SWIMPOOL

Bulletin # 006/2005

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SKM

اجهـزة تكييف هـواء

AIR-CONDITIONING EQUIPMENT

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This manual has been prepared to assist the mechanical engineer in the design and selection of the mechanical systems for enclosed swimming pools. Complete performance data on SKM SwimPool units is provided along with fan and electrical data, model information and design guidelines.

For further assistance, your SKM representative will be happy to provide you with computerized equipment selections.

AIR-CONDITIONING EQUIPMENT

Built in the Gulf ... for the world

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Nomenclature

SPA 80 2 6 X

- SPA: SP - SwimPool Basic Unit w/out remote condenser; SPA - SwimPool with auxiliary air cooled condenser; SPW - SwimPool with auxiliary water cooled condenser
- 80: Model Code
- 2: No. of Ref. Circuits
- 6: No. of rows of dehumidification coil
- X: Power Supply Code
  Y : 380V-415V/3Ph/50Hz ; P :440V/3Ph/50Hz
  R : 380V/3Ph/60Hz ; E : 460V-480V/3Ph/60Hz
  T : 220-230V/3Ph/60Hz

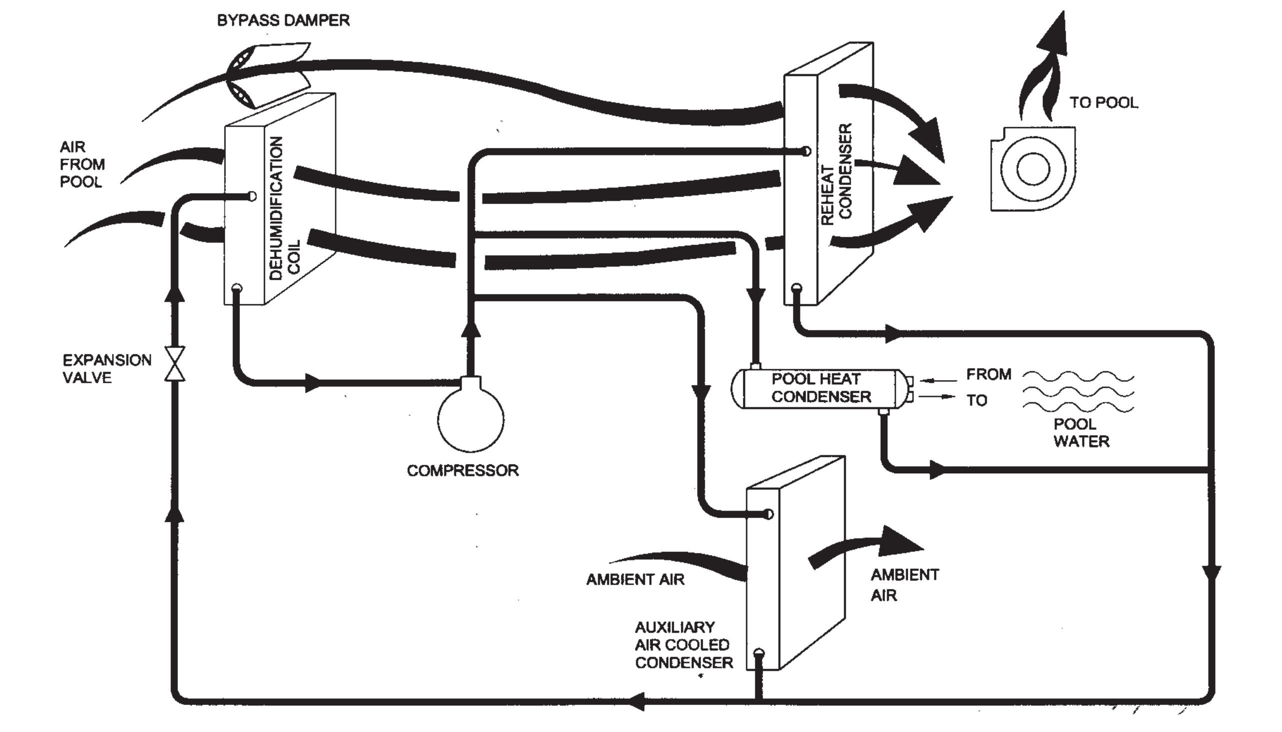
SwimPool Is The Answer

SwimPool has been developed for indoor swimming pool dehumidification with an eye towards controlling costs, both in terms of minimizing energy usage and preventing future building maintenance problems. The SwimPool concept combines the principles of mechanical dehumidification and the heat pump, substantially reducing energy costs. Its main duty will be to dehumidify and reclaim that very large amount of latent heat that normally would be wasted. Because the mechanical dehumidification equipment is basically a specialized airconditioner, it is possible to cool the space for a modest cost increase.*SKM builds everything in one package, providing an economical method for controlling the pool environment.*

The basic operating principle of the SwimPool is simple. Air is drawn from the pool enclosure through the dehumidification coil where moisture and heat are removed. Condensing the moisture on the coil releases the same amount of heat that was required to evaporate it from the pool surface. This heat is called **latent heat** and is transferred into the evaporating refrigerant. The air which cools during this process releases heat called **sensible heat**, that is also transferred into the evaporating refrigerant. On a well designed system, the latent heat will be approximately the same as sensible heat. When the refrigerant leaves the dehumidification coil, it is completely evaporated into a vapor and drawn into the compressor.

The compressor raises the temperature and pressure of the refrigerant vapor. The energy required to do this is transferred into the refrigerant vapor and is called **compressor heat**. The refrigerant now contains sensible and latent heat from the air and the compressor heat. This combination called the total heat of rejection, is available for pool use.

The high pressure refrigerant then passes to the reheat condenser where it is condensed. The air leaving the dehumidification coil is cold and nearly saturated. It must be heated to atleast the pool air temperature or it will cool the pool air. As the air passes through the reheat condenser where it receives heat from the condensing refrigerant, all of the sensible heat released from the air in the dehumidification process must be returned to the air by the reheat condenser. This brings the air back up to the pool air temperature.



SWIMPOOL POOL DEHUMIDIFIER

After satisfying air pool temperature, the refrigerant is switched to the pool water heat exchanger by a refrigerant diverting valve. Here, heat is transferred back into the pool water. The heat required by the pool is equal to the latent heat removed from the air by the dehumidification coil.

The inexpensive addition of an auxiliary heat rejection condenser and a 3-way diverting valve enables SKM's SwimPool to completely control the swimming pool environment on a year round basis. If the pool air and water require no heating and the space is still in need of dehumidification, the hot gas will be switched to the air cooled condenser and the heat will be rejected to the atmosphere.

SwimPool, in this simple yet effective manner, is the answer to the challenge of indoor swimming pool environmental control.

SKM offers SwimPool in an air-cooled version with remote or built-in condenser. Available in various sizes with nominal capacities ranging from 30 to 248 lb/hr [13.6 to 113 kg/hr] of dehumidification capacity, 50 & 60 Hz power supply. Larger units can be custom designed for special applications.

SKM SwimPool packaged swimming pool environmental control units have been designed from the ground up to meet the demanding conditions of the swimming pool environment. All features required to control and withstand the swimming pool environment are standard in the SwimPool design. Materials, components and finishes have been selected to provide many years of reliable service. Many optional features are also available for the engineer and architect designing a pool to satisfy the needs of their client.

Standard Features

Cabinet

The SwimPool cabinet is, as standard, double walled sandwiched type construction made from heavy gauge hot dip galvanized steel inner & outer skins. The outer skin is made of zinc coated galvanized steel sheets conforming to JIS - G 3302 and ASTM A653 which is phosphatized and then baked with electrostatic powder coat of approximately 60 microns. The finish and coating can pass a 1000 hour in 5% salt spray testing at 95°F (35°C) and 95% relative humidity as per ASTM B 117-95.

Hot dip galvanized inner skin is coated with baked electrostatic powder coating to provide resistance against corrosive chlorinated water environments prevalent in swimming pools. All cold bridges are prevented by proper sealing and insulation between inner and outer skins.

Compressors

Compressors used in SwimPool are fully accessible, semi-hermetic, reciprocating type. They are equipped with an oil sight glass, suction and discharge service valves and crankcase heater.

All compressors are refrigerant gas cooled and equipped with an oil pressure lubrication system. The oil pump working in either direction is protected by an oil screen and a valve provided for the fitting of an oil pressure gauge.

For protection, all compressors are fitted with preset internal relief valve between suction and discharge sides. The compressors are provided with vibration isolator springs under the compressor and therefore external to SwimPool, AVM's may be necessary only for critical applications.

The compressor motors have inherent thermal protection. This is in addition to other standard safety and protection controls. Compressors conform to DIN standards. SKM SwimPool uses the Copeland Discuss® series high efficiency compressors exclusively.

Pool Water Heat Exchanger

SKM SwimPool unit is equipped with copper-nickel shell & tubes pool water heat exchanger sized to transfer the full compressor heat of rejection to the swimming pool water.These heat exchangers are designed and manufactured to SKM's specifications for swimming pool use.

