COLMAC COIL
Manufacturing Inc.

BULLETIN 7300A

HEAT PUMP
HPA 2000

AUGUST 1, 2001
REPRINTED

HPA 2000
AIR-SOURCE HEAT PUMP FOR WATER HEATING

HEATING CAPACITY*
60,000 Btu/h (17.6 kW)

*@ 140°F (60°C) Leaving water,
85/72°F (29.4/22°C) Inlet Air.

Standard Features:

General - When you want to specify QUALITY, specify COLMAC. These packaged air-source water heating pumps are factory wired, charged, and tested. Low operating noise levels, high capacity, high efficiency, with environmentally safe refrigerants are integrated into this design.

Refrigerant - “Environmentally friendly” R134a refrigerant. 140°F (60°C) and higher water temperatures are easily achievable with this new refrigerant technology.

Compressor - State of the art Scroll Compressor operates at high efficiencies with low noise and vibration. Access for service is easy through large lift off panel. Compressor compartment is separated from fan and coil for in-operation servicing.

Evaporator Coil - Stainless Steel casing, copper tubes, and corrosion resistant fin coating makes for a durable, long-life coil.

Condensers - Condensers are of vented double-wall construction, suitable for potable water. Counterflow coaxial design produces high efficiencies and high water temperatures.

Fan - Direct driven centrifugal fan operates at 1075 rpm (60 Hz) for low noise operation. Vibration isolating motor mounts minimize noise and vibration. Fan is capable of operating with up to 1/2 iwg (12.7 mm Aq) external static pressure. Marine duty motor is corrosion protected.

Enclosure - Entire unit housing is made of Stainless Steel for corrosion resistance. Weatherproof design is excellent for outdoor service.

Water Pump - The all bronze circulating pump is corrosion resistant, and has high head capability at design flowrates. Flanged inlet and outlet make removal for service easy.

Automatic Controls - Factory control package includes a time delay feature which limits the number of compressor starts to 12 per hour.

Refrigerant Components - Included as standard are filter-dryer, moisture-indicating sight glass, and adjustable superheat TX valve.

Options:

Fan Discharge – Fan can be oriented for vertical discharge in lieu of standard horizontal discharge.

SPECIFY COLMAC QUALITY

NOMENCLATURE:

HP A 2000 - P - A - S

HP — Heat Pump

Air — Air Source

Model
- 2000 - Standard
- 2000R - Remote Heat Rejection

FIN MATERIAL
- A - ALUMINUM
- P - POLY COAT
- C - COPPER
- H - BAKED PHENOLIC COATED ALUM

VOLTAGE CODE
- A - 208-230/60/1
- B - 208-230/60/3
- I - 400/50/3

CABINET MATERIAL
- S - 304 SST
- G - GALV
- A - MARINE GRADE ALUMINUM

GENERAL

Colmac HPA air-source heat pumps offer you, the designer, a highly energy efficient means of generating potable hot water. Heat pump water heaters can be very successfully applied to commercial facilities with large hot water requirements, such as laundries, restaurants, hospitals, nursing homes, hotels, apartment buildings, condominiums, and health clubs.

The principle of moving heat with a heat pump, rather than generating it by burning fossil fuel (i.e., natural gas), or electric resistance, makes water heating with heat pumps the best choice for conserving fossil fuels, and reducing Global Warming. Depending on the temperature of the air supplied to the heat pump, water can be heated using one third to one fourth of the energy required by electric resistance, or natural gas.

C.O.P.

The energy efficiency of a water heater can be quantified by calculating the Coefficient of Performance, or C.O.P. This is the ratio of useful heating energy output to energy input, as shown by the following equation:

$$\text{C.O.P.} = \frac{\text{Heating Capacity, Btuh}}{\text{Input kW x 3413}} \text{, for electric input}$$

$$\left(\text{C.O.P.} = \frac{\text{Heating Capacity, kW}}{\text{Input kW}}\right)$$

$$\text{C.O.P.} = \frac{\text{Heating Capacity, Btuh}}{\text{Btuh Input}} \text{, for natural gas input}$$

Colmac HPA air-source heat pump water heaters operate with a C.O.P. between 3.0, and 4.0. Electric resistance heating can be done with C.O.P. between 0.85, and 0.95, while natural gas heating C.O.P. is normally between 0.50, and 0.75 . This substantial “efficiency advantage” when using Colmac HPA heat pumps means a good economic return by reducing energy operating costs, and a good environmental return by conserving fossil fuels, and reducing the threat of Global Warming.

