to use where high pressure or temperature is required,
otherwise, to follow as in A216 WCB

STRAINER, Y-TYPE: DN50 & BELOW

Body: Stainless Steel 304 / Forged Steel A105
Mesh Material: 304 stainless Steel
End Connection: Threaded / Socket / Butt Weld Type (as specified in design)
Working Parameters: 300 LBS at 350 Celsius degrees
DN50 in Forged Steel: Only to use where high pressure or temperature is required,
otherwise, to follow as in A216 WCB

BALL VALVES: DN65 & ABOVE

FOR COMMERCIAL GAS / OIL / DIESEL (AS SPECIFIED)

Body Material: Cast Steel ASTM A216 WCB / Stainless Steel 304
Flange to Flange: API 608 / ANSI 16.10
Body Style: Two-Piece full Port
Ball: 304 Stainless Steel
Lever: Steel / Aluminum
End Connection: Flange Type, Raised Face
Flange Holes Drilling: ANSI 16.5 Class 150 (as specified in design)
Pressure Rating: Minimum Class 150 for Flange Type
Painting: Not Painted if Stainless Steel
Working Parameters: 150 LBS at 350 Celsius degrees

BALL VALVES: DN50 & BELOW

FOR DOMESTIC GAS APPLICATION (AS SPECIFIED)

Body: DZR Forged Brass (Dezincification Resistant Brass)
Body Style: Two-piece full port
Ball: 304 Stainless Steel / Copper
Lever: Steel / Aluminum
Seat: Reinforced Teflon
End Connection: Threaded Type
Pressure Rating: Minimum PN20 equal to (290 Psi) & maximum Class PN32
equal to (460 Psi)
Working Parameters: 150 PSI at 120 Celsius degrees

BALL VALVES: DN65 & ABOVE

FOR OXYGEN / NITROGEN NITROUS OXIDE / CARBON DI OXIDE



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Body Material:	Stainless Steel 316
Flange to Flange:	API 608 / ANSI 16.10
Body Style:	Two-Piece full Port
Ball:	316 Stainless Steel
Lever:	Steel/Aluminum
End Connection:	Flange Type, Raised Face
Flange Holes Drilling:	ANSI 16.5 Class 150 (as specified in design)
Pressure Rating:	Minimum Class 150 for Flange Type
Working Parameters:	150 LBS at 350 Celsius degrees

BALL VALVES: DN50 & BELOW
FOR OXYGEN / NITROGEN / NITROUS OXIDE / CARBON DI OXIDE

Body:	Stainless Steel 316
Body Style:	Single Piece or Two-piece full port
Ball:	316 Stainless Steels
Lever:	Steel /Aluminum
Seat:	Reinforced Teflon
End Connection:	Threaded Type
Pressure Rating:	1000 PSI
Working Parameters:	300 LBS at 350 Celsius degrees

BALL VALVES: DN65 & ABOVE DRY STEAM / WET SETAM / VACCUM /
CONDENSATE DRAIN
COMPRESSED & MOIST COMPRESSED AIR / NATURAL GAS

Flange to Flange:	API 608 / ANSI 16.10
Body Material:	Stainless Steel 304
Body Style:	Two-Piece full Port
Ball:	304 Stainless Steel
Lever:	Steel/Aluminum
End Connection:	Flange Type, Raised Face
Flange Holes Drilling:	ANSI 16.5 Class 150 (as specified in design)
Pressure Rating:	Minimum Class 150 for Flange Type
Working Parameters:	150 LBS at 350 Celsius degrees

BALL VALVES: DN50 & BELOW
DRY STEAM / WET SETAM / VACCUM / CONDENSATE DRAIN
COMPRESSED & MOIST COMPRESSED AIR / NATURAL GAS

Body:	Stainless Steel 304
Body Style:	Single Piece or Two-piece full port
Ball:	304 Stainless Steels
Lever:	Steel /Aluminum
Seat:	Reinforced Teflon
End Connection:	Threaded Type
Pressure Rating:	1000 PSI
Working Parameters:	300 LBS at 350 Celsius degrees



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"TESTING, COMMISSIONING & HANDING OVER"

<i>BALANCING & PERFORMANCE QUALIFICATION BY A COMPETANT AUTHORITY OR CONTRACTOR AS PER DESIGN.</i>
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<i>PROTECTIVE & DECORATIVE PAINTING AND TAGS FOR IDENTIFICATION OF EQUIPMENT / MATERIAL.</i>
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<i>TEST RUN FOR ONE MONTH FOR MAINTENANCE OF ALL SYSTEM (16 HOURS OPERATION).</i>



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LIST OF APPROVED MANUFACTURERS FOR HVAC & MECHANICAL WORKS

IMPORTANT NOTICE TO TENDERERS:

Equipment & Material shall be supplied only from the approved sources noted below. However, in all cases the Contractor shall submit complete technical details of the equipment, material and obtain Consultant's approval prior to delivery on site. Where option of Approved Equivalent is indicated, it shall be at the discretion of the Consultant to accept the alternate proposal submitted by the Contractor.

