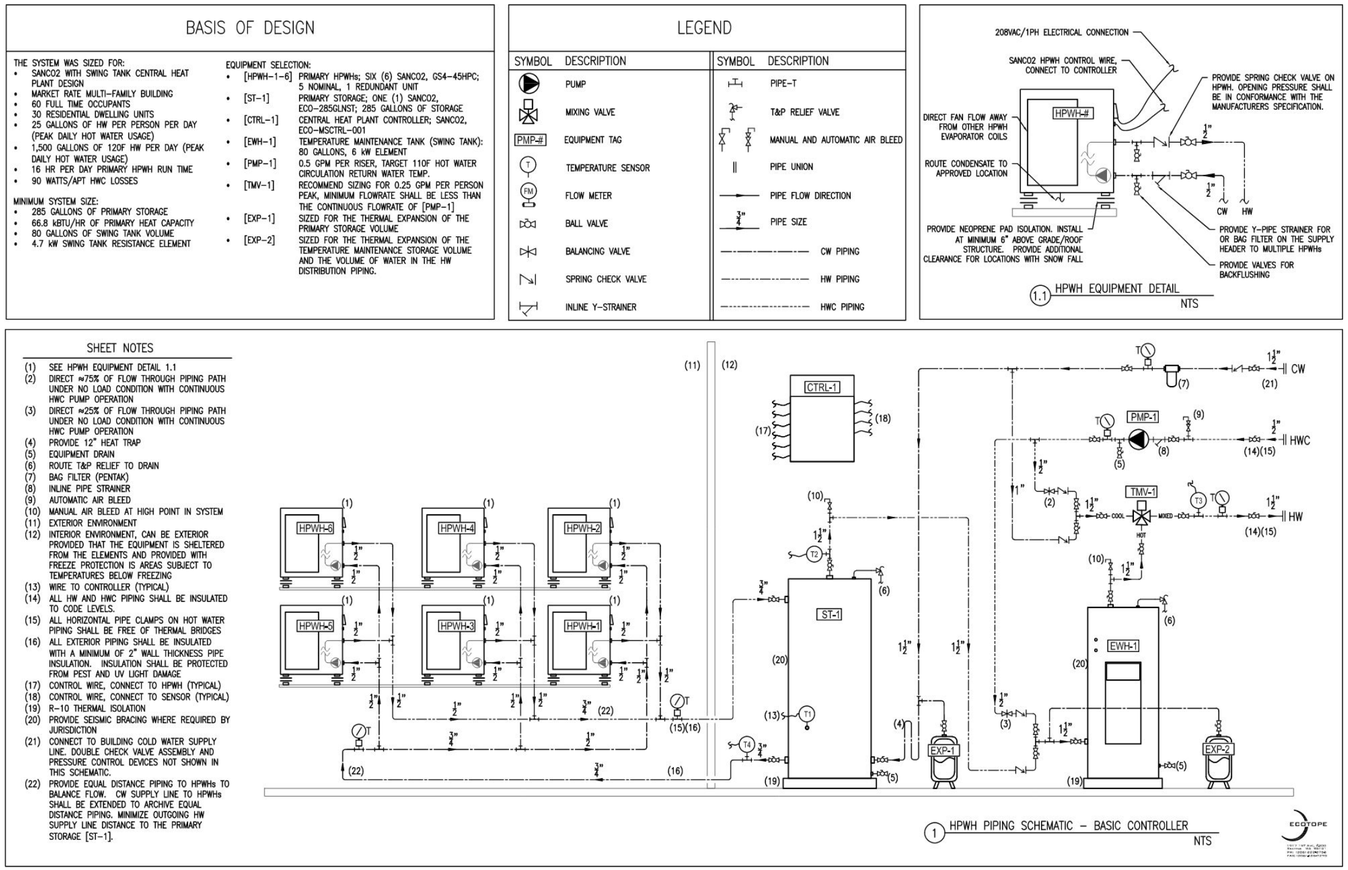
COMMERCIAL HEAT PUMP WATER HEATING:

DESIGN & MAINTENANCE

Colin Grist & Evan Green
Ecotope, Inc.

ECOTOPE

D+R LEARN



KEY QUESTIONS:

How do I choose the right equipment?

What steps do I need to take to implement a CHPWH system?

Joining as a participant?

No account needed.

Enter event code

We want to hear from you!