APPLICATION

General: Colmac HPA heat pumps use double-wall vented refrigerant condensers to produce safe, clean potable hot water. These heat pumps use ambient air as a heat source. They can be located outdoors, provided air temperatures do not fall below 50 degrees F (10°C), or indoors. When operated indoors, the heat pump provides the added benefit of air-conditioning (cooling) the surrounding air. This cooling effect of the heat pump can be used while the water heating load, and air- conditioning loads are concurrent.

Hot Water Load: The HPA 2000 Heat Pump is best suited for supplying hot water in commercial facilities where demands for hot water and space cooling are concurrent, or where there is a demand for hot water and ambient air temperatures do not fall below 50°F (10°C). good applications requiring space cooling and hot water are: Restaurants, Nursing Homes, Laundries, Hospitals, Kitchens, Food Processing Plants, Photographic Processing Plants, etc. Examples of buildings with large hot water loads and warm ambient air are: Hotels, condominiums, apartment buildings, etc.

LOAD CALCULATIONS

To select a Colmac water heating heat pump, an accurate estimate of monthly water heating load for the application must be made. If the facility is a new one, with no water heating load information available, then it is recommended the 1991 ASHRAE HVAC Applications Handbook, Chapter 44, be used to calculate total heating load per month.

If the heat pump is to provide hot water to an existing facility, use the historical monthly natural gas, or electrical power consumption for the water heating load estimate. Use the following equations to calculate the the average daily water heating load:

Natural Gas:

$$\text{Heating Load, BTU/day} = \frac{\text{Therms/mo. x 100,000 X Efficiency}}{\text{30.4 days/mo}} \quad \left(\text{Heating Load, kW-Hr/day} = \frac{\text{MJ/mo. X Efficiency}}{\text{30.4 days/mo. X 3.6}} \right)$$

Note: Efficiency is gas heater efficiency, typically about 0.65 .

Electric Resistance:

$$\text{Heating Load, BTU/day} = \frac{\text{kW-Hr/mo. X 3413 X Efficiency}}{\text{30.4 days/mo}} \quad \left(\text{Heating Load, kW-Hr/day} = \frac{\text{kW-Hr/mo. X Efficiency}}{\text{30.4 days/mo.}} \right)$$

Note: Efficiency is electric heater efficiency, typically about 0.95 .

To calculate the required Heating Capacity, in BTUH (kW), divide the Heating Load found above by 12 hours (for very high evening loads, divide by 10 hours).

$$\text{Heating Capacity, BTUH} = \frac{\text{Req'd Heat Pump Heat Load, BTU/day}}{\text{12 hours/day*}}$$

$$\left(\text{Heating Capacity, kW} = \frac{\text{Req'd Heat Pump Heat Load, kW-Hr/day}}{\text{12 hours/day*}} \right)$$

*10 hours/day for very high evening loads

Figure 4 (Figure 8) shows heat pump Heating Capacity in MBH (kW). to calculate MBH for use with the figure, divide BTUH found above by 1000 (i.e., 1 MBH = 1000 BTUH).

RECOVERY RATE

Another convenient method of rating water heating heat pump capacity is by Recovery Rate. This rate indicates the capacity of the heat pump to raise the water from supply temperature to finished temperature. The following equation can be used to calculate Recovery Rate:

$$\text{Recovery Rate, Gal/Hr.} = \frac{\text{BTUH Heating Capacity}}{\text{8.33 X Water Temp. Rise}} \quad \left(\text{Recovery Rate, l/s} = \frac{\text{kW Heating Capacity}}{\text{4.179 X Water Temp. Rise}} \right)$$

Where,

BTUH (kW) Heating Capacity = output of the heat pump, BTUH (kW)

Water Temp. Rise = Tank Temp. - Supply Water Temp.,°F (°C)
(Note that Supply Water Temp. varies with location. Typical values for Hawaii are 60 to 70°F (15 to 21°C)

FACTORS AFFECTING PERFORMANCE

50 Hz Operation: Ratings shown in this bulletin are for 60 Hz supply power. Colmac HPA heat pumps may be operated with 50Hz power. Ratings, and performance remain the same.

ECONOMIC PAYBACK

Since heat pump technology is 3 to 4 times more energy efficient for water heating than natural gas, or electric resistance, there will be substantial savings in operating costs for the heat pump. One way to quantify the return on an investment in a heat pump water heating system, is to calculate simple "payback", that is, the number of years required to recover the initial heat pump investment in energy savings.

$$\text{Payback, yrs.} = \frac{\text{Initial Installation Cost, \$}}{\text{Annual Operating Cost Savings, \$/yr}}$$

STORAGE TANK SIZING

Hot water storage tanks in heat pump water heating systems perform an important function. With adequate storage tank volume, the heat pump does not have to be sized to keep up with peak hot water demand. Most potable water heating applications have some time of the day when the hot water demand is relatively low, this is when the heat pump is "catching up" and storing hot water.