#	Equipment & Material	Approved Manufacturers	Country of Origin
1	Air Handling Units (Local Brands)	Mecair, Swift air, Eco star, SitalKlima, Coolmax, Eco Air, Lancer.	Pakistan
2	Air Handling Units (Imported Brands)	Carrier, Tecka King Air, York, System Air, Untes, Dunham-Bush, EuorKlima.	West Europe, Turkey, Malaysia, China
3	Terminal Hepa Filter	FCR, Ulpatech, Camfil, MGT, AAF	West Europe, Turkey, Malaysia
4	Electric Heaters	IME, Pak Premier, Shan Industries, Grand Impex	Pakistan
5	Ventilation Fans (Imported Brands)	Sisteven, , Kayites, Casals, Deton, Venco, Kruger, Green heck	Turkey, Malaysia, China, KSA, UAE.
6	Automatic & Temperature Controls	Johnson Controls, Schneider, Honeywell, Alteck	USA, Canada, Australia
7	Closed Cell Polyolefin Type Duct & Pipe Insulation	Inco flex, Aroflex, Armacell, Gulf-O-Flex or Thermobreak	UAE, Malaysia, Thailand, China
8	GI Sheets (Hot Dip Galvanized)	ISL, ASL or Imported	Pakistan
9	Paint	ICI / Berger	Pakistan
10	Thermometers, Pressure Gauges	Terice, Weksler.	USA or Approved Equal



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11	Supports & Anchors	Noble, Hilti, Fischer / Fabricate as per approved sample	Pakistan/Europe / Pakistan
12	Concrete Fasteners	Rawl plug Co., Hilti	UK, Germany
13	Motors	Siemens, ABB, Casals, Deton, Nicotra, Krugar or approved equal	Germany/Pakistan / China / USA, Europe, Japan
14	Air Filters	AAF / Camfil / Trox / Ulpatech / MGT / FCR or approved equal	Germany/ Pakistan / Korea / China / Italy / Taiwan
15	Chemicals	Drew Ameroid / Maxon or approved equal	USA / Singapore
16	Condenser Water Treatment Equipment (Large)	Drew Ameroid / Maxon or approved equal	USA / Singapore
17	Duct Flexible Connection	InfoTech Flow Duct, Duct mate or ALS.	USA, Turkey, UAE
18	Chilled & Steam Piping	See Piping Schedule	
19	PVC Condensate Pipe & Fittings (Class-D)	Dadex, Popular, Beta or equal	Pakistan
20	Hot & potable water Piping	See Piping Schedule	
21	Air Vents	Spirax Sarco / Venn	UK / USA / Japan / Approved equivalent Imported
22	Steam Traps & Specialties	TLV / Spirax Sarco	Japan / UK
23	Compressed Air Piping	See Piping Schedule	
24	PVC round Ducting / Piping	See Piping Schedule	
25	Demineralized Water Piping	See Piping Schedule	Local work through Specialized fabricator



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26	Centrifugal Sediment Separator	Bell & Gosset or approved equal	USA / Pakistan
27	Wet Scrubber	Steam Master, Chan Controls	Local Work Through Specialized Fabricator
28	Electrical Panels, ACP s, DB	Electrech, South Asian,, Bilal Switch Gear, Capital Electro or Approved Equal	Pakistan
29	Fiberglass Pipe Insulation	Afico / Kimco / Knauff	Saudi Arabia/Kuwait / UAE
30	Vapor barrier coating	Foster Approved equivalent	Imported
31	White Glue	Hoechst	Germany / Pakistan
32	Closed Cell Foam Insulation	Armaflex Aero flex	Thailand
33	Duct Insulation	Afico or	Saudi Arabia
34	Canvas Jacket	Approved equal	Pakistan
35	White Glue	Hoechst	Pakistan
36	Sheet Metal	Pakistan Steel	Pakistan / Imported Japan / As approved
37	Structural Steel	Prime quality as approved	Pakistan
38	Duct Sealant	Dow Corning/Zahbia	
39	Volume Dampers	Air Guide, Steel craft or Approved Equal / Air control, Mehran Engr.	Pakistan/China / Pakistan
40	Air Devices	Steel Craft, Pak Premier, EAP, Shan Industries, Air Carrier / FCR, Air control, Air Guide or Approved Equal	Pakistan



Bill of Quantities (BOQ)

