UVIC - STUDENT UNION BUILDING SUSTAINABILITY INITIATIVES

UVIC PROJECT NO.: F04567
AME PROJECT NO.: 050A-022-20

DESIGN DEVELOPMENT REPORT

NOVEMBER 10, 2020

PREPARED FOR:
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consulting mechanical engineers

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1. INTRODUCTION

The AME Consulting Group was engaged to perform a Design Development Report for the UVic Student Union Building (SUB) sustainability upgrades. An Energy Study was performed in 2012 with a list of potential energy conservations measures to reduce energy costs and greenhouse gas emissions. This report outlines two of the proposed measures from the energy study.

1.1 Scope of Work

The scope of work for this project includes two parts: converting the existing AHU-1 DX unit to a heat pump and implementing a heat recovery system to provide preheat the domestic hot water in the SUB Building.

2. DESIGN CRITERIA

2.1 Applicable Codes and Standards

The following is a list of applicable codes and standards that apply to the scope of work for this project.

- BC Building Code
- BC Plumbing Code
- BC Fire Code
- Applicable NFPA Regulations
- Local Building By-Laws and standards
- BC Gas Safety Regulations
- Canadian Standards Association (CSA)
- National Energy Code of Canada for Buildings (NECB)
- American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)
    - ASHRAE 90.1
    - ASHRAE Standards, Guidelines, Handbooks and Design Guides
- Sheet Metal Contractors Association of North America (SMACNA)

3. METHODOLOGY

To complete this report, information was gathered from multiple sources, including documentation and an on-site review of the equipment.

3.1 Supporting Documentation

UVic and Zeidler Architecture provided the required documentations, including drawings, system schematics and the original energy study by Avalon Energy Management.

3.2 Site Visits & Meetings

A site review was performed on October 14th, 2020 by Louise McKenzie (AME), Zach Denny (AME) and Jeff Halpenny (AES). A member from the building maintenance team provided a tour of the applicable locations and mechanical room, and also showed the rooftop equipment.

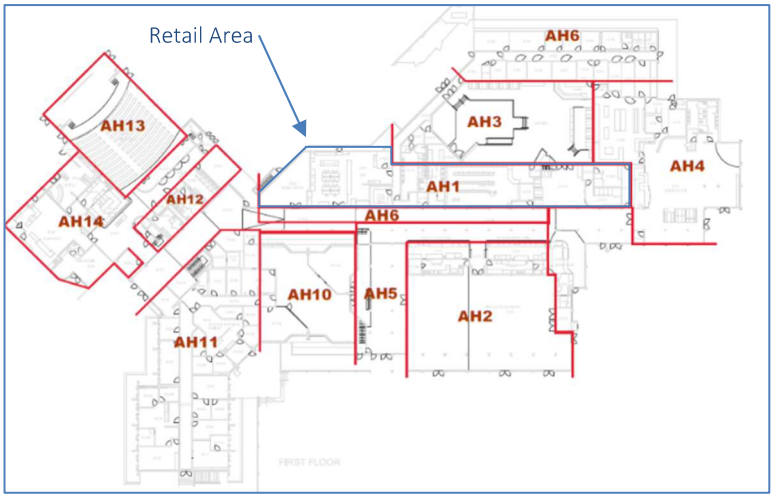
4. PROPOSED MECHANICAL UPGRADES

The following section elaborates on the scopes of work and the new equipment for each system. For new equipment selections described in this section, refer to Appendix A.

4.1 AHU-1 Conversion to Heat Pump

.1 Existing Equipment

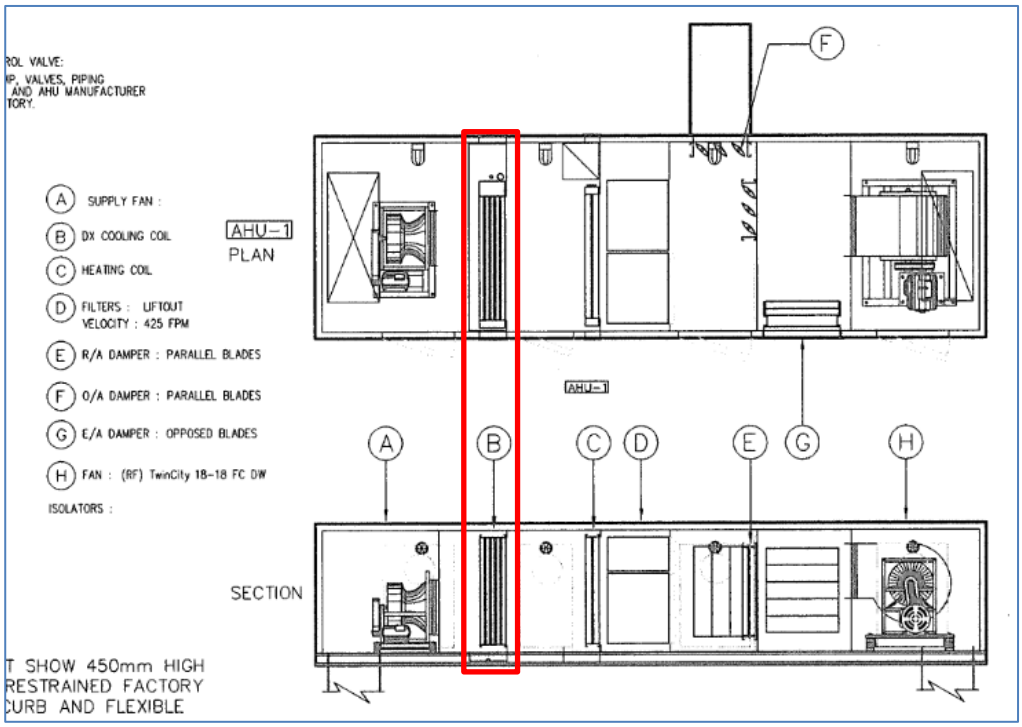
The existing AHU-1 is a Haakon Pentak unit. This unit is from a renovation to the building in 1995. AHU-1 has a 10Ton DX unit for cooling (TTA120A300B0). The current heating system is hydronic and takes heat from the district energy loop. One coil is for heating (district heating system) and one coil is for cooling (DX system). AHU-1 serves the retail area of SUB, see image below.



.2 New Equipment

The figure below shows the original detail for AHU-1. The DX cooling coil (B) is the targeted upgrade. Currently this coil is only designed and sized for cooling. Adjacent to the large AHU there is a condensing unit connected to the DX coil to provide the cooling (see photo 3 in Appendix B).

The proposed upgrade to AHU-1 involves removing the existing cooling only system and replacing it with a heat pump, so that the new coil (B) can provide both heating and cooling. The second coil (C) will provide additional heat from the district energy loop as needed. This upgrade will require modifications to the existing AHU, new piping between the coil and heat pump unit, new valves and new control points. Please refer to Appendix A for the new coil and heat pump selections.



One additional design consideration that was not listed in the original project scope is to upgrade the heating coil (C) as well. ASHRAE lists a typical life expectancy for these coils of 15-20 years and this coil is 25 years old. AME recommends replacing the heating coil, which provides heat from the district energy loop.

The existing condensing unit has a 38" x 52" footprint, while the new heat pump has dimensions of 38" x 51". It is expected that the new unit will not need the existing roof curbs to be modified.

4.2 AHU-7 Heat Recovery for DCW Preheat

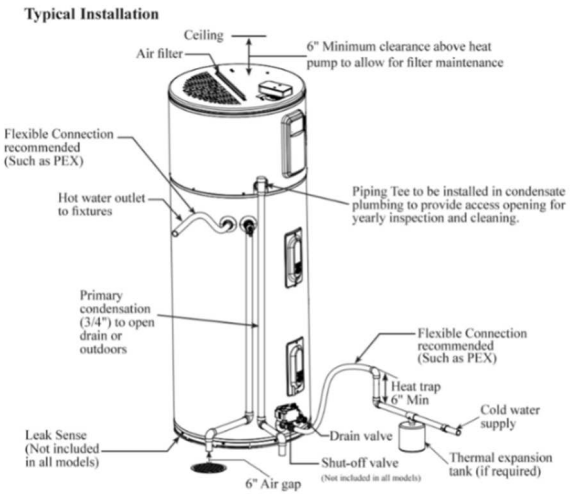
.1 Existing Equipment

AHU-7 serves the radio station and associated spaces, which has equipment that gives high thermal gains. Currently the AHU-7 return is open to the mechanical room. Due to the high temperature of return air and it being returned to the mechanical room, this provides the opportunity to use waste heat for preheating domestic hot water.