They are designed to give low water and refrigerant side pressure drops while maintaining high heat transfer efficiency. The inlet of each pool water heat exchanger is monitored by a flow switch and pool water sensor. These interface with SwimPool's automatic control system. *Specify option : PWHE*

Heat Transfer Coils

Coils are manufactured from seamless copper tubes mechanically bonded to Pre-Coated aluminium fins to ensure optimum heat transfer. Coils are hydraulically tested in water bed, dip cleaned and spray coated with protective coating to resist corrosive chlorinated swimming pool environments. The cross wave fins and staggered tube design uses the surface effectively by creating uniform air turbulence and optimum heat transfer over the entire finned surface.

The dehumidification coil is equipped with a manually adjusted bypass damper. This allows the proper evaporator air flow to be adjusted for various system air flow requirements. The coil air flow must be set to the design value to achieve the maximum dehumidification effect.The system air flow can be adjusted with the supply fan pulley to meet the site air flow requirements.
Dehumidification coils are rated in acordance with ARI - 410/91.

Auxiliary Air-Cooled Condenser

SPA models are equipped with an auxiliary air-cooled condenser section to reject compressor heat to the outside air when necessary. A three way valve diverts the hot refrigerant from the reheat air or pool water heat exchanger to the auxiliary condenser. The auxiliary air cooled condenser section consists of a finned tube heat transfer coil(s) with a direct drive propeller type fan(s). The heat transfer coil has the same quality construction as the indoor heat transfer coils, but without coat.

Protective coating can be provided on request. This condenser may be built in, as part of the unit or may be remote to the unit.

Fan Assembly

The supply fan is an efficient, heavy duty forward / backward curved fan wheel made of heavy gauge galvanized steel, coated with polyglycoat as protection against chlorine corrosion. The wheel is mounted on a turned, ground and polished solid steel shaft with self aligning, lubricated for life ball bearings.

The fan and motor assembly are mounted onto a welded structural steel base which is isolated from the unit base with anti vibration mounts.The fan discharge is connected to the duct connector through a reinforced canvas flexible connection which eliminates air leakage and prevents vibration transmission to the unit base.

The fan motor is IP55 protected with sealed and permanently lubricated bearings and fitted with an adjustable Vee - belt sheave.

Refrigeration Piping

The refrigeration circuit piping is fabricated from ACR grade copper piping. Each refrigeration circuit includes removable core filter drier, liquid line solenoid valve, thermostatic expansion valve, shut off valve, sight glass, suction vibration eliminator, discharge vibration eliminator, 3 nos check valves, 2 nos heat reclaim valves, 3/8'' solenoid valve and hot gas muffler. After fabrication, the refrigeration circuit suction line is insulated with 1/2'' (13mm) wall thickness closed cell pipe insulation.

Air Filters

Two inch thick cleanable aluminium filters average rated at 75% dust arrestance efficiency as per ASHRAE Standard 52-76 are supplied.The filters are installed in a flat rack assembled from a 16 gauge galvanized steel holding frame. Two inch thick disposable / pleated filters are available as an option.

Base Frame

The steel channel base is shot blasted before application of primer and a minimum of one coat of rust preventing black enamel. The whole structure comes complete with lifting holes for ease of rigging.

AIR-CONDITIONING EQUIPMENT

Ventilation

An air inlet damper with single detection grill and air filter, and manually adjustable damper is supplied to provide ventilation air into the pool enclosure.

To provide pressure relief for the pool area, an exhaust fan is supplied. A gravity type barometric relief damper and bird screen is mounted to the discharge of the fan.

Standard Controls

All SKM SwimPool units come factory installed with all required safety and operational controls.

Options Available

De-Superheaters

SKM SwimPool units can be equipped with de-superheaters to heat domestic hot water for whirlpools / Spa.

Spectator Ventilation Cycle

Is a low cost energy saving feature available on all SKM SwimPool dehumidifiers. Pools designed for athletic competition often have seating capacity for several hundred spectators. Local building codes and good engineering practices require that outside air be brought in to provide ventilation for spectators. Often the fresh air requirement for spectators is several times that needed for the pool.

Typically, the number of hours that spectators are present in the pool is small (usually less than 1% of the year). It makes sense to reduce the ventilation rate when spectators are not present and increase the rate when they are. SKM's spectator ventilation cycle package gives you the equipment to do just that. *Specify option : SPC*

Unoccupied Period Setback

Another energy saving option available from SKM is the unoccupied period setback control which sets the ventilation rate at zero during unoccupied periods. This control can be interfaced to either the building energy management system or the seven day time clock supplied with the customized remote monitoring panel.
Specify option : UPS

Heating Section

A variety of optional heating sections can be added to the SwimPool unit to provide supplemental heat. These heating options include :

- electric resistance heating *(Option Code : ERH)*
- hot water heating *(Option Code : HWH)*
  (Consult SKM for requirement)

Other Optional Features

Many other optional features are available for SKM SwimPool units, including :

- copper fins for heat transfer coils *(FC)*
- powder coated or anodized aluminium airofoil dampers *(CAFD or AAFD)*
- pressure gauges *(SDG)* for :
  - compressor discharge pressure
  - compressor suction pressure, and
  - compressor oil pressure
- Rainhood for outdoor applications *(ARH)*
- section lights with on/off switches *(BLF)*
- extended lubrication fitting *(LFE)*

If you do not see what you need, contact your SKM representative. SKM has the ability to customize any SwimPool unit to your exact specifications.

Specifications

SwimPool Model			1516	2016	3016	4016	4516	6026	7026	7526	8026	9026
* Pool Area (Approximate)		ft²	700	900	1,400	2,000	2,400	2,900	3,600	3,800	4,000	4,700
		m²	65	84	130	186	223	269	334	353	372	437
Performance (1)	Total Capacity	MBh	122.9	163.5	235.7	349.8	407.1	478.0	568.7	633.5	697.0	803.5
		KW	36.0	47.9	69.1	102.5	119.3	140.1	166.7	185.7	204.3	235.5
	Sensible Capacity	MBh	85.6	114.7	164.8	243.7	283.2	332.3	385.2	435.7	486.2	562.0
		KW	25.1	33.6	48.3	71.4	83.0	97.4	112.9	127.7	142.5	164.7
	Dehumidification Capa	lb/hr	31.4	41.0	59.7	89.2	103.6	123.2	153.6	167.0	173.7	200.6
		Kg/hr	14.3	18.6	27.1	40.5	47.1	56.0	69.8	75.9	79.0	91.2
	Compressor Power Inpu	KW	11.6	15.8	22.6	34.2	41.1	44.6	55.6	62.8	68.5	83.1
	Total Capacity	MBh	135.5	181.5	260.4	387.0	448.9	528.4	628.1	699.6	770.9	885.5
		KW	39.7	53.2	76.3	113.4	131.6	154.9	184.1	205.1	226.0	259.5
	Sensible Capacity	MBh	90.5	121.6	174.4	258.2	299.5	352.1	409.0	461.7	515.0	593.8
		KW	26.5	35.6	51.1	75.7	87.8	103.2	119.9	135.3	150.9	174.0
	Dehumidification Capa	lb/hr	38.1	50.8	72.1	109.7	127.4	154.8	189.3	202.7	215.0	248.6
		Kg/hr	17.3	23.1	32.8	49.9	57.9	70.3	86.0	92.1	97.7	113.0
	Compressor Power Inpu	KW	13.8	18.6	26.8	40.4	48.5	52.7	65.4	73.9	80.9	102.1
Compressor Section	Code	-	D10	D15	D25	D35	D40	D25	D25	D25	D35	D40
			-	-	-	-	-	D25	D35	D40	D35	D40
	Number of Refrigerant Circui	#	1	1	1	1	1	2	2	2	2	2
	Capacity Steps	-	2	2	2	2	2	4	4	4	4	4
Evaporator Section (2)	Dehumidification Coil Area	ft²	6.3	8.4	12.1	18.0	20.6	24.8	27.5	30.8	35.5	40.3
		m²	0.6	0.8	1.1	1.7	1.9	2.3	2.6	2.9	3.3	3.7
	Fan Code	-	315	315	400	500	500	560	630	630	710	710
	Fan Motor Size	KW	3.0	4.0	5.5	7.5	7.5	11.0	11.0	11.0	15.0	15.0
	Nominal Air Flow	cfm	3120	4210	6030	8870	10300	12060	13520	15630	17740	20600
		l/s	1472	1987	2846	4186	4861	5691	6380	7376	8372	9721
Exhaust Fan Section (3)	Fan Code	-	10	10	12	15	15	18	18	18	18	18
	Fan Motor Size	KW	1.1	1.1	1.5	3.0	3.0	3.0	3.0	4.0	5.5	5.5
	Maximum Air Flow Rate	cfm	1500	2000	3000	4500	5000	6000	6500	8000	9000	10000
		l/s	708	944	1416	2124	2360	2831	3067	3775	4247	4719
Reheat Condense	Condenser Coil Area	ft²	8.9	11.3	16.9	24.4	27.5	32.1	35.8	40.1	46.3	52.5
		m²	0.8	1.0	1.6	2.3	2.6	3.0	3.3	3.7	4.3	4.9
Auxiliary Condenser	Coil Area	ft²	12.2	19.4	24.4	36.7	53.3	64.0	64.0	72.0	72.0	96.0
		m²	1.1	1.8	2.3	3.4	5.0	5.9	5.9	6.7	6.7	8.9
	Fan Code / Quantity	-	729 / 1	628 / 2	729 / 2	829 / 2	829 / 3	823 / 4	823 / 4	829 / 4	829 / 4	829 / 6
	Motor Size / Quantity	KW / #	1.1 / 1	0.37 /2	1.1 / 2	1.5 / 2	1.5 / 3	1.5 / 4	1.5 / 4	1.5 / 4	1.5 / 4	1.5 / 6
	Air Flow Rate	cfm	7250	8780	14500	21180	32790	37160	35920	42160	42160	63960
		l/s	3421	4143	6843	9995	15474	17536	16951	19895	19895	30183
	Motor Size / Quantity	KW / #	1.5 / 1	0.55 /2	1.5 / 2	2.2 / 2	2.2 / 3	2.2 / 4	2.2 / 4	2.2 / 4	2.2 / 4	2.2 / 6
	Air Flow Rate	cfm	8520	10660	17040	25640	39660	45240	43760	51040	51040	77460
		l/s	4021	5030	8041	12100	18716	21349	20650	24086	24086	36553
Pool Water Heater (4)	Code	-	C-41	C-65	C-65	C-140	C-140	C-65	C-65	C-65	C-140	C-140
			-	-	-	-	-	C-65	C-140	C-140	C-140	C-140
	Water Pressure Drop (4	ftwg	9.4	6.7	8.4	10.0	15.0	8.4	8.4	8.4	10.0	15.0
		Kpa	28.1	20.0	25.0	29.9	44.8	25.0	25.0	25.0	29.9	44.8
		ftwg	-	-	-	-	-	8.4	10.0	15.0	10.0	15.0
		Kpa	-	-	-	-	-	25.0	29.9	44.8	29.9	44.8
	Water Flow Rate, Total (	Usgpm	30.7	41.2	46.9	88.4	103.7	93.8	135.3	150.6	176.8	207.4
		l/s	1.9	2.6	3.0	5.6	6.5	5.9	8.5	9.5	11.2	13.1
	Water Pressure Drop (4	ftwg	11.7	8.4	10.4	13.7	17.8	10.4	10.4	10.4	13.7	17.8
		Kpa	35.0	25.0	31.0	40.9	53.2	31.0	31.1	31.1	40.9	53.2
		ftwg	-	-	-	-	-	10.4	13.7	17.8	13.7	17.8
		Kpa	-	-	-	-	-	31.0	40.9	53.2	40.9	53.2
	Water Flow Rate, Total (	Usgpm	34.6	46.4	52.5	99.4	116.3	105.0	151.9	168.8	198.8	232.6
		l/s	2.2	2.9	3.3	6.3	7.3	6.6	9.6	10.6	12.5	14.7
Liquid Receiver	Code	-	LR-15	LR-20	LR-30	LR-40	LR-50	LR-30	LR-30	LR-30	LR-40	LR-50
			-	-	-	-	-	LR-30	LR-40	LR-50	LR-40	LR-50
Refrigerant Charge - R22 (5)		lbs	30.8	45.2	62.6	95.9	103.7	63.3	70.2	67.0	95.1	97.6
		kg	14.0	20.5	28.5	43.6	47.1	28.8	31.9	30.5	43.2	44.4
		lbs	-	-	-	-	-	63.3	92.8	116.5	95.1	97.6
		kg	-	-	-	-	-	28.8	42.2	53.0	43.2	44.4