CONSTRUCTION OF CLEAN ROOM/BIOTECH LABORATORY **AT CEMB**

Sr. No	DESCRIPTION OF ITEMS	QTY	UNIT	RATE PER UNIT	Total Amount (Rs.)
A	HVAC SYSTEMS FOR BIOTECH / CLEAN ROOMS, PRODUCTION LINE 1 & 2, GROUND FLOOR				
1	Installation & SUPPLY of D'X Packaged TYPE PHARMA GRADE HYGENIC AIR HANDLING UNITS With Condensing Units mentioned in schedule of equipment including shifting and fixing of equipment on foundations, complete in all respect as specified in the specifications and as directed by the Consultant/Engineer Incharge.				
1.1	AHU No-1 (Production Rm-1, Gowning, DeGowning, Air Lock, Exit-1, G.Floor) 2810 CFM.	1	NO		
1.2	AHU No-2 (Production Corridor, Production Rm-2, DeGowning, Air Lock, -5, G.Floor) 3345 CFM	1	NO		
1.3	AHU No-3 (Autoclave, Quarantine, QC Lab, Buffer, Utility Corridor, G.Floor), 1890 CFM	1	NO		
1.4	AHU No-4 (Microbiology Lab, Gowning, DeGowning, Air Lock, G.Floor) 1280 CFM	1	NO		
1.5	AHU No-5 (Raw Material Store, Material Quarantine Rejection, Approved Material, Change Room, G.Floor) 1290 CFM	1	NO		
2	Exhaust Air Inline Fans with louvers, Exhaust Air Louver-1 (2810 CFM)	1	NO		
3	Exhaust Air Louver-2 (3345 CFM)	1	NO		
4	Installation of H-13, 99.97% efficiency @0.3 microns, HEPA filters , make Trox, UplaTech, MGT, Sagicofim, American Air Filters or approved equal as directed by the consultant/Engineer and as per schedule of equipment and materials				
4.1	24"x24"x12"	6	NOS		
4.2	18"x18"x6"	4	NOS		
4.3	12"x12"x12"	5	NOS		
4.4	12"x12"x6"	6	NOS		
5	G4, 55%-2" Thick & 99.97% HEPA Filters For E.A. Filter Plenums				
5.1	24"x24"x12" & 24"x24"x6"	4	EACH		
5.2	G4, 55% EFF. Filters, 24"x24"x2"	4	EACH		
6	Supply and installation of WET SCRUBBER UNITS (CAP., 2810 CFM & 3345 CFM), with centrifugal fan, 3 HP Pump motor(EACH) with water collection, tank, tower packing/filling, complete in all respect as per schedule, specifications, and drawings.	2	NO		
7	Supply, fabrication and installation of G.I. Sheet metal ducting using prime quality sheets including all elbows, bends, reducers, splitter dampers, guide vanes, service doors, bracing, hangers, flanged joints above 24 gauge and supports etc.,				



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	complete in all respect as specified in the specifications, shown on the drawings and as directed by the consultant/engineer incharge in following thickness and quantities:-				
7.1	26 guage.	195	SFT		
7.2	24 guage.	6,810	SFT		
7.3	22 guage.	4,145	SFT		
8	Providing and fixing 16 kg/m ³ density blanket type glass wool insulation 1" thick with aluminium foil vapour barrier, adhesive tape on all joints and 8 Oz canvas cloth wrapping complete as specified in the specifications and directed by the consultant / Engineer incharge.	9,400	SFT		
9	Providing and fixing 32 kg/m ³ density blanket type glass wool insulation 2" thick with aluminium foil vapour barrier, adhesive tape on all joints and 8 Oz canvas cloth wrapping complete as specified in the specifications and directed by the consultant / Engineer incharge.	3,000	SFT		
10	26 Gauge Cladding on exposed ducts on all joints and complete as specified in the specifications and directed by the consultant / engineer incharge.	3,200	SFT		
11	Providing and fixing air control/regulating devices in supply and return air ducts complete in all respect as specified in the specifications, shown on the drawings and as directed by the consultant/engineer incharge in following quantities:, Perforated supply Air grilles, SS304				
11.1	27"x27"	7	NOS		
11.2	21"x21"	4	NOS		
11.3	15"x15"	11	NOS		
12	Supply & Installation of HEPA FILTER HOUSINGS (18g G.I. Sheet/MS. Sheet) Powder Coated				
12.1	26 1/2" x26 1/2" x16"	7	NOS		
12.2	20 1/2" x20 1/2" x10"	4	NOS		
12.3	14 1/2" x14 1/2" x16"	5	NOS		
12.4	14 1/2" x14 1/2" x10"	6	NOS		
13	Aluminium S.A.D having powder coating finish:				
13.1	21"x21"	1	NOS		
13.2	15"x15"	5	NOS		
13.3	12"x12"	5	NOS		
13.4	9"x9"	1	NOS		
14	R.A.Registers with fixed horizontal bars and powder coating finish:SS304,				
14.1	8"x12"	8	NOS		
14.2	8"x10"	4	NOS		
14.3	10"x12"	1	NO		
14.4	10"x16"	2	NOS		
14.5	12"x18"	1	NO		
15	E.A.Registers with movable horizontal bars: SS304				
15.1	8"x12"	11	NOS		
15.2	10"x14"	1	NO		
15.3	12"x22"	5	NOS		
16	VOLUME CONTROL DAMPERS (VCD), 18 gauge GI Sheet with 3% maximum leakage factors.				
16.1	18"x12"	3	NO		
16.2	18"x10"	1	NOS		