There are currently two hot water tanks beside the heat exchangers. According to the building maintenance representative, these tanks were used when the building was being transitioned to the district energy loop for heating domestic cold water (DCW). It is his understanding that these 120gallon units (x2 – GIANT 1126A-3-30) are no longer needed and can be removed and potentially used elsewhere. He also provided that these units were sufficient for heating the water to the full SUB. Eliminating the existing auxiliary units provides additional power capacity and space for the new unit to provide heat recovery. Conveniently the old units are located directly beside the existing heat exchangers and AHU-7 return air outlet.

.2 New Equipment

The new equipment selection is a hybrid electric water heater. These units function by pulling warm air over a coil which is used to preheat the incoming domestic cold water. The concept is to recover as much heat from the air as possible, which can be used to preheat domestic hot water. The remaining temperature difference (up to the setpoint) of the domestic hot water is made up by an electric coil. The largest size of these hybrid tanks would be 80 gallons.



As per the original energy study, AME recommends installing one 80-gallon unit. Additional tanks could be installed, if there is additional budget now or in the future.

The new unit would tie into the existing DCW line, before the heat exchanger connection, to preheat domestic hot water (see Appendix C & D). These units have the reclaimed heat from the air and an electric heating coil, so the capacity that they are used would be at the discretion of UVic. If electric heating is preferred, they could be maximized to get as much heat out of the air as possible and provide maximum heating by the electric coil, with any remainder being made up by the heat exchangers (which are connected to the district energy loop). If these units are preferred to maximize the heat recovery, but not rely on the electric coil, they could be maximized (heat pump mode) to get as much heat out of the air as possible and provide most of the remaining heating capacity from the heat exchanger (district energy loop).

The amount of heat provided by the electric coils is subject to the number of units installed and the preference from UVic of whether to make up the remaining heat via electric coil, district energy, or a combination the two. It should be noted that for the sake of costing and the DD report, a circulation pump has been include, however this will be dependent on the quantity of units and piping configuration.

The original design proposal was to duct the return air directly from the radio station return to the hybrid water heater, however there is another viable option, which could potentially increase

efficiency. An additional design consideration noted during the site visit was the high temperature of the mechanical room. There are several pieces of equipment (see Appendix B for photos), which provide thermal gains to the mechanical room, including an air compressor, uninsulated portions of pipe carrying the hot hydronic water and various other fans and AHUs. This provides the opportunity for potentially recovering more heat. Instead of ducting the return from AHU-7, which is currently returned to the mechanical room, directly to the water heater, it is proposed that the air from the full mechanical room be used. In this way, the return air from the radio station is still being used, since it returns to the mechanical room, but other potentially thermal gains from equipment can be recovered as well. This could potentially provide a more effective preheat.

Other considerations for the installation of new tank is seismic bracing and equipment pads. The existing two units did not appear to have seismic bracing and were located on the floor. Seismic bracing will be required for the new tanks. AME also recommends providing new equipment pads for any new equipment installed in the mechanical room, as all other pieces of equipment in the room are on pads.

It is AME's recommendation that UVic remove the two temporary hot water tanks and replace with one new hybrid electric unit, as per the original energy study recommendations. Should UVic desire to maintain the same electric water heating capacity as is currently installed, or desire to have full electric backup, or desire more preheating capacity, additional units could potentially be installed. Three units would be 240gallons of capacity, which would replace the existing two temporary units.

5. CONCLUSION

This Design Development Report summarizes the findings from the information provided, research performed, and observations made during the site walk-through. The recommendations and options pertaining to each upgrade have been discussed. It is AME's recommendation that UVic replace both the coils in AHU-1 and upgrade the DX unit to a heat pump. It is AME's recommendation that UVic replace the two auxiliary water heaters in the mechanical room, with one hybrid electric tank, preheat the domestic hot water. AME is prepared to work with UVic and Zeidler Architecture, to develop this project to tender ready documentation and through construction and closeout.

END OF REPORT

APPENDIX A

NEW EQUIPMENT SELECTIONS

Job Name: UVic Student Union Building - Heat Pump
Prepared By:
Unit Tag: 10T
Quantity: 1

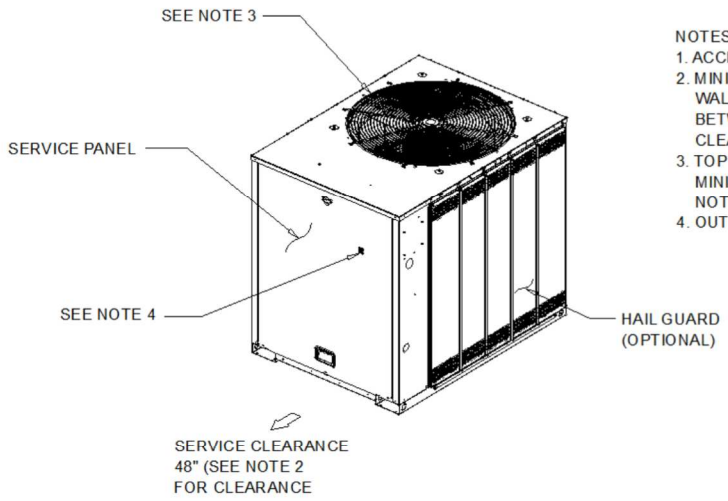
6 - 25 Ton Unitary Split Systems Outdoor

Unit Overview

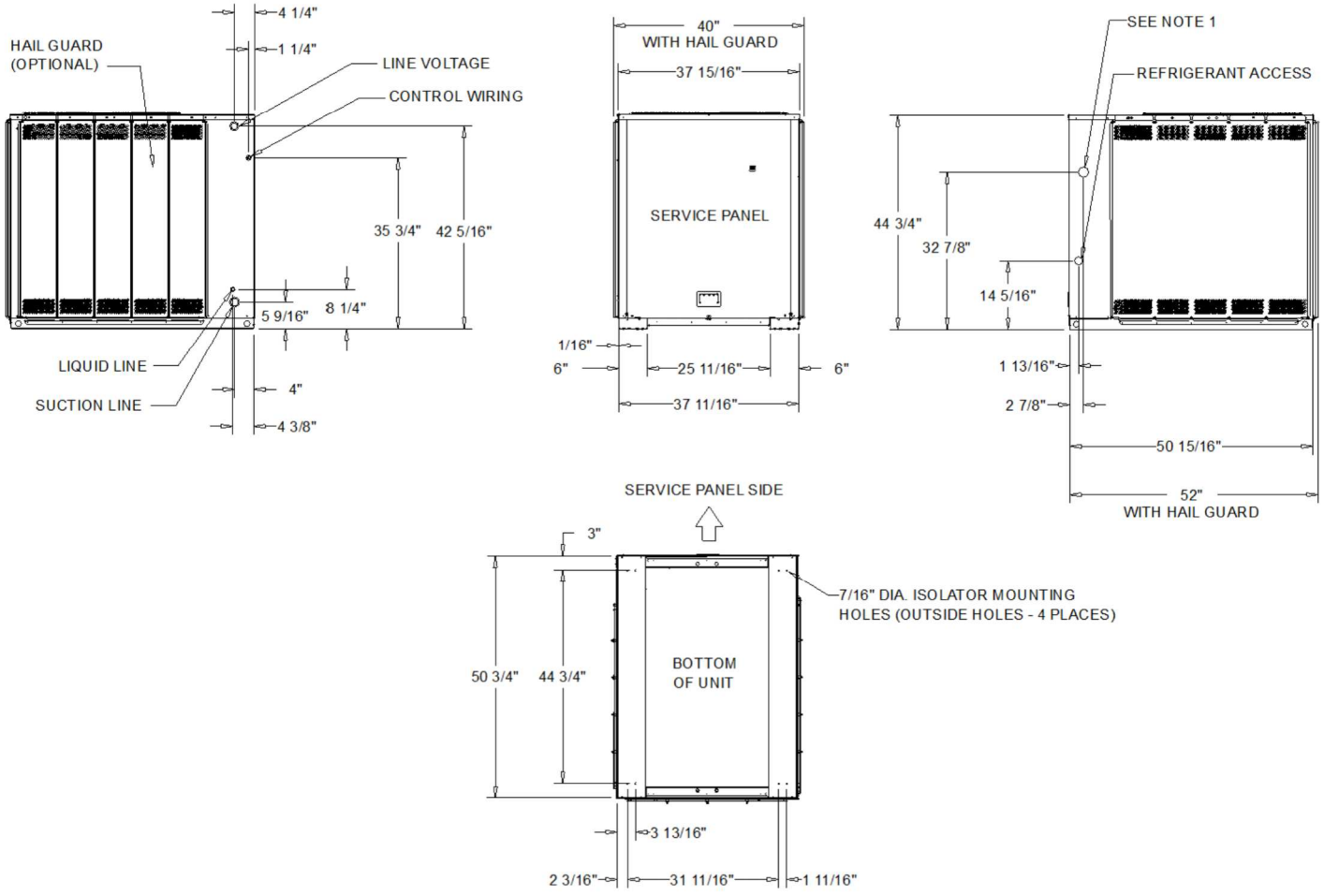
Model	TWA12043AAB**AR000000000000000000000000
Unit Tonnage	10 Tons
Refrigeration Circuit / Stage	Single Compressor / Single Circuit
Unit Function	Heat Pump

