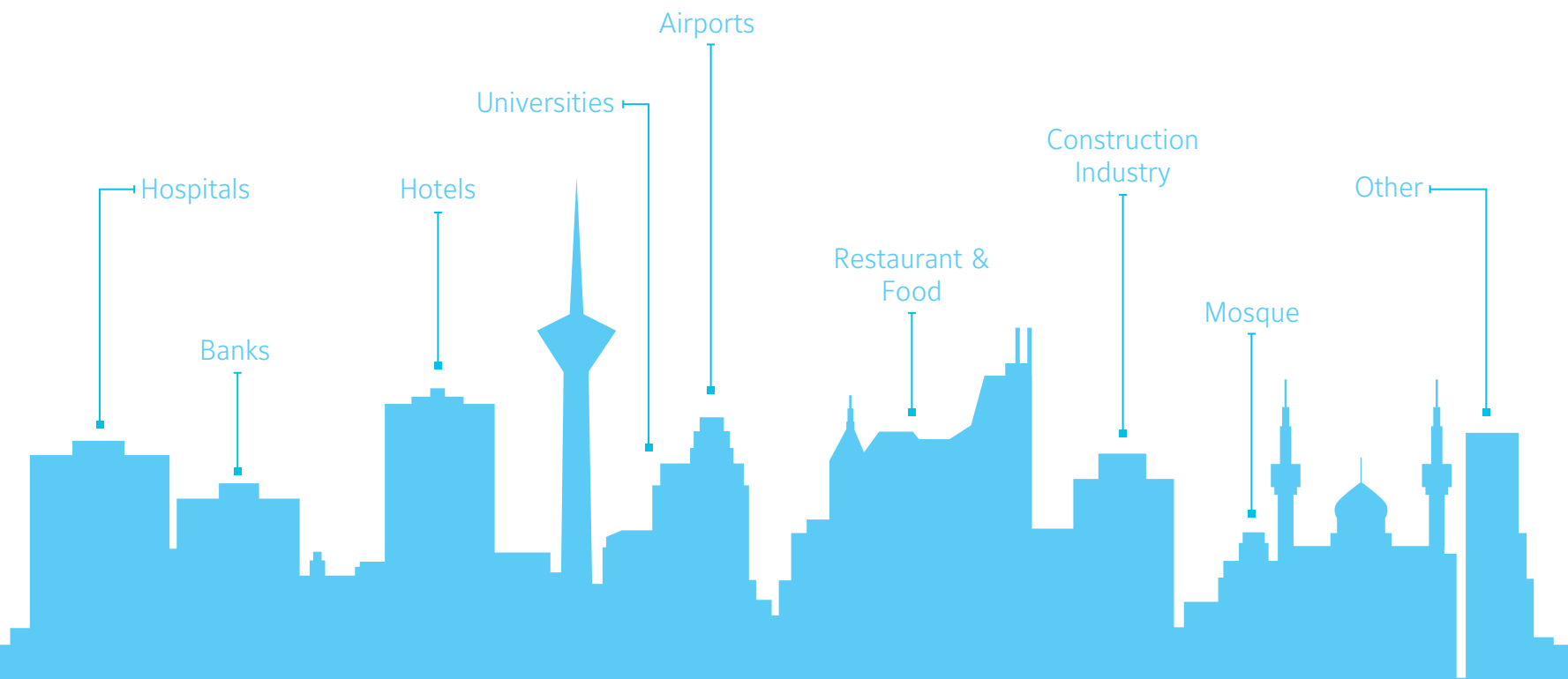


Saran

Life's Pleasant Breeze



AIR CONDITIONING MFG.GROUP

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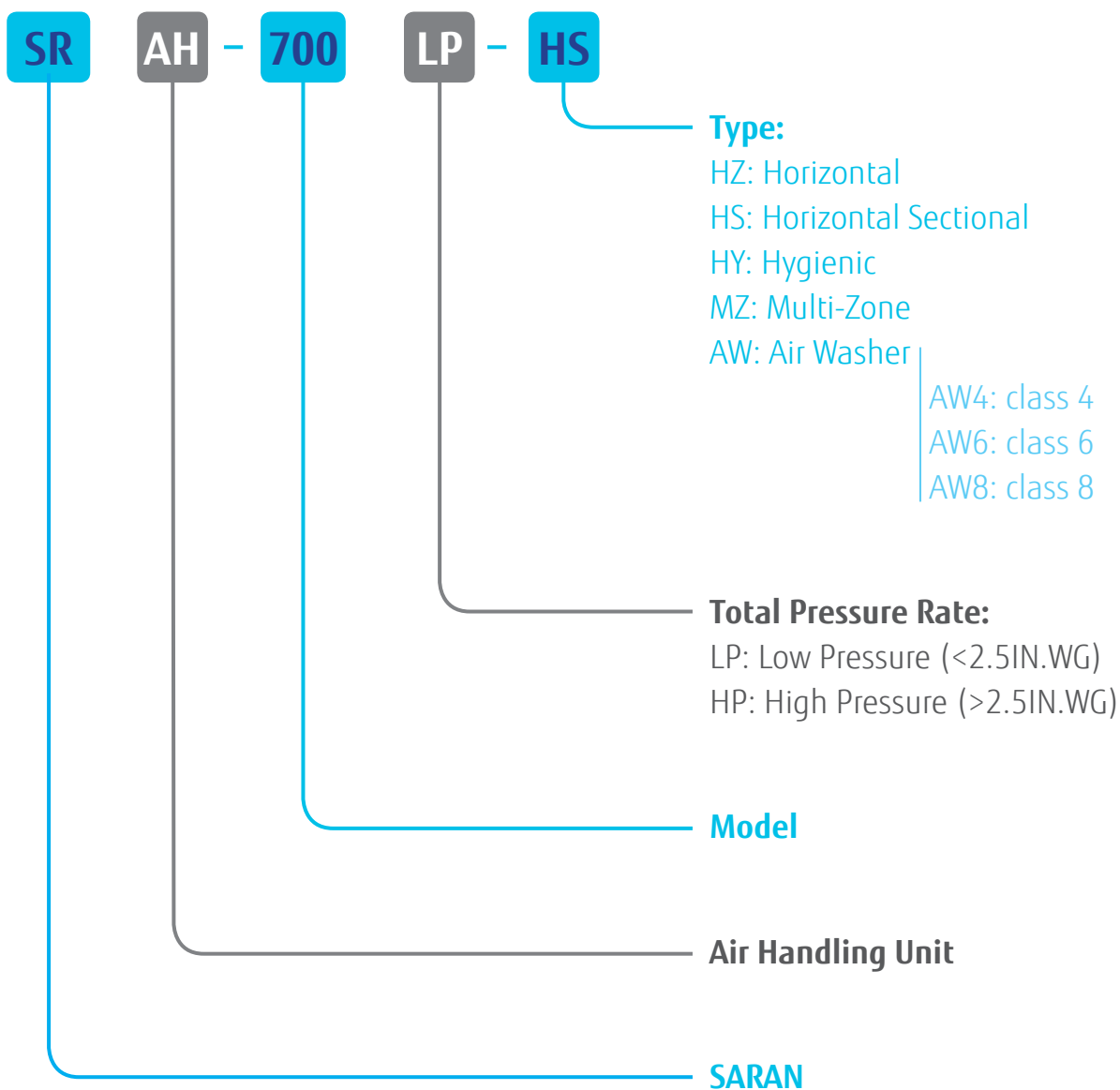
تهران، کیلومتر ۲۱ بزرگراه لشگری (جاده مخصوص کرج)
روبروی پالایشگاه نفت پارس، پلاک ۱۲

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NOMENCLATURE



Introduction

Saran air handling unit are designed and manufactured to meet the precise environmental demands of various applications from small office premises to larger industrial applications.

This units are suitable for both indoor and outdoor installations and are a perfect choice for hotels, shopping centers, office buildings, hospitals, residential and industrial buildings. All components of units selected from reliable and famous international brands or designed and constructed base on international air-conditioning equipment's standards.

Saran air handling unit available in 15 sizes covering a flow range from 2500 to 45000 CFM and up to a total static pressure of 5 IN.W.G. (For flow rate and total static pressure upper than standard, please send your inquiry to Saran MFG group).

Saran air handling unit has five major series such as Standard, Sectional, Hygienic, Multi-Zone and Air Washers (Saran air washer are available in the three different classes (4, 6 and 8) to meet the need of industry to clean humidity air).

Main Features:

- Single and multi-zone design
- Ability to variable fan selection include forward-curved, backward-curved and airfoil
- High efficiency cooling and heating coil design
- Ability to variable heating coil selection include Steam, Hot water and Electrical heater
- Ability to variable cooling coil selection include Chilled water, DX coil or Air washer system
- Low energy consumption and low risk of housing condensation due to quality thermal insulation and air- tightness of housing
- Anti-corrosion coated, double sloped drain pan
- Low leakage damper
- Equipped with standard mixing box and aluminum washable pre filters
- Ability to selection different type fine filter with grade range of EU2 to EU11
- Ability to equipped with variable frequency drive / Frequency inverter (VFD) and thermistor
- Ability to equipped with steam, water spray or electrical humidifier
- Accessible and maintenance
- Flexibility section for shipment

Component Features

Casing:

The air handling unit is constructed from framed modules manufactured from extruded anodized aluminum profiles joined by means of 3D injected molded and reinforced PE corners to form the "Penta-post" construction. This method has demonstrated superior mechanical characteristics and gives the unit its rigidity and design flexibility. The unique profiles with their unique cross sections designed to give extra strength and rigidity to the unit frame and to prevent any buckling or deformation.

As standard, the unit wall are made up by 40mm thickness double skin polyurethane foam (PU) insulation panel with 0.5 mm high strength pre-painted galvanized steel as internal and external skin.

Fan Assembly:

The standard used fans in Saran air handling units are high performance double width double Inlet (DWDI) centrifugal fans, optimally engineered for HVAC application, with high quality, and fully tested performance according to international standards.

All fans are optimally selected for best performance and sound characteristics based on maximum fan efficiency. The impellers can have forward curved, backward inclined or airfoil profile blades depending on the customer requirement and the system static pressure.

The impeller is galvanized finished for forward curve blade; glass reinforced polyamide or welded heavy gauge steel painted with epoxy for backward and airfoil blade. Fans housings are made of galvanized steel and shafts are made of carbon steel (CK45) and are precision machined to provide an accurate fit with the fan bearings and the wheel hub. All fans are statically and dynamically balanced for stable non-surfing operation.

Other power transmission components such as pulleys and belts are suitably chosen depending on the required fan speed and electric motor power and pre-installed by factory. Fan(s) and the corresponding electric motor(s) are installed on an independent chassis which is itself installed on the main chassis using vibration dampers in order to eliminate transfer of vibrations to the structure to further reduce the effects of vibrations, fan outlet (s) are also connected to the structure via flexible material such as canvas.

For reducing power consumption or hygienic application, high efficient plug fans are also available upon request.

Motor:

Motors are totally enclosed, fan cooled (TEFC) squirrel cage type with class "F" insulation at 104°F ambient temperature and continuous duty. Motors are of IP54 and protect the motor from dust and water. For motor sizing the mechanical losses incurred in transmitting the load from motor shaft to the fan shaft are taken into consideration along with a reasonable safety factor. Electric motors with ingress protection of (IP- 55) and VFD for motor are also available upon request.

Drain Pan:

In order to remove the condensate, dropped-out during dehumidification, the drain pan is supplied under the cooling coil, cover the entire coil section. The drain pan, as standard, is made of galvanized steel sheet protected with powder coating paint or stainless steel as option.

Filters:

As standard, Saran air handling units equipped with panel type aluminum washable pre-filter which efficiency is G2. They are arranged in V-type and installed in the track on the air inlet frame and can be drawn out from access side's door for check and maintenance. Other type of filters such as Pleated, Bag, Rigid V-Cell, HEPA, ULPA and Carbon Active filters available upon request (For more information about filter types and its class, please refer to Appendix 2)

Dampers:

Saran air handling units are equipped with heavy duty, airfoil, opposed type, aluminum blade, dampers to modulate and control the air flow of return and fresh air. Airfoil blades offer low pressure drop performance and are ideal for high velocity and pressure applications. Dampers are prepared for either manual or motorized operation (motor can be provided as an option). Supply air damper are also available upon request.

Coils:

All coils designed to deliver their respective duties at optimum performance at all design conditions and to meet a wide range of applications and requirements.

As standard, coils are manufactured from seamless copper tubes of 5/8" OD (Some type of DX coil may be manufactured from seamless copper tubes of 3/8" OD), mechanically expanded into collar continuous corrugated aluminum fins to provide a continuous compression bond over the entire finned length for maximum heat transfer rates. The standard fin spacing is 8 and 14 FPI; however, 10 and 12 FPI are available as an option upon the client request or to achieve the determined indoor conditions. Cleaning process is done after manufacturing each coil for optimum system cleanliness and all coils are factory tested at 200 psig.

Direct expansion coils are equipped with a properly sized expansion valve and distributor to ensure equal refrigerant fed to all circuits. The number of circuits is chosen to provide optimum heat transfer and reasonable refrigerant velocity and pressure drop so as not to trap any oil in the coil tubing.

Headers and connections for water coils and DX-coils are made of seamless copper pipes, and inlet and outlet connections are sealed against unit panels by rubber gaskets as standard wherever coil connections protrude through the casing. All water coils are fitted with plugged drain and vent tapping to facilitate draining and venting.

Other type of coil such as coil with copper fin or Hydrophilic fin (Golden Fin), Steam heating coil and Electrical heater available upon request.

Options and additional features:

All type air handling units can be equipped with:

- Fans with star delta running motors
- Fans with direct-drive motors and inverter
- Heating section with working fluid – steam
- All type of humidifier (such as Electronic Steam, Spray Nozzle and Steam Grid)
- Sections with increased insulation thickness (50mm) or other type insulation (such as rock wool and polyethylene)
- Anti-frost protection of water sections
- Dirty filter signalization
- 3-way valves with actuator for heating and cooling sections
- Air temperature and/or humidity sensor
- Internal light and inspection windows
- Electric board for control and automation
- Hygienic air handling units special consideration (such as Smooth inside surface design. Thermal break profile, Air tight dam and etc.).

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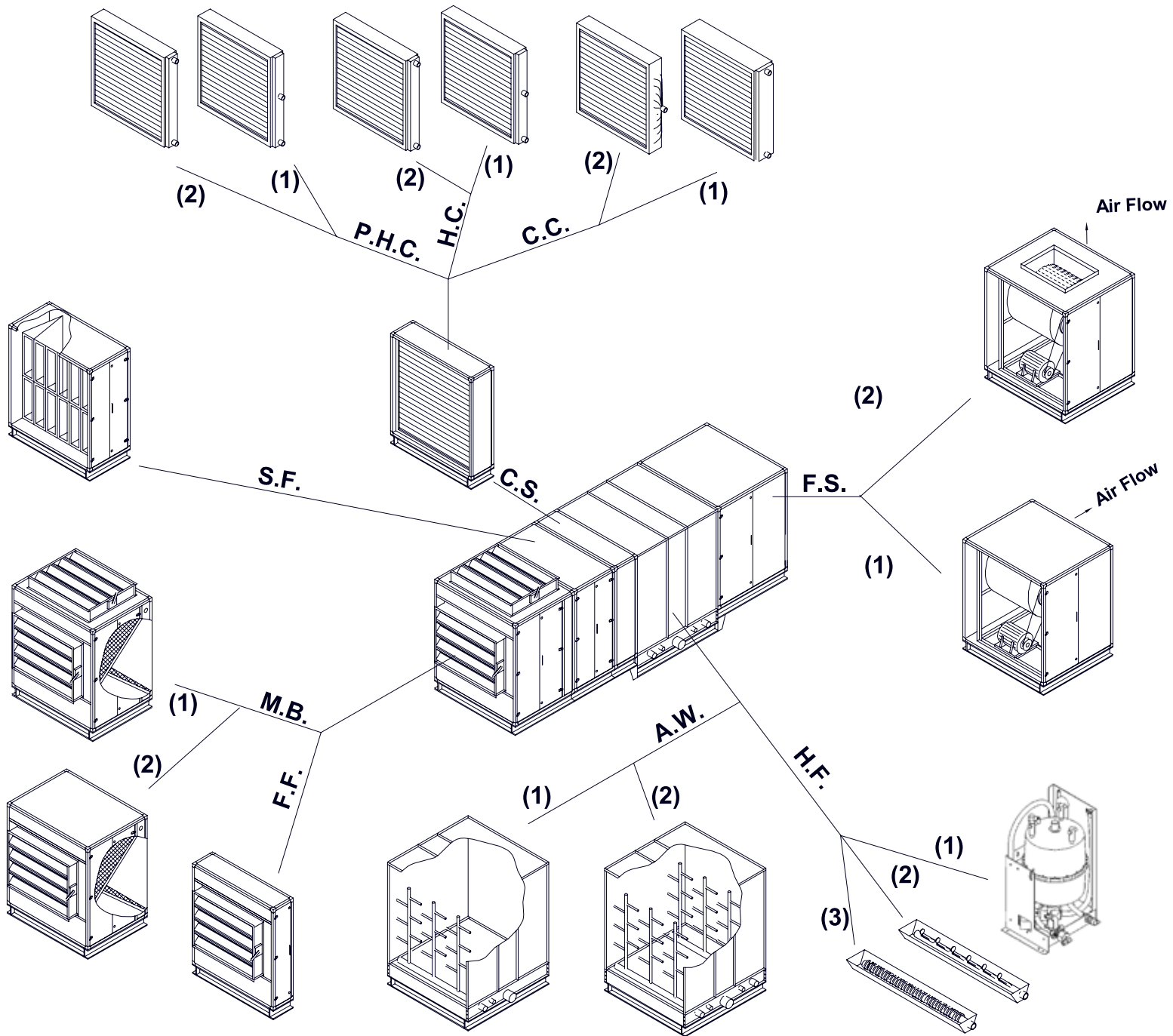
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تهران، کیلومتر ۲۱ بزرگراه لشگری (جاده مخصوص کرج)

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Air Handling Unit Configurations Overview



F.S. (Fan Section)

- 1- Top Horizontal Discharge
- 2- Up Blast Discharge

C.S. (Coil Section)

P.H.C. (Pre-Heating Coil)

- 1- Steam
- 2- Hot Water

H.C. (Heating Coil)

- 1- Steam
- 2- Hot Water

C.C. (Cooling Coil)

- 1- Chilled Water
- 2- DX Coil

S.F. (Special Filter)

- 1- Pleated and bag filter

M.B. (Mixing Box)

- 1- With fresh and return air dampers
- 2- With fresh or return air dampers (V Type filter arrangement)

F.F. (Flat Filter)

A.W. (Air Washer)

- 1- With one spray bank (Class 4, 6)
- 2- With two spray bank (Class 8)

H.F. (Humidifier)

- 1- Electronic Steam
- 2- Spray Nozzle
- 3- Steam Grid

Selection Example

Given

Required Air Flow Rate: 11000 CFM
Ambient Altitude: Sea level
External Static Pressure Drop = 0.76 IN.W.G

Summer Conditions

Total Cooling Load: 470,000 Btu/hr
Sensible Cooling Load: 320,000 Btu/hr
Entering Air Temperature: 80°F DB / 67°F WB
Entering/Leaving Water Temperature: 45°F / 55°F

Winter Conditions

Total Heating Load: 450,000 Btu/hr
Entering Air Temperature: 60°F DB
Entering/Leaving Water Temperature: 160°F / 140°F

Step1: Appropriate Air Handling Unit Model and Coil Selection

Considering the required airflow rate, we select SRAH-1000 from air handling unit models. By referring to performance tables, we can see total and sensible cooling capacity of this unit with 6Rows/14FPI cooling coil in given summer conditions ($Q_{Total} = 468$ MBH and $Q_{Sensible} = 313$ MBH) and 2Rows/8FPI heating coil in given winter conditions ($Q_{Total} = 585$ MBH) are satisfied our requirements.