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16.3	18"x8"	3	NO		
16.4	14"x10"	1	NO		
16.5	12"x12"	2	NO		
16.6	12"x10"	1	NOS		
16.7	12"x8"	1	NOS		
16.8	12"x6"	6	NO		
16.9	10"x10"	2	NOS		
16.10.	10"x8"	1	NO		
16.11	8"x8"	1	NO		
16.12	8"x6"	2	NO		
17	Aluminium powder coated fresh air intake louvers with fixed horizontal bars, VCDS & 2" Thick Washable Filters.				
17.1	34"x16"	1	NO		
17.2	30"x16"	1	NO		
17.3	10"x8"	3	NOS		
18	Fusible link type FIRE DAMPERS (FD), 18 gauge GI Sheet with linkage arrangement @ 60 deg CDB Temperature				
18.1	34"x16"	1	NO		
18.2	30"x16"	1	NO		
18.3	24"x14"	1	NO		
18.4	18"x14"	2	NOS		
19	HEPA, G4 Filter Plenums (20g G.I Sheet with 2" thick insulation and 26 gauge G.I.Sheet cladding) for exhaust air systems with inlet/outlet flanges, complete in all respect. 50"x26"x26"(LxWxH)	2	NOS		
20	Flexible Connectors				
20.1	34"x16"	2	NOS		
20.2	30"x16"	2	NOS		
20.3	24"x14"	1	NO		
20.4	22"x12"	1	NO		
20.5	18"x14"	2	NOS		
20.6	18"x12"	1	NO		
20.7	16"x14"	1	NO		
21	Motor control centers with circuit breakers , MCCBs, MCBs, Fuses, Motor, Switches, Instruments, Indicating lights, etc. for all equipments as per specification.				
21.1	MCC-1 (AHU-1 TO 5, Exhaust air fans, air curtains, Wet Scrubber Units, etc.), at Ground floor & roof top (160 KW, 320 Amps, TPN with two earthing points),	1	NO		
22	Power cabling including compression glands from local control panel to AHUS, Fans, Air Curtains, etc.				
22.1	150 sqmm, 4 Core	40	RFT		
22.2	70 sqmm, 4 Core	180	RFT		
22.3	16 sqmm, 4 Core	80	RFT		
22.4	10 sqmm, 3 Core	60	RFT		
22.5	4 & 2.5 sqmm, 2 Core	120	RFT		
	Control cabling including compression glands for thermostates , sensors & controllers including 20mm PVC conduit				
23	Condensate Drain PPRC / Piping (G.I. medium pressure / UPVC Class-C)	300	RFT		
24	Installation of U-tube manometers / megna helical gauges across filter sections. i) 1", 1.25" & 2" dia	150	RFT		



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25	Megnahelicals , Range 0~60 Pa / 0~2.4" of water guage with 4 NOS no SS 304 Display Panel Box complete with nozzles and flexible tubing, complete in all respect. (Dawyers, USA).	22	NO		
26	Manometers , Range 0~1250 Pa/ 0~5" of water guage, Dawyers, USA	15	NO		
27	Control panel unit , including return air thermostat, manually or by remote control device, 3 speed slector, rated power shall be at the middle speed only.	5	NO		
28	Upvc sleeves through which drain pipes plumbing services, and electrical services passés, of at least 25mm to 100mm diameters,	1	JOB		
29	Supply & Installation of Heavy duty type air curtains with mounting frames. (6'-X 7'), Make: AeroTech/SASA Metal / Air Control Or Imported	4	NO		
30	Special tools and instruments for maintenance.	1	L.S.		
31	Tags.	1	L.S.		
32	Glass frame Mounted Charts.	1	Sets		
33	Charts, Transparencies and 2 Sets.	1	L.S.		
34	Printed technical mannuals in English.	1	JOB		
35	Third Party Validation of all systems as per ISO 14644-3 with HVAC qualification documents DQ / IQ / OQ / PQ / OQ as per international norms. Temperature, Humidity, Differential air pressure, Airborne Particle count, Air Changes, Air Flow pattern. Installed Filter system leakage test (For Hepa filter only) HVAC documentation must include below attached minimum requirements .	1	L.S.		
36	Performing one month each summer and winter test run during maintenance period and setting the equipment and plant to deliver the design conditions and maintaining the log book during test run.	1	L.S.		
37	Preparing and providing 03 sets of shop drawings before start of work and 04 sets of as built drawings after completion of work for entire HVAC system including ducting, piping, electrical and controls wiring diagrams.	1	L.S.		
SUB TOTAL ITEM 1 TO 37			A		
B	CLEAN ROOMS PANELS				
38	3 MM THICK EPOXY PAINTS ON ENTIRE FLOOR with COVING	1700	SFT		
39	Supply and installation of 25 MM THICK GI SHEET, PU FALSE CEILING/Roof Panels FILLED WITH PU/ ROCKWOOL INSULATION, Density of 35~42 Kg/CUM	800	SFT		
40	Supply and installation of 50 MM THICK SANDWICH WALL/ PARTITION PANELS WITH PU / ROCKWOOL INSULATION, Density of 35~42 Kg/CUM COVING, ALUMINUM PROFILES, ETC.	1250	SFT		
41	Supply and installation of Single Door Size: 3' x 7',PU Density 40 to 42 Kg/ m³ Panels Skin Both sides Covered by Pre-Painted G.I sheets,thickness 0.45mm	105	SFT		
SUB TOTAL ITEM 38 TO 41			B		
C	ELECTRICAL WORKS				
42	CIRCUIT POINT WIRING: Supply and wiring of point to point with 1.5mm2 single core insulated 300/500 volt grade cables and 1.5mm2 cable as protective conductor (PC) in & including	800	RFT		