Electrical Information

Unit Voltage	208-230/60/3



NOTES:
1. ACCESS OPENING IS FOR FIELD INSTALLED BAYLOAM ACCESSORY.
2. MINIMUM CLEARANCE FOR PROPER OPERATION IS 36" FROM WALLS, SHRUBBERY, PRIVACY FENCES ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72". RECOMMENDED SERVICE CLEARANCE 48"
3. TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 100" MINIMUM. UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT
4. OUTDOOR AIR TEMPERATURE SENSOR OPENING (DO NOT BLOCK OPENING)



10 TON HEAT PUMP CONDENSER (SINGLE COMPRESSOR)

DIMENSIONAL DRAWING

ELECTRICAL DATA CONDENSER

ELECTRICAL DATA		COMPRESSOR MOTOR		CONDENSER FAN MOTOR	
Model:	TWA12043A	No.:	1	No.:	1
Unit Operating Voltage:	187-253	Volts:	208-230	Volts:	208-230
Minimum Circuit Ampacity:	46.0	Phase:	3	Phase:	1
Maximum Fuse Size:	70.0	Amp-RLA:	33.0	Amp-FLA:	4.8
Maximum Circuit Breaker:	70.0	Amp-LRA:	267.0	Amp-LRA:	20.0

GENERAL DATA CONDENSER

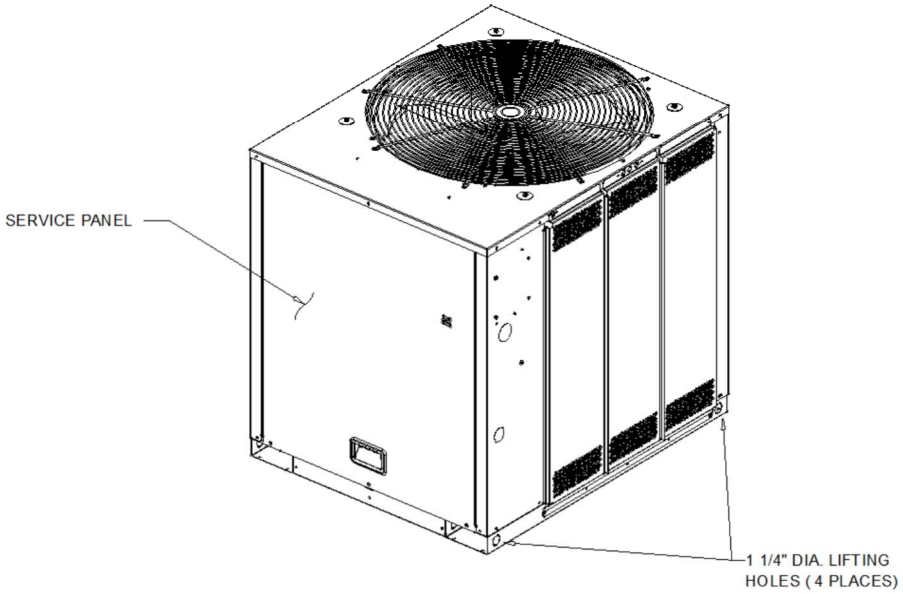
COOLING PERFORMANCE (1)(2)(3)(4)(5)		COMPRESSOR	
Matched Air Handler:	TWE1204*A*	Number:	Scroll
Condensing Unit Only:	117,000	No. Compressor / Tons:	1/8.6
ARI Net Cooling Capacity:	123,000		
Matched Air Handler (EER):	11.3		
Condensing Unit Only (EER):	12.5	SYSTEM DATA (7)	
System KW	10.6	No. Refrigerant Circuits:	1
Condensing Unit KW:	9.4	Suction Line (in.) OD:	1 3/8" Horizonal / 1 1/8" Vertical
System IEER:	12.4	Liquid Line (in.) OD:	1/2"

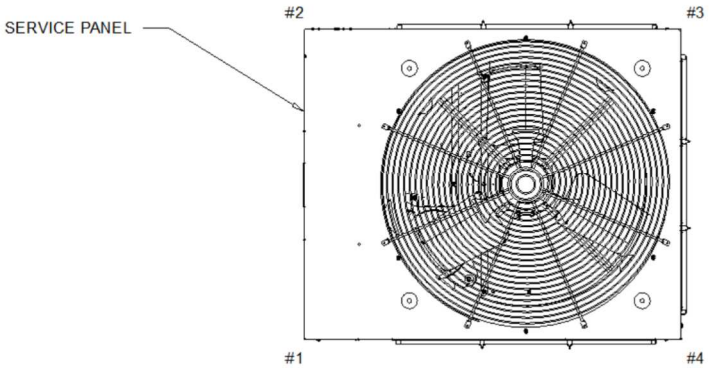
OUTDOOR COIL		OUTDOOR FAN	
Tube Size (in.) OD	3/8"	No. Used/Diameter (in.):	1 / 28"
Face Area (sq. ft.)	19 1/4"	Drive Type/No. Speeds:	DIRECT / 1
Rows/FPI	2/18	No. Motors/HP:	1 / 1
		Motor RPM:	1,100

REFRIGERANT CHARGE (Fld Supplied) (7)(8)	
TYPE:	R-410A
(Circuits #1):	37.7 lb
(Circuits #2):	N/A

NOTES:

1. Cooling performance is rated at 95 F ambient, 80 F entering dry bulb, 67 F entering wet bulb. Gross capacity does not include the effect of fan motor heat. AHRI capacity is net and includes the effect of fan motor heat. Ratings shown are tested and certified in accordance with AHRI
2. Standard 340/360 or 365 certification program.
3. Condensing Unit Only Gross Cooling Capacity rate at 45 F saturated suction temperature and at 95 F ambient.
4. ARI Net Cooling Capacity is calculated with matched blower coil and 25 ft. of OD interconnecting tubing. EER is rated at AHRI conditions and in accordance with DOE test procedures.
5. Integrated Part Load Value is based on AHRI Standard 340/360 or 365. Units are rated at 80 F ambient, 80 F entering dry bulb, and 67 F entering wet bulb at AHRI rated CFM.
6. Sound Rating shown is tested in accordance with AHRI Standard 270.
7. Refer to refrigerant piping program for line sizing and line length.
8. Refrigerant (operating) charge is for condensing unit (all circuits) with matching blower coils and 25 ft. of interconnecting refrigerant lines. All units are shipped with a small nitrogen holding charge only.



