



Table I - Classified Area

Pharmaceutical Cleanroom Project - Quote 15230-00

Table I: Design Data for the ISO-classified areas of the cleanroom

S.N	Description	Production Area	Warehouse Area (1,2)	Air-Locks 1	Changing Rooms (1,2)
1.	Approximate Area (m ²)	36.50	65.00	7.50	6.50
2.	Class of Cleanliness	1000 (ISO 6)	1000 (ISO 6)	1000 (ISO 6)	10000 (ISO 7)
3.	Inside Room Temperature	22 ± 1 °C	22 ± 1 °C	22 ± 2 °C	22 ± 2 °C
4.	Inside Room Relative Humidity	50 ± 5% (Dehumidifier required)	50 ± 5% (Dehumidifier required)	55 ± 5%	Minimum 65%
5.	Inside Room Positive Pressure (+ Pa) w.r.t. atmosphere	+ 40 ± 5 Pa (+15 Pa higher than Air Lock)	+ 40 ± 5 Pa (+15 Pa higher than Air Lock)	+ 25 ± 5 Pa (+15 Pa higher than Changing room)	+ 10 ± 5 Pa (+10 Pa higher than Corridor)
6.	Roof Height from FFL of Perforated Flooring.	4000 mm	4000 mm	4000 mm	4000 mm
7.	False Ceiling Height from FFL of Perforated Flooring.	3300 mm	3300 mm	3300 mm	3300 mm
8.	Depth of Perforated/Solid Floor from FFL (Height of Perforated/Solid Floor Tiles from Ground)	600 mm	600 mm	--NA (Solid Flooring only with ESD PVC)	-- NA (Solid Flooring only with ESD PVC)
9.	Supply Airflow Pattern	Downward Unidirectional	Downward Unidirectional	Downward Random Mixed	Downward Random Mixed
10.	Supply Air Change Rate Per Hour	30 ACPH	30 ACPH	20 ACPH	20 ACPH
11.	Supply Air Velocity	15 fpm ± 20%	10 fpm ± 20%	8 fpm ± 20%	8 fpm ± 20%
12.	% Filter Coverage	Minimum 25 %	Minimum 15 %	Minimum 15 %	Minimum 10%
13.	Particle Counts as per ISO 14644 Standard	< 35200 Particles/m ³ of size 0.5µm (1000 particles/ cubic ft of size 0.5µm)	< 35200 Particles/m ³ of size 0.5µm (1000 particles /cubic ft of size 0.5µm)	< 35200 Particles/m ³ of size 0.5µm (1000 particles/ cubic ft of size 0.5µm .)	< 352000 Particles/m ³ of size 0.5µm (10000 particles / cubic ft of size 0.5µm)



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14.	Types & Quality of Filters	HEPA (H -14) filter efficiency @ 99.995% down to 0.3 µm size particle	HEPA filter efficiency @ 99.995% down to 0.3 µm size particle	HEPA filter with efficiency @ 99.995% down to 0.3 µm size particle	HEPA filter with efficiency @ 99.995% down to 0.3 µm size particle
15.	Sound Pressure Level	55 ±5 db	55 ±5 db	55 ±5 db	55 ±5 db
16.	Supply Air plenum	Negative pressure plenum type airflow using FFU with H-14 - HEPA Filters	HEPA Filter WITH SECTION Directly on AHU Plenum	HEPA Filter WITH SECTION Directly on AHU Plenum	HEPA Filter WITH SECTION Directly on AHU Plenum
17.	Connected Equipment Load Heat Load by other components of HVAC & Air management System is to be added in Heat Load Calculation	125 kW	20 kW	Nil	5 kW
18.	Diversity Factor for Equipment Load for Heat Load Calculation	0.4	0.4	0.4	0.4
19.	Number of People	Eight	Four	Two	Eight
20.	Min Number of Fresh Air Changes Per Hour (ACPH)	Three	Three	Two	Two
21.	Lighting	~ 750 LUX White LED light	~ 600 LUX White LED light	~ 550 LUX White LED light	~ 500 LUX White LED light
22.	Process Exhaust of Air	600 cfm	150 cfm	Nil	Nil
23.	Outside Design Conditions to be Considered	Data as per ASHRAE / relevant standard; EU GGMP and ISO 14644-3	Data as per ASHRAE / relevant standard; EU GGMP, ISO 14644-3	Data as per ASHRAE / relevant standard; EU GGMP and ISO 14644-3	Data as per ASHRAE / relevant standard; EU GGMP and ISO 14644-3