Step2: Performance Adjustment Factors Consideration

Because of Saran air handling unit rating data presented in the "Performance Data" tables indicate capacity of them at standard condition, for other condition, indicated performance adjustment factor in table 7 to 11 shall be attend in air handling unit selection based on requirements, so to determine the performance adjustment factor in this problem, we use the following procedure:

- **Non Standard Air Flow Rate Correction Factors (C1)**

The ratio of Actual Air Flow Rate (11000 CFM) to Nominal Air Flow Rate of selected unit (10000CFM) is 1.1, so by referring to table 7, Non standard air flow rate correction factors for cooling and heating capacity are 1.03 and 1.05, respectively.

- **Fin Spacing Correction Factors (C2)**

This Correction Factor is 1.00 in this problem.

- **Entering Hot Water Temperature Correction Factors (C3)**

Base on given data, desired entering hot water temperature in this problem is 160°F, so by referring to table 9, its correction factor is 0.75.

- **Entering Chilled Water Temperature Correction Factors (C4)**

Base on given data, desired entering chilled water temperature in this problem is 45°F, so by referring to table 10, its correction factor is 1.00.

- **Steam Pressure Correction Factors (C5)**

Because of in this problem do not have steam coils, we ignore this correction factor.

Finally, based on above, we have:

Actual Total Cooling Capacity = $468 \times 1.03 \times 1.00 \times 1.00 = 482$ MBH

Actual Sensible Cooling Capacity = $313 \times 1.03 \times 1.00 \times 1.00 = 322.4$ MBH

Actual Heating Capacity = $585 \times 1.05 \times 1.00 \times 0.75 = 460.7$ MBH

Therefore, the chosen unit satisfies the load requirements.

Step3: Leaving Air Temperature Determining

To determine the leaving air temperature of selected unit in pervious steps, we can using following procedure:

Heating Mode Leaving Air Temperature:

$$\text{Temp.Difference (}^{\circ}\text{F)} = \frac{\text{Heating Capacity (MBH)} \times 1000}{1.085 \times \text{Actual Air Flow Rate (CFM)}} = \frac{460.7 \times 1000}{1.085 \times 11000} = 38.6^{\circ}\text{F}$$

Therefore, leaving air temperature in heating mode will be:

$$\text{Leaving Air Temp.} = \text{Entering Air Temp.} + \text{Temp. Difference} = 60 + 38.6 = 98.6^{\circ}\text{F}$$

Cooling Mode Leaving Air Temperature:

$$\text{Dry BulbTemp.Difference (}^{\circ}\text{F)} = \frac{\text{Sensible Cooling Capacity (MBH)} \times 1000}{1.085 \times \text{Actual Air Flow Rate (CFM)}} = \frac{322.4 \times 1000}{1.085 \times 11000} = 27^{\circ}\text{F}$$

$$\text{Enthalpy Difference (Btu/hr)} = \frac{\text{Total Cooling Capacity (MBH)} \times 1000}{4.5 \times \text{Actual Air Flow Rate (CFM)}} = \frac{482 \times 1000}{4.5 \times 11000} = 9.7 \text{ Btu/hr}$$

$$\text{Leaving Air Enthalpy} = \text{Entering Air Enthalpy (Table 24)} - \text{Enthalpy Difference} = 31.6 - 9.7 = 21.9 \text{ Btu/hr}$$

Therefore, leaving air temperature in cooling mode will be:

$$\text{Leaving Air DB Temp. (}^{\circ}\text{F)} = \text{Entering DB Air Temp. (}^{\circ}\text{F)} - \text{DB Temp. Difference (}^{\circ}\text{F)} = 80 - 27 = 53^{\circ}\text{F}$$

$$\text{Leaving Air WB Temp. (}^{\circ}\text{F)} = \text{Corresponding WB Temp. of Leaving Air Enthalpy (Table 24)} = 52.8^{\circ}\text{F}$$

Step4: Air Side Pressure Drop Determining

To determine the air side pressure drop, first, divide the air flow rate by units coil face area (table12) to obtain the coil face velocity:

$$\text{Coil Face Velocity} = \frac{\text{Air Flow Rate (CFM)}}{\text{Coil Face Area (Sq Ft)}} = \frac{11000}{20.7} = 531 \text{ FPM}$$

In next step, with calculated coil face velocity, we can determine the total internal air side pressure drop of selected air handling unit from table 16 to 18:

Cooling Coil (Table 16)	1.037 IN.W.G
+ Heating Coil (Table 16)	+ 0.189 IN.W.G
+ Aluminum Washable Filter (Table 17)	+ 0.100 IN.W.G
+ Mixing Air (Table 17)	+ 0.060 IN.W.G
+ Damper (Table 17)	+ 0.050 IN.W.G
<hr/>	<hr/>
Internal Pressure Drop	1.436 IN.W.G
+ External Pressure Drop	+ 0.760 IN.W.G
<hr/>	<hr/>
Total Pressure Drop	2.196 IN.W.G

Step5: Fan RPM and Motor Power Calculation

By referring to table19 and performing interpolation based on required air flow rate and determined air side pressure drop in pervious step, we can see the required fan speed and motor power is 660 RPM and 9.11HP (10HP) , respectively.



Step6: Water Side Pressure Drop Determining

To determine the water side pressure drop, first, determine required water flow rate in the coils based on required cooling and heating capacities and then based on determine water velocity inside the coils tube, so we have:

- Determine the water side pressure drop (Cooling Coil)

$$\text{Chilled water flow rate} = \frac{\text{Required Cooling Capacity (Btu/hr)}}{500 \times \text{Water Temperature Difference (}^\circ\text{F)}} = \frac{470000}{500 \times 10} = 94 \text{ GPM}$$

$$\text{Water velocity inside the tubes} = \frac{\text{Chilled water flow rate (GPM)}}{\text{No.of coils} \times \text{No.of circuits (Table 12)}} \times 1.2$$

$$\text{Water velocity inside the tubes} = \frac{94}{1 \times 29} \times 1.2 = 3.9 \text{ FPS}$$

By referring to table 15, we can see pressure drop of selected cooling coil (6 Rows Coil) in determined water velocity is 8.6 Ft. W.G.

- Determine the water side pressure drop (Heating Coil)

$$\text{Hot water flow rate} = \frac{\text{Required Heating Capacity (Btu/hr)}}{500 \times \text{Water Temperature Difference (}^\circ\text{F)}} = \frac{450000}{500 \times 20} = 45 \text{ GPM}$$

$$\text{Water velocity inside the tubes} = \frac{\text{Chilled water flow rate (GPM)}}{\text{No.of coils} \times \text{No.of circuits (Table 12)}} \times 1.2$$

$$\text{Water velocity inside the tubes} = \frac{45}{1 \times 29} \times 1.2 = 1.9 \text{ FPS}$$

By referring to table 15, we can see pressure drop of selected heating coil (2 Rows Coil) in determined water velocity is 1.67 Ft.W.G. By consideration of average water temperature correction factor (table14), the actual heating coil water pressure drop will be 1.3 Ft.W.G.

Performance Data

Table 1a: Chilled Water Rating (8FPI)

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	EWB (°F)	4ROW				6ROW				8ROW			
				Total Load (MBH)	Sen. Load (MBH)	LVG DB (°F)	LVG WB (°F)	Total Load (MBH)	Sen. Load (MBH)	LVG DB (°F)	LVG WB (°F)	Total Load (MBH)	Sen. Load (MBH)	LVG DB (°F)	LVG WB (°F)
250	2500	80	67	53	49	62	60	80	62	57	56	100	71	54	53
		90	71	76	69	64	62	110	86	58	57	133	96	54	54
		100	75	101	89	66	63	141	109	59	58	169	121	54	54
350	3500	80	67	73	68	62	60	110	86	57	56	145	101	53	53
		90	71	105	96	64	62	152	119	58	57	185	134	54	54
		100	75	140	124	66	64	196	151	59	58	235	169	54	54
500	5000	80	67	116	101	61	60	170	128	56	56	209	145	53	53
		90	71	164	142	63	61	230	176	57	57	276	197	54	53
		100	75	214	183	65	62	294	222	58	57	347	246	54	54
700	7000	80	67	176	147	61	59	252	184	56	55	305	209	53	52
		90	71	246	206	62	60	338	252	57	56	398	280	53	53
		100	75	317	262	65	62	428	317	58	57	498	350	53	53
1000	10000	80	67	286	225	59	58	391	277	55	54	462	310	51	51
		90	71	388	309	61	59	517	374	55	54	600	414	52	52
		100	75	496	392	63	60	684	469	56	55	741	513	52	52
1250	12500	80	67	352	278	59	58	483	343	55	54	573	385	52	52
		90	71	478	383	61	60	640	465	55	55	742	514	52	52
		100	75	612	485	63	61	801	582	56	55	919	638	52	52
1500	15000	80	67	426	335	59	58	585	414	55	54	691	464	52	52
		90	71	578	462	61	59	771	559	55	55	893	618	52	52
		100	75	740	585	63	61	966	700	56	55	1107	767	52	52
1750	17500	80	67	511	396	59	58	694	488	54	54	816	545	51	51
		90	71	689	543	61	59	909	656	55	54	1052	743	52	51
		100	75	877	687	63	60	1136	820	56	55	1298	898	52	52
2000	20000	80	67	607	462	59	57	813	566	54	53	951	631	51	51
		90	71	815	633	60	58	1063	761	55	54	1219	836	51	51
		100	75	1031	797	62	60	1325	949	56	55	1505	1036	52	51
2250	22500	80	67	680	517	59	57	907	633	54	54	1062	707	51	51
		90	71	906	706	61	59	1184	850	55	54	1364	937	51	51
		100	75	1149	890	63	60	1478	1061	56	55	1681	1160	52	52
2500	25000	80	67	806	598	58	57	1058	726	53	53	1221	804	51	50
		90	71	1068	812	60	58	1372	970	54	54	1559	1061	51	51
		100	75	1345	1021	62	59	1704	1207	55	54	1918	1312	51	51
3000	30000	80	67	801	630	59	58	1100	778	55	54	1299	872	52	52
		90	71	1087	869	61	59	1449	1051	55	55	1679	1162	52	52
		100	75	1391	1100	63	61	1816	1316	56	55	2081	1442	52	52
3500	35000	80	67	971	752	59	58	1319	927	54	54	1550	1036	51	51
		90	71	1309	1032	61	59	1727	1246	55	54	1999	1412	52	51
		100	75	1666	1305	63	60	2158	1558	56	55	2466	1706	52	52
4000	40000	80	67	1159	882	59	57	1553	1081	54	53	1816	1205	51	51
		90	71	1557	1209	60	58	2030	1454	55	54	2328	1597	51	51
		100	75	1969	1522	62	60	2531	1813	56	55	2875	1979	52	51
4500	45000	80	67	1306	993	59	57	1741	1215	54	54	2039	1357	51	51
		90	71	1740	1356	61	59	2273	1632	55	54	2619	1799	51	51
		100	75	2206	1709	63	60	2838	2037	56	55	3228	2227	52	52

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- EWB = Entering air wet bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving chilled water temperature of 45°F / 55°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.

Performance Data (Cont.)

Table 1b: Chilled Water Rating (14FPI)

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	EWB (°F)	4ROW				6ROW				8ROW			
				Total Load (MBH)	Sen. Load (MBH)	LVG DB (°F)	LVG WB (°F)	Total Load (MBH)	Sen. Load (MBH)	LVG DB (°F)	LVG WB (°F)	Total Load (MBH)	Sen. Load (MBH)	LVG DB (°F)	LVG WB (°F)
250	2500	80	67	65	56	59	59	95	69	55	54	115	77	52	52
		90	71	94	80	60	59	130	95	55	54	151	105	51	51
		100	75	125	103	61	60	166	121	55	55	190	131	51	51
350	3500	80	67	91	79	59	59	132	96	55	55	160	108	51	51
		90	71	131	112	60	60	181	133	55	55	212	146	51	51
		100	75	174	144	61	61	232	169	55	55	267	184	51	51
500	5000	80	67	147	119	58	58	205	144	53	53	242	161	51	51
		90	71	207	167	59	58	275	197	53	53	315	215	50	50
		100	75	270	213	60	59	348	248	54	54	392	267	50	50
700	7000	80	67	225	174	57	56	303	209	53	53	351	230	50	50
		90	71	310	242	58	57	402	283	53	53	453	306	50	50
		100	75	400	307	59	58	504	354	53	53	561	380	49	49
1000	10000	80	67	363	266	56	55	468	313	51	51	527	340	49	49
		90	71	488	364	56	55	609	419	51	51	673	449	49	49
		100	75	620	459	56	55	756	521	51	51	826	553	48	48
1250	12500	80	67	450	330	56	55	582	391	51	51	657	424	49	49
		90	71	606	425	56	56	757	522	51	51	839	560	49	49
		100	75	770	570	57	56	941	650	51	51	1030	690	49	49
1500	15000	80	67	542	398	56	55	700	469	51	51	789	509	49	49
		90	71	731	545	56	56	909	627	51	51	1008	672	49	49
		100	75	927	686	57	56	1131	780	51	51	1238	829	49	49
1750	17500	80	67	650	471	55	55	829	553	51	51	931	599	49	49
		90	71	868	642	56	55	1075	737	51	51	1184	788	48	48
		100	75	1098	807	57	56	1330	915	51	51	1451	971	48	48
2000	20000	80	67	770	550	55	54	968	641	51	51	1080	692	48	48
		90	71	1022	746	55	55	1248	851	51	51	1368	909	48	48
		100	75	1286	936	56	55	1543	1056	51	51	1672	1116	48	48
2250	22500	80	67	863	616	55	54	1086	719	51	51	1212	777	48	48
		90	71	1145	836	55	55	1399	956	51	51	1536	1019	48	48
		100	75	1439	1048	56	55	1730	1185	51	51	1871	1251	48	48
2500	25000	80	67	1004	705	54	54	1245	816	50	50	1372	875	48	48
		90	71	1324	953	55	54	1596	1081	50	50	1736	1146	48	48
		100	75	1657	1191	55	55	1965	1337	50	50	2114	1406	48	18
3000	30000	80	67	1019	748	56	55	1316	882	51	51	1483.3	956.9	49	49
		90	71	1374	1025	56	56	1709	1179	51	51	1895	1263	49	49
		100	75	1743	1290	57	56	2126	1466	51	51	2327	1559	49	49
3500	35000	80	67	1222	885	55	55	1559	1040	51	51	1750	1126	49	49
		90	71	1632	1207	56	55	2021	1386	51	51	2226	1481	48	48
		100	75	2064	1517	57	56	2500	1720	51	51	2728	1825	48	48
4000	40000	80	67	1448	1034	55	54	1820	1205	51	51	2030	1301	48	48
		90	71	1921	1402	55	55	2346	1600	51	51	2572	1709	48	48
		100	75	2418	1760	56	55	2901	1985	51	51	3143	2098	48	48
4500	45000	80	67	1622	1158	55	54	2042	1352	51	51	2279	1461	48	48
		90	71	2153	1572	55	55	2630	1797	51	51	2888	1916	48	48
		100	75	2705	1970	56	55	3252	2228	51	51	3517	2352	48	48

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- EWB = Entering air wet bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving chilled water temperature of 45°F / 55°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.