(1) Performance based on Pool Air Conditions of 82°F (26.7°C) Dry Bulb Temperature & 50% Relative Humidity at 115°F (46.1°C)
(2) Motor Size at Nominal Supply Air Flow Rate @ 3 inwg (750Pa) Total Static Pressure
(3) Motor Size at Maximum Exhaust Air Flow Rate @ 2 inwg (500Pa) Total Static Pressure
(4) Water Flow Rates and Water Pressure Drops @ Nominal Unit Performance (1)
(5) Refrigerant Charge for a complete Packaged Unit comprising of Reheat Heat Coil, Pool Water Heater, Auxiliary Air Cooled Condenser and Liquid Reciever.
* The given pool areas are approximate / for quick selection, calculated on the basis of 20 fpm air velocity over the surface of pool water for the corresponding SwimPool models. For actual calulations, contact SKM

Electrical Data

Power Supply : 380 - 415 / 3Ph / 50 Hz — **Voltage Tolerance : 342 V - 440V**

Model	MFA	MCA	Compressor				Condenser Motor			Supply Fan Motor		Exhaust Fan Motor	
	(Amps)	(Amps)	Qty	MOC	RLA	LRA	Qty.	FLA*	LRA*	FLA	LRA	FLA	LRA
1516	63	37	1	22	20	121	1	3.1	11.6	7.2	37	2.6	12.2
2016	80	48	1	29	27	129	2	1.4	4.4	9.1	52	2.6	12.2
3016	125	69	1	42	38	177	2	3.1	11.6	11.9	76	3.6	18
4016	160	103	1	64	58	272	2	4.4	18	15.2	117	7.2	37
4516	200	128	1	81	74	325	3	4.4	18	15.2	117	7.2	37
6026	200	131	2	42	38	177	4	4.4	18	21.1	163	7.2	37
7026	250	157	2	42 + 64	38 + 58	177 + 272	4	4.4	18	21.1	163	7.2	37
7526	250	179	2	42 + 81	38 + 74	177 + 325	4	4.4	18	21.1	163	9.2	52
8026	250	189	2	64	58	272	4	4.4	18	29.1	216	11.9	76
9026	315	233	2	81	74	325	6	4.4	18	29.1	216	11.9	76

Power Supply : 440V / 3 Ph / 50 Hz — **Voltage Tolerance : 400V - 462V**

Model	MFA	MCA	Compressor				Condenser Motor			Supply Fan Motor		Exhaust Fan Motor	
	(Amps)	(Amps)	Qty	MOC	RLA	LRA	Qty.	FLA*	LRA*	FLA	LRA	FLA	LRA
1516	63	36	1	22	20	121	1	2.8	10.5	6.5	33.5	2.3	11.2
2016	80	46	1	29	27	129	2	1.3	3.8	8	43	2.3	11.2
3016	125	66	1	42	38	177	2	2.8	10.5	10.6	65	3.2	16
4016	160	100	1	64	58	272	2	3.9	16.4	13.9	104	6.5	33.5
4516	200	124	1	81	74	325	3	3.9	16.4	13.9	104	6.5	33.5
6026	200	126	2	42	38	177	4	3.9	16.4	18.5	135	6.5	33.5
7026	250	151	2	42 + 64	38 + 58	177 + 272	4	3.9	16.4	18.5	135	6.5	33.5
7526	250	173	2	42 + 81	38 + 74	177 + 325	4	3.9	16.4	18.5	135	8	43
8026	250	183	2	64	58	272	4	3.9	16.4	26.4	197	10.6	65
9026	315	226	2	81	74	325	6	3.9	16.4	26.4	197	10.6	65

Power Supply : 460V / 3 Ph / 60 Hz — **Voltage Tolerance : 414V - 506V**

Model	MFA	MCA	Compressor				Condenser Motor			Supply Fan Motor		Exhaust Fan Motor	
	(Amps)	(Amps)	Qty	MOC	RLA	LRA	Qty.	FLA*	LRA*	FLA	LRA	FLA	LRA
1516	63	37	1	22	20	121	1	4	18	6.2	36.6	2.3	12
2016	80	47	1	29	27	129	2	1.6	6.4	7.8	51	2.3	12
3016	125	69	1	42	38	177	2	4	18	10.2	75	3.4	18
4016	160	102	1	64	58	272	2	5.1	32	13.5	114	6.2	36.6
4516	200	127	1	81	74	325	3	5.1	32	13.5	114	6.2	36.6
6026	200	130	2	42	38	177	4	5.1	32	18.4	156	6.2	36.6
7026	250	156	2	42 + 64	38 + 58	177 + 272	4	5.1	32	18.4	156	6.2	36.6
7526	250	178	2	42 + 81	38 + 74	177 + 325	4	5.1	32	18.4	156	7.8	51
8026	250	186	2	64	58	272	4	5.1	32	24.9	216	10.2	75
9026	315	232	2	81	74	325	6	5.1	32	24.9	216	10.2	75