Increased storage volume improves the ability of the system to meet high peak hot water demands. Generally speaking, bigger is better for storage tanks, however, there is obviously some economic optimum tank size for a given system. To size tanks for use in typical hotel, and condominium applications, use the following equation:

$$\text{Tank Volume, gallons} = \frac{\text{BTUH Heating Capacity X Factor}}{\text{8.33 X Water Temp. Rise}} \quad \left(\text{Tank Volume, m}^3 = \frac{\text{kW Heating Capacity X Factor X 0.8614}}{\text{Water Temp. Rise}}\right)$$

Where,

BTUH (kW) Heating Capacity = output of the heat pump, BTUH (kW)
Factor = a factor established by field experience in Hawaii, 1.75 for condominiums, 2.00 for hotels.
Water Temp. Rise = Tank Temp. - Supply Water Temp., °F (°C)
(Note that Supply Water Temp. varies with location. Typical values for Hawaii are 60 to 70°F (15 to 21°C)

Another important function of storage tanks, is the water temperature stratification they provide to the heat pump. Colmac HPA heat pumps are provided with their own internal water circulating pump. This pump is sized to increase the water temperature 15 to 18°F (8.3 to 10°C) as it passes through the heat pump. So, it is important for efficient system operation that the tank(s) be arranged to give 15 to 18°F (8.3 to 10°C) of temperature stratification. This can best be achieved when the storage volume required is divided between two tanks, piped in series (shown later).

STORAGE TANK PIPING

Piping schematics for one or more Colmac HPA heat pumps, with storage tanks in series are shown in Figures 1 thru 3.

Use good piping practice, according to local and national codes, for potable hot water systems. Insulate lines and storage tanks to prevent excessive heat loss.

FIGURE 1: TWO STORAGE TANKS IN SERIES

LEGEND:

- ⟶ = P & T RELIEF VALVE
- ⋈ = BALL VALVE
- ⊣⊢ = PIPE UNION
- ⊿ = CHECK VALVE
- ↓ = HOSE BIB
- HW = HOT WATER

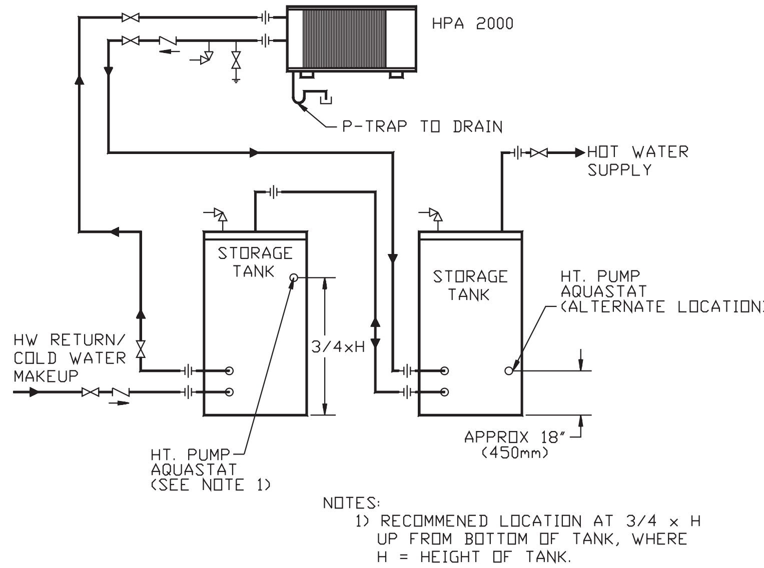
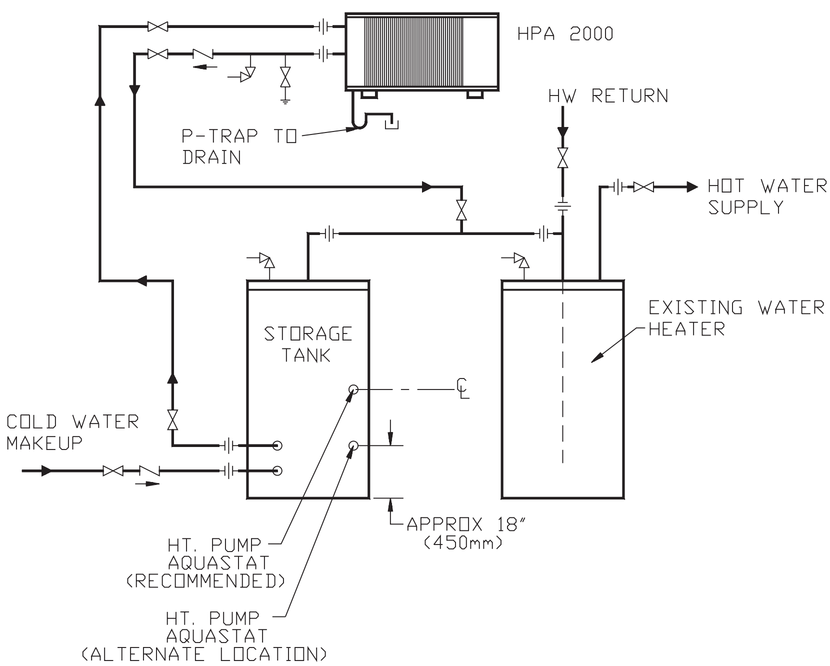