Performance Data (Cont.)

Table 2a: Hot Water Rating (8FPI)

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1ROW		2ROW		3ROW		4ROW	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)
250	2500	0	129	44	215	75	286	102	335	122
		20	112	59	187	87	249	112	293	130
		40	95	74	158	98	213	121	251	136
		60	78	89	130	110	177	129	210	142
350	3500	0	180	43	300	75	398	102	467	122
		20	156	59	260	87	347	111	408	129
		40	132	74	220	98	297	120	350	136
		60	108	89	182	109	247	128	293	142
500	5000	0	264	45	438	76	578	104	675	123
		20	229	60	381	89	505	113	591	131
		40	195	75	324	100	433	122	508	137
		60	160	90	268	111	361	130	425	143
700	7000	0	377	46	627	78	821	105	955	125
		20	329	61	546	90	718	115	838	132
		40	280	76	466	102	617	123	720	139
		60	232	91	387	113	516	132	604	145
1000	10000	0	565	48	935	82	1210	109	1400	128
		20	494	64	817	94	1061	118	1226	135
		40	423	78	701	105	913	127	1056	142
		60	352	93	585	116	766	134	888	147
1250	12500	0	695	47	1153	81	1495	107	1731	127
		20	606	63	1007	93	1310	117	1518	134
		40	519	77	863	104	1128	126	1308	141
		60	433	92	720	115	961	135	1100	146
1500	15000	0	840	47	1391	81	1804	108	2086	127
		20	734	63	1216	93	1581	117	1830	135
		40	629	78	1044	105	1361	126	1576	141
		60	524	93	871	116	1142	134	1326	147
1750	17500	0	980	47	1624	81	2103	108	2432	127
		20	857	63	1421	93	1844	117	2133	135
		40	734	78	1219	105	1588	126	1838	141
		60	629	94	1020	116	1335	134	1548	147

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving hot water temperature of 180°F / 160°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.



Performance Data (Cont.)

Table 2a: Hot Water Rating (8FPI) - Continued

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1ROW		2ROW		3ROW		4ROW	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)
2000	20000	0	1140	48	1885	83	2434	110	2806	129
		20	997	64	1651	95	2135	119	2462	136
		40	856	79	1417	106	1840	127	2124	142
		60	715	94	1186	117	1547	135	1788	148
2250	22500	0	1260	47	2091	81	2704	108	3124	127
		20	1104	63	1831	94	2372	118	2742	135
		40	946	78	1574	105	2045	126	2365	141
		60	790	93	1318	116	1720	134	1993	147
2500	25000	0	1470	50	2418	85	3123	113	3560	131
		20	1287	65	2121	97	2744	122	3125	138
		40	1107	80	1823	108	2368	130	2696	144
		60	925	95	1529	119	1996	138	2273	150
3000	30000	0	1626	46	2685	80	3584	107	4046	126
		20	1421	62	2347	92	3141	116	3549	134
		40	1218	77	2015	104	2704	125	3057	140
		60	1014	92	1681	115	2269	133	2572	146
3500	35000	0	1909	46	3163	80	4215	107	4759	126
		20	1669	62	2767	92	3696	116	4174	134
		40	1429	77	2374	104	3183	125	3597	140
		60	1225	93	1986	115	2676	133	3029	146
4000	40000	0	2227	47	3690	82	4905	109	5520	128
		20	1948	63	3232	94	4302	118	4843	135
		40	1673	78	2774	105	3708	126	4179	141
		60	1397	93	2322	116	3117	134	3518	147
4500	45000	0	2468	46	4115	80	5373	107	6178	126
		20	2162	62	3603	93	4714	117	5423	134
		40	1853	77	3098	104	4064	125	4677	140
		60	1547	92	2594	115	3418	133	3941	146

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving hot water temperature of 180°F / 160°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.

Performance Data (Cont.)

Table 2b: Hot Water Rating (14FPI)

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1ROW		2ROW		3ROW		4ROW	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)
250	2500	0	180	62	278	99	351	129	393	147
		20	156	75	241	108	305	135	343	151
		40	133	88	204	117	261	140	294	155
		60	109	101	168	125	217	145	246	158
350	3500	0	251	60	387	99	489	128	549	146
		20	218	75	336	108	426	134	479	151
		40	184	88	284	116	364	140	411	154
		60	151	101	234	124	302	145	343	157
500	5000	0	368	63	568	101	710	130	793	148
		20	320	76	493	111	620	137	693	152
		40	272	89	420	119	530	142	595	156
		60	223	102	347	127	442	147	498	159
700	7000	0	526	60	812	104	1006	132	1120	150
		20	459	74	707	113	880	139	980	154
		40	391	87	604	121	755	144	842	157
		60	324	101	500	129	632	149	707	161
1000	10000	0	788	67	1208	109	1477	136	1630	153
		20	689	82	1054	117	1293	142	1427	157
		40	590	93	903	126	1111	148	1228	160
		60	491	106	753	133	933	152	1033	163
1250	12500	0	970	66	1492	107	1831	135	2025	152
		20	846	80	1303	116	1602	141	1773	156
		40	724	92	1116	125	1377	147	1525	159
		60	604	105	930	132	1172	151	1283	162
1500	15000	0	1172	66	1800	108	2205	136	2437	152
		20	1024	80	1572	117	1930	142	2133	156
		40	878	93	1346	125	1659	147	1835	160
		60	731	106	1122	133	1393	152	1544	163
1750	17500	0	1367	66	2105	108	2574	136	2844	153
		20	1196	80	1840	117	2254	142	2491	157
		40	1024	93	1577	125	1940	147	2144	160
		60	878	108	1317	133	1629	152	1804	163

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving hot water temperature of 180°F / 160°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.

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تهران، کیلومتر ۲۱ بزرگراه لشگری (جاده مخصوص کرج)

روبروی پالایشگاه نفت پارس، پلاک ۱۲



Performance Data (Cont.)

Table 2b: Hot Water Rating (14FPI) - Continued

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1ROW		2ROW		3ROW		4ROW	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)
2000	20000	0	1591	68	2440	110	2971	137	3272	154
		20	1391	82	2135	119	2603	143	2867	158
		40	1194	95	1832	127	2241	149	2468	161
		60	998	108	1531	134	1883	153	2078	164
2250	22500	0	1758	66	2714	109	3314	136	3659	153
		20	1540	80	2376	118	2904	142	3206	157
		40	1320	93	2039	126	2500	148	2761	160
		60	1102	106	1706	134	2103	152	2325	163
2500	25000	0	2053	71	3118	113	3795	141	4133	156
		20	1797	84	2730	121	3329	147	3622	159
		40	1571	98	2346	129	2870	152	3120	162
		60	1288	109	1965	137	2418	156	2629	165
3000	30000	0	2284	65	3508	107	4380	135	4818	151
		20	1996	79	3064	116	3834	141	4217	155
		40	1711	92	2623	124	3296	146	3628	159
		60	1425	105	2187	132	2767	151	3053	162
3500	35000	0	2675	65	4119	107	5160	135	5674	152
		20	2341	79	3601	116	4518	141	4970	156
		40	2004	92	3086	124	3889	146	4277	159
		60	1718	107	2577	132	3265	151	3599	162
4000	40000	0	3130	67	4800	109	5987	136	6562	153
		20	2737	81	4200	118	5245	142	5750	157
		40	2349	94	3604	126	4516	148	4950	160
		60	1963	107	3012	133	3794	152	4167	163
4500	45000	0	3463	65	5346	108	6630	135	7341	152
		20	3034	79	4681	117	5810	141	6433	156
		40	2600	92	4017	125	5002	147	5540	159
		60	2171	105	3361	133	4207	151	4665	162

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving hot water temperature of 180°F / 160°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.



Performance Data (Cont.)

Table 3: Hot Water Rating of Multi Zone Air Handling Unit

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	8FIN				14FIN			
			1ROW		2ROW		1ROW		2ROW	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)
250	2500	0	118.5	40	198	69	167	57	260	92
		20	103	56	172	82	144	71	225	102
		40	87	71	146	94	122	85	191	111
		60	71	87	120	105	100	98	156	120
350	3500	0	160	38	270	67	226	55	356	90
		20	139	55	235	80	196	69	308	100
		40	118	70	199	92	165	86	261	110
		60	96	86	164	104	135	96	214	119
500	5000	0	233	39	394	68	330	56	520	92
		20	202	55	343	81	286	71	451	102
		40	172	71	292	94	243	84	384	112
		60	142	86	242	106	200	98	316	121
700	7000	0	337	40	572	71	477	58	753	95
		20	293	57	498	84	415	73	655	105
		40	250	72	426	96	353	86	559	115
		60	207	88	354	108	292	99	464	123
1000	10000	0	491	41	833	72	697	60	1100	98
		20	429	57	728	85	608	74	960	108
		40	367	73	624	98	520	88	822	118
		60	305	88	520	110	432	101	684	127
1250	12500	0	619	42	1048	73	878	60	1382	99
		20	541	58	916	86	766	74	1206	109
		40	463	73	785	98	654	88	1032	118
		60	385	89	655	110	543	101	860	127
1500	15000	0	726	41	1234	71	1032	59	1633	97
		20	634	57	1079	85	900	73	1426	108
		40	542	73	924	97	769	87	1220	117
		60	451	88	771	109	639	100	1016	126
1750	17500	0	871	42	1475	73	1236	61	1946	100
		20	761	58	1291	86	1080	75	1701	110
		40	652	74	1108	99	924	88	1457	119
		60	544	89	925	110	769	101	1216	128

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving hot water temperature of 180°F / 160°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.



Performance Data (Cont.)

Table 3: Hot Water Rating of Multi Zone Air Handling Unit - Continued

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	8FIN				14FIN			
			1ROW		2ROW		1ROW		2ROW	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)
2000	20000	0	995	42	1685	73	1414	61	2229	100
		20	871	58	1477	86	1236	75	1948	110
		40	747	74	1268	99	1059	89	1672	119
		60	623	89	1060	110	882	102	1397	128
2250	22500	0	1097	41	1865	72	1563	60	2476	98
		20	960	57	1634	85	1367	74	2166	109
		40	823	73	1404	98	1171	88	1859	118
		60	688	89	1175	110	976	101	1553	127
2500	25000	0	1198	41	2023	72	1700	59	2667	98
		20	1047	57	1768	85	1483	73	2328	108
		40	896	72	1515	97	1266	87	1992	117
		60	745	88	1264	109	1051	100	1660	126
3000	30000	0	1405	40	2382	70	1998	58	3152	96
		20	1227	56	2083	84	1742	72	2752	107
		40	1049	72	1783	96	1489	86	2355	116
		60	873	87	1488	108	1237	99	1961	125
3500	35000	0	1696	41	2873	72	2407	60	3790	99
		20	1482	57	2514	85	2103	74	3313	109
		40	1270	73	2158	98	1799	87	2838	118
		60	1059	88	1801	109	1498	100	2368	127
4000	40000	0	1944	41	3299	72	2763	60	4364	99
		20	1702	57	2892	85	2415	74	3814	109
		40	1460	73	2482	98	2069	88	3273	118
		60	1217	88	2075	109	1723	101	2735	127
4500	45000	0	2148	40	3670	71	3061	59	4873	97
		20	1880	56	3216	84	2677	73	4263	108
		40	1612	72	2763	97	2293	87	3659	117
		60	1347	88	2312	109	1911	100	3056	126

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on entering / leaving hot water temperature of 180°F / 160°F.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.

Performance Data (Cont.)

Table 4: DX Coil Rating

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	EWB (°F)	4 Rows				6 Rows			
				Total Load (MBH)	Sensible Load (MBH)	LVG DB (°F)	LVG WB (°F)	Total Load (MBH)	Sensible Load (MBH)	LVG DB (°F)	LVG WB (°F)
250	2000	80	67	61	44	59	57	82	53	55	53
		90	71	76	62	60	59	93	68	57	56
		100	75	99	73	64	60	115	83	59	57
350	2500	80	67	89	62	57	55	118	78	51	50
		90	71	102	79	61	58	137	99	54	52
		100	75	117	96	65	60	157	119	56	55
500	3500	80	67	123	86	57	55	163	109	51	50
		90	71	147	112	60	57	196	140	53	52
		100	75	162	134	65	61	217	166	57	55
700	5500	80	67	178	125	57	55	237	157	51	50
		90	71	205	159	61	58	274	198	54	52
		100	75	235	193	65	60	315	239	56	55
1000	7000	80	67	250	175	57	55	332	221	51	50
		90	71	288	223	61	58	384	277	54	52
		100	75	329	270	65	60	441	334	56	55
1250	10000	80	67	354	249	57	55	471	314	51	50
		90	71	408	317	61	58	545	395	54	52
		100	75	467	384	65	61	626	476	56	55
1500	12500	80	67	434	307	57	55	578	387	51	50
		90	71	500	391	61	58	668	488	54	53
		100	75	572	474	65	61	767	588	57	55
1750	15000	80	67	513	365	57	55	684	460	52	51
		90	71	591	465	61	58	791	580	54	53
		100	75	676	564	65	61	908	700	57	55
2000	17500	80	67	583	477	59	57	813	602	53	51
		90	71	666	588	63	60	929	737	55	54
		100	75	726	700	67	64	1069	872	59	57
2250	20000	80	67	718	503	57	55	953	634	51	50
		90	71	827	639	61	57	1103	797	53	52
		100	75	946	774	65	60	1267	960	56	54
2500	22500	80	67	756	616	54	53	1054	718	52	51
		90	71	864	760	61	60	1204	951	56	55
		100	75	962	839	66	64	1385	1027	58	57
3000	25000	80	67	868	615	57	55	1156	775	51	50
		90	71	1000	782	61	58	1337	976	54	53
		100	75	1144	949	65	61	1535	1177	57	55
3500	30000	80	67	1027	730	57	55	1369	921	52	51
		90	71	1182	930	61	58	1583	1160	54	53
		100	75	1352	1129	65	61	1817	1400	57	55
4000	35000	80	67	1166	953	59	57	1326	1204	53	51
		90	71	1332	1176	63	60	1858	1474	55	54
		100	75	1452	1400	67	64	2138	1744	59	57
4500	40000	80	67	1436	1007	57	55	1907	1268	51	50
		90	71	1655	1278	61	57	2207	1594	53	52
		100	75	1893	1549	65	60	2534	1920	56	54

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on 45°F evaporator temperature and 14 FPI coil fin spacing.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.

Performance Data (Cont.)

Table 5: Steam Rating

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1 Row Coil		2 Rows Coil		Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1 Row Coil		2 Rows Coil	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)				Total Load (MBH)	LVG DB (°F)		
250	2500	0	184	68	326	121	2000	20000	0	1470	68	2668	124
		20	168	82	297	130			20	1340	82	2433	133
		40	153	97	270	140			40	1218	96	2210	142
		60	136	110	240	149			60	1083	110	1965	151
350	3500	0	274	72	495	131	2250	22500	0	1562	64	2997	123
		20	250	86	452	140			20	1497	82	2733	132
		40	227	100	410	148			40	1657	108	2483	142
		60	202	113	365	157			60	1473	121	2208	151
500	5000	0	366	68	665	123	2500	25000	0	1814	67	3327	123
		20	334	82	606	132			20	1654	81	3033	132
		40	303	96	551	142			40	1503	96	2756	142
		60	270	110	490	151			60	1336	109	2450	151
700	7000	0	509	67	923	122	3000	30000	0	2077	64	3792	117
		20	464	81	842	131			20	1892	78	3456	127
		40	421	96	756	140			40	1720	93	3143	137
		60	375	110	680	150			60	1530	107	2793	146
1000	10000	0	726	67	1331	123	3500	35000	0	2436	64	4431	117
		20	662	81	1213	132			20	2219	79	4039	127
		40	601	96	1102	142			40	2018	93	3671	137
		60	535	110	980	151			60	1794	107	3264	146
1250	12500	0	907	67	1663	123	4000	40000	0	2793	65	5069	117
		20	826	81	1516	132			20	2546	79	4623	127
		40	751	96	1378	142			40	2314	94	4199	137
		60	668	109	1225	151			60	2058	108	3734	146
1500	15000	0	1093	67	1996	123	4500	45000	0	2968	61	5694	117
		20	996	81	1819	132			20	2844	79	5193	127
		40	905	96	1654	142			40	3148	105	4718	137
		60	805	110	1470	151			60	2799	118	4195	146
1750	17500	0	1282	68	2332	123							
		20	1168	82	2126	132							
		40	1062	96	1932	142							
		60	944	110	1718	151							

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on steam pressure of 5 PSIG and 8 FPI coil fin spacing.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.



Performance Data (Cont.)