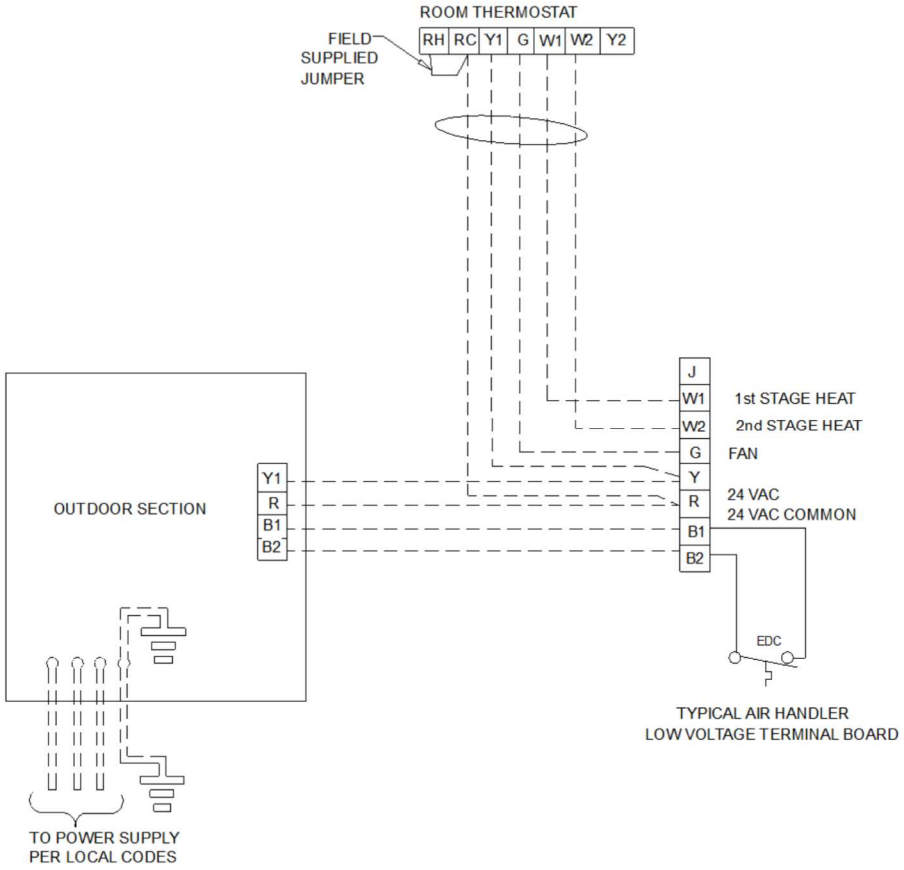


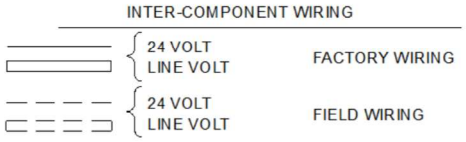
WEIGHTS AND CORNER WEIGHTS

Shipping:	496.0 lb
Net	467.0 lb
Corner 1:	166.0 lb
Corner 2:	109.0 lb
Corner 3:	116.0 lb
Corner 4:	76.0 lb

WEIGHTS AND LOAD POINT LOCATION

WEIGHT AND RIGGING





NOTES:

1. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
2. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
3. LOW VOLTAGE WIRING TO BE 18 A.W.G. MINIMUM CONDUCTOR.
4. USE COPPER CONDUCTORS ONLY.

General - TWA
Weatherproofed Steel Mounting/Lifting Rails
Hermetic Scroll Compressors
Plate Fin Condenser Coils
Fans and Motors
Standard Operating Range 50-125F (Min. 0°F with Low Ambient Accy)
Nitrogen Holding Charge
Certified and Rated in Accordance with AHRI and DOE Standards
Certified to UL 1995

Casing - TWA
Zinc Coated, Heavy Gauge, Galvanized Steel Weather Resistant Baked Enamel Finish Meets 672 hr Salt Spray Test Removable Single Side Maintenance Access Panels Lifting Handles in Maintenance Access Panels Unit Base Provisions for Forklift and/or Crane Lifting

Refrigeration System - TWA
Single Compressor (TWA073D, TWA090D, TWA120D) Single Refrigeration Circuit with Integral Subcooling Circuit. Single Direct Drive Hermetic Scroll Compressor with Centrifugal Oil Pump Providing Lubrication To Moving Parts Suction Gas-Cooled Motor w/ ± 10% Voltage Utilization Range of Unit Nameplate Voltage Reversing Valve Crankcase Heater Internal Temperature and Current Sensitive Motor Overloads No Compressor Suction and/or Discharge Valves (Reduced Vibration/Sound) Factory Installed Liquid Line Filter Drier Phase Loss/Reverse Rotation Monitor External High Pressure Cutout Device External Low Pressure Cutout Device Evaporator Defrost Control Loss of Charge Protection (Discharge Line Thermostat)

Condenser Coil - TWA
3/8" Internally Enhanced Copper Tube Mechanically Bonded to Lanced Aluminum Plate Fins Factory Pressure and Leak Tested to 660 psig.

Condenser Fan - TWA
26" or 28" Propeller Fan(s) Direct Drive Statically and Dynamically Balanced

Condenser Motor(s) - TWA
Permanently Lubricated Totally Enclosed or Open Construction Built-In Current and Thermal Overloads Ball or Sleeve Bearing Type

Controls - TWA
Centralized Microprocessor Indoor and Outdoor Temperature Sensors Drive Algorithms Making Decisions for All Heating, Cooling, and Ventilation Integrated Anti-Short Cycle Timer Integrated Time Delay Between Compressors Completely Internally Wired Numbered and Colored Wires Contractor Pressure Lugs or Terminal Block Unit External Mounting Location for Disconnect Device Single Point Power Entry

SUPER RADIATOR COILS

Version: 4.4.0.0 © 2020

Customer: Trane Creative Solutions Team
Project: UVic Student Union Building
Item: DX-1

Date: 11/4/2020
By: Zachary Moffett
Units: English

Evaporator Coil | **Coil Qty:** 1 | **Model:** 36.25x40 - 4R - 0.5/216

Input

Airside Requirements:

Coil Application:		Cooling
Surface Condition:		Wet
Air Flow:	SCFM	5,100
Capacity:	Btu/Hr.	120,000
Entering Air Dry-Bulb:	°F	80.0
Entering Air Wet-Bulb:	°F	67.0
Leaving Air Wet-Bulb:	°F	59.7
Air Pressure:	PSIA	14.696
Coil Hand:		Left Hand

Tubeside Requirements:

Refrigerant:		R-410A
Refrigerant Suction Temp.:	°F	45.0
Degrees Superheat:	°F	10.0
Liquid Temperature:	°F	110.0
Refrig. Mass Flow:	Lbs./Hr.	1,811

Output

Coil Selection:

Model Number:		36.25x40 - 4R - 0.5/216
Tube Size:	In.	0.500
Arrangement:		1.25 x 1.083 Staggered
Fin Surface:		Sine Wave
Face Area / Coil:	ft²	10.1
Face Velocity / Coil:	Ft/Min. (STD)	506.5
Number Of Circuits:	Qty	29
Circuitry Flow:		Thermal Parallel Flow
Tube Material:		Copper
Tube Wall:	In.	0.022
Fin Material:		Aluminum
Fin Thickness:	In.	0.0055
Header Material:		Std.Type 'L' Copper
Header OD:	In.	1.125
Connection Material:		Std.Type 'L' Copper
Connection OD:	In.	1.125
Casing Material:		16 Ga. Galv. Steel (Std.)
Casing Depth:	In.	9.625
Dry Weight:	Lbs./Coil	167

Coil Rating

Capacity:

Capacity / Coil:	Btu/Hr.	123,435
Sensible Cap. / Coil:	Btu/Hr.	113,160
Leaving Air Dry-Bulb:	°F	59.6
Leaving Air Wet-Bulb:	°F	59.4
Air Friction:	In.H2O/Coil	1.33
Surface Condition:		Wet
Refrigerant Inlet Temp.:	°F	44.9
Refrig. Press. Drop:	PSI/Coil	0.109
Circuit Loading:	Btu/Hr.	4,256
Internal Volume:	ft³	0.48

Evaporator Coil

Version: 4.4.0.0

Customer: Trane Creative Solutions Team
By: Zachary Moffett
Company: Trane Creative Solutions Team

