



Table I-7 - Classified Area

Pharmaceutical Cleanroom Project - Quote 15231-00

Table I-7: 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 <sup>2</sup> )	36.50	65.00	7.50	6.50
2.	Class of Cleanliness	10000 (ISO 7)	10000 (ISO 7)	10000 (ISO 7)	100000 (ISO 8)
3.	Inside Room Temperature	22 ± 2 °C	22 ± 1 °C	22 ± 2 °C	22 ± 2 °C
4.	Inside Room Relative Humidity	60 ± 5% (Dehumidifier required )	Minimum 65%	Minimum 65%	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	Turbulently Random Ventilation	Turbulently Random Ventilation	Turbulently Random Ventilation	Turbulently Random Ventilation
10.	Supply Air Change Rate Per Hour	20 ACPH	20 ACPH	20 ACPH	15 ACPH
11.	Supply Air Velocity	10 fpm ± 20%	8 fpm ± 20%	8 fpm ± 20%	8 fpm ± 20%
12.	% Filter Coverage	Minimum 10 %	Minimum 10 %	Minimum 10 %	Maximum 10%
13.	Particle Counts as per ISO 14644 Standard	< 352,000 Particles/m <sup>3</sup> of size 0.5µm (10,000 particles/ cubic ft of size 0.5µm)	< 352,000 Particles/m <sup>3</sup> of size 0.5µm (10,000 particles /cubic ft of size 0.5µm)	< 352,000 Particles/m <sup>3</sup> of size 0.5µm (10,000 particles/ cubic ft of size 0.5µm .)	< 3,520,000 Particles/m <sup>3</sup> of size 0.5µm (100,000 particles / cubic ft of size 0.5µm)



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14.	Types & Quality of Filters	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	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	72 ±5 db	72 ±5 db	72 ±5 db	72 ±5 db
16.	Supply Air plenum	Only One HEPA Filter WITH SECTION Directly on AHU Supply Plenum	Only One HEPA Filter WITH SECTION Directly on AHU Supply Plenum	Only One HEPA Filter WITH SECTION Directly on AHU Supply Plenum	Only One HEPA Filter WITH SECTION Directly on AHU Supply Plenum
17.	Connected Equipment Load Heat Load by other components of HVAC & Air management System is to be added in Heat Load Calculation	82 kW	15 kW	Nil	3 kW
18.	Diversity Factor for Equipment Load for Heat Load Calculation	0.5	0.5	0.5	0.5
19.	Number of People	Six	Two	Two	Six
20.	Min Number of Fresh Air Changes Per Hour (ACPH)	Two	Two	Two	One
21.	Lighting	~ 550 LUX White LED light	~ 500 LUX White LED light	~ 400 LUX White LED light	~ 300 LUX White LED light
22.	Process Exhaust of Air	300 cfm	75 cfm	Nil	Nil
23.	Outside Design Conditions to be Considered	Data as per ASHRAE / relevant standard; <b>EU GGMP and ISO 14644-3</b>	Data as per ASHRAE / relevant standard; <b>EU GGMP, ISO 14644-3</b>	Data as per ASHRAE / relevant standard; <b>EU GGMP and ISO 14644-3</b>	Data as per ASHRAE / relevant standard; <b>EU GGMP and ISO 14644-3</b>

Table B.7 - AC Equipments

Pharmaceutical Cleanroom Project - Quote 15231-00

Table B.7: 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	6	1.5	82	40	22	60	20	2	300	ISO 7	Dehumidifier required to achieve RH after first 2 years operation
2	AHU 1	Warehouse Area	700	10.8	2	1.5	15	40	22	65	20	2	75	ISO-7	
3	AHU 1	AIR LOCKS 1	81	10.8	2	1.0	0	25	22	65	20	2	0	ISO-7	
4	AHU 1	CHANGING ROOMS	65	10.8	6	1.0	3	10	22	65	15	1	0	ISO-8	
a	AHU 1	<b>SUB TOTAL</b>	<b>1,239</b>	<b>10.8</b>	<b>16</b>	<b>5</b>	<b>100</b>	<b>29</b>	<b>22</b>	<b>64</b>	<b>19</b>	<b>2</b>	<b>375</b>	<b>7</b>	
<b>SUM</b>		<b>GRAND TOTAL</b>	<b>1,239</b>		<b>16</b>		<b>100</b>						<b>375</b>		



Table C.7- Air Equipments Calculation

Pharmaceutical Cleanroom Project - Quote 15231-00

Table C-7: 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 <sup>2</sup> )	Area (ft <sup>2</sup> )	Height (ft)	Volume (ft <sup>3</sup> )	ACPH	CFM Steady	Add CFM Fresh Air	Add CFM Heat Load	CFM SUM
1	Production Area	10000	7	36.5	393	10.8	4244.4	20	1414.80	0.00	300.00	1714.80
2	Warehousing Area	10000	7	65	700	10.8	7560	20	2,520	0.00	75	2595.00
3	Air-Locks	10000	7	7.5	81	10.8	874.8	20	292	0.00	0	291.60
4	Changing Rooms	100000	8	6.5	65	10.8	702	15	176	0.00	0	175.50
<b>a</b>	<b>AHU-1</b>	<b>4,800</b>		<b>CFM</b>	<b>12.00</b>		<b>TR</b>		<b>4,402</b>	<b>0</b>	<b>375</b>	<b>4,777</b>