Power Supply : 380V / 3 Ph / 60 Hz — **Voltage Tolerance : 342V - 418V**

Model	MFA	MCA	Compressor				Condenser Motor			Supply Fan Motor		Exhaust Fan Motor	
	(Amps)	(Amps)	Qty	MOC	RLA	LRA	Qty.	FLA*	LRA*	FLA	LRA	FLA	LRA
1516	80	43	1	26	24	158	1	4.5	18.9	6.6	31.3	2.6	10.3
2016	100	54	1	35	32	152	2	1.9	7	8.5	44	2.6	10.3
3016	125	80	1	50	45	209	2	4.5	18.9	11.7	65	3.4	15.3
4016	200	119	1	76	69	324	2	5.8	33.6	15	99	6.6	31.3
4516	250	149	1	97	88	376	3	5.8	33.6	15	99	6.6	31.3
6026	250	152	2	50	45	209	4	5.8	33.6	21.6	136	6.6	31.3
7026	315	183	2	50 + 76	45 + 69	209 + 324	4	5.8	33.6	21.6	136	6.6	31.3
7526	315	208	2	50 + 97	45 + 88	209 + 376	4	5.8	33.6	21.6	136	8.5	44
8026	315	218	2	76	69	324	4	5.8	33.6	28.4	189	11.7	65
9026	400	272	2	97	88	376	6	5.8	33.6	28.4	189	11.7	65

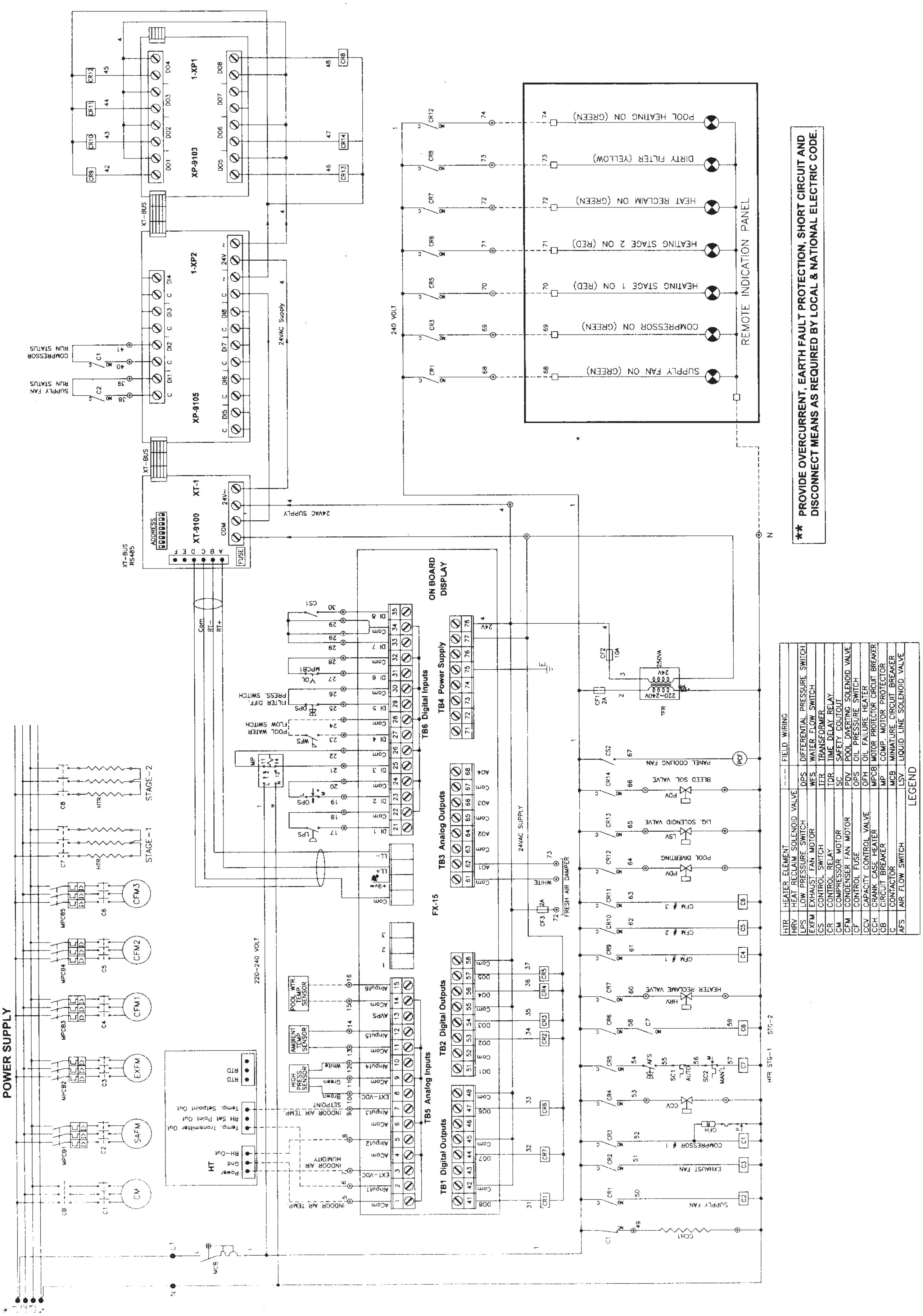
Power Supply : 200V / 3 Ph / 60 Hz — **Voltage Tolerance : 200V - 242V**

Model	MFA	MCA	Compressor				Condenser Motor			Supply Fan Motor		Exhaust Fan Motor	
	(Amps)	(Amps)	Qty	MOC	RLA	LRA	Qty.	FLA*	LRA*	FLA	LRA	FLA	LRA
1516	125	77	1	45	43	274	1	7.8	33	11.5	54.2	4.5	17.8
2016	160	99	1	61	59	263	2	3.2	13	14.7	76.2	4.5	17.8
3016	250	145	1	91	83	424	2	7.8	33	20.3	112.5	5.9	26.5
4016	315	219	1	139	127	622	2	11.4	66	26	171.5	11.5	54.2
4516	400	274	1	178	162	709	3	11.4	66	26	171.5	11.5	54.2
6026	400	281	2	91	83	424	4	11.4	66	37.4	236	11.5	54.2
7026	500	336	2	91+139	83+127	424 + 622	4	11.4	66	37.4	236	11.5	54.2
7526	630	383	2	91+178	83+162	424 + 709	4	11.4	66	37.4	236	14.7	76.2
8026	630	400	2	139	127	622	4	11.4	66	49.2	327	20.3	112.5
9026	800	502	2	178	162	709	6	11.4	66	49.2	327	20.3	112.5

Legend : FLA : Full Load Amperes; **RLA :** Rated Load Amperes at 80°F(26.6 °C) DB & 50 % RH Pool Air Conditions & ambient temp 115 °F (46 °C)**; LRA :** Locked Rotar Amperes; **MCA :**Minimum Circuit Amperes; **MFA :** Maximum Fuse Amperes; **MOC :** Maximum Operating Current ***Voltage Tolerance between phases not to exceed 2% .***

**** EACH***

Typical Wiring Diagram



Supply Fan Data

Fan Code	Air Flow Rate		Total Static Pressure, inwg [Pa]																	
			2.00 [500]		2.25 [562]		2.50 [625]		2.75 [687]		3.00 [750]		3.25 [812]		3.50 [875]		3.75 [937]		4.00 [1000]	
	cfm	*l/s*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*
315	**3000**	**1416**	1141	1.4	1216	1.6	1286	1.8	1353	2.0	1416	2.2	1476	2.4	1534	2.6	1589	2.9	1643	3.1
	4000	**1888**	1110	1.9	1184	2.1	1255	2.3	1322	2.6	1387	2.8	1449	3.1	1509	3.3	1566	3.6	1621	3.8
	5000	**2360**	1097	2.4	1164	2.7	1230	3.0	1294	3.2	1357	3.5	1417	3.8	1476	4.1	1533	4.4	1589	4.7
400	**5500**	**2595**	871	2.2	927	2.5	981	2.7	1032	3.0	1082	3.3	1130	3.6	1176	3.9	1221	4.2	1264	4.5
	6500	**3067**	870	2.7	922	3.0	972	3.3	1022	3.6	1069	3.9	1116	4.2	1161	4.5	1204	4.8	1247	5.2
	7500	**3539**	879	3.3	927	3.6	974	3.9	1020	4.2	1064	4.6	1108	4.9	1151	5.2	1194	5.6	1235	6.0
500	**8000**	**3775**	744	3.1	791	3.5	836	3.9	878	4.3	920	4.7	959	5.2	997	5.6	1033	6.0	1069	6.5
	9500	**4483**	743	3.9	787	4.3	830	4.7	872	5.1	912	5.6	951	6.0	988	6.5	1025	7.0	1060	7.5
	11000	**5191**	751	4.7	792	5.2	832	5.6	871	6.1	909	6.6	946	7.1	983	7.6	1018	8.1	1053	8.6
560	**11000**	**5191**	648	4.3	689	4.8	728	5.4	766	5.9	802	6.5	838	7.0	871	7.6	904	8.2	936	8.8
	12000	**5663**	648	4.8	687	5.3	725	5.9	762	6.4	798	7.0	833	7.6	866	8.2	899	8.8	930	9.5
	13000	**6135**	650	5.4	688	5.9	724	6.5	760	7.0	795	7.6	829	8.2	862	8.9	894	9.5	925	10.2
630	**13000**	**6135**	563	5.1	599	5.7	634	6.3	667	7.0	698	7.6	729	8.3	758	9.0	786	9.7	814	10.5
	14500	**6843**	560	5.7	595	6.4	629	7.0	662	7.7	693	8.4	724	9.2	753	9.9	781	10.7	808	11.4
	16000	**7550**	560	6.5	593	7.2	626	7.9	658	8.6	689	9.3	719	10.1	748	10.9	776	11.7	803	12.5
710	**17000**	**8022**	500	6.5	532	7.3	562	8.1	591	9.0	619	9.8	646	10.7	672	11.6	697	12.5	721	13.5
	19000	**8966**	500	7.5	530	8.3	559	9.1	587	10.0	615	10.9	641	11.8	667	12.8	692	13.7	716	14.7
	21000	**9910**	503	8.6	532	9.4	559	10.3	586	11.2	613	12.1	638	13.1	657	14.0	688	15.1	711	16.1