Table B.2 - AC Equipments

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Table B.2: Design Data for Cleanroom (AC Equipments)

S. No.	AHU No.	Room Description	Area (sq.ft)	Height (ft)	Occupancy (Nos)	Lighting Load (watt/sft)	Total connected Equipment Load (kW)	+ Pressure (Pa)	Design Temp.(°C) (+/- 2)	Design R H (%) (+/-5)	Air Cahanges per Hour(ACPH)	Minimum Fresh Air Change	Machine Exhaust (cfm)	Cleanliness Grade	REMARKS
1	AHU 1	Production Area	393	10.8	8	2.0	125	40	22	55	30	3	600	ISO 6	ACPH based on 25 % HEPA Coverage & Dehumidifier required to achieve RH
a	AHU 1	SUB TOTAL	393	10.8	8	2	125	40	22	55	30	3	600	6	
2	AHU 2	Warehouse Area	700	10.8	4	2.0	20	40	22	55	30	3	150	ISO-6	Dehumidifier required to achieve RH
3	AHU 2	AIR LOCKS 1	81	10.8	2	1.5	0	25	22	60	20	2	0	ISO-6	
4	AHU 2	CHANGING ROOMS	65	10.8	8	1.5	5	10	22	65	20	2	0	ISO-7	
b	AHU 2	SUB TOTAL	846	10.8	14	5	25	25	22	60	23	2	150	7	
SUM		GRAND TOTAL	1,239		22		150						750		



Table C.2- Air Equipments Calculation

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Table C-2: Air Equipment Calculation for the ISO-classified areas of the cleanroom

Classified Clean Room Area "a" - AHU-1 Calculation												
S.N	Area Description	Class	ISO	Area (m ²)	Area (ft ²)	Height (ft)	Volume (ft ³)	ACPH	CFM Steady	Add CFM Fresh Air	Add CFM Heat Load	CFM SUM
1	Production Area	1000	6	36.5	393	10.8	4244.4	30	2122.20	212.22	600.00	2934.42
a	AHU-1	3,000		CFM	7.50		TR		2,122	212	600	2,934

Classified Clean Room Area "b" - AHU-2 Calculation												
S.N	Area Description	Class	ISO	Area (m ²)	Area (ft ²)	Height (ft)	Volume (ft ³)	ACPH	CFM Steady	Add CFM Fresh Air	Add CFM Heat Load	CFM SUM
2	Warehousing Area	1000	6	65	700	10.8	7560	30	3,780	378.00	150	4308.00
3	Air-Locks	1000	6	7.5	81	10.8	874.8	20	292	29.16	0	320.76
4	Changing Rooms	10000	7	6.5	65	10.8	702	20	234	23.40	0	257.40
b	AHU-2	4,900		CFM	12.50		TR		4,306	431	150	4,886