FIGURE 2: STORAGE TANK USED AS PREHEAT WITH EXISTING WATER HEATER



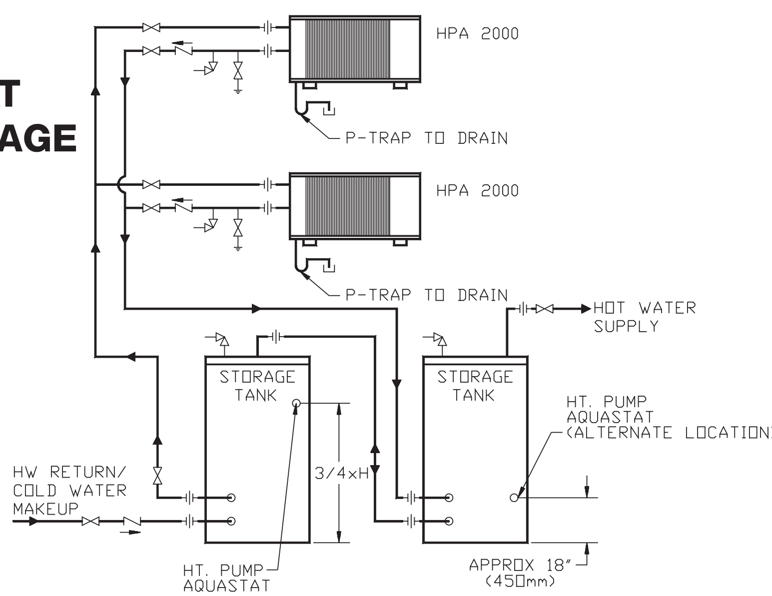
LEGEND:

- ⟶ = P & T RELIEF VALVE
- ⋈ = BALL VALVE
- ⊣⊢ = PIPE UNION
- ⊿ = CHECK VALVE
- ↓ = HOSE BIB
- HW = HOT WATER

FIGURE 3: MULTIPLE HEAT PUMPS PIPED TO TWO STORAGE TANKS IN SERIES

LEGEND:

- ⟶ = P & T RELIEF VALVE
- ⋈ = BALL VALVE
- ⊣⊢ = PIPE UNION
- ⊿ = CHECK VALVE
- ↓ = HOSE BIB
- HW = HOT WATER



AIRFLOW

General: The HPA 2000 is an air-source water heating heat pump. This means that the air supplied to the unit is cooled (heat is removed) and dehumidified. It is important to note when the unit is located indoors a sufficient source of heat is required, that is, there must be an air-conditioning load present that matches (or exceeds) the cooling capacity of the HPA 2000 (see Figure 5). Additionally, the air-conditioning load must be concurrent with the demand for hot water. If outdoor air is used as the heat source and the unit is located indoors, the space must be well ventilated or else air must be ducted to and from the unit.

Free Airflow (Unit not ducted): The rated airflow of the HPA 2000 with no duct work is 1850 CFM (873 l/s) @ 60 HZ. The unit is designed with a weatherproof cabinet suitable for installation indoors or outdoors. It is recommended when installing the unit for free air discharge (no ducting) that the optional bird screen (P/N 60527-12) be installed on the blower discharge.

Ducted Airflow: As mentioned above, the HPA 2000 is designed to produce 1850 CFM (873 l/s) with 0 iwg (0 mm Aq) external static pressure (no duct work). The fan is capable of operating with as much as 0.5 iwg (12.7 mm Aq) of external static pressure. Airflow produced at various external static pressure levels is shown below in Table 1.