PI = Fan Input Power in KW

Exhaust Fan Data

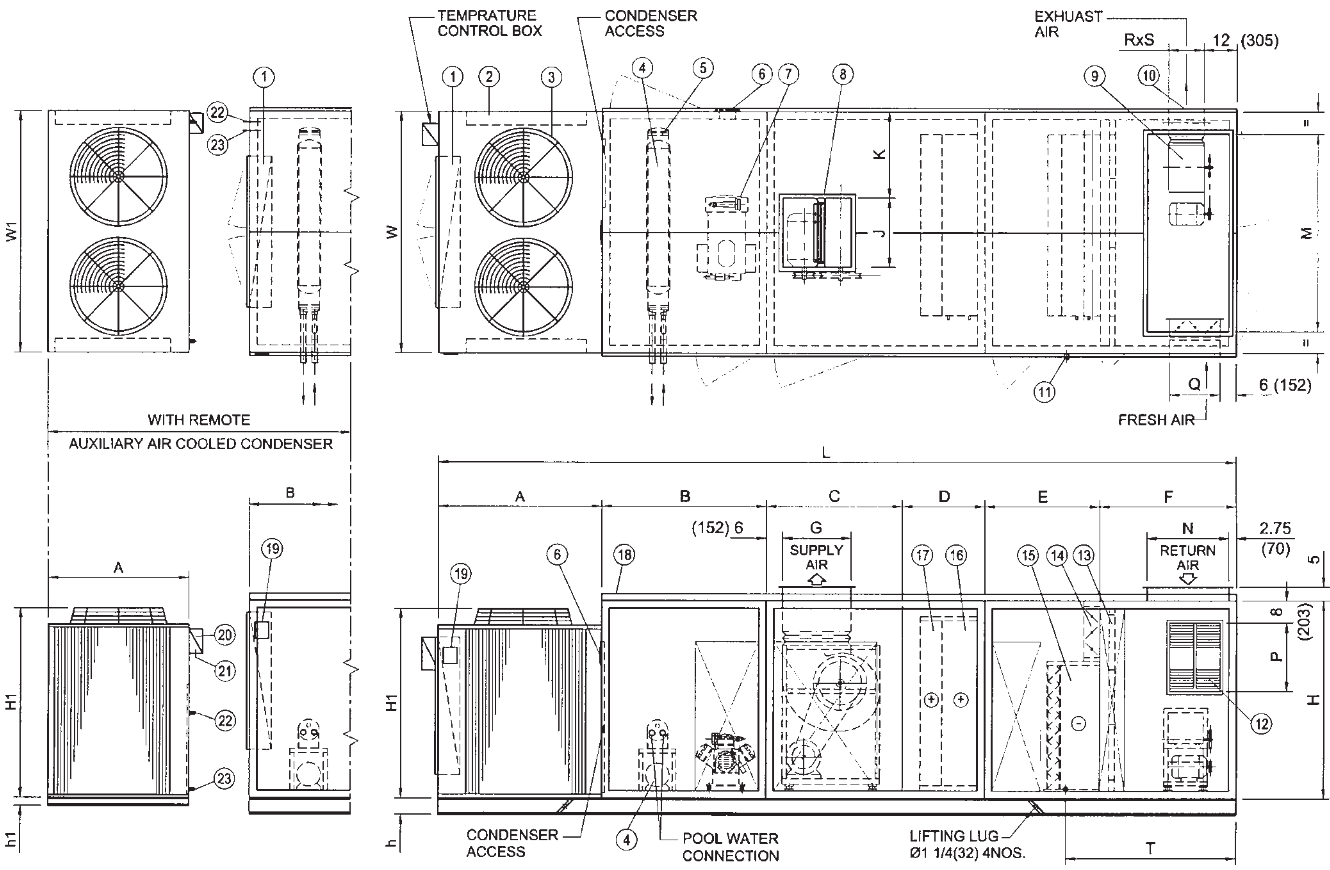
Fan Code	Air Flow Rate		Total Static Pressure, inwg [Pa]																	
			1.00 [250]		1.25 [312]		1.50 [375]		1.75 [437]		2.00 [500]		2.25 [562]		2.50 [625]		2.75 [687]		3.00 [750]	
	cfm	*l/s*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*	*rpm*	*PI*
10	**750**	**354**	1003	0.2	1132	0.2	1249	0.2	-	-	-	-	-	-	-	-	-	-	-	-
	1000	**472**	973	0.2	1101	0.3	1218	0.3	1326	0.4	1426	0.4	1520	0.5	1608	0.5	-	-	-	-
	1250	**590**	951	0.3	1074	0.3	1189	0.4	1295	0.5	1395	0.5	1489	0.6	1578	0.7	1662	0.7	1743	0.8
	1500	**708**	941	0.3	1057	0.4	1166	0.5	1269	0.6	1367	0.6	1459	0.7	1547	0.8	1631	0.9	1712	1.0
	2000	**944**	960	0.5	1058	0.5	1153	0.6	1245	0.7	1333	0.8	1419	1.0	1502	1.1	1582	1.2	1659	1.3
12	**1750**	**826**	813	0.3	916	0.4	1008	0.5	1094	0.6	-	-	-	-	-	-	-	-	-	-
	2000	**944**	807	0.4	908	0.5	1000	0.6	1086	0.7	1165	0.8	1240	0.9	-	-	-	-	-	-
	2250	**1062**	802	0.5	902	0.6	993	0.7	1078	0.8	1157	0.9	1232	1.0	1302	1.1	1369	1.3	-	-
	2500	**1180**	800	0.5	897	0.6	987	0.7	1071	0.9	1149	1.0	1224	1.1	1294	1.2	1361	1.4	1425	1.5
	3000	**1416**	805	0.7	895	0.8	980	0.9	1060	1.1	1137	1.2	1210	1.3	1279	1.5	1346	1.6	1410	1.8
15	**3000**	**1416**	665	0.6	749	0.8	828	0.9	901	1.1	970	1.3	1035	1.5	1097	1.6	1157	1.8	-	-
	3500	**1652**	661	0.7	742	0.9	817	1.1	888	1.3	955	1.5	1019	1.7	1080	1.9	1138	2.1	1194	2.3
	4000	**1888**	664	0.9	739	1.0	811	1.2	879	1.4	944	1.6	1006	1.9	1065	2.1	1122	2.3	1178	2.5
	4500	**2124**	671	1.0	742	1.2	810	1.4	875	1.6	937	1.8	997	2.1	1055	2.3	1110	2.6	1164	2.8
	5000	**2360**	684	1.2	750	1.4	814	1.6	876	1.9	935	2.1	993	2.3	1048	2.6	1102	2.8	1154	3.1
18	**6000**	**2831**	569	1.2	634	1.5	695	1.7	752	2.0	806	2.3	858	2.5	906	2.8	953	3.1	998	3.4
	7000	**3303**	580	1.5	639	1.8	695	2.1	750	2.4	802	2.7	852	3.0	900	3.3	946	3.6	990	4.0
	8000	**3775**	597	1.9	651	2.2	703	2.5	753	2.9	803	3.2	850	3.5	896	3.8	941	4.2	984	4.5
	9000	**4247**	621	2.4	669	2.7	716	3.1	763	3.4	809	3.8	854	4.1	898	4.5	940	4.9	982	5.2
	10000	**4719**	649	3.0	692	3.3	736	3.7	779	4.1	821	4.4	863	4.8	904	5.2	944	5.6	984	6.0

PI = Fan Input Power in KW

Weights

Model			1516	2016	3016	4016	4516	6026	7026	7526	8026	9026
Condenser Section	**A**	**lbs**	520	660	850	1055	1425	1588	1718	1980	1980	2145
		Kg	236	300	386	480	648	722	781	900	900	975
Compressor Section	**B**	**lbs**	1426	1605	1790	2057	2141	2765	2950	3232	3375	3590
		Kg	648	730	814	935	973	1257	1341	1469	1534	1632
Supply Air Section	**C**	**lbs**	820	914	1146	1444	1463	1729	1895	1956	2208	2288
		Kg	373	415	521	656	665	786	861	889	1004	1040
Reheat Section	**D**	**lbs**	767	885	1040	1242	1315	1422	1503	1624	1757	1918
		Kg	348	402	473	565	598	646	683	738	799	672
Dehumidifier Section	**E**	**lbs**	870	994	1136	1323	1381	1477	1542	1639	1742	1859
		Kg	395	452	516	601	628	671	701	745	792	845
Return Air Plenum	**F**	**lbs**	828	919	1025	1339	1359	1537	1572	1649	1836	1918
		Kg	376	418	466	609	618	699	715	750	835	872