Table 6: Steam Rating (Multi Zone)

Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1 Row Coil		2 Rows Coil		Model	Nominal Air Flow Rate (CFM)	EDB (°F)	1 Row Coil		2 Rows Coil	
			Total Load (MBH)	LVG DB (°F)	Total Load (MBH)	LVG DB (°F)				Total Load (MBH)	LVG DB (°F)		
250	2500	0	165	61	293	108	2000	20000	0	1323	61	2401	111
		20	151	76	267	119			20	1206	76	2189	121
		40	137	91	243	130			40	1096	91	1989	132
		60	122	105	216	140			60	974	105	1768	141
350	3500	0	246	65	445	117	2250	22500	0	1478	60	2698	110
		20	225	80	406	127			20	1347	75	2459	120
		40	204	94	369	137			40	1224	90	2235	131
		60	181	108	328	147			60	1088	104	1987	141
500	5000	0	329	61	598	110	2500	25000	0	1550	57	2842	105
		20	300	75	545	121			20	1412	72	2592	116
		40	272	90	495	131			40	1283	88	2356	127
		60	243	105	441	141			60	1142	102	2094	138
700	7000	0	458	60	830	109	3000	30000	0	1868	58	3412	105
		20	417	75	757	120			20	1702	73	3110	116
		40	378	90	680	130			40	1547	88	2827	127
		60	337	104	612	141			60	1376	102	2514	138
1000	10000	0	653	60	1197	110	3500	35000	0	2191	58	3988	106
		20	595	75	1091	121			20	1997	73	3635	116
		40	540	90	991	131			40	1815	88	3304	127
		60	481	104	882	141			60	1613	103	2937	138
1250	12500	0	816	60	1496	110	4000	40000	0	2514	58	4562	106
		20	743	75	1364	121			20	2291	73	4159	116
		40	675	90	1240	131			40	2082	88	3779	127
		60	601	104	1102	141			60	1851	103	3359	138
1500	15000	0	983	60	1796	110	4500	45000	0	2808	58	5126	105
		20	896	75	1637	121			20	2559	73	4672	116
		40	814	90	1488	131			40	2326	88	4247	127
		60	724	105	1323	141			60	2067	103	3775	138
1750	17500	0	1153	60	2099	110			0				
		20	1051	75	1913	120			20				
		40	955	90	1739	131			40				
		60	849	104	1546	141			60				

NOTE

- 1MBH = 1000 Btu/hr
- EDB = Entering air dry bulb temperature
- LVG = Leaving air temperature
- All above data are based on steam pressure of 5 PSIG and 8 FPI coil fin spacing.
- Interpolation is allowed but extrapolation outside table boundary is not allowed. Contact Saran MFG group for operating conditions outside table boundary.
- The above data is subject to change without notice.



Selection Considerations

Saran air handling unit rating data presented in the "Performance Data" tables indicate capacity of them at standard condition, so for other condition, following performance adjustment factors shall be attend in air handling unit selection:

Table 7: Non Standard Air Flow Rate Correction Factors (C1)

Actual CFM / Nom. CFM	0.7	0.8	0.9	1.0	1.1	1.2	1.4
Cooling Coil	0.86	0.92	0.95	1.00	1.03	Not Recommended	
Heating Coil	0.80	0.88	0.93	1.00	1.05	1.11	1.19

Table 8: Fin Spacing Correction Factors (C2)

No of Rows	Fin Spacing		
	8 FPI	10 FPI	12 FPI
4	1.00	1.10	1.19
6	1.00	1.08	1.15
8	1.00	1.06	1.10

NOTE

- To determine capacity of coils with 10 or 12 FPI fin spacing, multiply the capacity of unit in 8 FPI fin spacing performance rating table to above correction factors.

Table 9: Entering Hot Water Temperature Correction Factors (C3)

Entering Hot Water Temp. (°F)	160	180	200	220
Heating Capacity Correction Factor	0.75	1.00	1.25	1.50

Table 10: Entering Chilled Water Temperature Correction Factors (C4)

Entering Chilled Water Temp. (°F)	42	44	45	46
Cooling Capacity Correction Factor	1.09	1.04	1.00	0.97

Table 11: Steam Pressure Correction Factors (C5)

Stem Pressure (psig)	2	5	10	15	20	30	40	50	60
Heating Capacity Correction Factor	0.95	1.00	1.07	1.14	1.19	1.28	1.35	1.42	1.48

Water Coils Engineering Data

Table 12: Coils Face Area

Model	Coil Data						
	Qty	No. of Circuits			Height (In)	Length (In)	Total Coil Face Area (Sq Ft)
		1Rows	3Rows	Other			
250	1	8	12	15	23.6	30.7	5.0
350	1	11	16	21	32.5	30.3	6.8
500	1	12	18	24	36.9	38.2	9.8
700	1	14	21	27	41.3	47.6	13.7
1000	1	15	22	29	44.3	67.3	20.7
1250	2	9	13	17	26.6	67.3	24.8
1500	2	11	16	21	32.5	67.3	30.4
1750	2	11	16	21	32.5	77.2	34.8
2000	2	11	17	22	34.0	87.0	41.0
2250	2	11	17	22	34.0	92.9	43.8
2500	2	12	18	23	35.4	102.4	50.4
	4*	12	18	23		51.2	
3000	4	11	16	21	32.5	64.6	58.3
3500	4	11	16	21	32.5	74.4	67.1
4000	4	11	17	22	34.0	84.3	79.5
4500	4	11	17	22	34.0	90.2	85.0

NOTE

* Air handling unit with 6 or 8 Rows Coil (In this case, coils connections are in both sides of AHU).

Table 13: Coils Connections Sizes (Inch)

Model	No. of Coils	Chilled Water			Hot Water				Steam			
		4Rows	6Rows	8Rows	1Row	2Rows	3Rows	4Rows	Inlet		Outlet	
									1Row	2Rows	1Row	2Rows
250	1	1 ¼	1 ½	1 ½	1	1	1 ¼	1 ¼	1 ½	1 ½	1 ¼	1 ¼
350	1	1 ½	2	2	1 ¼	1 ¼	1 ½	1 ½	1 ½	1 ½	1 ¼	1 ¼
500	1	1 ½	2	2	1 ¼	1 ¼	1 ½	1 ½	2	2	1 ½	1 ½
700	1	2	2	2 ½	1 ½	1 ½	2	2	2	2	1 ½	1 ½
1000	1	2	2 ½	2 ½	1 ½	1 ½	2	2	2	2	1 ½	1 ½
1250	2	2	2	2 ½	1 ½	1 ½	2	2	2	2	1 ½	1 ½
1500	2	2	2	2 ½	1 ½	1 ½	2	2	2	2	1 ½	1 ½
1750	2	2 ½	2 ½	2 ½	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½
2000	2	2 ½	2 ½	2 ½	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½
2250	2	2 ½	2 ½	2 ½	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½
2500	2	2 ½	-	-	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½
	4*	-	2	2 ½	1 ½	1 ½	2	2	2	2	1 ½	1 ½
3000	4	2	2	2 ½	1 ½	1 ½	2	2	2	2	1 ½	1 ½
3500	4	2 ½	2 ½	2 ½	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½
4000	4	2 ½	2 ½	2 ½	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½
4500	4	2 ½	2 ½	2 ½	1 ½	1 ½	2	2 ½	2	2	1 ½	1 ½

NOTE

The coils data are different in air washer and multi zone air handling unit (for more information contact Saran MFG).

* In this case, coils connections are in both sides of AHU.

Table 14: Coil Water Side Pressure Drop Correction Factors

Average Water Temperature (°F)	40	50	60	80	100	120	140	150	160	180	200	220
Correction Factor	1.04	1	0.96	0.90	0.86	0.83	0.80	0.78	0.77	0.76	0.74	0.73

Table 15: Water Side Pressure Drop (FT.WG)

Model	Water Velocity Feet Per Sec. 1Row											
	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7	8
250,350	0.11	0.29	0.53	0.80	1.13	1.44	1.82	2.22	3.04	4.00	4.95	6.06
500,700	0.14	0.36	0.65	0.95	1.35	1.75	2.20	2.70	3.70	4.75	5.90	7.30
1000, 1250, 1500, 3000	0.16	0.42	0.75	1.02	1.60	2.08	2.62	3.16	4.38	5.73	7.17	8.85
1750, 3500	0.17	0.45	0.80	1.20	1.70	2.25	2.80	3.40	4.70	6.20	7.70	9.25
2000, 4000	0.20	0.49	0.88	1.30	1.85	2.43	3.03	3.67	5.10	6.68	8.36	10.32
2250, 2500, 4500	0.21	0.50	0.90	1.35	1.90	2.50	3.15	3.80	5.30	6.90	8.70	10.70

Model	Water Velocity Feet Per Sec. 2Rows											
	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7	8
250, 350	0.13	0.34	0.62	0.92	1.31	1.71	2.14	2.61	3.58	4.68	5.82	7.12
500, 700	0.15	0.41	0.75	1.10	1.56	2.04	2.55	3.12	4.30	5.57	6.90	8.54
1000, 1250, 1500, 3000	0.18	0.49	0.88	1.29	1.85	2.40	2.95	3.66	5.13	6.70	8.38	10.35
1750, 3500	0.20	0.53	0.95	1.42	2.01	2.63	3.30	4.00	5.55	7.25	9.05	11.20
2000, 4000	0.21	0.57	1.02	1.51	2.05	2.83	3.54	4.28	5.97	7.81	9.78	12.07
2250, 2500, 4500	0.24	0.58	1.05	1.56	2.25	2.95	3.70	4.45	6.20	8.81	10.20	12.06

Model	Water Velocity Feet Per Sec. 3Rows											
	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7	8
250, 350	0.17	0.45	0.82	1.23	1.74	2.26	2.86	3.52	4.82	6.30	7.85	9.66
500, 700	0.21	0.55	1.00	1.48	2.13	2.80	3.48	4.30	5.90	7.70	9.65	11.95
1000, 1250, 1500, 3000	0.24	0.67	1.16	1.80	2.54	3.33	4.21	5.15	7.15	9.37	11.70	14.15
1750, 3500	0.26	0.73	1.30	1.95	2.75	3.60	4.55	5.60	7.80	10.20	12.70	15.75
2000, 4000	0.28	0.79	1.40	2.07	2.98	3.90	4.93	6.05	8.40	11.05	13.80	16.70
2250, 2500, 4500	0.29	0.85	1.45	2.15	3.10	4.10	5.15	6.30	8.75	11.50	14.40	17.85

Model	Water Velocity Feet Per Sec. 4Rows											
	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7	8
250, 350	0.21	0.56	1.02	1.51	2.17	2.83	3.57	4.42	6.05	7.90	9.92	12.20
500, 700	0.26	0.70	1.25	1.87	2.70	3.50	4.40	5.45	7.45	9.80	12.25	15.20
1000, 1250, 1500, 3000	0.29	0.85	1.51	2.23	3.21	4.22	5.36	6.60	9.15	12.00	15.00	18.63
1750, 3500	0.32	0.93	1.65	2.45	3.50	4.60	5.80	7.20	10.00	13.10	16.40	20.30
2000, 4000	0.35	1.01	1.78	2.62	3.81	4.98	6.32	7.76	10.83	14.24	17.83	22.09
2250, 2500, 4500	0.36	1.06	1.85	2.72	3.96	5.22	6.60	8.10	11.30	14.85	18.60	23.10

Model	Water Velocity Feet Per Sec. 6Rows											
	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7	8
250,350	0.29	0.80	1.44	2.13	3.08	4.03	5.05	6.20	8.54	11.28	14.07	17.35
500, 700	0.36	0.98	1.80	2.65	3.83	5.00	6.30	7.77	10.70	14.14	17.78	21.93
1000, 1250, 1500,2500, 3000	0.43	1.18	2.19	3.20	4.70	6.11	7.73	8.80	13.21	17.40	22.9	27.04
1750, 3500	0.48	1.30	2.40	3.50	5.10	7.65	8.40	10.35	14.40	19.00	24.00	30.00
2000, 4000	0.52	1.39	2.56	3.78	5.53	7.25	9.15	11.26	15.66	20.70	26.11	32.20
2250, 4500	0.54	1.45	2.70	3.95	5.80	7.60	9.65	11.80	16.50	21.70	27.40	33.70

Model	Water Velocity Feet Per Sec. 8Rows											
	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7	8
250,350	0.38	1.04	1.86	2.73	3.97	5.23	6.53	7.98	10.03	14.65	18.22	22.50
500, 700	0.46	1.23	2.28	3.41	4.98	6.57	8.22	10.10	13.96	18.48	23.05	28.60
1000, 1250, 1500,2500, 3000	0.57	1.51	2.82	4.18	6.10	8.00	10.10	12.40	17.37	22.81	28.85	35.40
1750, 3500	0.64	1.64	3.10	4.55	6.65	8.70	11.00	13.50	18.90	24.90	31.50	38.80
2000, 4000	0.69	1.78	3.35	4.95	7.25	9.52	12.00	14.76	20.50	27.16	34.40	42.31
2250, 4500	0.71	1.85	3.50	5.20	7.65	10.00	12.70	15.50	21.60	28.60	36.30	44.40

NOTE

- All above data are based on 50°F entering water temperature, in other condition please consider denoted correction factor in Table 14.

Components Air Side Pressure Drop

Table 16: Coil Pressure Drop (IN.WG)

Fin Spacing	Rows Deep	Coil Face Velocity (FPM)									
		300		400		500		600		700	800
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Dry
8 FPI	1	0.04	0.05	0.06	0.08	0.08	0.11	0.11	0.15	0.15	0.18
	2	0.07	0.11	0.12	0.16	0.17	0.23	0.23	0.29	0.3	0.37
	3	0.09	0.16	0.15	0.24	0.22	0.34	0.3	0.44	0.39	0.49
	4	0.16	0.21	0.19	0.32	0.27	0.45	0.37	0.59	0.47	0.6
	5	0.15	0.26	0.23	0.4	0.34	0.57	0.46	0.74	0.59	0.75
	6	0.18	0.31	0.27	0.48	0.4	0.68	0.55	0.88	0.71	0.9
	8	0.23	0.41	0.37	0.65	0.55	0.87	0.73	1.18	0.95	1.2
14 FPI	1	0.06	0.08	0.09	0.11	0.12	0.15	0.17	0.21	0.23	0.27
	2	0.11	0.15	0.19	0.22	0.26	0.32	0.34	0.41	0.45	0.56
	3	0.14	0.22	0.2	0.33	0.33	0.47	0.45	0.62	0.59	0.74
	4	0.16	0.28	0.3	0.43	0.41	0.63	0.56	0.83	0.71	0.9
	5	0.24	0.35	0.36	0.55	0.51	0.79	0.69	1.04	0.89	1.13
	6	0.29	0.42	0.42	0.65	0.6	0.95	0.83	1.23	1.1	1.35
	8	0.37	0.55	0.58	0.88	0.83	1.21	1.1	1.65	1.43	1.8

NOTE

- Use "Dry" values for heating coils pressure drop determining and "Wet" values for cooling coils pressure drop determining.
- For coils with 10FPI and 12FPI fin spacing, multiply the values of 8FPI in 1.16 and 1.32, respectively.

Table 17: Accessories Pressure Drop (IN.WG) (At 500 FPM Face Velocity)

Model	Damper	Electrical Heater	Diffuser	Mixing without Filter	Aluminum Washable Filter	Droplet Eliminator	Air Washer		
							Class 4	Class 6	Class 8
250	0.04	0.012	0.02	0.06	0.1	0.1	0.23	0.35	0.45
350	0.04	0.012	0.03	0.06	0.1	0.1	0.23	0.35	0.45
500	0.05	0.012	0.03	0.06	0.1	0.1	0.23	0.35	0.45
700	0.05	0.016	0.03	0.06	0.1	0.1	0.23	0.4	0.5
1000	0.05	0.016	0.04	0.06	0.1	0.1	0.23	0.4	0.5
1250	0.05	0.016	0.04	0.06	0.1	0.1	0.23	0.4	0.5
1500 , 3000	0.05	0.016	0.04	0.06	0.1	0.1	0.23	0.45	0.55
1750 , 3500	0.05	0.016	0.04	0.06	0.1	0.1	0.26	0.45	0.55
2000 , 4000	0.05	0.016	0.04	0.06	0.1	0.1	0.26	0.45	0.55
2250 , 4500	0.05	0.016	0.04	0.06	0.1	0.1	0.26	0.45	0.55
2500	0.05	0.016	0.04	0.06	0.1	0.1	0.26	0.45	0.55

Table 18: High Stage Filters Pressure Drop (IN.WG) (At 500 FPM Face Velocity)

Filter Class	EU3	EU4	EU5	EU6	EU7	EU8	EU9	EU10	EU11	EU12
Pressure Drop	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3

NOTE

- All above data are based on Saran MFG standard filters. In other cases, consult your filter supplier.
- For more information about the filters classes, please refer to Appendix 2.