TABLE 1
AIRFLOW VS. EXTERNAL STATIC PRESSURE

External Static Pressure, iwg (mm Aq)	60 Hz Airflow, CFM (l/s)	50 Hz Airflow CFM (l/s)
0 (0)	1850 (873)	1525 (720)
.125 (3.2)	1740 (821)	1350 (637)
.250 (6.4)	1625 (767)	1200 (566)
.375 (9.5)	1500 (708)	N/A
.500 (12.7)	1300 (614)	N/A

Ductwork, diffusers, dampers, etc. must be designed not to exceed the static pressure shown above at the desired airflow rate. there are numerous duct design methods available, an excellent source of information is the 1993 ASHRAE Fundamentals Handbook, Chapter 32. Be sure to insulate ducts well with a good external vapor barrier to prevent condensation on external surfaces of ductwork.

Moisture Removal (Dehumidification): As air passes over the heat pump evaporator coil, it contacts the coil fins and tubes which normally operate below the dew point of the air. When this happens moisture is condensed on the coil and leaves the unit through the drain. The amount of air dehumidification that takes place depends on entering air temperature and relative humidity.

Table 2 below shows leaving air temperatures, and average moisture removal rates at various inlet air temperatures:

TABLE 2
LEAVING AIR TEMP AND MOISTURE REMOVAL*

Inlet Air Dry Bulb Temp, °F (°C)	Lving Air Dry Bulb Temp, °F (°C)	Moisture Removal Rate, Pints/Hr. (l/h)
60 (15.5)	44 (6.7)	4.2 (1.9)
65 (18.3)	48 (8.9)	5.5 (2.6)
70 (21.1)	53 (11.7)	7.2 (3.4)
75 (23.9)	57 (13.9)	9.0 (4.3)
80 (26.7)	61 (16.1)	11.0 (5.2)
85 (29.4)	65 (18.3)	13.1 (6.2)
90 (32.2)	70 (21.1)	17.0 (8.0)
95 (35.0)	76 (24.4)	22.0 (10.4)

*Based on 55% relative humidity Inlet Air, 1500 CFM (708 l/s), 130°F (54.4°C) Lving Wtr., 60 Hz operation.

TABLE 3
60Hz Performance

Performance:		
Leaving Water Temp,°F (°C)	120 (48.9)	140 (60)
Heating Capacity, MBH (Kw)	61.6 (18.1)	59.2 (17.4)
C.O.P.	4.5	3.6
Circulating gpm (L/s) *	6 (.38)	6 (.38)
Recovery Rate:		
@60°F (15.5°C), GPH (L/h)	125 (471)	90 (342)
@70°F (21°C), GPH (L/h)	150 (566)	103 (391)
Cooling Capacity, Tons, (Kw)	4.2 (14.9)	3.8 (13.4)

Note: Above figures based on; (a) 84°F (28.9°C) inlet air dry bulb @ 60% rh;
(b) R134a refrigerant
(c) *GPM (L/s) shown delivered at 7 ft H20 (21 kPa) external system pressure loss.

TABLE 4
50Hz Performance

Performance:		
Leaving Water Temp,°F (°C)	120 (48.9)	140 (60)
Heating Capacity, MBH (Kw)	63.7 (18.7)	62.8 (18.4)
C.O.P.	4.5	3.6
Circulating gpm (L/s)	6 (.38)	6 (.38)
Recovery Rate:		
@60°F (15.5°C), GPH (L/h)	129 (487)	96 (362)
@70°F (21°C), GPH (L/h)	155 (585)	110 (414)
Cooling Capacity, Tons, (Kw)	4.3 (15.2)	4.0 (14.0)

Note: Above figures based on; (a) 84°F (28.9°C) inlet air dry bulb @ 60% rh;
(b) R134a refrigerant
(c) *GPM (L/s) shown delivered at 4.1 ft H20 (12 kPa) external system pressure loss.

COLMAC HPA AIR-SOURCE HEAT PUMP WATER HEATERS
CALCULATION WORKSHEET NO. 1 (I-P)
Converting Energy Consumption (Utility Records) to gal/day

I. Calculate Daily Water Heating Load (based on utility records)

Heating Load = Energy Consumption x Factor x Efficiency / 30.4 days/mo.

A. Natural or Synthetic Gas:

Heating Load = ____________ Therms/mo. x 100,000 x _____ Eff. / 30.4 days/mo.

= ______________ Btu/day

Note: Efficiency is gas heater efficiency, typically about 0.65.

B. Electric Resistance:

Heating Load = _____________ kW-h/mo. x 3413 _____ Eff. / 30.4 days/mo.

= _____________ Btu/day

Note: Efficiency is electric heater efficiency, typically about 0.95

C. LPG (Liquid Propane Gas):

Heating Load = _____________ gal LPG/mo. x 91,500 x _____ Eff. / 30.4 days/mo.