Dimensional Data



LEGEND

1 - CONTROL PANEL
2 - AUXILIARY COND. COIL
3 - CONDENSER FAN
4 - LIQUID RECEIVER
5 - POOL HEAT CONDENSER
6 - VENTILATION GRILL
7 - COMPRESSOR
8 - SUPPLY AIR FAN
9 - EXHAUST AIR FAN
10 - EXHAUST GRILL & GRAVITY DAMPER
11 - DRAIN Ø1 1/4(32) MPT-1#
12 - FRESH AIR GRILL, DAMPER & FILTER
13 - FLAT FILTER
14 - BYPASS DAMPER
15 - EVAPORATOR COIL + ELIMINATOR
16 - REHEAT CONDENSER COIL
17 - OPTIONAL HOT WATER COIL OR ELECTRIC HEATER
18 - WEATHER PROOF CANOPY
19 - DETACHABLE PLATE FOR CABLE ENTRY
20 - TERMINAL BOX
21 - CABLE ENTRY
22 - HOT GAS CONNECTION
23 - LIQUID CONNECTION

(20–23: For remote air cooled condenser)

ALL DIMENSIONS ARE IN INCHES (MM)

MODEL	L	W	H	h	W1	H1	h1	A	B	C	D	E	F	G	J	K	M	N	P	Q	R	S	T
1516	249 (6325)	62 (1575)	50 (1270)	6 (152)	56 (1422)	48 (1219)	2 (51)	38 (965)	60 (1524)	35 (889)	30 (762)	42 (1067)	44 (1118)	15.91 (404)	15.91 (404)	23 (584)	36 (914)	24 (610)	24 (610)	12.5 (317)	13.03 (331)	11.38 (289)	56.3 (1430)
2016	256 (6502)	76 (1930)	50 (1270)	6 (152)	68 (1727)	49 (1245)	2 (51)	45 (1143)	60 (1524)	35 (889)	30 (762)	42 (1067)	44 (1118)	15.91 (404)	15.91 (404)	30 (762)	48 (1219)	24 (610)	30 (762)	12.5 (317)	13.03 (331)	11.38 (289)	56.3 (1430)
3016	273 (6934)	80 (2032)	63 (1600)	6 (152)	76 (1930)	48 (1219)	2 (51)	56 (1422)	60 (1524)	41 (1041)	30 (762)	42 (1067)	44 (1118)	19.96 (507)	19.96 (507)	30 (762)	68 (1727)	24 (610)	30 (762)	18.5 (470)	15.55 (395)	13.43 (341)	56.3 (1430)
4016	292 (7417)	88 (2235)	74 (1880)	6 (152)	88 (2235)	69 (1753)	2 (51)	56 (1422)	60 (1524)	48 (1219)	30 (762)	42 (1067)	56 (1422)	25.12 (638)	25.12 (638)	31.44 (798)	68 (1727)	36 (914)	36 (914)	24.5 (622)	18.54 (471)	15.91 (404)	68.3 (1735)
4516	312 (7925)	88 (2235)	78 (1981)	6 (152)	88 (2235)	69 (1753)	3 (76)	76 (1930)	60 (1524)	48 (1219)	30 (762)	42 (1067)	56 (1422)	25.12 (638)	25.12 (638)	31.44 (798)	72 (1829)	36 (914)	36 (914)	24.5 (622)	18.54 (471)	15.91 (404)	68.3 (1735)
6026	356 (9042)	88 (2235)	87 (2210)	6 (152)	88 (2235)	73 (1854)	3 (76)	84 (2134)	85 (2159)	53 (1346)	30 (762)	42 (1067)	62 (1575)	28.15 (715)	28.15 (715)	29.92 (760)	72 (1829)	42 (1067)	42 (1067)	24.5 (622)	21.93 (557)	18.82 (478)	74.3 (1887)
7026	361 (9169)	88 (2235)	93 (2362)	6 (152)	88 (2235)	73 (1854)	3 (76)	84 (2134)	85 (2159)	58 (1473)	30 (762)	42 (1067)	62 (1575)	31.54 (801)	31.54 (801)	28.23 (717)	76 (1930)	42 (1067)	50 (1270)	24.5 (622)	21.93 (557)	18.82 (478)	74.3 (1887)
7526	361 (9169)	96 (2438)	93 (2362)	8 (203)	88 (2235)	81 (2057)	3 (76)	84 (2134)	85 (2159)	58 (1473)	30 (762)	42 (1067)	62 (1575)	31.54 (801)	31.54 (801)	32.23 (819)	88 (2235)	42 (1067)	50 (1270)	30.5 (775)	21.93 (557)	18.82 (478)	74.3 (1887)
8026	373 (9474)	96 (2438)	102 (2591)	8 (203)	88 (2235)	81 (2057)	3 (76)	84 (2134)	85 (2159)	64 (1626)	30 (762)	42 (1067)	68 (1727)	35.35 (898)	35.35 (898)	30.32 (770)	88 (2235)	48 (1219)	55 (1397)	30.5 (775)	21.93 (557)	18.82 (478)	80.3 (2040)
9026	399 (10135)	106 (2692)	102 (2591)	8 (203)	88 (2235)	81 (2057)	3 (76)	110 (2794)	85 (2159)	64 (1626)	30 (762)	42 (1067)	68 (1727)	35.35 (898)	35.35 (898)	35.32 (897)	88 (2235)	48 (1219)	60 (1524)	30.5 (775)	21.93 (557)	18.82 (478)	80.3 (2040)

Pool Design Guidelines

Air and Water Conditions

Special consideration must be given to the design of pool enclosures. In addition to the normal considerations of HVAC design, attention must be given to problems caused by extremely humid environment maintained inside the pool. The pool architect and engineer must work closely together to specify the air and water conditions, the selection of construction materials and the air distribution system in order to insure a successful project. This section is intended to be a brief discussion of the special considerations of pool enclosure design and should augment a pre-existing knowledge of HVAC design and building construction.

The operating conditions of the pool must first be determined before the mechanical systems can be designed and selected. The three conditions to be considered are, the pool water temperature, the design air temperature and the design air relative humidity level. The optimal temperature at which the pool water will be maintained is related to the main use of the pool. ASHRAE recommends the following :

Pool Water	Temperature
Pleasure Swimming	75 to 85°F, (24 to 29°C)
Therapeutic	85 to 95°F (29 to 35°C)
Competitve Swimming	72 to 75°F (22 to 24°C)
Whirlpool/Spa	97 to 102°F (36 to 39°C)
Indoor Air	**Temperature & Humidity**
Pleasure Swimming	75-85°F, (24-29°C), 50-60% RH
Therapeutic	80-85°F, (27-29°C), 50-60 RH
Competitive Swimming	72-75°F, (22-24°C), 55-60% RH
Whirlpool Spa	85-90°F, (29-32°C), 40-60% RH

In order to minimize evaporation and keep comfortable environment for swimmers when they are out of water, the air should be kept at relatively higher temperature than the pool water temperature. In the case of Spa or Sauna this is not feasible because temperatures above 90°F [32.2°C] are not practical.

Two factors influence the selection of the relative humidity inside a pool enclosure. The maximum humidity level is determined to prevent condensation on the inside of the building at cold outside temperatures. Experience has shown that it is practical to prevent condensation with air relative humidity levels as high as 60%.

With air temperatures between 80°F [26.7°C]and 85°F [29.4], a relative humidity level of 60% will result in a dew point temperature of approximately 15°F [-9.4°C] below the air temperature. This means that the inside surfaces of the pool enclosure must be kept within 15°F [-9.4°C] of the air temperature. This is possible if special consideration is given to the windows and structural steel during the construction phase.

The lower limit on humidity is established by the comfort level of the swimmers. Low humidity levels will result in substantial evaporation off the swimmers as they leave the water, causing them to feel cold. Experience has shown that reasonable comfort levels can be maintained down to 50% RH at air temperatures between 80°F [26.7°C] and 85°F [29.4°C].

Operating costs also influence the humidity level set point. Lower humidity levels ,mean higher energy consumption. Low humidity levels result in high pool evaporation rates, which in turn, increase the demand for heat in the pool and cause the dehumidification equipment to run longer. SKM recommends designing the structure to prevent condensation at 60% RH in the pool area at winter design conditions. We also recommend selecting the dehumidification equipment to maintain 50% RH in the winters and 60% during summer months. The influence of outside air required for pool ventilation combined with lower condensing temperatures cause the equipment to have greater dehumidification capacities in the winter months than in the summer months.

Sizing the equipment for 50% in the summer design condition would oversize the equipment in the winter design condition. With high outside temperatures, condensation is not a problem. Therefore, a 60% RH design for summer operation is adequate. The 10% RH difference between the structure design and equipment selection will result in a safety margin and create a dead band in which the controls can operate.