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	PVC conduit installed recessed in walls / R.C.C. Slab, installed on ceiling or as required as per site conditions. complete in all respects as per specifications and drawings.				
43	Supply and wiring of light circuit from DB to switchboard with 2.5mm ² single core insulated 300/500 volt grade cables and 2.5mm ² cable as protective conductor (PC) in & including PVC conduit installed recessed in walls / R.C.C. Slab, installed on ceiling or as required as per site conditions. Complete with all conduit accessories junction boxes, pull boxes as required complete in all respects as per specifications and drawings.	1400	RFT		
44	POWER SOCKET WIRING , Wiring and fixing of 1-3 pin 6amp to 20 Amps combined switch socket away from switch board and wired with 3 x 1 core 4 mm sq. P+N+CPC, Cu/PVC wires 300/500 Volt grade, in and including cost of 25mm dia. heavy duty PVC conduit, make as specified in Annexure "A", recessed in walls, floor, above false ceiling or as required as per site conditions, all PVC conduit accessories, pull boxes, steel pull wires, M.S. box shall be made of 16 SWG sheet steel with earth terminal having 2 coats of antirust paint , M.S. box shall be of the same size as that of 1-15 Amps switch socket, INCLUDING cost of 15 Amps 3 pin combined switch socket with porcelain base and plug, make CLIPSAL, LEGRAND, ABB or as specified in Annexure "A", complete in all respect. Wiring shall be done directly from the MCB installed in the respective DB without any claim of circuit.				
44.1	4mm ² single core pvc cable shall be use for all German Sockets wiring	380	Rft		
44.2	CPC/earthing & Neutral cables	1050	Rft		
45	Power Switch Sockets , Wiring and fixing of 1-3 pin 6amp to 20 Amps combined switch socket away from switch board and wired with 3 x 1 core 4 mm sq. P+N+CPC, Cu/PVC wires 300/500 Volt grade, in and including cost of 25mm dia. heavy duty PVC conduit, make as specified in Annexure "A", recessed in walls, floor, above false ceiling or as required as per site conditions, all PVC conduit accessories, pull boxes, steel pull wires, M.S. box shall be made of 16 SWG sheet steel with earth terminal having 2 coats of antirust paint , M.S. box shall be of the same size as that of 1-15 Amps switch socket, INCLUDING cost of 15 Amps 3 pin combined switch socket with porcelain base and plug, make CLIPSAL, LEGRAND, ABB or as specified in Annexure "A", complete in all respect. Wiring shall be done directly from the MCB installed in the respective DB without any claim of circuit.				
45.1	6A German Swicth Socket	12	Nos.		
45.2	10A German Swicth Socket	3	Nos.		
45.3	20A German Swicth Socket	3	Nos.		
45.4	32A 3 PHASE SOCKET	1	No.		
45.5	4Cx10mm ² PVC cable with 16mm single CPC for 32A 3 phase socket	150	Rft		
46	LIGHT FIXTURES				
46.1	LED Light size 24"x24" - (4 Tube-24 W, Each)	26	Nos.		
46.2	Down light (18 W, Each)	33	Nos.		
46.3	Emergency Light	4	Nos.		