Fan Performance Data

Table 19: Fan Performance

Model	No. of Fans × Fan Size	Coil Face Area (Sq.Ft.)	Coil Face Velocity (FPM)	Air Flow Rate (CFM)	Total Static Pressure in Inch of Water															
					0.5		0.75		1		1.25		1.5		2		2.5		3	
					RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P
250	1×13"	5	400	2000	639	0.5	727	0.75	814	0.75	903	1	993	1	---	---	---	---	---	---
			450	2250	675	0.75	756	0.75	833	1	911	1	990	1.5	1147	1.5	---	---	---	---
			500	2500	714	0.75	790	1	860	1	929	1.5	999	1.5	1141	2	1284	3	---	---
			550	2750	753	1	828	1	893	1.5	956	1.5	1019	1.5	1147	2	1276	3	1407	3
			600	3000	---	---	865	1.5	929	1.5	989	1.5	1047	2	1162	2	1279	3	1399	3
			700	3500	---	---	943	2	1004	2	1060	2	1112	3	1212	3	1310	3	1410	4
350	1×14"	6.8	400	2720	570	0.75	640	0.75	706	1	773	1.5	842	1.5	972	2	---	---	---	---
			450	3060	606	1	672	1	731	1.5	791	1.5	851	2	973	2	1083	3	---	---
			500	3400	643	1	705	1.5	762	1.5	816	2	869	2	977	3	1185	3	1186	3
			550	3740	680	1.5	742	1.5	796	2	847	2	895	3	992	3	1091	4	1188	4
			600	4080	717	1.5	778	2	831	2	880	3	926	3	1015	3	1104	4	1194	5.5
			700	4760	---	---	856	3	904	3	950	4	993	4	1073	4	1149	5.5	1226	5.5
500	1×17"	9.8	400	3920	460	1	517	1.5	571	1.5	626	2	682	2	794	3	---	---	---	---
			450	4410	489	1.5	542	1.5	591	2	639	2	688	3	787	3	886	4	---	---
			500	4900	519	1.5	570	2	616	2	659	3	703	3	790	4	880	5.5	969	5.5
			550	5390	548	2	599	3	642	3	684	3	723	4	801	4	882	5.5	963	7.5
			600	5880	---	---	638	3	682	4	720	4	756	4	827	5.5	897	5.5	969	7.5
			700	6860	---	---	688	4	730	5.5	768	5.5	802	5.5	867	7.5	928	7.5	990	7.5
700	1×19"	13.7	400	5480	410	1.5	469	1.5	525	2	584	3	642	3	753	4	851	5.5	---	---
			450	6165	432	1.5	486	2	537	3	587	3	639	4	744	5.5	842	5.5	931	7.5
			500	6850	455	2	507	3	555	3	599	4	645	4	738	5.5	832	7.5	922	7.5
			550	7535	479	3	528	3	574	4	616	4	657	4	740	5.5	825	7.5	911	10
			600	8220	502	3	552	4	595	4	636	5.5	676	5.5	750	7.5	826	7.5	905	10
			700	9590	---	---	---	---	641	5.5	677	7.5	713	7.5	781	7.5	845	10	910	10
1000	1×22"	20.7	400	8280	364	2	410	3	454	3	500	4	544	5.5	633	7.5	715	7.5	---	---
			450	9315	387	3	429	3	469	4	509	5.5	548	5.5	629	7.5	707	10	781	10
			500	10350	411	4	451	4	488	5.5	524	5.5	559	7.5	631	7.5	702	10	773	15
			550	11385	---	---	473	5.5	508	5.5	542	7.5	574	7.5	639	10	703	10	769	15
			600	12420	---	---	497	7.5	530	7.5	562	7.5	592	10	652	10	710	15	770	15
			700	14490	---	---	---	---	577	10	606	10	633	15	687	15	738	15	788	20
1250	1×26"	24.8	400	9920	306	3	345	3	383	4	423	4	464	5.5	545	7.5	---	---	---	---
			450	11160	324	3	361	4	395	4	429	5.5	464	5.5	537	7.5	610	10	---	---
			500	12400	344	4	378	4	409	5.5	441	5.5	471	7.5	534	10	600	10	664	15
			550	13640	365	5.5	397	5.5	427	7.5	455	7.5	483	7.5	539	10	597	15	657	15
			600	14880	---	---	417	7.5	445	7.5	472	10	497	10	549	15	600	15	654	15
			700	17360	---	---	---	---	484	10	508	15	532	15	577	15	621	20	665	20
1500	1×29"	30.4	400	12160	267	3	303	4	339	4	375	5.5	413	7.5	487	10	---	---	---	---
			450	13680	282	4	316	4	347	5.5	379	7.5	411	7.5	479	10	545	15	---	---
			500	15200	299	4	331	5.5	359	7.5	387	7.5	416	7.5	474	10	536	15	---	---
			550	16720	317	5.5	346	7.5	373	7.5	399	10	425	10	477	15	531	15	587	20
			600	18240	336	7.5	363	7.5	388	10	413	10	437	15	485	15	532	15	582	20
			700	21280	---	---	399	10	421	15	444	15	465	15	506	20	547	20	587	25
1750	1×29"	34.8	400	13920	285	4	318	4	348	5.5	379	7.5	412	7.5	478	10	544	15	---	---
			450	15660	304	5.5	335	5.5	363	7.5	390	7.5	418	10	475	10	534	15	594	20
			500	17400	325	5.5	353	7.5	380	7.5	405	10	430	10	480	15	532	15	585	20
			550	19140	---	---	373	10	397	10	421	10	444	11	490	15	535	20	582	20
			600	20880	---	---	393	10	416	15	439	15	461	15	503	20	544	20	585	25
			700	24360	---	---	---	---	457	15	477	20	497	20	534	25	571	25	606	30

Table 19: Fan Performance (Cont.)

Model	No. of Fans × Fan Size	Coil Face Area (Sq.Ft.)	Coil Face Velocity (FPM)	Air Flow Rate (CFM)	Total Static Pressure in Inch of Water															
					0.5		0.75		1		1.25		1.5		2		2.5		3	
					RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P	RPM	H.P
2000	1×32"	41	400	16400	250	4	281	5.5	310	7.5	340	7.5	370	10	434	15	---	---	---	---
			450	18450	267	5.5	295	7.5	321	7.5	347	10	373	10	428	15	483	15	---	---
			500	20500	283	7.5	310	7.5	335	10	358	10	382	15	429	15	478	20	528	20
			550	22550	301	7.5	326	10	349	10	371	15	393	15	436	20	479	20	523	25
			600	24600	---	---	344	15	366	15	386	15	406	15	445	20	484	20	524	25
			700	28700	---	---	---	---	399	20	418	20	436	20	471	25	505	30	538	30
2250	1×32"	43.8	400	17520	259	5.5	288	5.5	316	7.5	344	7.5	372	10	430	15	486	15	---	---
			450	19710	277	7.5	304	7.5	329	10	353	10	378	10	428	15	480	20	531	20
			500	21900	295	7.5	321	10	344	10	367	15	390	15	433	15	479	20	525	25
			550	24090	---	---	339	10	361	15	382	15	402	15	442	20	483	20	524	25
			600	26280	---	---	357	15	379	15	398	20	417	20	455	20	491	25	528	30
2500	2×26"	50.4	400	20160	306	3	345	3	383	4	423	4	464	5.5	545	7.5	---	---	---	---
			450	22680	324	3	361	4	395	4	429	5.5	464	5.5	537	7.5	610	10	---	---
			500	25200	344	4	378	4	409	5.5	441	5.5	471	7.5	534	10	600	10	664	15
			550	27720	365	5.5	397	5.5	427	7.5	455	7.5	483	7.5	539	10	597	15	657	15
			600	30240	---	---	417	7.5	445	7.5	472	10	497	10	549	15	600	15	654	15
3000	2×29"	58.3	400	23320	267	3	303	4	339	4	375	5.5	413	7.5	487	10	---	---	---	---
			450	26235	282	4	316	4	347	5.5	379	7.5	411	7.5	479	10	545	15	---	---
			500	29150	299	4	331	5.5	359	7.5	387	7.5	416	7.5	474	10	536	15	---	---
			550	32065	317	5.5	346	7.5	373	7.5	399	10	425	10	477	15	531	15	587	20
			600	34980	336	7.5	363	7.5	388	10	413	10	437	15	485	15	532	15	582	20
			700	40810	---	---	399	10	421	15	444	15	465	15	506	20	547	20	587	25
3500	2×29"	67.1	400	26840	285	4	318	4	348	5.5	379	7.5	412	7.5	478	10	544	15	---	---
			450	30195	304	5.5	335	5.5	363	7.5	390	7.5	418	10	475	10	534	15	594	20
			500	33550	325	5.5	353	7.5	380	7.5	405	10	430	10	480	15	532	15	585	20
			550	36905	---	---	373	10	397	10	421	10	444	11	490	15	535	20	582	20
			600	40260	---	---	393	10	416	15	439	15	461	15	503	20	544	20	585	25
			700	46970	---	---	---	---	457	15	477	20	497	20	534	25	571	25	606	30
4000	2×32"	79.5	400	31800	250	4	281	5.5	310	7.5	340	7.5	370	10	434	15	---	---	---	---
			450	35775	267	5.5	295	7.5	321	7.5	347	10	373	10	428	15	483	15	---	---
			500	39750	283	7.5	310	7.5	335	10	358	10	382	15	429	15	478	20	528	20
			550	43725	301	7.5	326	10	349	10	371	15	393	15	436	20	479	20	523	25
			600	47700	---	---	344	15	366	15	386	15	406	15	445	20	484	20	524	25
			700	55650	---	---	---	---	399	20	418	20	436	20	471	25	505	30	538	30
4500	2×32"	85	400	34000	259	5.5	288	5.5	316	7.5	344	7.5	372	10	430	15	486	15	---	---
			450	38250	277	7.5	304	7.5	329	10	353	10	378	10	428	15	480	20	531	20
			500	42500	295	7.5	321	10	344	10	367	15	390	15	433	15	479	20	525	25
			550	46750	---	---	339	10	361	15	382	15	402	15	442	20	483	20	524	25
			600	51000	---	---	357	15	379	15	398	20	417	20	455	20	491	25	528	30
			700	59500	---	---	---	---	398	20	434	25	452	25	485	30	517	30	547	40

Dimensions

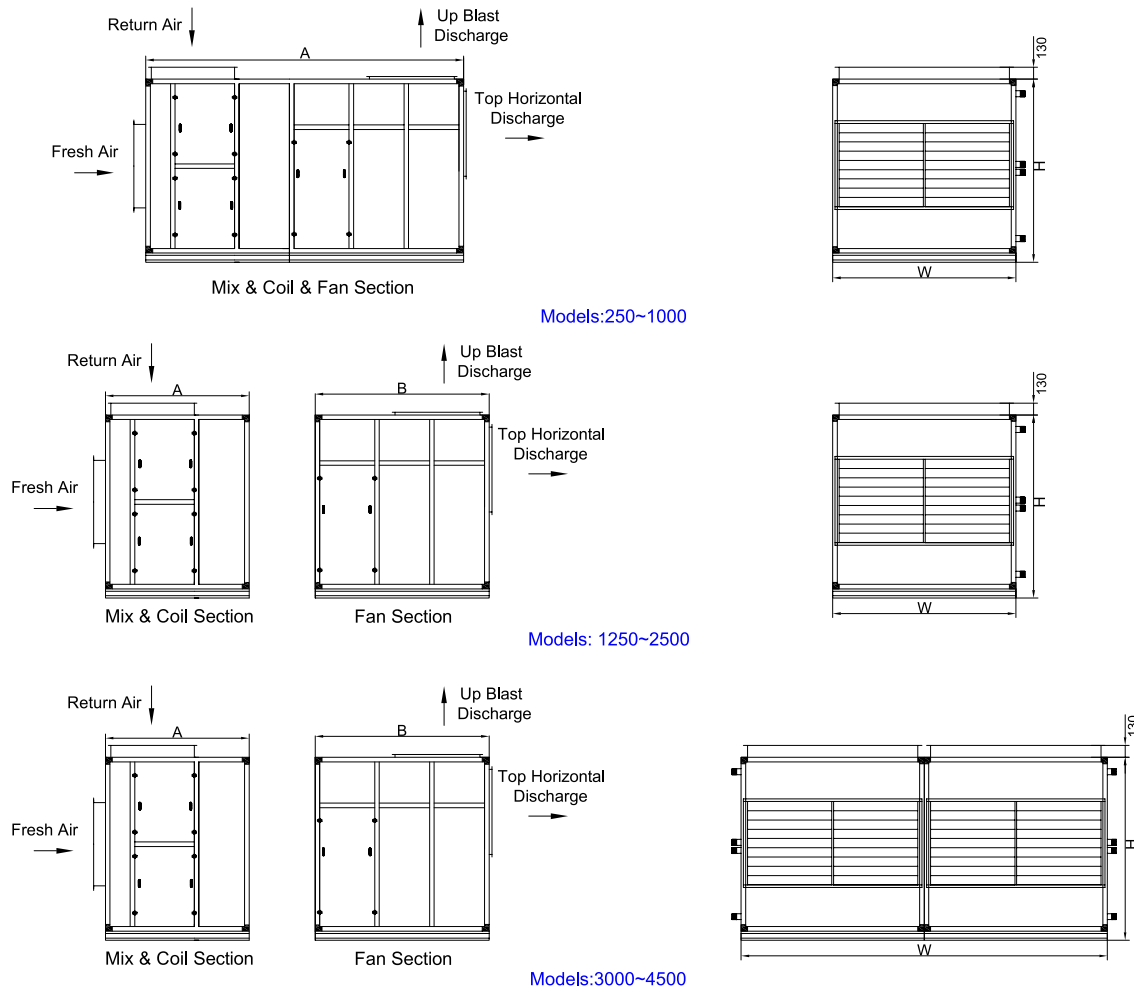


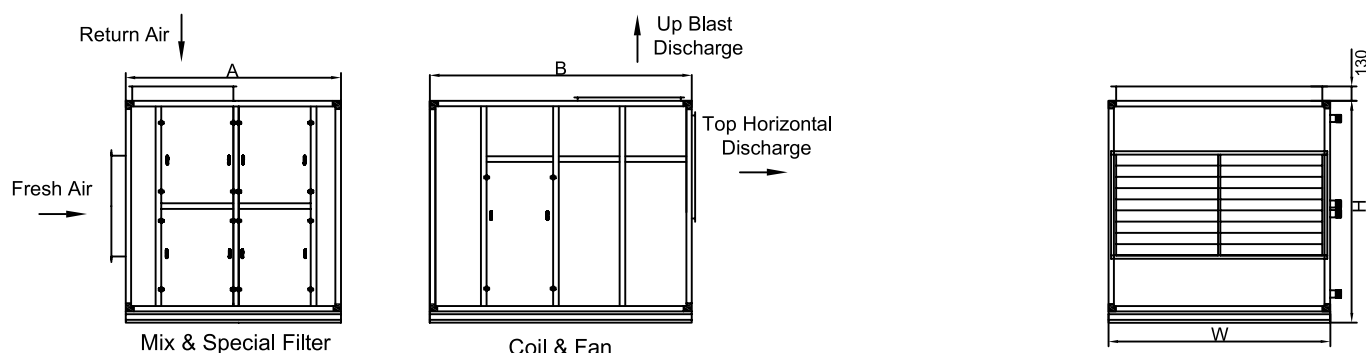
Table 20a: Horizontal Air Handling Unit Dimensions

Model	A	B	H	W	Weight (kg)	
					Net	Oper.
SRAH-250	2280	-	1050	1050	500	540
SRAH-350	2330	-	1150	1050	590	640
SRAH-500	2580	-	1250	1250	854	909
SRAH-700	2720	-	1400	1500	947	1007
SRAH-1000	2920	-	1500	2000	1256	1316
SARH-1250	1370	1800	1700	2000	1477	1547
SRAH-1500	1570	1900	2000	2000	1670	1780
SRAH-1750	1770	1900	2000	2250	1893	2043
SRAH-2000	1770	2150	2100	2500	2251	2421
SRAH-2250	1870	2150	2100	2650	2354	2554
SRAH-2500	1800	1700	2220	3200	2954	3094
SRAH-3000	1570	1900	2000	4000	3340	3560
SRAH-3500	1770	1900	2000	4500	3786	4086
SRAH-4000	1770	2150	2100	5000	4502	4842
SRAH-4500	1870	2150	2100	5300	4708	5108

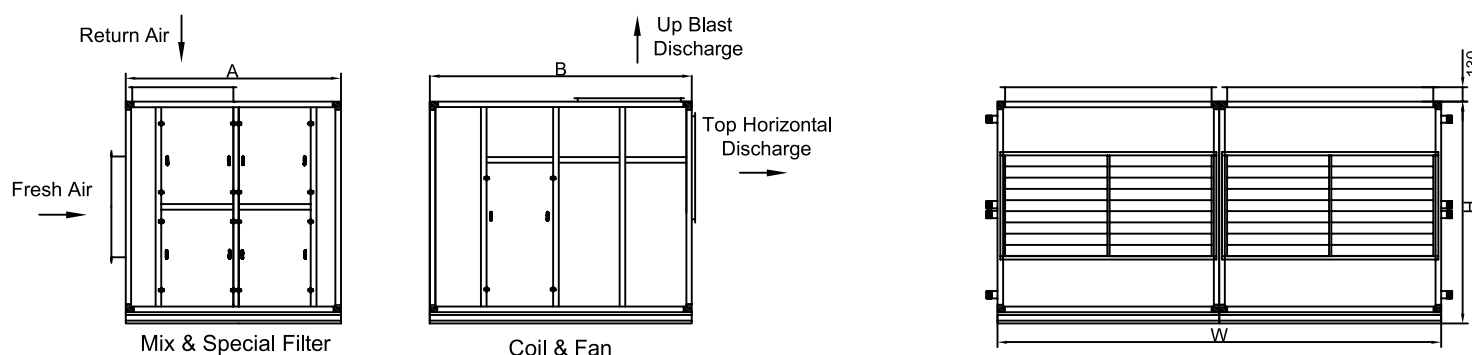
NOTE

- All dimensions are in mm.
- Weights are based on default air handling unit equipment.

Dimensions (Cont.)