Load Calculations

A certain amount of controversy exists in determining the evaporation rate off of the pool surface. ASHRAE suggests the following equation in IP System :

$$w_p = A\,(p_w - p_a)\,(95 + 0.425V) / Y$$

Where

- w_p = evaporation of water, lb/hr
- A = area of pool surface, ft^2
- V = air velocity over water surface, fpm =20 (rec.)
- Y = latent heat required to change water to vapour at surface water temperature, Btu/lb
- p_a = saturation pressure at room dew point, in.Hg
- p_w = saturation pressure taken at the surface water temperature, in.Hg

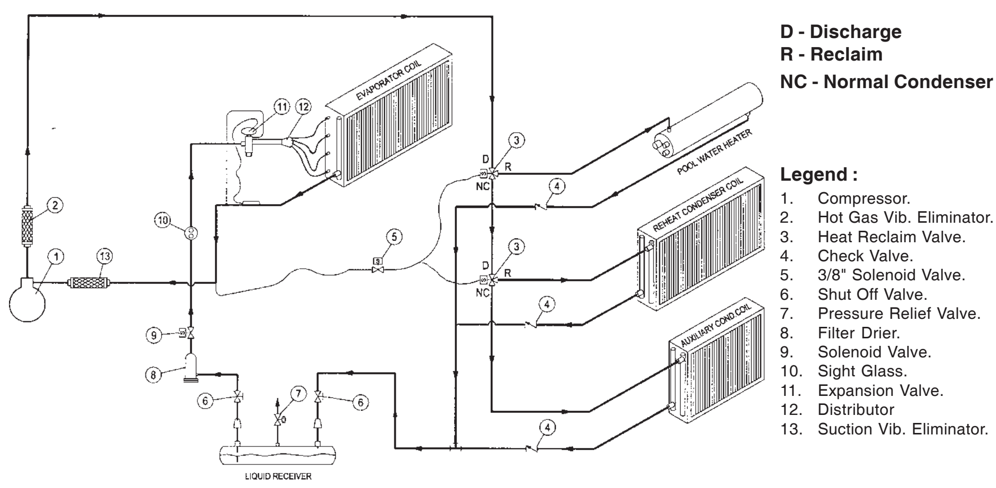
OR, in SI System :

$$w_p = A\,(p_w - p_a)\,(0.089 + 0.0782V) / Y$$

Where

- w_p = evaporation of water, Kg/s
- A = area of pool surface, m^2
- V = air velocity over water surface, m/s
- Y = latent heat required to change water to vapour at surface water temperature, KJ/Kg

Refrigerant Piping Diagram (Typical)



p_a = saturation pressure at room dew point, kPa
p_w = saturation pressure taken at the surface water temperature, kPa

This equation does not recognize the influence of pool activity on the evaporation rate. Clearly, activities such as competition swimming, children splashing, wet pool decks and the use of air bubblers in whirlpools, all influence the rate of evaporation. Some evidence points to 'active' pool surfaces evaporating water at twice the rate of 'still' pool surfaces.

SKM's experience in sizing and installing this equipment indicates that the ASHRAE equation approximates the worst case of peak pool evaporation rate. We do not recommend the use of activity factors to modify this equation for equipment sizing for the following reasons :

- Activity factors attempt to average out the pool evaporation rate. The equipment, however must be able to respond to the peak demand. One of the primary functions of the dehumidification equipment is to prevent condensation.Temporary condensation caused by peak pool evaporation in excess of the equipment capacity can still cause substantial damage.
- Insufficient research exists to substantiate the magnitude of the activity factors. Considering the substantial damage that can result from undersizing and the potential liabilities that follow, it is not prudent engineering to rely on unsubstantiated calculation methods. ASHRAE has called for further study on this issue.
- The activity patterns of the pool may change, or may not be clearly understood at the time the pool is designed.
- Undersizing the equipment will result in corrosion of the pool enclosure and equipment. This can lead to substantial repair costs and has the potential to cause personal injury.

Activity factors can be used to approximate equipment annual energy consumption, but they should not be used for equipment sizing.

Material Selections

Care should be taken in selecting materials to be used in the pool enclosure. The moist chlorine laden atmosphere in the pools is corrosive to many common metals. All steel and aluminium items used in the pool enclosure should be specially coated. Steel parts should be, at very minimum galvanized.

Better protection is provided if the galvanized steel part is then painted with baked electrostatic powder coat. Ungalvanized steel should be primed with zinc rich primer and then coated with a two-part epoxy or a catalyzed polyurethane paint. Aluminium parts must be coated to withstand the pool environment.Properly primed polyurethane or fluoropolymer paints provide excellent corrosion protection for aluminium parts. High nickel alloy stainless steels hold up well in the pool environment and do not require additional coatings.

Condensation

Condensation will form whenever moist pool air reaches surfaces that are at temperatures below the dew point of the air. The moist pool air will contain water vapor at partial pressures far in excess of those that exist on the outside of the pool enclosure. If not contained by a proper moisture barrier, this pressure difference will cause the moisture to be pushed out to the perimeter of the building. As the moisture passes through the structure's walls, it will condense when the temperature reaches the dew point. If the outside temperature is low enough, the water will freeze inside the wall causing substantial damage to the structure. It is important that all walls be insulated and treated with a moisture barrier on the pool side of the insulation.

The structural steel used to support the building and roof can provide a thermal bridge to the outside and can also cause substantial condensation problems if not properly treated. Roofing systems should be selected to effectively insulate the roof trusses to keep the truss surface temperatures above the dew point. Those structural members that cannot be sufficiently insulated from the outside must be enclosed on the inside with an appropriate moisture barrier system.

Windows and skylights create a particular problem and require special treatment. Where possible, triple glazing should be used. Triple glazing alone will not keep the glass surface temperature above the pool area dew point with still air on the window when the outside air temperature is 10°F [-12.2°C] or lower. Air should be blown over the surface of the glass at a rate of atleast 50 feet / minute [0.25m/sec] to keep the triple glazed window from condensing at temperatures below -10°F [-23.3°C]. Higher velocities are required for double glazed windows, and single pane windows are almost impossible to keep from condensing at this temperature. The warm supply air form the HVAC system should be ducted to distribute air over the windows and skylights. If it is impossible to duct supply air to the windows, a separate fan should be supplied to blow room air over them.

Suspended ceilings in pool enclosures pose problems that are difficult to solve. While they typically provide an effective thermal barrier, they do not work as a moisture barrier. This combination leads to condensation problems above the ceiling because the area above the ceiling is not heated and tends to have lower temperatures than the area below the ceiling. If moisture is allowed to migrate freely, it tends to condense on the cold surfaces found above the ceiling.The lights and supports are all subject to hidden corrosion.If a suspended ceiling is required, these problems must be solved. The plenum area above the ceiling can be heated, or the dropped ceiling can be insulated and a moisture barrier installed between the ceiling and the insulation. In either event, a regular inspection program for hidden corrosion above the ceiling should be implemented.

Air Distribution

Special consideration to air distribution must be made during the design stage. Low air velocities should be maintained over the deck area and over the pool. High air velocity over the deck causes swimmer discomfort. High air velocity over the pool increases the evaporation rate off the pool. Air velocities over 20 feet per minute [0.10 m/sec] in the pool and deck areas are not recommended. Return air inlets should be centrally located above the pool near the ceiling. Air should be distributed along the exterior perimeter of the structure at floor level. This will allow the air to blanket the perimeter walls with high velocity warm air and pick up the skin load without excessive air flow over the pool and deck areas.

Sufficient air should be supplied to blanket all exposed walls, ceiling areas and windows. This will usually result in three to six air changes in the space per hour. The minimum air flow requirement is a function of the air required to operate the dehumidification equipment.This air flow is approximately 50CFM/LBM/Hr [10.7L/s/Kg/Hr] of pool evaporation rate. The outside air requirement will be established by local codes, based on building occupancy. It is desirable to keep the outside air ventilation rate to the minimum possible value to minimize site energy consumption. A positive means of exhaust should be supplied in order to keep the pool area at a slight negative pressure. This will keep the moist chlorine from permeating to untreated adjacent spaces.

Spectator Areas

Spectator areas require special consideration. Competitive swimming pools may be designed with a large capacity for spectators. Local codes and good engineering practice require that a substantial amount of ventilation air be brought in, as a result. The amount of outside required to handle the spectators may be many times greater that the pool would normally require. The energy consumption of the pool will go up dramatically when a large amount of ventilation air is introduced to the environment. A typical competitive pool in a high school or university may only be occupied by spectators 100 hours each year. The balance of the year, it is either unoccupied or occupied only by swimmers. Maintaining the outside air requirement as set by the spectator load will result in unnecessary high energy consumption for the pool.

SKM recommends a two stage ventilation cycle for these applications. The maximum air volume can be specified to handle the maximum occupancy, and the normal air volume can be specified to handle the normal occupancy of the pool. The equipment will switch from the low ventilation rate to the high ventilation rate. This can be controlled by a manual switch or it can be tied to the lighting system for the spectator areas. If the number of spectators planned for is unusually large (i.e. several thousand people), separate HVAC equipment should be utilized for those areas. This enables it to be shut off when unoccupied.