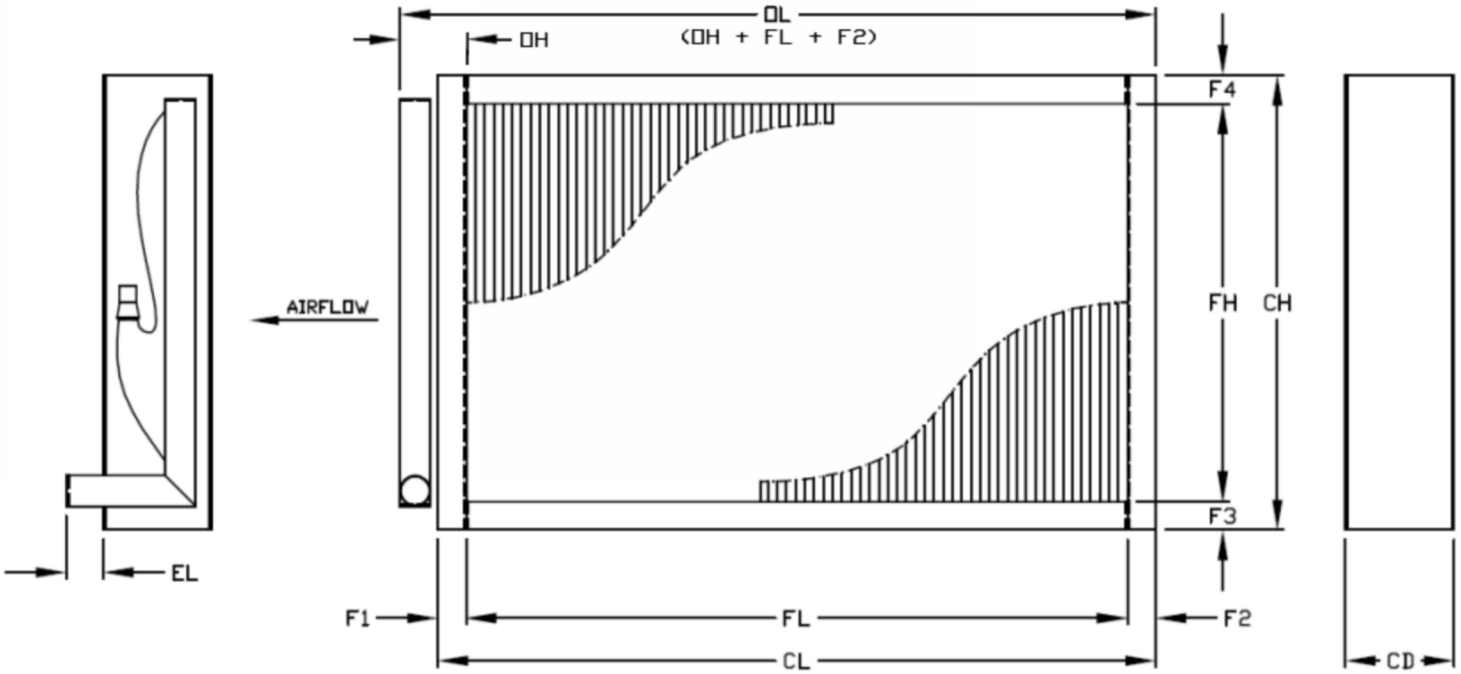
Coil Name: DX-1
Model: 36.25x40 - 4R - 0.5/216
Today: 11/4/2020

Coil Data

Fin Height (FH): 36.25
Finned Length (FL): 40
Rows: 4
Fins Per Inch: 18
Die Surface: 0.5 - 1.25 x 1.083 Stag. (Sine-#16)
Number Of Circuits: 29
Circuitry Type: Thermal Parallel Flow
Headers: 1.125" Dia. Std.Type 'L' Copper
Connections: 1.125" Dia.

Materials & Options

Tube Material: Copper
Tube Wall: 0.022
Fin Material: Aluminum
Fin Thickness: 0.0055
Casing Material: 16 Ga. Galv.
Casing Style: Encased
Num. Of Inter. Plates: 0
Coil Hand / Airflow: Left Hand



Coil Drawing Dimensions (Changes Subject To Review)

Casing Height (CH Dim.): 38.75 In.
Overall Length (OL Dim.): 44 In.
Coil Depth (CD Dim.): 9.625 In.
Casing Length (CL Dim.): 42.5 In.
Ext. / Conn. Length (EL Dim.): 3 In.

F1 / F2 / F3 / F4 Dims.: 1.25 / 1.25 In.
OH Dim.: 2.75 In.
Approx. Coil Dry Weight: 167 Lbs.

Notes

The new degree of comfort®

Hybrid Electric Commercial water heaters are available in 50, 65 and 80-gallon capacities and are the most efficient water heaters available

Efficiency

- High 3.55 - 3.70 UEF reduces operating cost
- ENERGY STAR® rated

Performance

- Delivers more hot water than most standard electric water heaters – 67 gallons first-hour delivery for 50-gallon model, 75 gallons FHD for 65-gallon model and 89 gallons FHD for 80-gallon model
- Ambient operating range: 37-145° F is widest in class, offering more days of HP operation annually; designed to meet Northern Climate Spec (Tier 3)
- Maximum temperature setting is 150°F

Easy Installation

- Easy access side connections
- Quick access to electrical junction box
- Easily replaces a standard electric water heater

Integration

- LCD Screen with built-in water sensor alert with audible alarm

EcoNet®

- EcoNet® WiFi-connected* technology and free mobile app gives users control over water systems, allowing for customizable temperature, vacation settings, energy savings and system monitoring at home or away. Visit Rheem.com/hybridsolutions
- Water sensor detects water outside of the unit and sends an alert via the free Rheem EcoNet® mobile app to the homeowner

Operation Modes

- Energy Saver
- Heat Pump
- High Demand
- Electric
- Vacation: 2-28 days (or placed on hold indefinitely)

Plus...

- Premium grade anode rod with resistor extends the life of the tank
- 3/4" NPT water inlet and outlet; 3/4" condensate drain connections
- Incoloy stainless steel resistor elements
- Dry-fire protection
- Easy access, top mounted washable air filter
- 2" Non-CFC foam insulation
- Enhanced flow brass drain valve
- Temperature and pressure relief valve installed
- Low lead compliant

Warranty

- 3-Year limited tank and parts warranty

  See Commercial Warranty Certificate for complete information

*WiFi broadband internet connection required.

Efficiency | These models have been tested according to DOE test procedures, and exceed the minimum energy factor requirements of current ASHRAE Standards (Part of the federally mandated Energy Policy Act (EPact). Also exceeds energy efficiency codes of all states including California Energy Commission (CEC).

Safety and Construction | Safety and Construction: These products are design certified by Underwriters Laboratories (UL) as electric storage tank water heaters. All models are North Carolina and Massachusetts Code compliant. **Certified for a 150 PSI Maximum Working Pressure.**

Rheem Hybrid
50, 65 and 80-Gallon Capacities
208-240 Volt / 1 PH / 30 Amps
Electric