Models: 250~2500



Models: 3000~4500

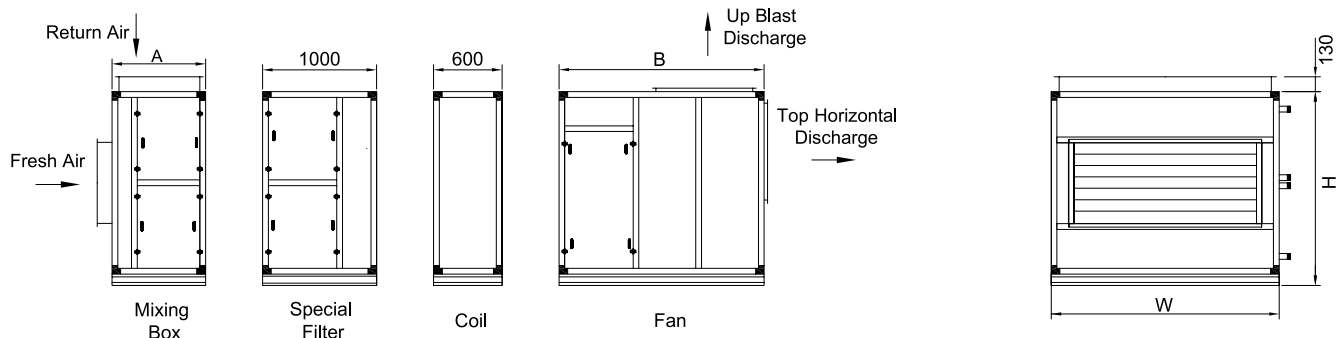
Table 20b: Horizontal Air Handling Unit Dimensions (With Special Filter)

Model	A	B	H	W	Weight (kg)	
					Net	Oper.
SRAH-250	1580	1700	1050	1050	585	625
SRAH-350	1580	1750	1150	1050	685	735
SRAH-500	1680	1900	1250	1250	985	1040
SRAH-700	1770	1950	1400	1500	1080	1140
SRAH-1000	1770	2150	1500	2000	1430	1490
SARH-1250	1770	2350	1700	2000	1655	1725
SRAH-1500	1970	2450	2000	2000	1875	1985
SRAH-1750	2170	2450	2000	2250	2125	2275
SRAH-2000	2170	2700	2100	2500	2500	2670
SRAH-2250	2270	2700	2100	2650	2620	2820
SRAH-2500	2130	2340	2220	3200	3350	3560
SRAH-3000	1970	2450	2000	4000	3750	3970
SRAH-3500	2170	2450	2000	4500	4250	4550
SRAH-4000	2170	2700	2100	5000	5000	5340
SRAH-4500	2270	2700	2100	5300	5240	5640

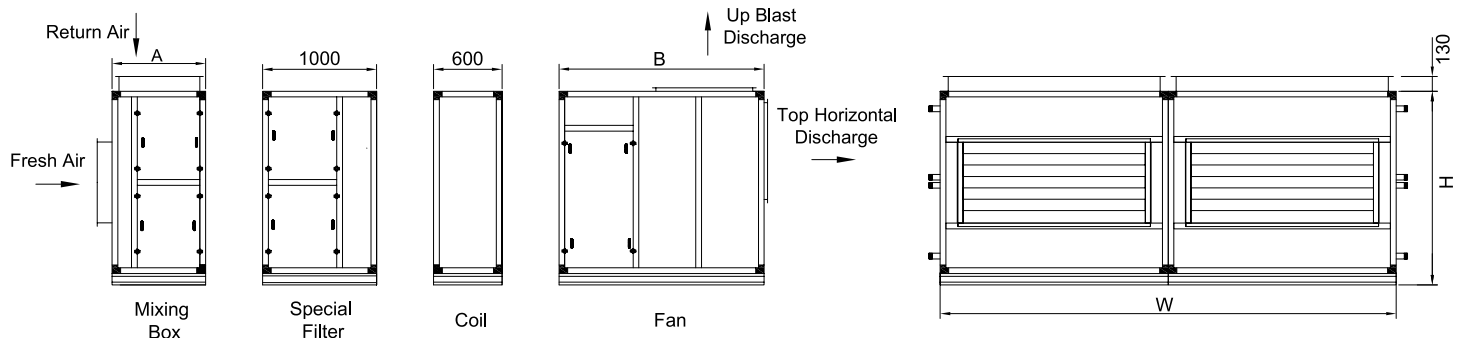
NOTE

- All dimensions are in mm.
- Weights are based on default air handling unit equipment.

Dimensions (Cont.)



Models:250~2250



Models:2500~4500

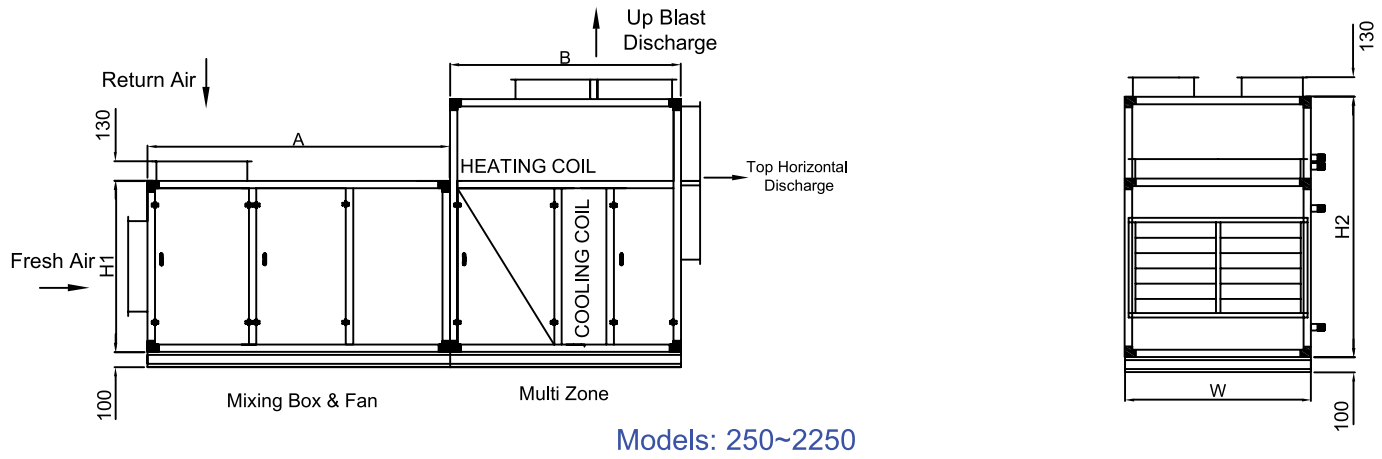
Table 21: Horizontal Sectional Air Handling Unit Dimensions

Model	A	B	H	W	Weight (kg)	
					Net	Oper.
SRAH-250	630	1150	1050	1050	600	640
SRAH-350	630	1200	1150	1050	700	750
SRAH-500	730	1350	1250	1250	1000	1055
SRAH-700	820	1400	1400	1500	1100	1160
SRAH-1000	820	1600	1500	2000	1450	1510
SARH-1250	820	1800	1700	2000	1680	1750
SRAH-1500	1020	1900	2000	2000	1900	2010
SRAH-1750	1220	1900	2000	2250	2150	2300
SRAH-2000	1220	2150	2100	2500	2530	2700
SRAH-2250	1320	2150	2100	2650	2650	2850
SRAH-2500	1160	1700	2220	3200	3400	3610
SRAH-3000	1020	1900	2000	4000	3800	4020
SRAH-3500	1220	1900	2000	4500	4300	4600
SRAH-4000	1220	2150	2100	5000	5060	5400
SRAH-4500	1320	2150	2100	5300	5300	5700

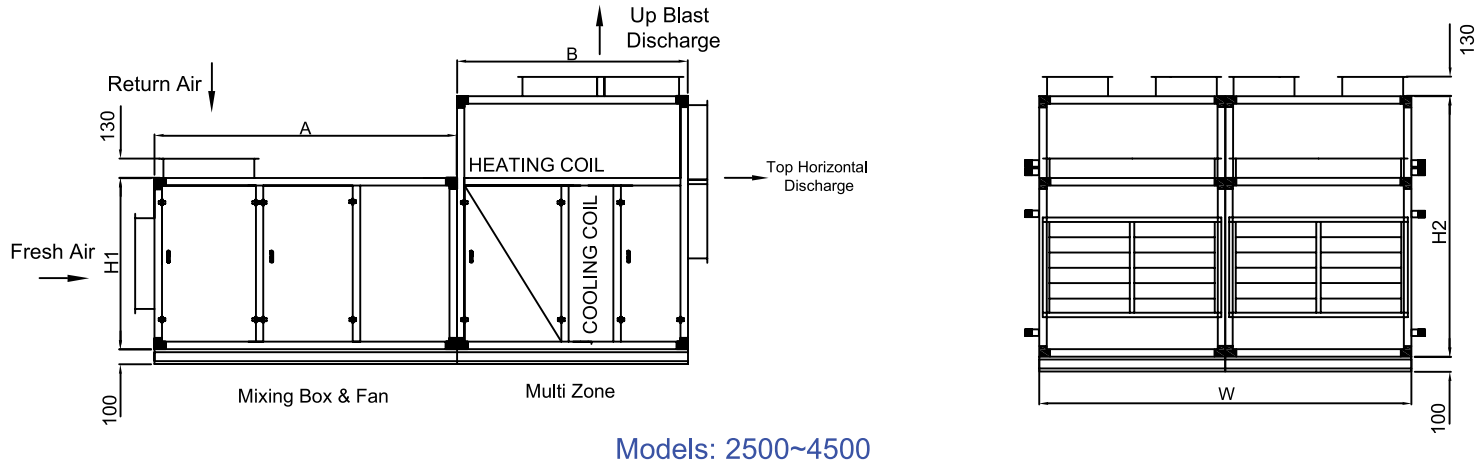
NOTE

- All dimensions are in mm.
- Weights are based on default air handling unit equipment.

Dimensions (Cont.)



Models: 250~2250



Models: 2500~4500

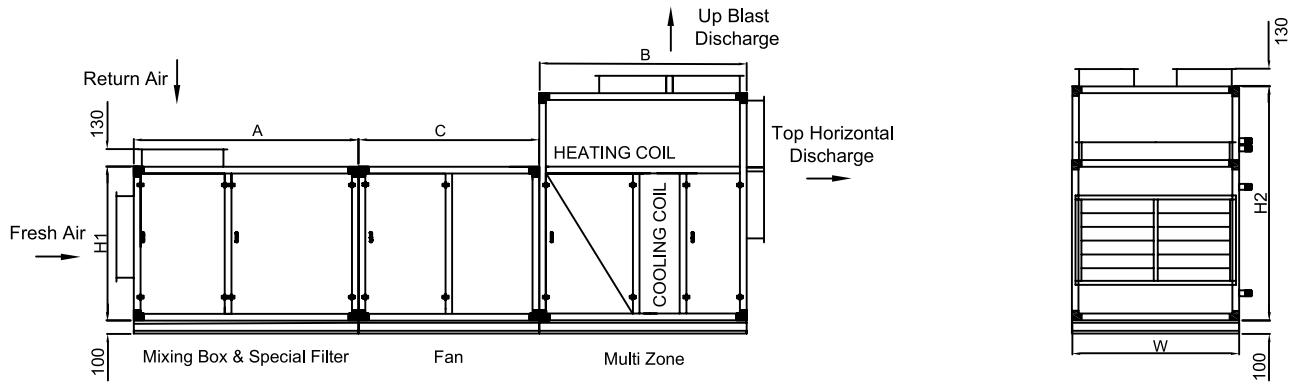
Table 22a: Multi Zone Air Handling Unit Dimensions

Model	A	B	H1	H2	W	Weight (kg)	
						Net	Oper.
SRAH-250	1730	1400	950	1500	1050	667	693
SRAH-350	1780	1500	1050	1600	1050	766	802
SRAH-500	2030	1550	1150	1700	1250	1039	1089
SRAH-700	2170	1700	1300	1900	1500	1136	1205
SRAH-1000	2370	1700	1400	2000	2000	1500	1598
SARH-1250	2570	2000	1600	2200	2000	1801	1926
SRAH-1500	2870	2250	1900	2550	2000	2106	2255
SRAH-1750	3070	2300	1900	2550	2250	2357	2526
SRAH-2000	3320	2300	2000	2600	2500	2747	2943
SRAH-2250	3420	2300	2000	2600	2650	2987	3195
SRAH-2500	2570	2000	1600	2200	4000	3602	3852
SRAH-3000	2870	2250	1900	2550	4000	4212	4510
SRAH-3500	3070	2300	1900	2550	4500	4714	5052
SRAH-4000	3320	2300	2000	2600	5000	5494	5886
SRAH-4500	3420	2300	2000	2600	5300	5974	6390

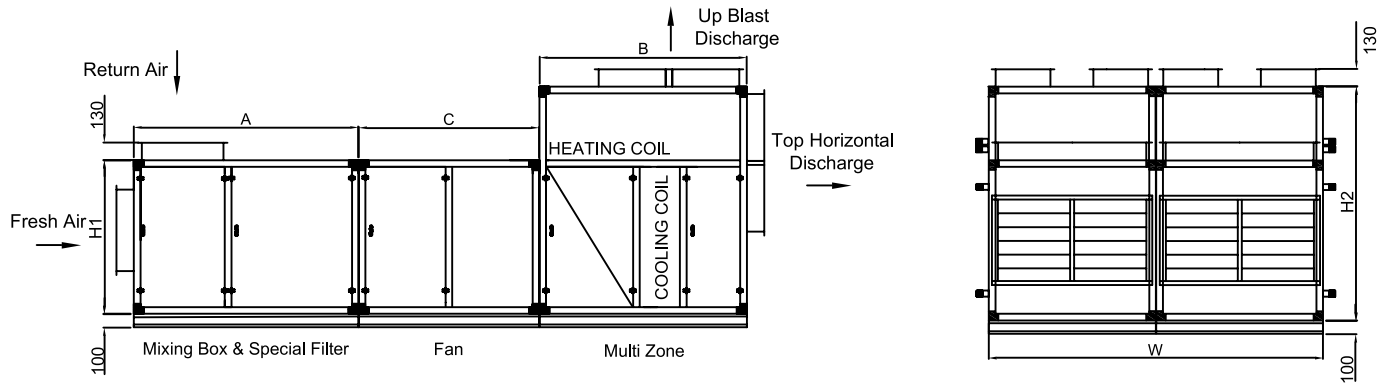
NOTE

- All dimension are in mm
- Weights are based on default air handing unit equipment.

Dimensions (Cont.)



Models: 250~2250



Models: 2500~4500

Table 22b: Multi Zone Air Handling Unit Dimensions (With Special Filter)

Model	A	B	C	H1	H2	W	Weight (kg)	
							Net	Oper.
SRAH-250	1580	1400	1150	950	1500	1050	765	791
SRAH-350	1580	1500	1200	1050	1600	1050	875	925
SRAH-500	1680	1550	1350	1150	1700	1250	1193	1248
SRAH-700	1770	1700	1400	1300	1900	1500	1301	1361
SRAH-1000	1770	1700	1600	1400	2000	2000	1709	1769
SARH-1250	1770	2000	1800	1600	2200	2000	2017	2087
SRAH-1500	1970	2250	1900	1900	2550	2000	2346	2456
SRAH-1750	2170	2300	1900	1900	2550	2250	2623	2773
SRAH-2000	2170	2300	2150	2000	2600	2500	2993	3191
SRAH-2250	2270	2300	2150	2000	2600	2650	3249	3449
SRAH-2500	1770	2000	1800	1600	2200	4000	4034	4174
SRAH-3000	1970	2250	1900	1900	2550	4000	4692	4912
SRAH-3500	2170	2300	1900	1900	2550	4500	5246	5546
SRAH-4000	2170	2300	2150	2000	2600	5000	5986	6382
SRAH-4500	2270	2300	2150	2000	2600	5300	6498	6898

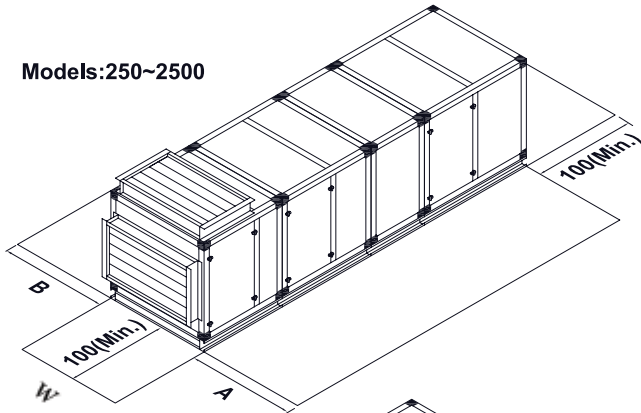
NOTE

- All dimensions are in mm.
- Weights are based on default air handling unit equipment.