= _____________ Btu/day

Note: Efficiency is propane heater efficiency, typically about 0.65

D. Fuel Oil (#2):

Heating Load = _____________ gal oil/mo. x 144,250 x _____ Eff. / 30.4 days/mo.

= _____________ Btu/day

Note: Efficiency is oil-fire boiler efficiency, typically about 0.65

II. Calculate Daily Water Usage (gal/day)

Water Usage = Heating Load / (Factor x (Tank Temp - Supply Temp))

Water Usage = _____________ Btu/day / (8.33 x (_____ F - _____ F))

= _____________ gal/day

COLMAC HPA AIR-SOURCE HEAT PUMP WATER HEATERS
CALCULATION WORKSHEET NO. 1 (SI)
Converting Energy Consumption (Utility Records) to L/day

I. Calculate Daily Water Heating Load (based on utility records)

Heating Load = Energy Consumption x Factor x Efficiency / 30.4 days/mo.

A. Natural or Synthetic Gas:

Heating Load = ____________ MJ/mo. x 0.28 x _____ Eff. / 30.4 days/mo.

= ______________ kW-h/day

Note: Efficiency is gas heater efficiency, typically about 0.65.

B. Electric Resistance:

Heating Load = _____________ kW-h/mo. x _____ Eff. / 30.4 days/mo.

= _____________ kW-h/day

Note: Efficiency is electric heater efficiency, typically about 0.95

C. LPG (Liquid Propane Gas):

Heating Load = _____________ Litres LPG/mo. x 7.083 x _____ Eff. / 30.4 days/mo.

= _____________ kW-h/day

Note: Efficiency is propane heater efficiency, typically about 0.65

D. Fuel Oil (#2):

Heating Load = _____________ Litres oil/mo. x 11.17 x _____ Eff. / 30.4 days/mo.

= _____________ kW-h/day

Note: Efficiency is oil-fire boiler efficiency, typically about 0.65

II. Calculate Daily Water Usage (L/day)

Water Usage = Heating Load / (Factor x (Tank Temp - Supply Temp))

Water Usage = _____________ kW-h/day / (0.00116 x (_____ C - _____ C))

= _____________ L/day

COLMAC HPA AIR-SOURCE HEAT PUMP WATER HEATERS
CALCULATION WORKSHEET NO. 2 (I - P)
HPWH / Tank Sizing

I. Calculate Daily Water Heating Load (based on gal/day)

Heating Load = Usage x Factor x (Tank Water Temp. - Supply Water Temp)
Heating Load = _____________ gal/day x 8.33 x (_____ F - _____ F)
= ______________________ Btu/day

II. Calculate Required Heat Pump Capacity

Heat Pump Capacity = Heat Load / Runtime
where Runtime = hours of operation per day (typical runtime = 14 h/day)
Heat Pump Capacity = _______________________ Btu/day / _____ h/day
= ________________ Btu/h

III. Calculate Required Recovery Rate

Recovery Rate = Heat Pump Capacity / (Factor x (Tank Temp - Supply Temp))
Recovery Rate = _________________ Btu/h / 8.33 x (_____ F - _____ F))
= _________________ gal/h

IV. Calculate Storage Tank Volume

A. Hotels

1. When HPA runtime is less than 10 h/day:
Tank Volume, gal = Recovery Rate, gal/h x 2.0 h
= ___________________ gal/h x 2.0
= ___________________ gal
2. When HPA runtime is greater than 10 h/day:
Tank Volume, gal = Usage, gal/day x (0.036 x runtime, h/day - 0.24)
= ___________________ gal/day x (0.036 x ____h/day - 0.24)
= ___________________ gal

B. Apartment/Condominiums

1.When HPA runtime is less than 12 h/day:
Tank Volume, gal = Recovery Rate, gal/h x 1.75 h
= ___________________ gal/h x 1.75
= ___________________ gal
2. When HPA runtime is greater than 12 h/day:
Tank Volume, gal = Usage, gal/day x (0.03 x runtime,h/day - 0.28)
= ___________________ gal/day x (0.03 x ____h/day - 0.28)
= ___________________ gal

COLMAC HPA AIR-SOURCE HEAT PUMP WATER HEATERS
CALCULATION WORKSHEET NO. 2 (SI)
HPWH / Tank Sizing

I. Calculate Daily Water Heating Load (based on L/day)

Heating Load = Usage x Factor x (Tank Water Temp. - Supply Water Temp)
Heating Load = ____________ L/day x 0.00116 x (_____ C - _____ C)
= _________________kW-h/day