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47	Swich Board Supply consisting of one point controlled by one switch with 1.5mm ² PVC insulated 300/500 volt grade wire in and including PVC conduits recessed in walls/R.C.C. slab, or installed on ceilings including all conduit accessories junction boxes, pull boxes, pull wire, 2.5mm ² cable as PC. complete with 10 Amp. Single way switch make CLIPSAL / MK installed on & including 16 SWG sheet steel boards recessed in wall/column complete in all respects as per drawing & specifications.				
47.1	One Gang Way switch	30	Nos.		
47.2	Two Way switch	3	Nos.		
48	DISTRIBUTION BOARDS (DB) , Installation, testing and commissioning at site of following Distribution board (DB)/Light/Power ,complete in all respect up to the satisfaction of Engineer. Sizes of the body of all DB shall be of identical dimensions irrespective the quantity of outgoing MCBs.(See Attched Power Layout)				
48.1	6-Way 3 phase distribution Board for Light. Total Lighting Load 2.5KW Incoming Breaker MCCB size 40ATP and Outgoing 10Ampare MCB-18 Nos (Single Pole) including BUS BAR for Neutral alongwith DB Panel, Phase indication Light., Digital Volt meter, Ampare Meter Complete in all respect.	1	No.		
48.2	6-Way 3 phase distribution Board for Power Total Power Load 86 KW Incoming Breaker MCCB size 200ATP and Outgoing 20Ampare MCB-18 Nos (Single Pole) including BUS BAR for Neutral alongwith DB Panel, Phase indication Light., Digital Volt meter, Ampare Meter Complete in all respect. 32 Ampare 3 Phase Breaker for Production Room-1	1	No.		
49	DISTRIBUTION BOARDS Main Power Cables				
49.1	Distribution Board-Light , Main Incoming cable 4C x 16mm ² and 10mm single core (Earthing) for Distributuion Board - Light to Main Power Panel.	200	Rft		
49.2	Distribution Board-Power , 4C x 70mm ² and 35mm single core (Earthing) for Distributuion Board - Power to Main Power Panel	200	Rft		
50	CABLE TRAYSS : upply and installation of GI or MS or pvc cable trays of following sizes duly powder coated in approved colour. The gauge of sheet will not be less than 16, including the cost of installation of hangers and other necessary arrangements.				
50.1	6"x3" for power cable trays	200	Rft		
50.2	4"x3" for Communication	200	Rft		
50.3	Shop Drawing / Asbuilt Drawing and Submittal	3	SETS		
	SUB TOTAL ITEMS 42 TO 50.3			C	
D	FIRE ALARM SYSTEM				
51	Supply Installation Testing and commissioning of wiring of Fire Alarm System				
51.1	Smoke Detector	30	Nos.		
51.2	Supply Installation Testing and commissioning of wiring of smoke sensors /bells sounder and manual call station with 2 core fire resistant cable in one inch heavy duty pvc condit or felxible. Complete in all respect.	400	Rft		



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51.3	Supply, installation, testing and commissioning of microprocessor based 02 loop Control Panel Intelligent (Addressable) Fire Alarm Panel of Approved MAKE with built-in power supply unit and NICAD battery backup, supervisory buzzer, alarm cancelling device, complete in all respects, as per the specifications and drawings and to the satisfaction of the Engineer.	1	Nos.		
51.4	Alarm Sounder	2	Nos.		
51.5	FAJB	1	No.		
51.6	Smoke Detector control Panel	1	No.		
	SUB TOTAL ITEMS 51.1 TO 51.6			D	
E	PROCESS / UTILITIES WORKS				
52	INSTALLATION, COMMISSIONING & TESTING OF FOLLOWING OWNER SUPPLIED EQUIPMENTS FROM CLEAN UTILITY ROOM TO THE PRODUCTION FACILITIES (GROUND FLOOR & ROOF TOP INCLUDING LOADING, UPLIFTING, PLACEMENT & SHIFTING AT RESPECTIVE FOUNDATIONS COMPLETE IN ALL RESPECTS.				
52.1	AIR COMPRESSOR (WITH DRYER & STORAGE TANK), SS-316L	1	100 CFM/ 3 CM /MIN		
52.2	R.O WATER / PURIFIED WATER STORAGE TANKS , SS-316L	2	Each		
52.3	VACUUM CONVEY (100L Storage bin to Production areas) & (Production Areas to Storage bin 700L), SS-304L	1	1000 L		
52.4	WATER FOR INJECTION SYSTEM (WFI) FOR PRODUCTION AREAS, SS-316L	1	100 L		
52.5	CORBONDIOXIDE GAS (CO ₂) CYLINDER, SS-304L	1	50 KG/H		
52.6	HAND SANITIZERS (500 ML), PVC BOTTLES	4	ML		
52.7	WALL MOUNTED EYE WASHERS STATIONS COMPLETE WITH WATER CONNECTIONS/FITTINGS, ETC, MS POWDER COATED	2	Each		
53	COMPRESSED AIR PIPING SYSTEM, SS-316L, Ø 1"	70	Each		
54	GATE VALVE, Ø 1"	1	Each		
55	TAP WATER (PPRC /UPVC) , Supply and delivery of Polypropylene Random Pipe and (DIN 8077 / DIN 8078 PN. 20) with Turkish Standards (TS-9937-11451-11755), or approved equivalent, for Cold / hot Water Piping System, including the cost of all fittings such as elbows, tees, unions, adopters, etc., complete in all respects as described in specifications, drawing and approval of the Consultants: PIPES				
55.1	Ø 1"	35	Rft		
55.2	Ø 1-1/4"	100	Rft		
56	GATE VALVE				
56.1	1 " Ø	2	Each		
56.2	1 1/4" Ø	1	Each		
57	PRESSURE GAUGES: Supply and delivery of Pressure gauge 3½" (90mm) dia including the gauge cocks, connecting line as per drawing(s) and specifications and / or as directed and approved by the Engineer complete in all respects: 0 to 4.5 Kg / Cm ²	2	Each		