General Installation Requirements

Unit Location

The SwimPool unit should be located as close to the pool enclosure as possible to minimize the duct run, keeping the air horsepower requirements to a minimum. Outdoor packages can be configured for roof curb mounting with air connections through the roof. Indoor packages are also available. Adequate service clearance should be provided on all four sides. On SPA models, there should be atleast six feet [1800 mm] clearance from the face of the air-cooled condenser surface to the nearest wall. The discharge of the condenser fans should not be obstructed.

Any duct work exposed to the ambient air should be covered with a minimum of one inch [25 mm] of high quality thermal insulation.

Piping

Figure given below, shows the recommended piping arrangement. The SwimPool unit and auxiliary pool heater should be tied into the pool filtration loop immediately prior to the return connection to the pool (as indicated). The filtration pump and piping should be designed according to the recommendations of the equipment manufacturer.

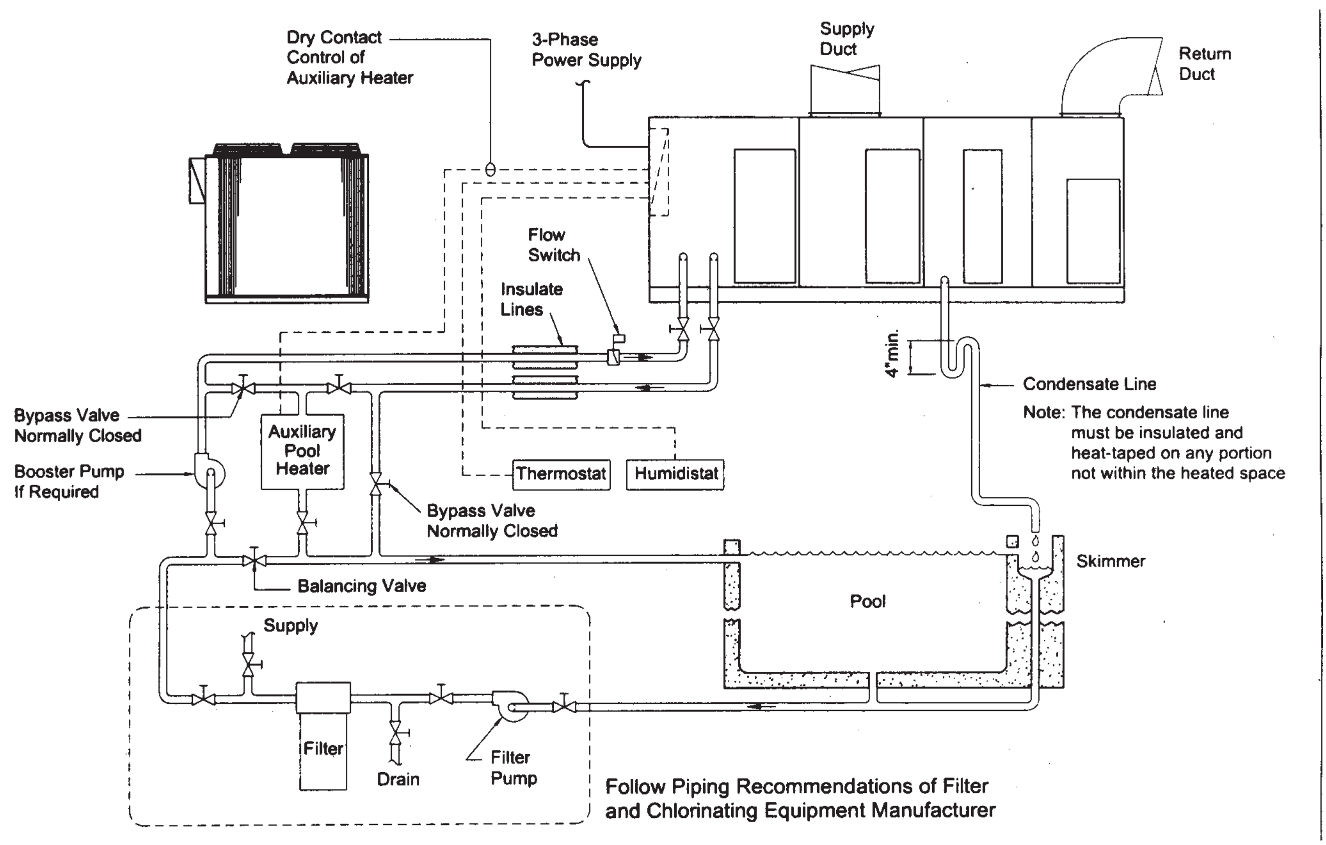
The piping shown is typical but not necessarily complete. The pool filtration system will normally require more flow than the SwimPool unit and auxiliary pool heater. A balancing valve should be provided in the line as shown, to provide sufficient pressure drop to produce rated flow in the SwimPool unit and auxiliary pool heater loop. A booster pump may have to be added to this loop if the filter pump cannot handle the increased pressure drop. The auxiliary pool heater should be installed in series with and after the SwimPool unit pool condenser, and isolation and bypass valves should be provided.

Note : If automatic chlorinating equipment is supplied, the chlorine should be injected downstream of the SwimPool unit pool heating equipment.

The condensate line should be trapped with a trap height greater than the negative pressure of the unit after the dehumidification coil. This will be conservatively, two inch [50 mm] plus the return duct pressure loss. A four inch [100mm] trap height will normally suffice.If convenient, the condensate can be run back into the pool, thereby reducing the amount of feed water required.

Any piping , *including the condensate line,* that is exposed to the outside air must be insulated and heat taped to prevent freeze up of the lines. A bleed vent should be installed on the highest system point and at any natural air traps in the piping. All piping materials should be selected to withstand the corrosive effects of the pool water. Stainless steel and PVC should provide good life. Steel pipes and fittings should not be used. Pumps with cast iron housings and impellers are not recommended.

All valves, pumps, heaters and piping shown external to the SwimPool unit in figure below are supplied by others.



TYPICAL SWIMPOOL INSTALLATION

AIR-CONDITIONING EQUIPMENT

Auxiliary Pool Heater

All sites will require an auxiliary pool water heater which will normally be sized by the pool designer and supplied by a pool equipment manufacturer. These heaters are sized to reduce the heat-up time of the pool (after filling with cold water) to an acceptable time period. They generally supply four to five times the heat output of the SwimPool unit pool heat condenser. The SwimPool unit pool heat condenser is adequate to maintain the pool water temperature, but will not bring a cold pool up to temperature in an acceptable amount of time.

Supplementary Air Heating

Most sites will require a supplementary air heater. This heater should be sized to handle the entire building load in the event that the pool is not operating (i.e. water has been drained out of the pool for repairs). SKM can provide electric or hot water heating systems built as an integral part of the SwimPool package. A duct heater could also be provided in the supply duct and interfaced with the SwimPool temperature control system.

Data Input Sheet for SKM Swimming Pool Load Estimating & SwimPool Selection

General Data

Project Description : ____________________ Location : ____________________

------------ By :____________________Owner : ____________________

Engineer : ____________________ Elevation ft. (m) : ____________________

Pool Data

Note : All values in brackets [ ] are recommended values

	Main Pool		Diving Well		Hot Tub / Spa	
Pool Width ft.(m)	________		________		________	
Pool Length ft.(m)	________		________		________	
Pool Water Temperature. °F (°C)	________	[80 (26.7)]	________	[80 (26.7)]	________	[90 (32.2)]
Air Velocity Over Pool. ft./min. (m/s)	________	[20 (0.1)]	________	[20 (0.1)]	________	[20 (0.1)]

System Air Flow Data

System Air Flow CFM (l/s) OR Pool Enclosure Area ft^2 (m^2) ________

Average Pool Enclosure Height ft. (m) ________

Number of Air Changes/Hour ________

Design Data

Is summer airconditioning required ? (yes or no) ________ If YES, select AIR or WATER cooled condenser ______

[SUMMER (complete only with summer airconditioning)**]** ____

Pool Area Air Temp.,°F (°C) ________ [82 (27.8)] ________

Pool Area Relative Humidity, %RH ____ [60] ________

Design Ambient DB Temp., °F (°C) ________

Design Ambient WB Temp., °F (°C) ________

Design Sensible Heat Gain, BTUH (KW) ________

Lighting Load (Watts) ________

[WINTER]

Pool Area Air Temp., °F (°C) ________

Pool Area Relative Humidity, %RH ________

Design Ambient DB Temp., °F (°C) ________

Design Sensible Heat Loss, BTUH (KW) ________

System Outside Air Temperature

Minimum Outside Air, CFM (l/s) ________ OR Number of Swimmers (max^m) ________

Number of Swimmers (max^m) ________ Number of Spectators (max^m) ________

Number of Spectators (max^m) Outside Air Required/Swimmer ________

[20]

Outside Air Required/Spectator ________ [5]

Minimum Pool Ventilation Rate ________ [0.2]

Supply & Return Duct Losses

Estimated Supply Duct Loss, inwg (Pa) ________ [1.0 (250)]

Estimated Return Duct Loss, inwg (Pa) ________ [0.5 (125)]