II. Calculate Required Heat Pump Capacity

Heat Pump Capacity = Heating Load / Runtime

where Runtime = hours of operation per day
= 12 h/day (for typical loads)
= 10 h/day (for very high evening loads)

Heat Pump Capacity = ______________________ kW-h/day / _____ h/day
= _______________ kW

III. Calculate Required Recovery Rate

Recovery Rate = Heat Pump Capacity x 861 (Tank Temp - Supply Temp))
Recovery Rate = ________________ kW x 861 / (_____ C - _____ C))
= _______________ L/h

IV. Calculate Storage Tank Volume

A. Hotels

1. When HPA runtime is less than 10 h/day:
Tank Volume, L = Recovery Rate, L/h x 2.0 h
= __________________L/h x 2.0
= __________________L

2. When HPA runtime is greater than 10 h/day:
Tank Volume, L = Usage, L/day x (0.036 x runtime, h/day - 0.24)
= __________________ L/day x (0.036 x ____h/day - 0.24)
= __________________ L

B. Apartment / Condominiums

1.When HPA runtime is less than 12 h/day:
Tank Volume, L = Recovery Rate, L/h x 1.75 h
= __________________ L/h x 1.75
= __________________ L

2. When HPA runtime is greater than 12 h/day:
Tank Volume, L = Usage, L/day x (0.03 x runtime,h/day - 0.28)
= __________________ L/day x (0.03 x ____h/day - 0.28)
= __________________ L

FIGURE 4
DIMENSIONS

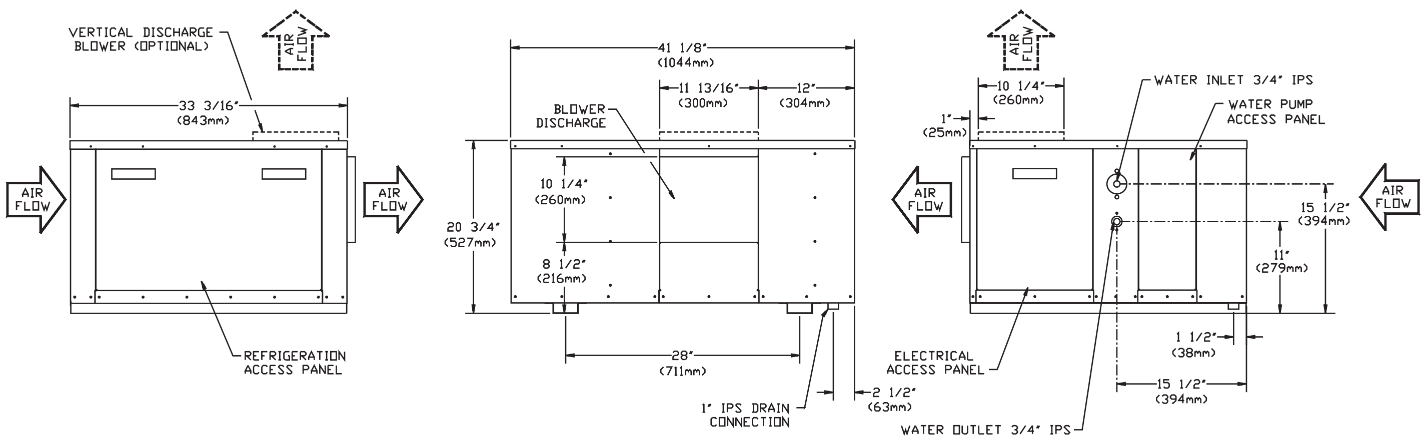


TABLE 5
SPECIFICATIONS

Performance (60Hz)		
Leaving Water Temp., °F (°C)	120 (48.9)	140 (60)
Heating Capacity, MBH (kw)	61.6 (18.1)	59.2 (17.4)
C.O.P.	4.5	3.6
Circulating GPM (L/s)*	6 (.38)	6 (.38)
Recovery Rate:		
@ 60°F (15.5°C), GPH (L/h)	125 (471)	90 (342)
@ 70°F (21°C) GPH (L/h)	150 (566)	103 (391)
Cooling Capacity, tons (kw)	4.2 (14.9)	3.8 (13.4)

Note: Above figures based on:
(a) 84°F (28.9°C) inlet air dry bulb at 60% rh;
(b) R134a refrigerant
(c) *GPM (L/s) shown delivered at 7 ft H20 (21 kPa) external system pressure loss.