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58	Supply and delivery of Automatic Air Vent Valve , Size: ½ " dia (15mm), AUTOMATIC AIR VENT VALVE:	4	Each		
59	WATER FOR INJECTION (WFI), SS-316L , Stainless steel Tube with ss flanges joints, clamps, orbital welding complete in all respect.				
59.1	1 " Ø	144	Rft		
59.2	Ø 1 1/4"	124	Rft		
59.3	Ø 1 1/2"	96	Rft		
60	GATE VALVES, Ø 1"	10	Each		
61	RO/PURIFIED WATER, SS-316L, PIPES				
61.1	1" Ø	36	Rft		
61.2	3/4" Ø	50	Rft		
61.3	1 -1/4" Ø	35	Rft		
61.4	1- 1/2" Ø	20	Rft		
62	GATE VALVES, 3/4" Ø	5	Each		
63	CORBON DI OXIDE GAS (CO ₂), SS-304L, PIPE, 3/16" Ø x 3/8" Ø	85	Rft		
64	GATE VALVE, Ø 3/16" x 3/8" Ø	1	Each		
65	VACUUMED SYSTEM, SS-304L , PIPES				
65.1	Ø 1 1/4"	120	Rft		
65.2	Ø 1 1/2"	36	Rft		
66	GATE VALVES, 1 1/4" Ø	4	Each		
67	Completon of all above accessories, Installation, testing and commissioning of compressed Air, WFI, RO Water/Purified Water, CO ₂ , Tap Water, etc complete in all respect.	1	JOB		
	SUB TOTAL ITEMS 52 TO 67			E	
F	CIVIL AND PLUMBING WORKS				
68	EXTERNAL SEWERAGE SYSTEM: Supply and delivery of R.C.C Pipes ASTM-C 76 BS 5911 as manufactured by Pakistan Pipe & Construction Co. (Pvt) Ltd. Or approved equivalent including collars, cement mortar for joints, excavation & back –filling, compacting, and testing and / or as directed and approved by the Engineer complete in all respects. R.C.C / HDPE				
68.1	Size dia 4"	200	Rft		
68.2	Size dia 6"	10	Rft		
69	INTERNAL DRAINAGE WASTE AND VENT SYSTEM: Supply and delivery of of brass Cleanout Plugs, as shown on drawings, and specification and/or as directed by Consultants-Engineer complete in all respects: Size dia 4"	20	Each		
70	FLOOR DRAINS: Providing of GMP SS Floor Drains as shown on drawings, as directed by Consultants-Engineer complete in all respects: SS304, Size 4" dia	9	Each		
71	Providing and fixing of brass screw downs type clean-out plug with C.I adapter piece etc. equivalent to ZURN CO. BRASS/PPRC, Size dia 4"	9	Each		
72	Supply and delivery of uPVC Pipes as Manufactured by Cosmoplast or equivalent 6 bars (BSEN 1329) for Soil, Waste Water & Vent Piping, including the cost of all fittings, specialties and pushfit/rubber rings, as per drawing and specification and/or directed by Consultants-/Engineer complete in all respects, Size dia 4" (Internal dia)	160	Rft		
73	Providing and making waste water jointing assembly for wash basin and sink (bottle trap) including cost of PVC molded wall	4	Each		



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	socket, C.I. hub etc. Complete as per Drawing and instruction of Engineer Incharge . UPVC/HDPE, For Wash basin/Sink				
74	Providing and making Gulley Traps Chamber with all accessories including cost of C.I. gulley trap, C.I. grating 300mm x 300mm. (15" x 15") C.I. covers.	1	Each		
75	Septick Tank (two or three chambers) with Cast Iron covers and frame fixed with 6" thick RCC 1:2:4 lintal, 1:3:6 CC bed, 2" thick 1:2:4 RCC flooring, 6" thick 1:3:6 RCC block masonry walls set in 1:6 cement mortar and with ½" thick cement plaster, Complete in all respect. Size 4'-0"x2'-6" depth 4' to 5'-0".	1	Each		
76	Fabrication of 3mm Thick Fiber Glass Shed , MS powder coated stand/frame, angle iron Strips, red oxide paint, grouting, etc., @ 12' height From F.F.L. (3000 SFT, Approx.).	1	JOB		
	SUB TOTAL ITEMS 68 TO 76			F	
G	FURNITURE AND MECHANICAL WORKS				
77	CROSS OVER BENCHES				
77.1	SS304, 20 GAUGE CROSS OVER BENCHES (SIZE: 4'X12"X18")	3	Each		
77.2	SS304, 20 GAUGE CROSS OVER BENCHES (LxWxH: 3'x0'-9"x12"),	4	Each		
77.3	SS304, 20 GAUGE LOCKERS FOR GOWNING/DEGOWNING (LxDxH): 2'-6"x0'-9"x5'-0", MINIMUM 3 PARTITIONS)	4	Each		
78	Fabrication of Shoe Lockers in dull finish 304 stainless Steel, 8 partitions with 8 no. doors. Each door will be Equipped with Chinese lock. Door on front side and Stainless steel net on rear side. Complete fabrication In 16 gauge stainless steel.				
78.1	a. Size: 40" x 20" x 36"	1	Each		
78.2	b. Size: 30 x 20" x 36"	2	Each		
79	Fabrication of Executive Cabinet with 4 shelves and 4 doors in Dull 304 stainless Steel finishes. Thickness 1.5 mm (16 gauge). Each door shall be equipped with Chinese Lock. Size: 42" x 20" x 72"	1	Each		
80	LAMINAR FLOW CABINET WITH BENCH (OPTION-1) ,Size: 2 ft x 4 ft x 7.0 ft (L X W x H) (Vertical flow, downward direction through HEPA) With 24" X 48" x 3", 99.9995% efficiency @ 0.12 microns H14-HEPA filter (AAF, Sagicofim, MGT KLC, or approved equal), SS 304 side walls, fan with 1/3 HP imported fan Motor, single phase explosion proof, 220V, 50 Hz (DWDI), 55% efficiency pre filter or 30% efficiency 2" thick Pre-filters, with UV and fluorescent lights, blower to maintain Velocity @ 0.45m/s +/- 20%, variable speed drive control, Megnehelic pressure gauge, air flow pattern shall be 100% Discharge, etc.	2	Each		
81	SUPPLY & INSTALLATION OF SS304, 18 Gauge STATIC PASS THRU BOXES , DOOR INTERLOCKING, ETC (LxHxD: 2'x2'x1'-6")	4	NO		
82	SUPPLY & INSTALLATION OF SS304, 18 Gauge, DYNAMIC PASS THRU BOXES , DOORS, WINDOWS, DOOR INTERLOCKING, etc.(LxHxD: 2'x2'x1'-6")	4	NO		
83	WALL MOUNTED MIRRORS (WxH: 1'-6"x3'-0")	4	NO		
	SUB TOTAL ITEMS 77 TO 83			G	