Table D.2 - BOQ for HVAC System for Pharma Cleanroom

HVAC SYSTEM FOR PHARMA CLEANROOM -- Project Quote 15230-00

Table D-2: BOQ - HVAC SYSTEM FOR PHARMA CLEANROOM

S.N	Description	Unit	QTY	Offered Makes	Supply EGP		Erection (EGP)		Total Supply & Erection
					Unit Rate	Amount	Unit Rate	Amount	
1	AIR HANDLING UNITS (AHUs)								
	Supply, installation, testing and commissioning of Modular type Roof mounted Double Skin Air Handling Units with Thermal break Profile, complete in all respect (as per specifications) having different capacities with sufficient Static pressure & shall Comprise of Mixing chamber section with supply and return air dampers, Cooling coil, section, mist eliminator, Blower section with plug fan & Filter sections, fresh air system, have provision to Connect Fresh air system, Air Bleed. Mixing chambers & Dehumidifiers etc Complete as per specification								
1-a	i) AHU-1 for Production Area	No	1	Century	75000	75,000	7000	7,000	82,000
1-b	ii) AHU-2 for Warehousing Area, AIR LOCKs & CHANGING ROOMs	No	1	Century	125000	125,000	8000	8,000	133,000
2	CONDENSING UNITS (C.Us)								
2-a	i) CU-1 for Production Area	No	1	Century	75000	75,000	4000	4,000	79,000
2-b	ii) CU-2 for Warehousing Area, AIR LOCKs & CHANGING ROOMs	No	1	Century	100000	100,000	6000	6,000	106,000
3	ACCESSORIES FOR AIR EQUIPMENTS								
3-1	AHU Supply Plenum	No	2	Century	18000	36,000	500	1,000	37,000
3-2	AHU Mixing Box with Damper	No	2	Century	20000	40,000	500	1,000	41,000
3-3	AHU Fresh Air Intake with Damper	No	2	BADRY	15000	30,000	500	1,000	31,000
3-4	AHU BAG Filter with Section	No	2	BADRY	24000	48,000	500	1,000	49,000
3-5	AHU Empty Section for HEPA Access	No	2	BADRY	10000	20,000	500	1,000	21,000
3-6	AHU HEBA Filter with Section	No	3	OMEGA	54950	164,850	850	2,550	167,400
3-7	AHU Wet Deck	No	2	Century	26000	52,000	800	1,600	53,600



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S.N	Description	Unit	QTY	Offered Makes	Supply EGP		Erection (EGP)		Total Supply & Erection
					Unit Rate	Amount	Unit Rate	Amount	
4	DEHUMIDIFIERS FOR Classified Area in Cleanroom								
	Dessicant Type dehumidifier, non cyclic, rotary type, shall be able to dry the air by process of continuous physical adsorption to control humidity. The dessicants used shall be non toxic, non flammable having maxium moisture removal capacity of suitable throughput (cfm) as per specification								
4-a	i) DH-1 for Production Area	No	1	Century	28000	28,000	2000	2,000	30,000
4-b	ii) DH-2 for Warehousing Area	No	1	Century	37000	37,000	3000	3,000	40,000
5	Electric Strip / Duct Heaters for AHU								
5-1	Electric Tubular Heaters of suitable capacity for each AHU, duly insulated in ducts Complete with mounting arrangement as per specification	No	2	Century	13900	27,800	1100	2,200	30,000
6	Copper Works between AHU & C.U								
6-1	Supply, install Hard Copper piping works between AHU & C.U including Rifrigrant Filling, Valves via R-134a or Equal	LS	2	Maksal ANBI	13000	26,000	2000	4,000	30,000
7	Air Duct Accessories (Grilles, Outlets and Dampers)								
	Factory fabricated/ machine-fabricated at site GI Ducting with zinc deposition of 180gms/sqm as per SMACNA as per specification & STDs								
7-1	Stainless Steel Supply Air Diffusers (SS-304), SAD	LS	2	BADRY	4000	8,000	500	1,000	9,000
7-2	Stainless Steel Return Air Grilles (SS-304), SAG	LS	2	BADRY	3000	6,000	500	1,000	7,000
7-3	Stainless Steel Air Volume Dampers (SS-304), AVD	LS	2	BADRY	3000	6,000	500	1,000	7,000
7-4	Steel Air Fire Dampers, FDs	LS	2	BADRY	3000	6,000	500	1,000	7,000