Electrical:

	208-230/60/1	208-230/60/3	400/50/3
RLA:	28.8	17.0	8.3
LRA:	168	128	67

Dimensions:

Uncrated:	41.25” W x 33.25” L x 20.75” H
Cube (crated):	23.6 cu ft. (668 m^3)

Weight:

Dry:	361 lbs. (164 kg)
Operating:	375 lbs. (170 kg)
Crated:	390 lbs. (177 kg)

EQUIPMENT SPECIFICATION
HPA 2000 AIR-SOURCE HEAT PUMP (W/R134a REFRIGERANT)
COLMAC COIL MANUFACTURING, INC.

I. GENERAL

The heat pump water heater shall be air source equipment, factory assembled, charged, and tested. The heat pump shall have the capability of producing no less than 140°F (60°C) water, with heating capacity as indicated on the drawings.

1. **Heat Pump Unit:** Heat Pump unit shall consist of compressor, condensers, evaporator coil, fans, water pump, piping, and controls, factory assembled, charged, and tested. The heat pump shall contain the following components, and features:

   Cabinet: Shall be type 304 stainless steel. Supports, channels and beams shall also be constructed o type 304 stainless steel. Compartments shall have large access doors for servicing. Compressor and condenser shall be located in separate compartment from fan and evaporator for in-operation servicing. Base section under evaporator for in-operation servicing. Base section under evaporator coil shall have stainless steel drip pan for condensate. Cabinet shall be designed for outdoor operation.

   Fans: The fan arrangement shall be draw-through design. Fans shall be centrifugal, direct driven at no more than 1075 RPM (60 Hz). Fan diameter shall not be greater than 9" (229 mm.). Construction shall be epoxy coated steel. Motor shall be mounted to blower scroll with vibration isolating rubber grommets, with stainless steel fasteners. Motor shall be marine duty corrosion protected.

   Evaporator Coils: Shall be constructed with aluminum waffle plate fins mechanically bonded to seamless copper tubing. All tube joints to be brazed with silver solder. Coils shall have corrosion inhibiting coated fins and type 304 stainless steel coil casings and drain pan. (For Copper Fins see Option 1.)

   Refrigerant: Refrigerant shall be R134a. This refrigerant is environmentally safe, and is readily available.

   Expansion Valves: Valves shall be specifically designed for heat pump use with field adjustable superheat feature.

   Compressors: Scroll type, suitable for high temperature operation with R134a refrigerant.

   Compressor Controls: Compressor controls/accessories must include the following:
   Crankcase Heater　　Crankcase Heater Relay　　High Pressure Safety Switch
   Low Pressure Safety Switch

   Indicator Lights for:
   Power On　　Normal Stop　　High Pressure Fail　　Low Pressure Fail

   Condensers: Coaxial vented double wall type. Suitable for high temperature operation with potable water.

   Refrigerant Accessories:
   A. Filter-Driers: Sweat connection type.
   B. Site Glass: Moisture indicating type.

   Anti-Cycle Control: Units shall be factory wired to allow a maximum of twelve compressor starts per hour to prevent compressor short cycling and allow time for suction and discharge pressures to equalize permitting the compressor to start in an unloaded condition.

   Water Circulating Pumps: Shall be in-line all bronze or stainless steel body centrifugal type able to deliver rated flow against the external head shown on the drawings.

   Controls: The heat pump unit shall be factory wired for fully automatic operation. Safeties shall include compressor and fan motor thermal overload protection, manual reset pressurestats, anti-cycling compressor relays, plus standard items recommended by the equipment manufacturer.

   Manufacturer: Colmac Coil Manufacturing, Inc., Model HPA 2000

   Option 1. Evaporator Coils: Shall be constructed with copper waffle plate fins mechanically bonded to seamless copper tubing. All copper tube joints to be brazed with silver solder.

A Tradition of Quality

Colmac Coil was founded in 1971 and has been distinguished for its commitment to quality in the new and replacement coil markets with listings, certifications, and code markings such as ARI, ASME, UL, CSA, and CRN. Located in the Northwest USA, Colmac has grown to prominence as a trusted coil manufacturer with commercial/industrial heating & cooling, HVAC and refrigeration customers worldwide. Colmac has a network of over 250 factory representatives in over 80 sales offices around the world.

QUALITY COLMAC PRODUCTS

HEAT TRANSFER PRODUCTS

HVAC/Industrial/OEM

- Heating and Cooling Coils
- Fluid Coolers
- Heat Pipe Coils

HEAT PUMP WATER HEATERS

Commercial/Industrial

- Air-Source Heat Pump Water Heaters with Air Conditioning Benefit

REFRIGERATION PRODUCTS

Industrial/Commercial

- Evaporators - Air Coolers
- Air-Cooled Condensers
- Blast Freezers
- Tube Bundles
- Hydro Coolers
- Bunker Coils

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