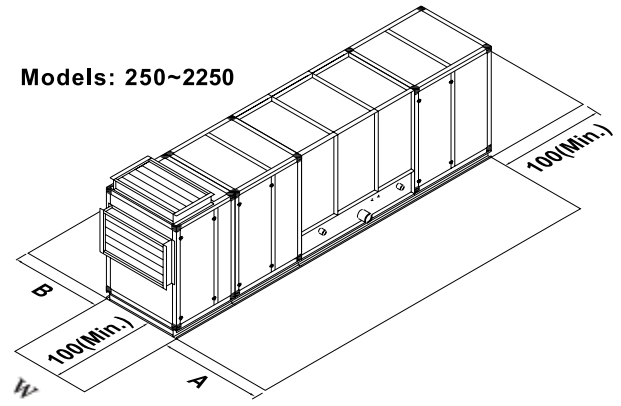
Single Zone - Horizontal

Air Washer

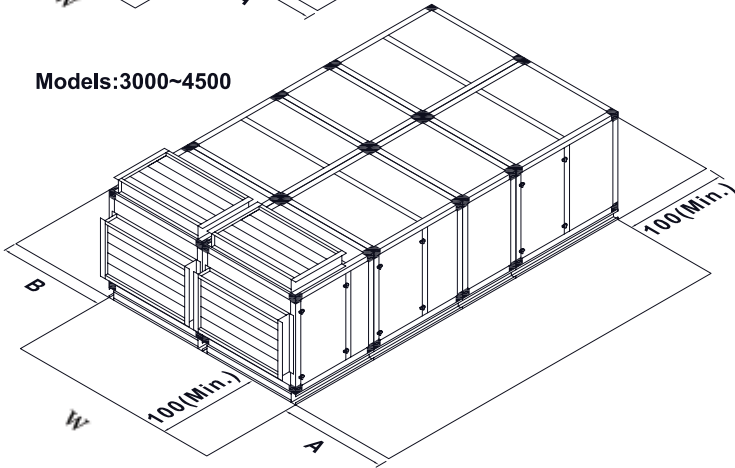
Models: 250~2500



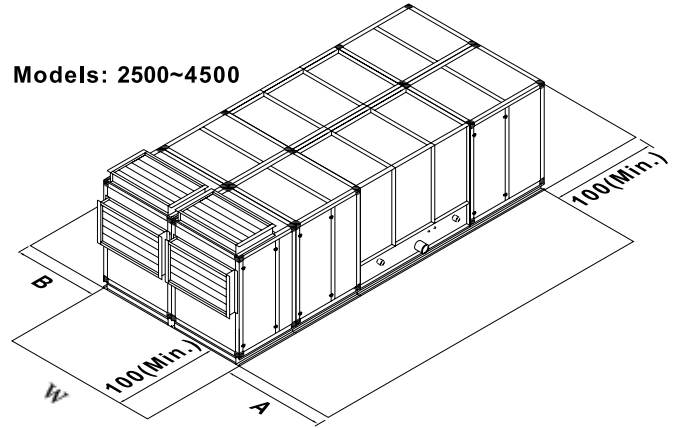
Models: 250~2250



Models: 3000~4500

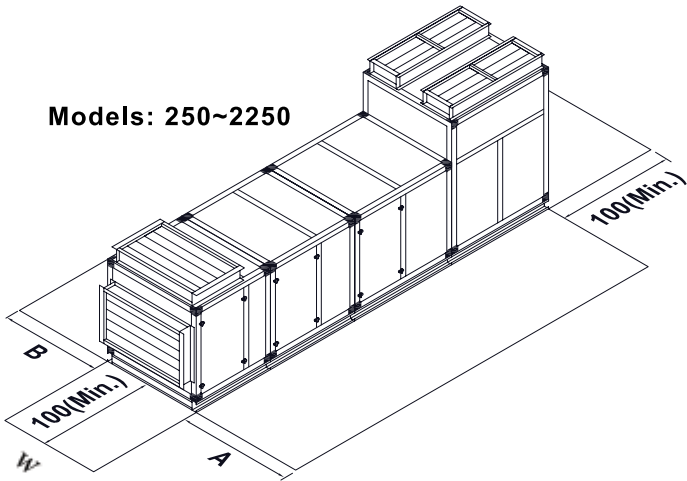


Models: 2500~4500



Multi Zone

Models: 250~2250



Models: 2500~4500

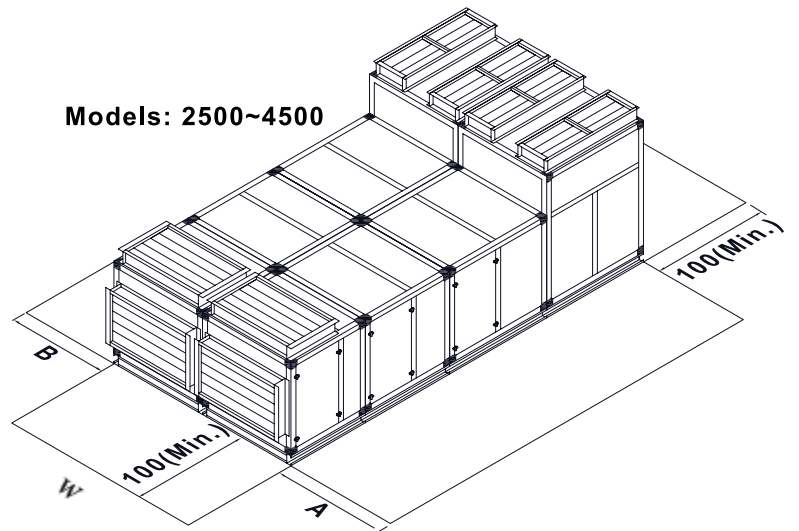


Table 23

	250	350	500	750	1000	1250	1500	1750	2000	2250	2500	3000	3500	4000	4500
A	70	70	80	80	100	100	100	100	120	120	W/2	W/2	W/2	W/2	W/2
B	W	W	W	W	W	W	W	W	W	W	W	W/2	W/2	W/2	W/2

NOTE

- All dimensions are in cm.
- W: Air Handling Unit Width
- Only left-handed connections are shown.

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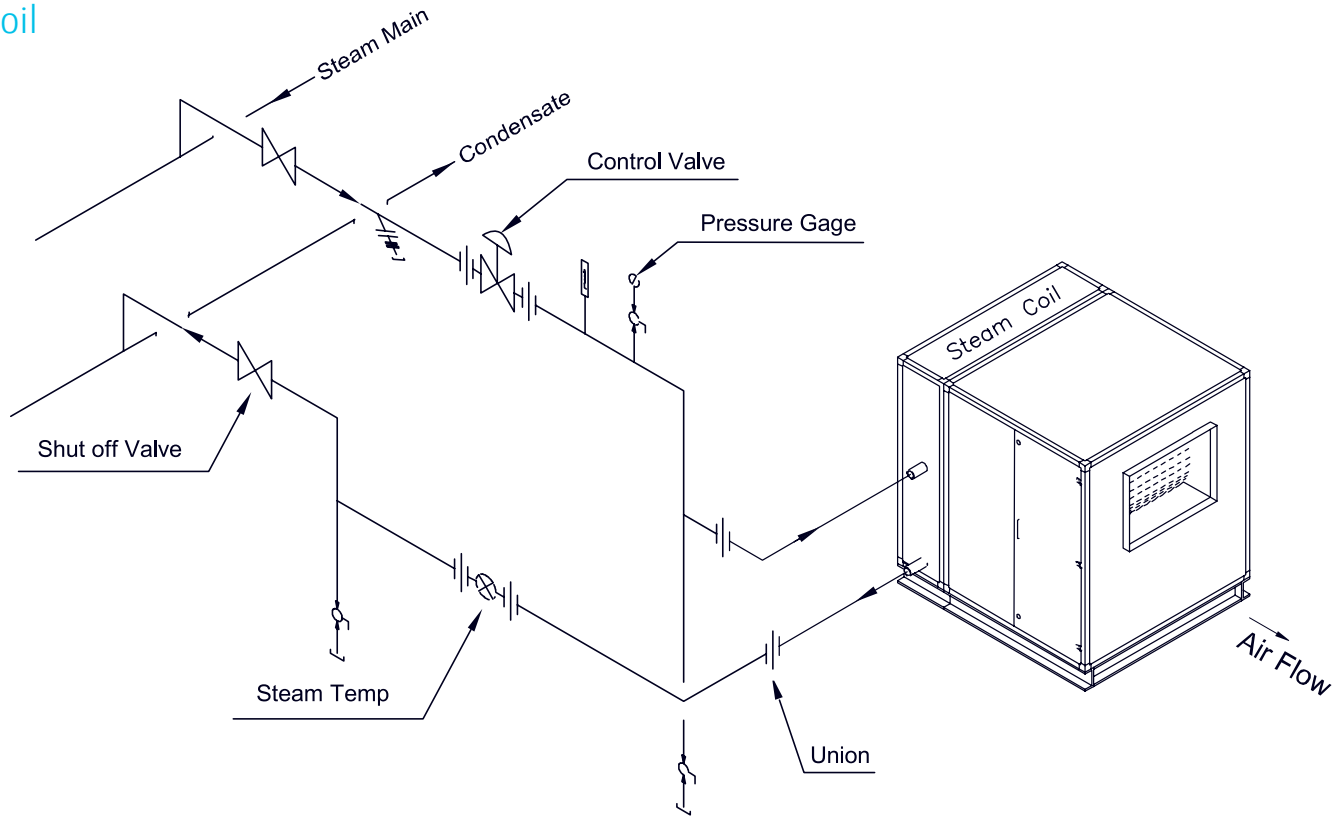
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تهران، کیلومتر ۲۱ بزرگراه لشگری (جاده مخصوص کرج)

روبروی پالایشگاه نفت پارس، پلاک ۱۲

Recommended Piping Details

Steam Coil



Heating and Cooling Coil

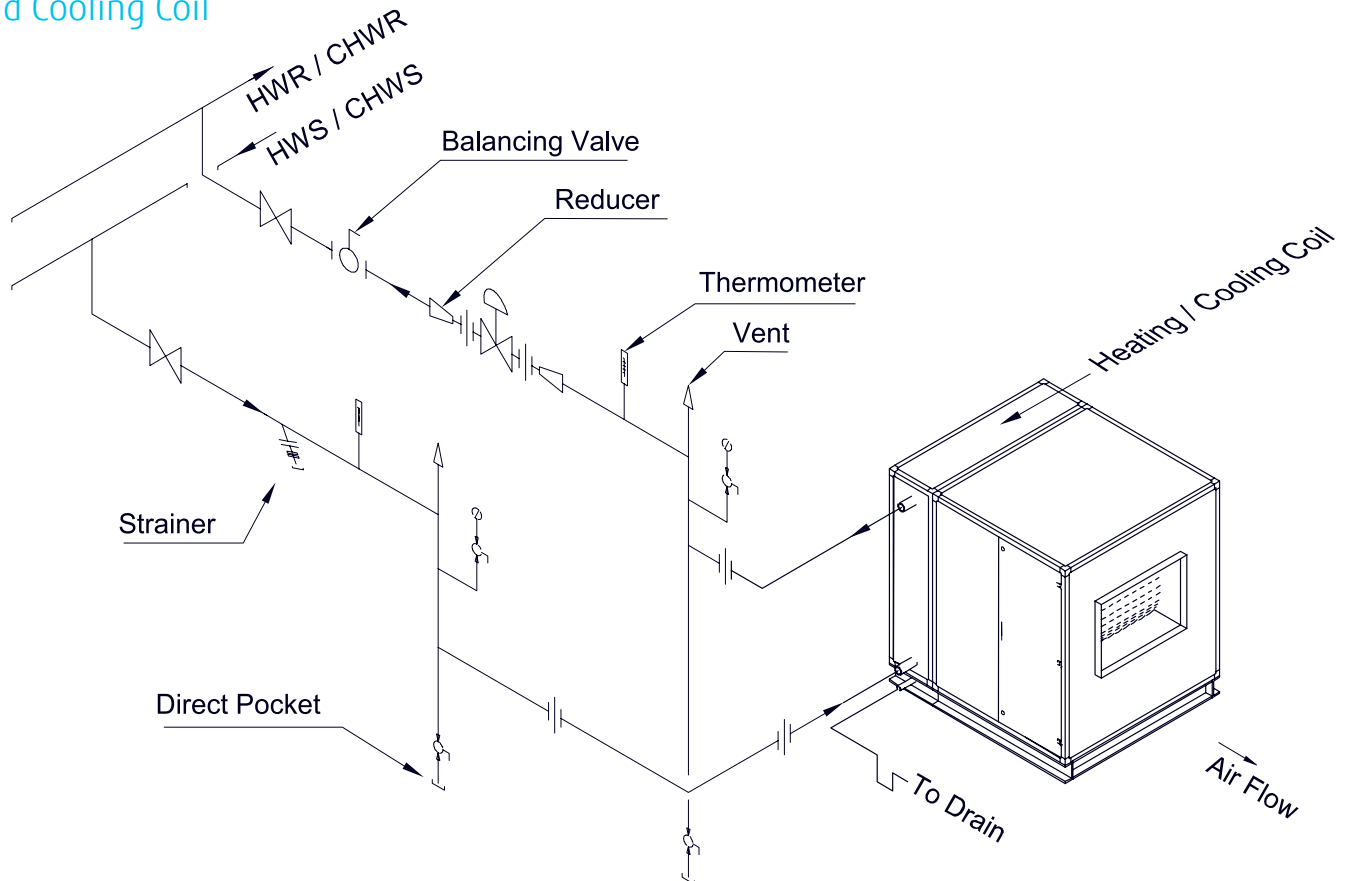


Table 24: Enthalpy / Altitude

Air Wet Bulb Temperature (°F)	Attitude (Ft)					
	0	1000	2000	3000	4000	5000
	Enthalpy (BTU/Lb)					
35	13.0	13.2	13.3	13.5	13.7	13.9
36	13.4	13.5	13.8	14.0	14.2	14.5
37	13.9	14.0	14.3	14.4	14.7	14.8
38	14.2	14.5	14.7	15.0	15.1	15.3
39	14.8	15.0	15.2	15.4	15.6	15.9
40	15.2	15.4	15.7	15.9	16.2	16.4
41	15.7	15.9	16.1	16.4	16.6	16.8
42	16.2	16.4	16.6	16.9	17.2	17.4
43	16.6	16.9	17.1	17.4	17.6	18.0
44	17.2	17.4	17.6	17.9	18.2	18.5
45	17.7	17.9	18.2	18.4	18.7	19.0
46	18.2	18.4	18.7	19.0	19.3	19.6
47	18.7	18.9	19.3	19.5	19.8	20.2
48	19.2	19.5	19.8	20.0	20.4	20.8
49	19.7	20.0	20.4	20.6	21.0	21.3
50	20.3	20.6	20.9	21.2	21.6	22.3
51	20.9	21.2	21.5	21.8	22.2	22.6
52	21.4	21.7	22.1	22.5	22.8	23.2
53	22.0	22.4	22.7	23.1	23.5	24.0
54	22.6	23.0	23.4	23.8	24.1	24.6
55	23.2	23.6	24.0	24.4	24.8	25.3
56	23.8	24.2	24.6	25.0	25.5	25.9
57	24.4	24.8	25.3	25.8	26.2	26.7
58	25.2	25.5	25.9	26.4	26.9	27.4
59	25.8	26.2	26.7	27.2	27.6	28.2
60	26.5	26.9	27.4	27.8	28.4	28.9
61	27.2	27.6	28.1	28.6	29.2	29.7
62	27.9	28.3	28.9	29.4	29.9	30.5
63	28.5	29.0	29.6	30.2	30.7	31.4
64	29.3	29.8	30.3	31.0	31.6	32.2
65	30.1	30.6	31.2	31.7	32.3	33.0
66	30.8	31.4	32.0	32.6	33.3	33.9
67	31.6	32.2	32.8	33.5	34.1	34.8
68	32.4	33.0	33.7	34.3	35.0	35.8
69	33.2	33.9	34.5	35.3	35.9	36.7
70	34.0	34.7	35.4	36.1	36.9	37.6
71	34.9	35.6	36.3	37.0	37.9	38.6
72	35.8	36.5	37.3	38.0	38.8	39.7
73	36.7	37.5	38.2	39.0	39.9	40.7
74	37.6	38.4	39.2	40.0	40.9	41.8
75	38.6	39.4	40.2	41.0	42.0	42.9
76	39.6	40.3	41.2	42.1	43.0	44.0
77	40.6	41.4	42.3	43.2	44.2	45.2
78	41.5	42.5	43.4	44.3	45.3	46.4
79	42.6	43.5	44.5	45.5	46.5	47.5
80	43.7	44.6	45.6	46.6	47.6	48.8
81	44.8	45.8	46.7	47.8	48.8	50.0
82	45.9	46.9	48.0	49.0	50.3	51.4

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روبروی پالایشگاه نفت پارس، پلاک ۱۲



APPENDIX 1 - Saran Air Washer

Air washer, as their name implies, not only remove dust and dirt from the air, but also perform necessary heat transfer functions such as humidification and cooling.

Saran air washers basically consist of a casing containing a spray system. A tank at the bottom for collecting the spray water, and an eliminator section at the leaving end of the unit for the removal of water droplets entrained in the air. Air is drawn into the air washer casing through entry louvers, which smooth out the air flow and, at the same time, prevent any backlash of spray water from falling outside the unit. Water sprays covering the entire area of the unit wash of air clean of dust, dirt and fumes. The cleaned air then passes through the eliminators which trap the droplet of moisture carried over from the spray system.

Saran air washer are available in the three different classes (4, 6 and 8) to meet the need of industry to clean humidity air.

Class 4:

A compact and economical single spray bank air washer specially designed for effective humidifying and air washing purposes.

Class 6:

A single spray bank unit for medium capacity applications, the ideal air washer for most types evaporative cooling and air washing tasks.