AHRI CERTIFIED

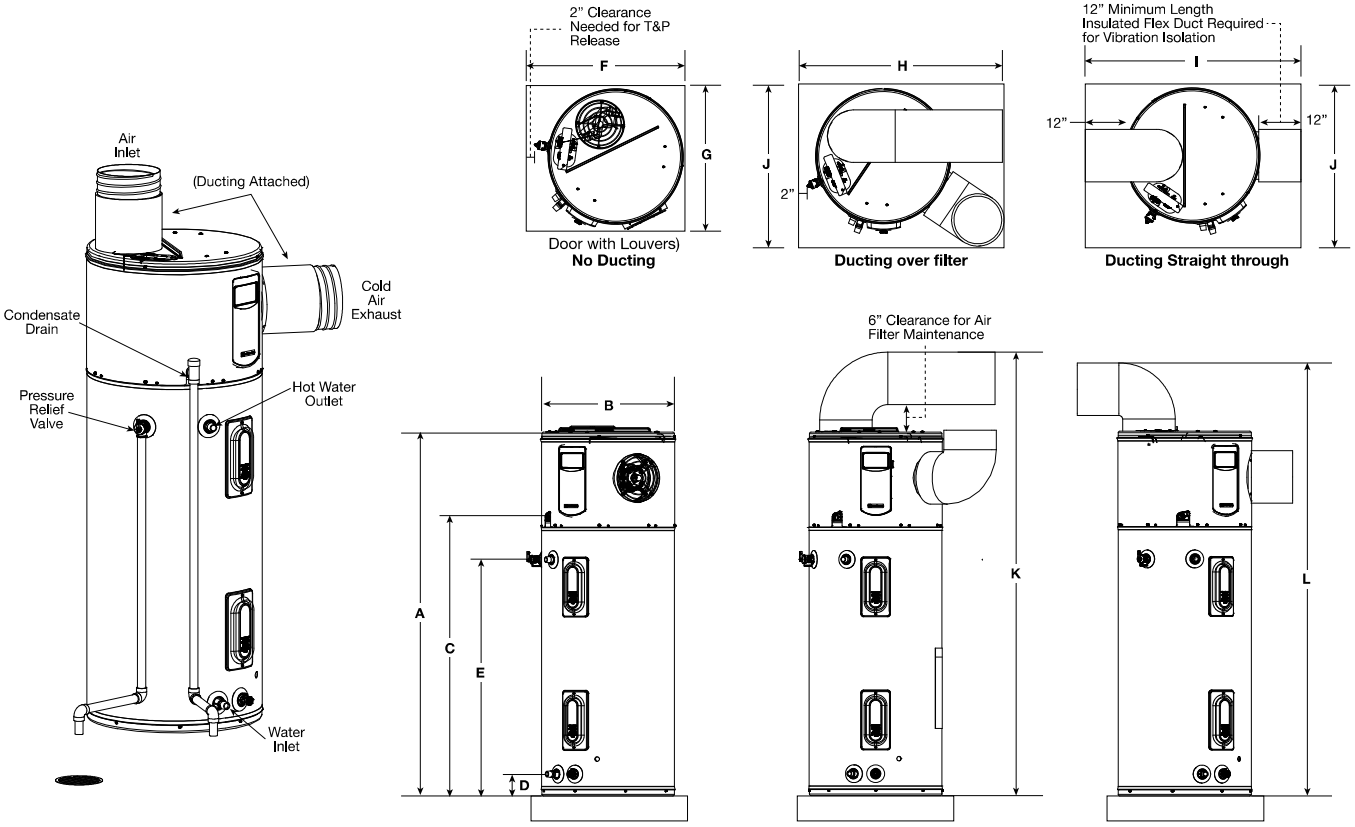
ENERGY STAR

PRINTED IN U.S.A. 11/17 WP FORM NO. RR102CE-10

Specifications

DESCRIPTION					FEATURES				TANK DIMENSIONS (SEE SPACE REQUIREMENTS IN DIAGRAMS BELOW)					
NOMINAL GALLON CAPACITY	RATED GALLON CAPACITY	MODEL NUMBER	UNIFORM ENERGY FACTOR (UEF)	ESTIMATED YEARLY ENERGY COST	COMPRESSOR BTU/H	SOUND LEVEL (dBA)	UEF FIRST HR. RATING G.P.H.	RECOVERY IN G.P.H 90° F RISE	HEIGHT A	DIAM. B	HT. TO COLD INLET & DRAIN VALVE	HT. TO HOT OUTLET & T&P	UNIT WT. (LBS)	APPROX. SHIP WT. (LBS.)
50	45	HPLD50	3.55	$110	4200	49	67	29	61"	22-1/4"	3-5/8"	39-5/8"	178	218
65	59	HPLD65	3.70	$161	4200	49	75	29	64"	24-1/4"	3-7/8"	42-3/8"	225	262
80	72	HPLD80	3.70	$161	4200	49	89	29	74"	24-1/4"	3-7/8"	52-3/8"	244	281

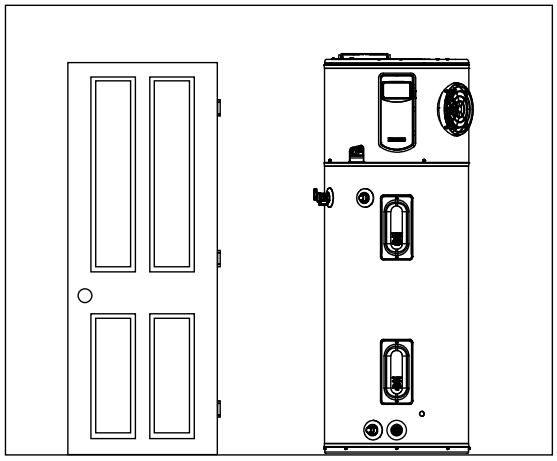
Estimated energy cost based on a national average electricity cost of $0.12 /kWh. Uniform Energy Factor and rated gallon capacity based on Department of Energy (DOE) requirements.
All units have integrated WiFi control board.



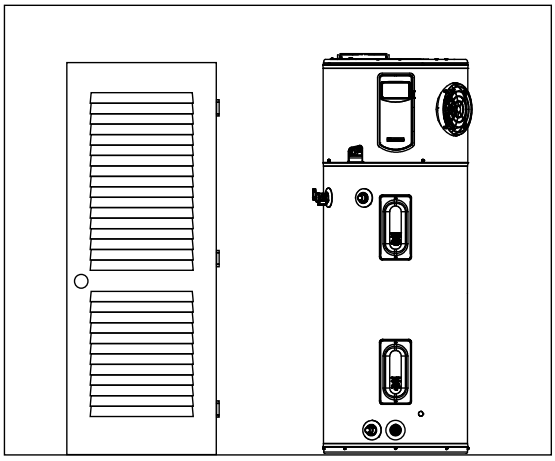
DESCRIPTION		DIMENSIONS (SHOWN IN INCHES)											
NOMINAL GALLON CAPACITY	MODEL NUMBER	A	B	C	D	E	F	G	H	I	J	K	L
50	HPLD50	61	22-1/4	47	3-5/8	39-5/8	28	24	36	50	27	77	73
65	HPLD65	64	24-1/4	49	3-7/8	42-3/8	30	26	38	52	29	80	76
80	HPLD80	74	24-1/4	59	3-7/8	52-3/8	30	26	38	52	29	90	86

Hybrid Water Heater Installation Guidelines to Provide Optimal Efficiency

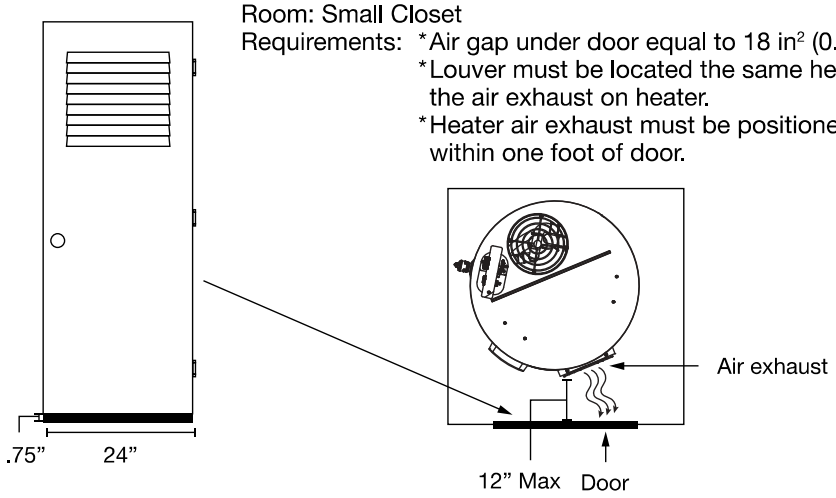
Heater: Not Ducted
Room size: Larger than 700 ft^3 (e.g. 7' x 10' x 10').
Requirements: No additional ventilation needed.



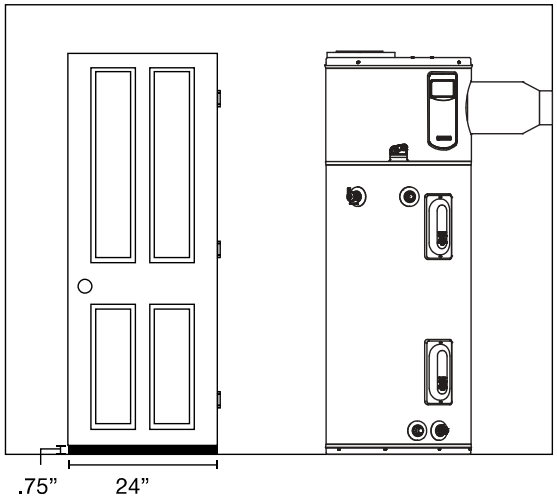
Heater: Not Ducted
Room size: Smaller than 700 ft^3 (e.g. 7' x 10' x 10').
Requirements: Full louvered door OR two louvers top and bottom. See below.



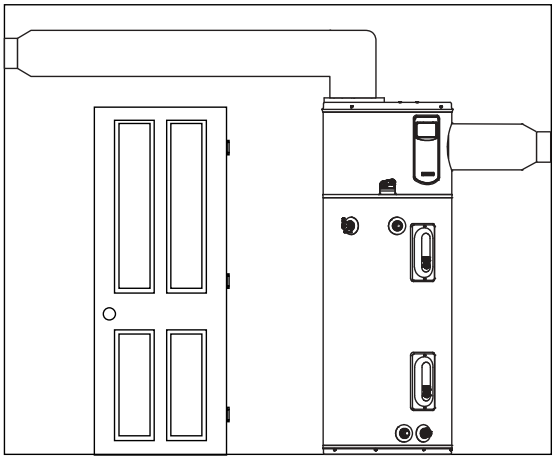
Heater: Not Ducted
Room: Small Closet
Requirements:
* Air gap under door equal to 18 in^2 (0.75” clearance).
* Louver must be located the same height on door as the air exhaust on heater.
* Heater air exhaust must be positioned towards louver within one foot of door.