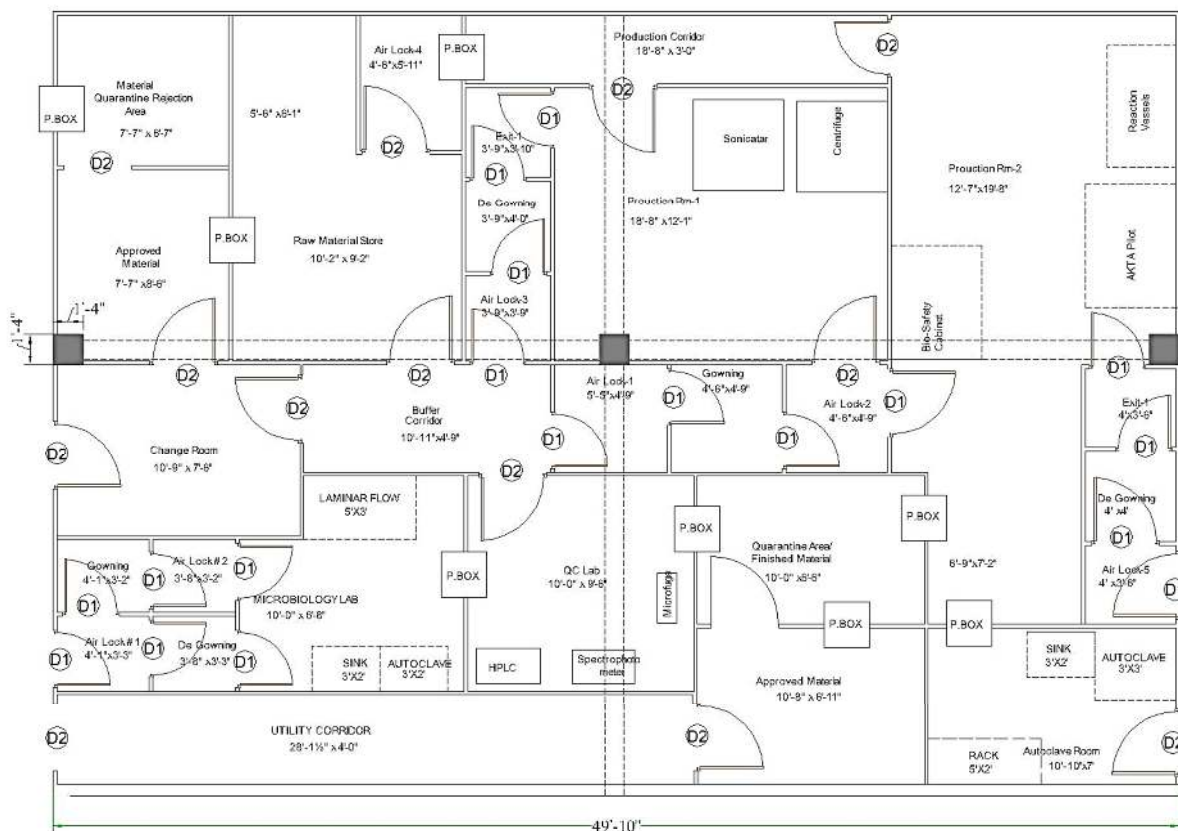
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	SUB TOTAL (A TO G)	
	PST @ 5%	
	GRAND TOTAL	



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DRWAINGS



**GROUND FLOOR
LAYOUT OF CIVIL PLAN**

Note:	Other Complete Drawings for each discipline, including HVAC, Civil, Electrical, and others, are organized in separate folders.
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