Class 8:

A highly efficient heavy duty unit with two spray banks used whenever the utmost in heat transfer, humidification or air cleaning is required.

In all classes, casing are constructed of galvanized steel sheet and braced with galvanized steel angle with all joints and angle braces riveted to prevent water leakage. Entry and leaving end of the air washer have a flanges with holes ready drilled suitable for air handling unit sections.

Tanks are 300 mm deep for class 4 and 400 mm deep for class 6&8 and are heavily coated with anti-corrosion coat. A quick fill connection varying from 3/4" to 1", depending upon the size of the air washer, is provided for connection to fresh water supply. A make-up water connection with an automatic float valve is also provided to maintain a suitable level of water in the tank. All air washer are furnished complete with over flow and overflow line. An access door and frame made galvanized steel is provided on all air washers and each door has a glass inception window.



APPENDIX 1 - Saran Air Washer (Cont.)

Table 25: Air Washers Engineering Data

Model	Nominal Air Flow Rate (CFM)	Face Area (Sq.Ft)	Water Flow Rate (GPM)			Connection Sizes (Inch)					
			Class 4	Class 6	Class 8	Class 4			Class 6 & 8		
						Make Up	Quick Fill	Over Flow	Make Up	Quick Fill	Over Flow
250	2500	5.4	11	15	22	1/2	1/2	1	1/2	1/2	1
350	3500	6.6	15	22	30	1/2	1/2	1	1/2	1/2	1
500	5000	9.4	24	35	48	1/2	1/2	1	1/2	1/2	1
700	7000	13.4	35	46	70	1/2	1/2	1	3/4	3/4	1
1000	10000	19.6	44	62	97	1/2	1/2	2	3/4	3/4	2
1250	12500	24.4	59	79	119	3/4	3/4	2	3/4	3/4	2
1500	15000	29.3	63	95	127	3/4	3/4	2	3/4	3/4	2
1750	17500	34.4	70	101	143	3/4	3/4	2	3/4	3/4	2
2000	20000	39.6	79	119	158	3/4	3/4	2	3/4	3/4	2
2250	22500	43.2	97	143	191	3/4	3/4	2	1	1	2
2500	25000	46.0	119	158	238	2 × 3/4	2 × 3/4	2 × 2	2 × 3/4	2 × 3/4	2 × 2
3000	30000	55.3	126	190	254	2 × 3/4	2 × 3/4	2 × 2	2 × 3/4	2 × 3/4	2 × 2
3500	35000	65.3	140	202	286	2 × 3/4	2 × 3/4	2 × 2	2 × 3/4	2 × 3/4	2 × 2
4000	40000	75.7	158	238	316	2 × 3/4	2 × 3/4	2 × 2	2 × 3/4	2 × 3/4	2 × 2
4500	45000	82.8	194	286	382	2 × 3/4	2 × 3/4	2 × 2	2 × 1	2 × 1	2 × 2

Table 26: Air Washer Evaporative Cooling Efficiency

Air Handling Unit Model	Air Washer Class	Air Face Velocity (FPM)			
		450	500	550	600
250 , 350, 500	Class 4	0.59	0.56	0.52	-
	Class 6	0.65	0.65	0.64	0.63
	Class 8	0.88	0.87	0.86	0.85
700, 1000, 1250, 2500	Class 4	0.59	0.56	0.52	-
	Class 6	0.67	0.66	0.65	0.64
	Class 8	0.91	0.9	0.89	0.87
1500, 1750, 2000, 2250, 3000, 3500, 4000, 4500	Class 4	0.59	0.56	0.52	-
	Class 6	0.70	0.69	0.68	0.67
	Class 8	0.94	0.93	0.92	0.90

Table 27: Air Density Correction Factors

Altitude (ft)	0	1000	2000	3000	4000	5000	6000
Air Density Factor	1	0.9702	0.9414	0.9133	0.8862	0.8598	0.8342



APPENDIX 1- Saran Air Washer (Cont.)

Air Washer Selection Example:

Given:

Required Air Flow Rate: 10000 CFM

Ambient Altitude: Sea level

Required Sensible Cooling Load: 270,000 Btu/hr

Entering Air Temperature: 95°F DB / 63°F WB

Step1: Appropriate Air Handling Unit Model Selection

Considering the required airflow rate, we select SRAH-1000 from air handling unit models.

Step2: Air Washer Efficiency Calculation

For Air Washer model selection, in first, we need to calculate required air washer efficiency (evaporative cooling efficiency), so we have:

$$\text{Leaving Air DB Temp.} = \text{Entering Air DB Temp.} - \frac{\text{Sensible Cooling Load (Btu/hr)}}{1.085 \times \text{Air Density Factor (Table 27)} \times \text{Air Flow Rate (CFM)}}$$

$$\text{Leaving Air DB Temp.} = 95 - \frac{270000}{1.08 \times 10000} = 70 \text{ } ^\circ\text{F}$$

$$\text{Air Washer Efficiency} = \frac{\text{Entering Air DB Temp.} - \text{Leaving Air DB Temp.}}{\text{Entering Air DB Temp.} - \text{Entering Air WB Temp.}} = \frac{95 - 70}{95 - 63} = 0.78$$

Step3: Air Washer Model Selection

In this step, we select appropriate air washer based on calculated air washer efficiency in pervious step, so in first, we need to calculate air face velocity based following formula:

$$\text{Face Velocity} = \frac{\text{Air Flow Rate (CFM)}}{\text{Coil Face Area (Sq Ft)}} = \frac{10000}{19.6} = 510 \text{ FPM}$$

Then, by referring to table 26, we can see evaporative cooling efficiency of class 8 air washer in calculated face velocity is 0.898, therefore, this model satisfies our requirement.

Actual leaving air temperature and sensible cooling load based on selected air washer will be:

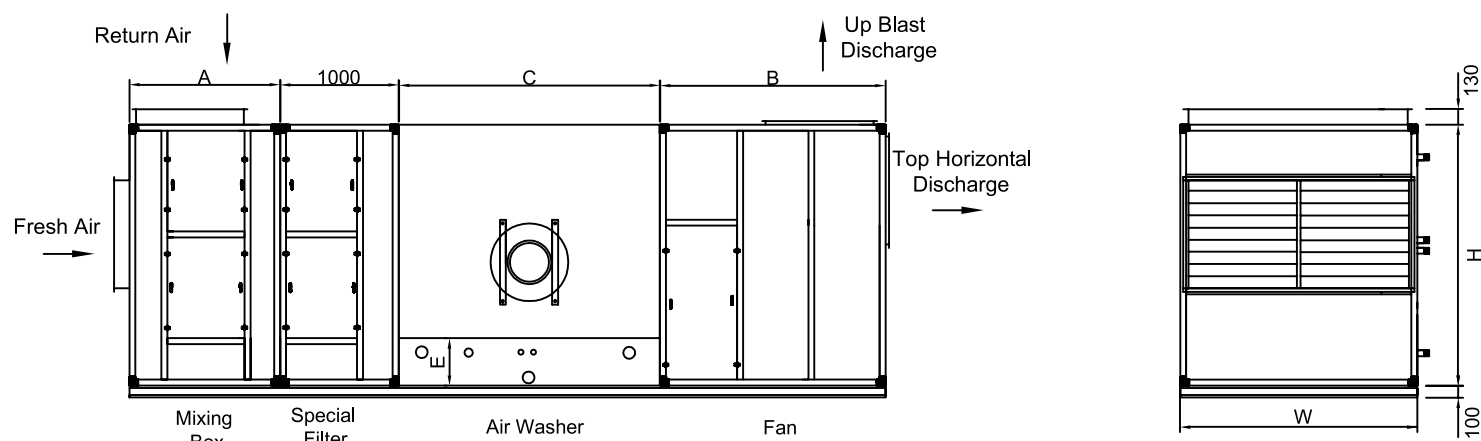
$$\text{Leaving Air DB Temp.} = \text{Entering Air DB Temp.} - \text{Air washer efficiency} \times (\text{Entering Air DB Temp.} - \text{Entering Air WB Temp.})$$

$$\text{Leaving Air DB Temp.} = 95 - 0.898 \times (95 - 63) = 66.3 \text{ } ^\circ\text{F}$$

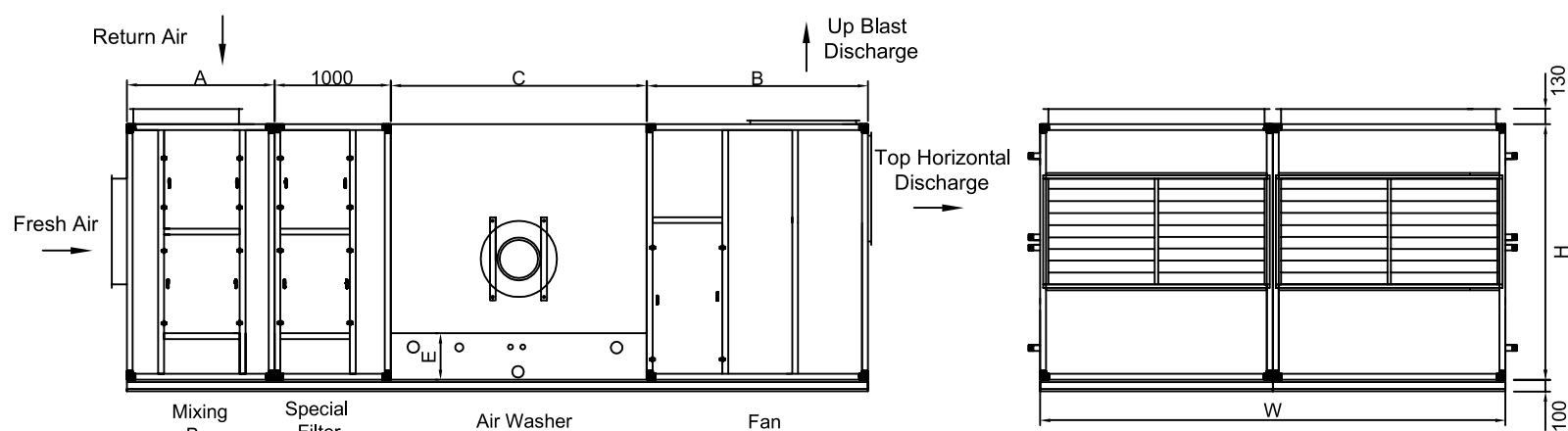
$$\text{Sensible cooling load} = 1.085 \times \text{Air Density factor (Table 27)} \times \text{Air Flow Rate (CFM)} \times (\text{Entering Air DB Temp.} - \text{Leaving Air DB Temp.})$$

$$\text{Sensible cooling load} = 1.085 \times 10000 \times (95 - 66.3) = 309960 \text{ Btu/hr}$$

APPENDIX 1 - Saran Air Washer (Cont.)



Models: 250~2250



Models: 2500~4500

Table 28: Air Washer Dimensions

Model	A	B	C			E			H			W	Weight (kg)	
			Class 4	Class 6	Class 8	Class 4	Class 6	Class 8	Class 4	Class 6	Class 8		Net	Oper.
250	880	1150	1000	1750	2200	300	400	400	1120	1220	1220	1050	1050	2120
350	880	1200	1000	1750	2200	300	400	400	1260	1360	1360	1050	1192	2250
500	980	1350	1000	1750	2200	300	400	400	1190	1290	1290	1500	1442	2650
700	1070	1400	1000	1750	2200	300	400	400	1490	1590	1590	1500	1593	2793
1000	1070	1600	1000	1750	2200	300	400	400	1500	1600	1600	2000	1908	3446
1250	1070	1800	1000	1750	2200	300	400	400	1830	1930	1930	2000	2150	3651
1500	1270	1900	1000	1750	2200	300	400	400	2100	2200	2200	2000	2457	4212
1750	1470	1900	1000	1750	2200	300	400	400	2130	2230	2230	2250	2630	4452
2000	1470	2150	1000	1750	2200	300	400	400	2160	2260	2260	2500	3429	4933
2250	1570	2150	1000	1750	2200	300	400	400	2200	2300	2300	2650	3550	5650
2500	1070	1800	1000	1750	2200	300	400	400	1830	1930	1930	4000	4302	7302
3000	1270	1900	1000	1750	2200	300	400	400	2100	2200	2200	4000	4914	8424
3500	1470	1900	1000	1750	2200	300	400	400	2130	2230	2230	4500	5260	8904
4000	1470	2150	1000	1750	2200	300	400	400	2160	2260	2260	5000	6859	9867
4500	1570	2150	1000	1750	2200	300	400	400	2200	2300	2300	5300	7100	11300

NOTE

- All dimensions are in mm.
- Weights are based on default air washer equipment.



APPENDIX 2 - Air Filters Types and Classification

Aluminum Washable Filters

The Metal Washable Panel Air Filter is a coarse filter suitable for ventilation and air conditioning systems, where clean ability is required and low efficiency filtration can be accepted. Washable air filter is suitable for use at higher air velocities, and hence when dealing with large air volumes. The metal washable panel filter is noncombustible and is therefore especially suited to applications where fire is a potential hazard.

As standard, Saran Air handling units equipped with Aluminum washable filters, which the air filtration media is crimped aluminum knitted wire mesh and enclosed in either a galvanized channel frame (Aluminum and stainless steel frame available upon request). Stainless steel metal washable air filters are also available in a grid mesh style filter or alternatively panels with galvanized media with stainless steel frames, to offer a long lasting product resistant to harsh atmospheres.

Pleated Panel Filters

The Pleated Panel Air Filter is a medium efficiency disposable air filter, suitable for ventilation and air conditioning systems which require a higher efficiency and greater dust holding capacity than can be achieved with glass or synthetic panels. The EU4 filter can be used where glass panels are undesirable, such as in the food industry and hospitals. Typically EU4 panel filters are used as pre filters on supply air systems to High Performance Bag Filters, or to protect heating or cooling coils from dust build up which leads to system inefficiency. Generally, Pleated filters used in class range of EU3 to EU5.

Bag Filters

The Multi-Pocket Bag Filter is a high efficiency filter and is designed for a wide range of air conditioning and general ventilation applications where large volumes of air are to be handled, and systems dictate high dust holding capacity, coupled with a low resistance.

High performance bag filters are available in five efficiency grades, which gives a choice of characteristics to meet customer requirements for dust holding capacity, efficiencies and pressure loss. Generally, Bag filters used in class range of EU6 to EU9.

V-Cell Compact Filters

V-Cell Compact Filters have all features of bag filters but The V-Cell allowing a high filtering flow in relation to the front surface area.

This equipment has the following advantages:

- Solid, sturdy construction for fast, easy installation.
- Compact, reduced-volume design.

Generally, V-Cell Compact Filters used in class range of EU6 to EU9.

HEPA and ULPA Filters

HEPA Filters are installed where the highest level of air filtration is required in applications such as clean rooms, operating theatres, research facilities, the electronics industries, nuclear and pharmaceutical industries.

The filtration medium is provided by microfine glass fibers formed into a paper-like surface, supplied in various grades depending upon filtration efficiency required. The filter paper is formed into a close pleated package to provide a large surface area. Generally, V-Cell Compact Filters used in class range of EU10 to EU14.

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APPENDIX 2 - Air Filters Types and Classification (Cont.)

Table 29: Classification of coarse and fine filters according to CEN EN 779 and EU 4/5

Type of filter	Particle Size, μm	CEN EN 779 Efficiency Class	Average Arrestance With Synthetic Dust ($A_m\%$)	Average Opacimetric Efficiency ($E_m\%$)	Final Pressure drop (Pa)	Eurovent 4/5 Efficiency Class
Coarse Filters	$> 10 \mu\text{m}$	G1	$A_m < 65$	-	250	EU1
		G2	$65 \leq A_m < 80$	-	250	EU2
	$3.0-10 \mu\text{m}$	G3	$80 \leq A_m < 90$	-	250	EU3
		G4	$90 \leq A_m$	-	250	EU4
Fine Filters	$1.0 - 3.0 \mu\text{m}$	F5	-	$40 \leq E_m < 60$	450	EU5
		F6	-	$60 \leq E_m < 80$	450	EU6
	$0.3-1.0 \mu\text{m}$	F7	-	$80 \leq E_m < 90$	450	EU7
		F8	-	$90 \leq E_m < 95$	450	EU8
		F9	-	$95 \leq E_m$	450	EU9

Table 30 : Classifications of HEPA and ULPA filters according to EN 1822 and EUROVENT 4/4

Type of Filter	Particle Size, μm	EN 1822			EUROVENT 4/4	
		Efficiency Class	Global MPPS Efficiency	Punctual Efficiency Localized Drop	Filter Class	Efficiency @ $0.3 \mu\text{m}$ (NaCl)
HEPA Filters	$0.3-1.0 \mu\text{m}$	H10	$85 \leq E$	-	EU10	$95 \leq E < 99.9$
	$< 0.3 \mu\text{m}$	H11	$95 \leq E$	-	EU11	$99.9 \leq E < 99.97$
		H12	$99.5 \leq E$	-	EU12	$99.97 \leq E < 99.99$
		H13	$99.95 \leq E$	99.75	EU13	$99.99 \leq E < 99.999$
		H14	$99.995 \leq E$	99.975	EU14	$99.999 \leq E$
ULPA Filters	$0.2-0.1 \mu\text{m}$	U15	$99.9995 \leq E$	99.9975	EU15	-
		U16	$99.99995 \leq E$	99.99975	EU16	-
		U17	$99.999995 \leq E$	99.9999	EU17	-