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S.N	Description	Unit	QTY	Offered Makes	Supply EGP		Erection (EGP)		Total Supply & Erection
					Unit Rate	Amount	Unit Rate	Amount	
8	SMD DUCTING "Sheet Metal Steel"								
	Factory fabricated/ machine-fabricated at site GI Ducting with zinc deposition of 180gms/sqm as per SMACNA as per specification & STDs								
8-1	Supply Air Duct	LS	2	BADRY	13000	26,000	2500	5,000	31,000
8-2	Return Air Duct	LS	2	BADRY	10000	20,000	1500	3,000	23,000
8-3	Fresh Air Duct	LS	2	BADRY	7000	14,000	1000	2,000	16,000
9	DUCT INSULATION								
	Supply & Return Air Duct Thermal Insulation with Aluminum foil faced self adhesive, Closed cell, Nitrile Rubber Insulation with proper sealing of joints								
9-1	Supply Air Duct 19 mm thick (Outer)	LS	2	IZOCAM	6000	12,000	1000	2,000	14,000
9-2	Return Air Duct 13 mm thick (Outer)	LS	2	IZOCAM	3000	6,000	1000	2,000	8,000
9-3	Inner Supply Air Duct Lining via Armoflex Pad 5 : 7 mm thick for First 3 : 4 meters from Supply duct length after AHU (Inner = Duct Lining)	LS	2	IZOCAM	3000	6,000	1000	2,000	8,000
10	DUCT SUPPORTS AND HANGERS for each AHU								
	Rectangular duct shall be supported from roof/perlins/truss/ceiling using hanger rods. Ducts shall rest on supporting MS slotted angle or channel. The supporting angle or channel shall be supported by MS rods with threads.as per specification	LS	2	BADRY	3500	7,000	1500	3,000	10,000
11	DUCT TRANSFORMATION for Cleanroom								
	shall be made for easy and noiseless flow of air.	LS	2	BADRY	0	0	2500	5,000	5,000
12	AHU DUCT INSTALLATION / STRUCTURAL WORK								
	Supply & Installation of structural work for Supporting the Ducting from AHUs to Parent Building, made out of structural steel with suitable channels & I sections & complete	LS	2	BADRY	0	0	5000	10,000	10,000
13	AHU DUCT CLADDING								



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S.N	Description	Unit	QTY	Offered Makes	Supply EGP		Erection (EGP)		Total Supply & Erection
					Unit Rate	Amount	Unit Rate	Amount	
	Supply & Installation Aluminium 0.5 mm thickness cladding for the Ducting of each AHU (Supply & Return) on roof to riser till above false ciling for riser only	LS	2	BADRY	11000	22,000	4000	8,000	30,000
14	AHU DRAIN PIPING								
	Providing & Fixing of AHU condensate Drain Piping in <u>G.I (B class)</u> with 19 mm thick nitrile insulation. - 40 : 50 mm NB	LS	2	BADRY	8500	17,000	1500	3,000	20,000
15	DEVICES & GAUGES								
	Supply, Installation of Device / Gauge of temperature / Pressure								
15-1	PRESSURE GAUGE C/W VALVE	No	4	OUT-M	1900	7,600	100	400	8,000
15-2	HUMIDITY STAT	No	4	OUT-M	1300	5,200	100	400	5,600
15-3	THERMOSTAT	No	4	OUT-M	600	2,400	100	400	2,800
15-4	DIGITAL TEMPERATURE AND RH INDICATOR	No	4	OUT-M	800	3,200	100	400	3,600
16	ELECTRICAL WORKS								
	Supply, Installation of Electrical Works:								
16-1	MCC Electric Power Operation Panel for each AHU / C.U	LS	2	BADRY	6150	12,300	600	1,200	13,500
16-2	Power Cables from exist MDB to MCC then to each AHU / C.U	LS	2	BADRY	3500	7,000	500	1,000	8,000
16-3	Control Cables from MCC then to each AHU / C.U	LS	2	BADRY	3500	7,000	750	1,500	8,500
16-4	Cable trays, connections in roof / above ceiling for each AHU / C.U	LS	2	BADRY	2000	4,000	500	1,000	5,000
17	Testing & Balance								
	Testing & Ballancing of HVAC / Ducting Systems of Each Area / AHU of the CLEANROOM Acc. To ASHARE / SMACNA / ISO Classification	LS	2	BADRY	1000	2,000	4000	8,000	10,000
S1	CLEAN-ROOM - SUM / HVAC WORKS				One Milion and Two Hundreds Thousands EGP			1,200,000	