Heater: Ducted with inlet OR outlet duct
Room size: Any size room
Requirements: Air gap under door equal to 18 in^2 (0.75” clearance)

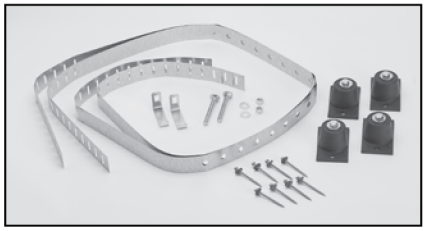


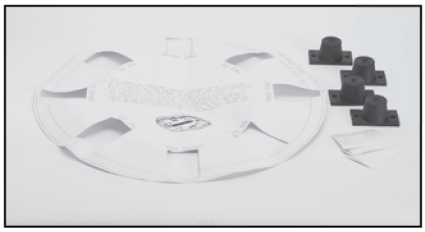
Heater: Ducted with inlet AND outlet duct
Room size: Any size room
Requirements: No additional ventilation needed.

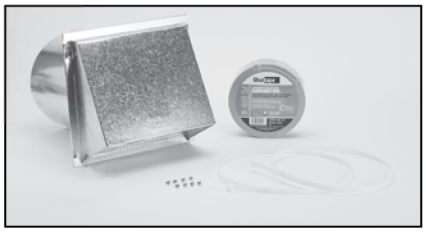


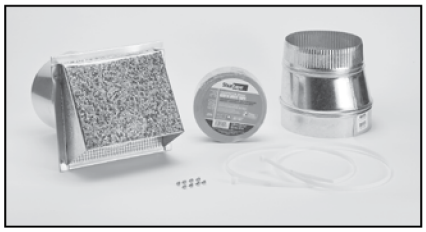
Hybrid Accessories

PART NUMBER	DESCRIPTION	USE FOR
SP20882	Earthquake Isolation Kit	Installations in seismic regions
SP20883	Vibration Isolation Kit	Installation on non-concrete floors
SP20884	8" Diameter UL Certified Termination Kit	Termination to the outside or to the attic with 8" diameter
SP20885	7" Diameter UL Certified Termination Kit	Termination to the outside or to the attic with 7" diameter
SP20886	6" Diameter UL Certified Termination Kit	Termination to the outside or to the attic with 6" diameter
SP20887	5" Diameter UL Certified Termination Kit	Termination to the outside or to the attic with 5" diameter
SP20888	8" Rheem Approved Damper Kit	Exhaust only to the outside ducting configuration (no inlet duct)
SP20889	25' Flexible 8" Diameter Duct Kit	For up to 25' of ducting
SP20890	Rigid Elbow Duct Kit	Installation in tight places where space needs to be minimized


SP20882


SP20883


SP20884


SP20885


SP20886


SP20887


SP20888


SP20889


SP20890

In keeping with its policy of continuous progress and product improvement, Rheem reserves the right to make changes without notice.

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APPENDIX B

EXISTING EQUIPMENT PHOTOS

Photos:

Photo 1. AHU-1

Photo 2. AHU-1

Photo 3. AHU-1 DX Unit

Photo 4. Auxiliary HWTs and Heat Exchanger

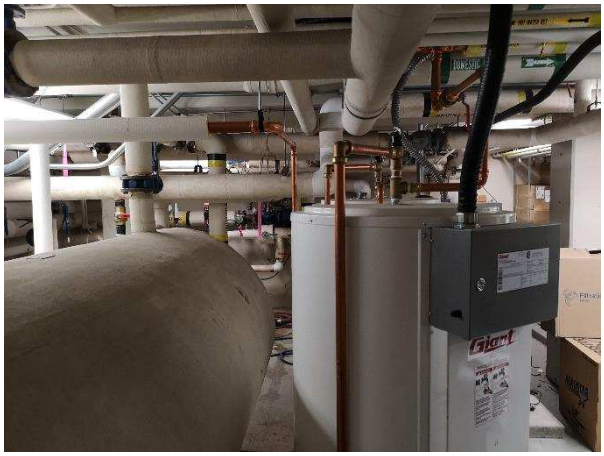

Photo 5. Auxiliary HWTs and Heat Exchanger

Photo 6. Other Equipment in Mech Room

Photo 7. Other Equipment in Mech Room

Photo 8. SF-7 and Auxiliary HWTs

APPENDIX C

EXISTING WATER SCHEMATIC

COMM./TEL. EXHAUST FAN
SCALE: NOT TO SCALE

EF-16 — E/A — E/A — REVERSE ACTING T-STAT

WASHROOM EXHAUST FANS
SCALE: NOT TO SCALE

WASHROOMS

EF-4, EF-5, EF-6, EF-10 — E/A — E/A — DI ST EF / DO EF

ELECTRICAL ROOM EXHAUST FAN
SCALE: NOT TO SCALE

EF-13 — O/A — S/A — E/A — DI FB EF13 — WIRED BY DIV. 16 — AI RM.A.T.

SPACE SENSOR — AI RM.A.T. / DI FZ SF1 / DI SF-1 / DO SF-1 — SF-1 — S/A — AO CV HC1 / AI S.A.T.

MIN. FRESH AIR 475 l/s — AO CD AHU1 / AI M.A.T. / DI FB AHU1 — O/A — E/A — DI RF1 / DO RF10 — RF-10 — AI R.A.T. — R/A — AHU-1 / HC-1 — SD 08 M-16

SPACE SENSOR — AI RM TEMP / DI FB AHU4 / DI FZ SF4 / DI SF-4 / DO SF-4 — SF-4 — S/A — AO CV HC4 / AI S.A.T.

AHU-4

MIN. FRESH AIR 2855 l/s — AO CD AHU4 / AI M.A.T. / AI H.R.A.T. — O/A — E/A — DI RF-4 / DO RF-4 — RF-4 — R/A — HC-4 — AO CV GC4 / AI TEMP — AI R.A.T. / AI TEMP — SD 08 M-16 — SD 01 M-17

AI O.A.T.

SPACE SENSOR — AI RM.A.T. / AI S.A.T. / DI FZ AHU3 / DI SF-3 / DO SF-3 — SF-3 — S/A — HC-3 — AO CV RH14 — AO CV HC3 — SD 08 M-16 — SD 01 M-17

MIN. FRESH AIR 4390 l/s — DI FB SF3 / AO CD AHU3 / AI M.A.T. / AI H.R.A.T. — O/A — E/A — DI RF3 / DO RF-3 — RF-3 — R/A — AHU-3 — AO CV GC3 / AI TEMP — AI R.A.T. / AI TEMP.

AO CV RH13 — AO CV RH14 — AO CV RH15 — AO CV RH16 — AO CV RH17 — AO CV RH18 — AO CV RH-2 — AO CV RH-3 — AO CV RH-5 — AO CV RH-6 — AO CV RH2 — AO CV RH3 — AO CV RH12 — AO CV RH8 — AO CV RH9 — AO CV RH10

SPACE SENSOR — AI RM.A.T. / AI S.A.T. / DI FZ AHU6 / DI SF-6 / DO SF-6 — SF-6 — S/A — AHU-6 / HC-6 — AI S.A.T. / AO CV HC6 — DI FB AHU6 — O/A — AI RM.A.T. — 2 SPACE SENSORS — SD 09 M-16

SPACE SENSOR — AI S.A.T. / DI SF-2 / DO SF-2 / AI S.A.T. — SF-2 — S/A — HC-2 — AHU-2 — AO CV HC2 — DI FZ SF2 — AI RM.A.T. — 2 SPACE SENSORS

MIN. FRESH AIR 3540 l/s — AO CD AHU2 / AI M.A.T. / DI FB AHU2 — O/A — E/A — DI RF-2 / DO RF-2 — RF-2 — R/A

SPACE SENSOR — DI FZ SF5 — SF-5 — S/A — DI SF-5 / DO SF-5 / AI S.A.T. — AO CD AHU5 / AI M.A.T. / DI FB AHU5 — O/A — E/A — AI RM.A.T. — HC-5 / AHU-5 — AI R.A.T. — R/A