**HVAC SYSTEM FOR PHARMA CLEANROOM -- Project Quote 15231-00**

**Table D-7: 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	
<b>1</b>	<b>AIR HANDLING UNITS (AHUs)</b>								
	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, Air Bleed. Mixing chambers & Dehumidifiers etc Complete as per specification								
1-a	i) AHU-1 for Classified ISO-7 Area of the Cleanroom	No	1	Century	119000	119,000	10000	10,000	129,000
<b>2</b>	<b>CONDENSING UNITS (C.U.s)</b>								
2-a	i) CU-1 for AHU-1	No	1	Century	95850	95,850	5650	5,650	101,500
<b>3</b>	<b>ACCESSORIES FOR AIR EQUIPMENTS</b>								
3-1	AHU Supply Plenum	No	1	Century	17000	17,000	500	500	17,500
3-2	AHU Mixing Box with Damper	No	1	Century	19000	19,000	500	500	19,500
3-3	AHU Fresh Air Intake with Damper	No	1	BADRY	14000	14,000	500	500	14,500
3-4	AHU BAG Filter with Section	No	1	BADRY	23000	23,000	500	500	23,500
3-5	AHU Empty Section for HEPA Access	No	2	BADRY	9000	18,000	500	1,000	19,000
3-6	AHU HEBA Filter with Section	No	2	OMEGA	54000	108,000	850	1,700	109,700
3-7	AHU Wet Deck	No	1	Century	25000	25,000	800	800	25,800



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					Unit Rate	Amount	Unit Rate	Amount	
<b>4</b>	<b>DEHUMIDIFIERS FOR Classified Area in Cleanroom</b>								
	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
<b>5</b>	<b>Electric Strip / Duct Heaters for AHU</b>								
5-1	Electric Tubular Heaters of suitable capacity for each AHU, duly insulated in ducts Complete with mounting arrangement as per specification	No	1	Century	13900	13,900	1100	1,100	15,000
<b>6</b>	<b>Copper Works between AHU &amp; C.U</b>								
6-1	Supply, install Hard Copper piping works between AHU & C.U including Rifrigrant Filling, Valves via R-134a or Equal	LS	1	Maksal ANBI	13000	13,000	2000	2,000	15,000
<b>7</b>	<b>Air Duct Accessories (Grilles, Outlets and Dampers)</b>								
	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	1	BADRY	8000	8,000	1000	1,000	9,000
7-2	Stainless Steel Return Air Grilles (SS-304), SAG	LS	1	BADRY	6000	6,000	1000	1,000	7,000
7-3	Steel Air Volume Dampers, AVD	LS	1	BADRY	6000	6,000	1000	1,000	7,000
7-4	Steel Air Fire Dampers, FDs	LS	1	BADRY	6000	6,000	1000	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	
<b>8</b>	<b>SMD DUCTING "Sheet Metal Steel"</b>								
	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	1	BADRY	26000	26,000	5000	5,000	31,000
8-2	Return Air Duct	LS	1	BADRY	20000	20,000	3000	3,000	23,000
8-3	Fresh Air Duct	LS	1	BADRY	14000	14,000	2000	2,000	16,000
<b>9</b>	<b>DUCT INSULATION</b>								
	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	1	IZOCAM	12000	12,000	2000	2,000	14,000
9-2	Return Air Duct 13 mm thick (Outer)	LS	1	IZOCAM	6000	6,000	2000	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	1	IZOCAM	6000	6,000	2000	2,000	8,000
<b>10</b>	<b>DUCT SUPPORTS AND HANGERS for each AHU</b>								
	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	1	BADRY	7000	7,000	3000	3,000	10,000
<b>11</b>	<b>DUCT TRANSFORMATION for Cleanroom</b>								
	shall be made for easy and noiseless flow of air.	LS	1	BADRY	0	0	5000	5,000	5,000
<b>12</b>	<b>AHU DUCT INSTALLATION / STRUCTURAL WORK</b>								
	Supply & Installation of <b>structural work</b> for Supporting the Ducting from AHUs to Parent Building, made out of structural steel with suitable channels & I sections & complete	LS	1	BADRY	0	0	10000	10,000	10,000
<b>13</b>	<b>AHU DUCT CLADDING</b>								





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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	1	BADRY	22000	22,000	8000	8,000	30,000
<b>14</b>	<b>AHU DRAIN PIPING</b>								
	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	1	BADRY	17000	17,000	3000	3,000	20,000
<b>15</b>	<b>DEVICES &amp; GAUGES</b>								
	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
<b>16</b>	<b>ELECTRICAL WORKS</b>								
	Supply, Installation of Electrical Works:								
16-1	MCC Electric Power Operation Panel for each AHU / C.U	LS	1	BADRY	12000	12,000	1000	1,000	13,000
16-2	Power Cables from exist MDB to MCC then to each AHU / C.U	LS	1	BADRY	7000	7,000	1000	1,000	8,000
16-3	Control Cables from MCC then to each AHU / C.U	LS	1	BADRY	7000	7,000	2000	2,000	9,000
16-4	Cable trays, connections in roof / above ceiling for each AHU / C.U	LS	1	BADRY	4000	4,000	1000	1,000	5,000
<b>17</b>	<b>Testing &amp; Balance</b>								
	Testing & Ballancing of HVAC / Ducting Systems of Each Area / AHU of the CLEANROOM Acc. To ASHARE / SMACNA / ISO Classification	LS	1	BADRY	2000	2,000	8000	8,000	10,000
<b>S1</b>	<b>CLEAN-ROOM - SUM / HVAC WORKS</b>				<b>Eight Hundreds Thirty Thousands EGP</b>			<b>830,000</b>	