TIE IN NEW WATER HEATER ON DCW, BEFORE HEAT EXCHANGER SEE APP. D

TO STUDENT UNION BLDG. EAST FLOOR PLAN DWG. M-6

TO STUDENT UNION BLDG. WEST FLOOR PLAN DWG. M-5

VACUUM BREAKER — AI TEMP. — DHWT-1 / HE-1 — DO ST P3 / DI P3 STAT / P-3 — AO HCV — DOMESTIC WATER CAPPED OFF FOR PHASE TWO — CUH-4 — CUH-5

FIRE HOSE CONNECTION AND CAP ON BRASS WALL PLATE. FROM SITE SERVICE — 40ø TO OUTSIDE OF BUILDING — N.C. — P.R.V. EPOXY LINED — B.F.P.-1 — T.S. TO FIRE SYSTEM — AI PRESS. — DO ST P2 / DI P2 STAT / P-2 — DO ST P5 / DI P5 STAT / P-5 — DO ST P4 / DI P4 STAT / P-4

EXPANSION TANK A.A.V. — T-1 — P.R.V. B.F.P.-3 — NC AIRTROL FITTING — 100ø HWR LINE CAPPED OFF FOR PHASE TWO — 100ø HWS LINE CAPPED OFF FOR PHASE TWO

AI TEMP. / AI FLOW / FM / TS — PLATE/FRAME HEAT EXCHANGER — HE-2 — AI TEMP / AI TEMP — FROM: 120°c — CENTRAL PLANT MAINS — TO: — AO CV BLDG — TS — AI TEMP.

NOTE:
THE TEMP. SENSORS AND FLOW METER SHALL FUNCTION AS A TOTALIZING BTU METER

ISSUE NO:
REVISED TO AS BUILT 95-07-10

WE HEREBY CERTIFY THAT THESE DRAWINGS REPRESENT THE BUILDING AS BUILT

SIGNATURE

CONTRACTOR — DATE

DRAWN BY: RSW DATE: 22/06/95
CHECKED BY: HJS

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STUDENT UNION BUILDING EXPANSION & RENOVATION
UNIVERSITY OF VICTORIA
PHASE ONE 1994

U.VIC PROJECT NO: 308

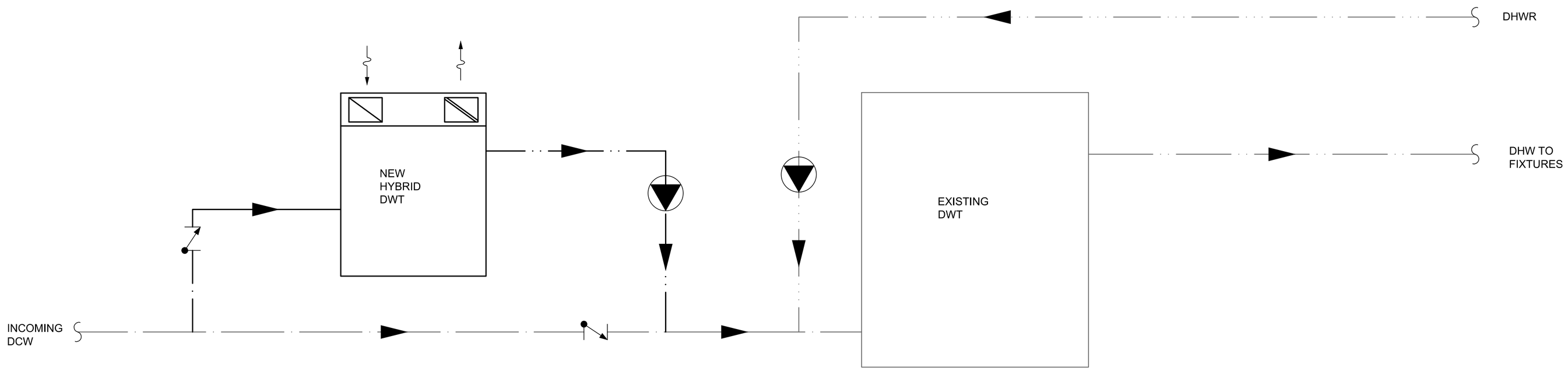
JOB NUMBER 4772-10

WET PIPING AND CONTROL SCHEMATICS

DWG. NO: M-18 M-032

APPENDIX D

PRELIMINARY WATER HEATER SCHEMATIC



DATE	DESCRIPTION
2020-11-10	ISSUED FOR DD

AME Group
consulting mechanical engineers

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VANCOUVER, BC V6B 1E3

CALGARY ☐
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F. 403-253-3324
710 - 1122 4TH STREET SW
CALGARY, AB T2R 1M1

PROJECT TITLE:
UVIC STUDENT UNION BUILDING (SUB) - SUSTAINABILITY UPGRADES

DRAWN BY	ZD
CHECKED BY	LM
SCALE	NTS
DATE	NOV-10-2020

DRAWING TITLE:
PRELIMINARY SCHEMATIC

PROJECT NO.	DRAWING NO.
050A-022-20	M0.00

APPENDIX E

PRELIMINARY MOTORLIST

AME Group
consulting mechanical engineers

PROJECT NAME: UVic SUB - Sustainability **BY:** Zach Denny **DATE:** 09 Nov, 2020

MECHANICAL MOTORLIST

UNIT NUMBE	UNIT DESCRIPTION	UNIT LOCATION	ELECTRICAL LOAD				VOLT	PH	EQUIPMENT			STARTER				DISCONNECT			CONTROL				NOTES
			MCA	FLA	KW	HP			S	I	C	S	I	C	TYPE	S	I	C	S	I	C	TYPE	
	HEAT PUMP																						
HP-1	**10 TON HEAT PUMP FOR AHU-1**	ROOF	70				208	3	M	M	E	M	M	E	-	E	E	E	M	M	E	BMS	
	PUMPS																						
HWT-1	**PREHEAT CIRCULATION PUMP**	MECHANICAL ROOM				FRAC	115	1	M	M	E	E	E	E	MAG	E	E	E	M	M	M	BMS	1
	WATER HEATER																						
HWT-1	**HYBRID ELECTRIC WATER HEATER**	MECHANICAL ROOM		24			208	1	M	M	E	-	-	-	HOA	E	E	E	M	M	E	BMS	1

SUPPLIER / INSTALL / WIRE CODES:
MECH = MECHANICAL
ELEC = ELECTRICAL
G = GENERAL CONTRACTOR
S = SUPPLIED BY
I = INSTALLED BY
C = CONNECTED BY

ELECTRICAL LOAD CODES:
BHP = BREAK HORSEPOWER
FLA = UNIT FULL LOAD AMPS
HP = UNIT OR MOTOR HORSE POWER
PH = POWER PHASE
MCA = MINIMUM CIRCUIT AMPS
VOLT = REQUIRED SUPPLY VOLTAGE

CONTROL DEVICE CODES:
BMS = BLDG MANAGEMENT SYSTEM
ES = END SWITCH
ET = LINE VOLTAGE T'STAT
H = HUMIDITY SENSOR
I = INTERLOCK, SEE NOTES
LS = LEVEL SWITCH
PS = PRESSURE SWITCH
R. STAT = REVERSE ACTING THERMOSTAT
TC = TIME CLOCK
T = LOW VOLTAGE T'STAT OR SENSOR
TS = TAMPER SWITCH
VS = VARIABLE SPEED SWITCH
WS = WALL SWITCH

STARTER CODES:
MAN = MANUAL STARTER
HOA = MAGNETIC STARTER W/ HAND/OFF/AUTO SWITCH W/ AUX. CONTACTS
MAG = MAGNETIC STARTER C/W AUX STATUS CONTACTS
PCS = PACKAGED CONTROL SYSTEM
VFD = VARIABLE FREQUENCY DRIVE
WS = WALL SWITCH
CP = CONTROL PANEL

MISCELLANEOUS CODES:
FFCP = FIRE FIGHTERS CONTROL PANEL
FRAC = FRACTIONAL HORSEPOWER
INT = INTEGRAL PART OF UNIT

GENERAL NOTES:
A. PCS EQUIPMENT REQUIRES SINGLE SOURCE POWER CONNECTION, UNLESS NOTED OTHERWISE
B. CP, VFD EQUIPMENT REQUIRES POWER WIRING TO AND FROM CONTROL PANEL TO CONTROLLED EQUIPMENT

NOTES:
1. To be updated after tank quantity is reviewed.
2.