GO TO SLIDO.COM

Enter event code:

DESIGN3

slido

CASE STUDY:
JACKSON APARTMENTS

JACKSON **APARTMENTS**

Buildings

Mall

Terraces

JACKSON
APARTMENTS

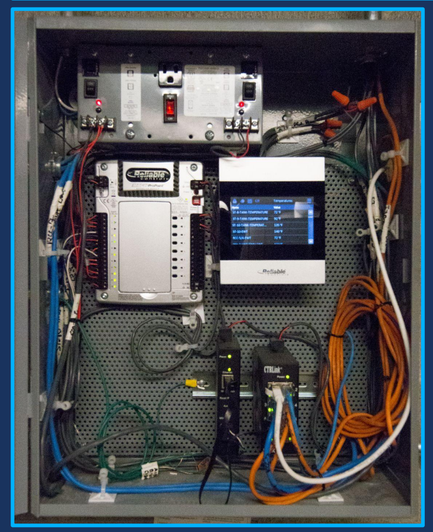
New construction

(2) Colmac CxA-15, single pass
(3) 500 gal tanks

Parallel loop configuration
(1) Colmac CxV-5; (1) 500 gal tank

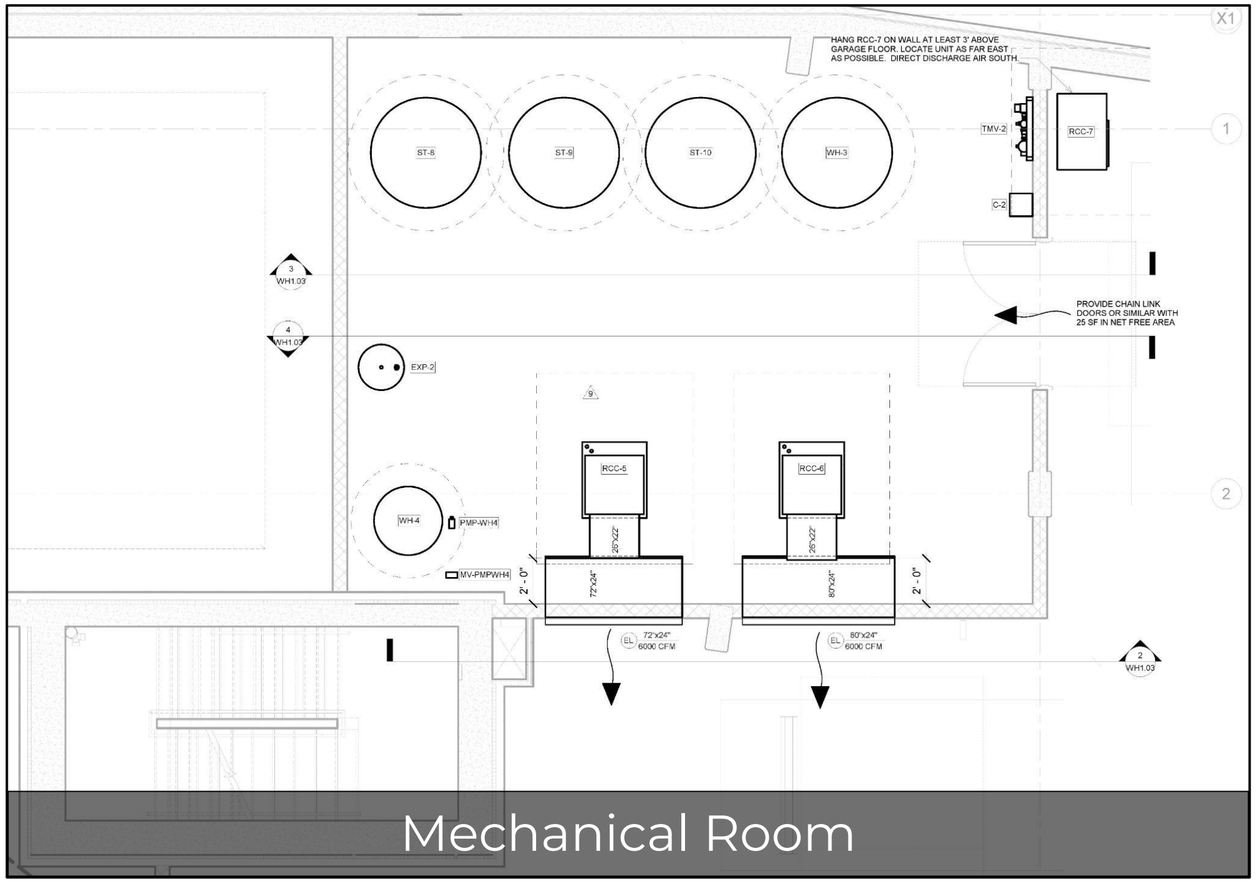
Garage

15.1 % annual energy savings



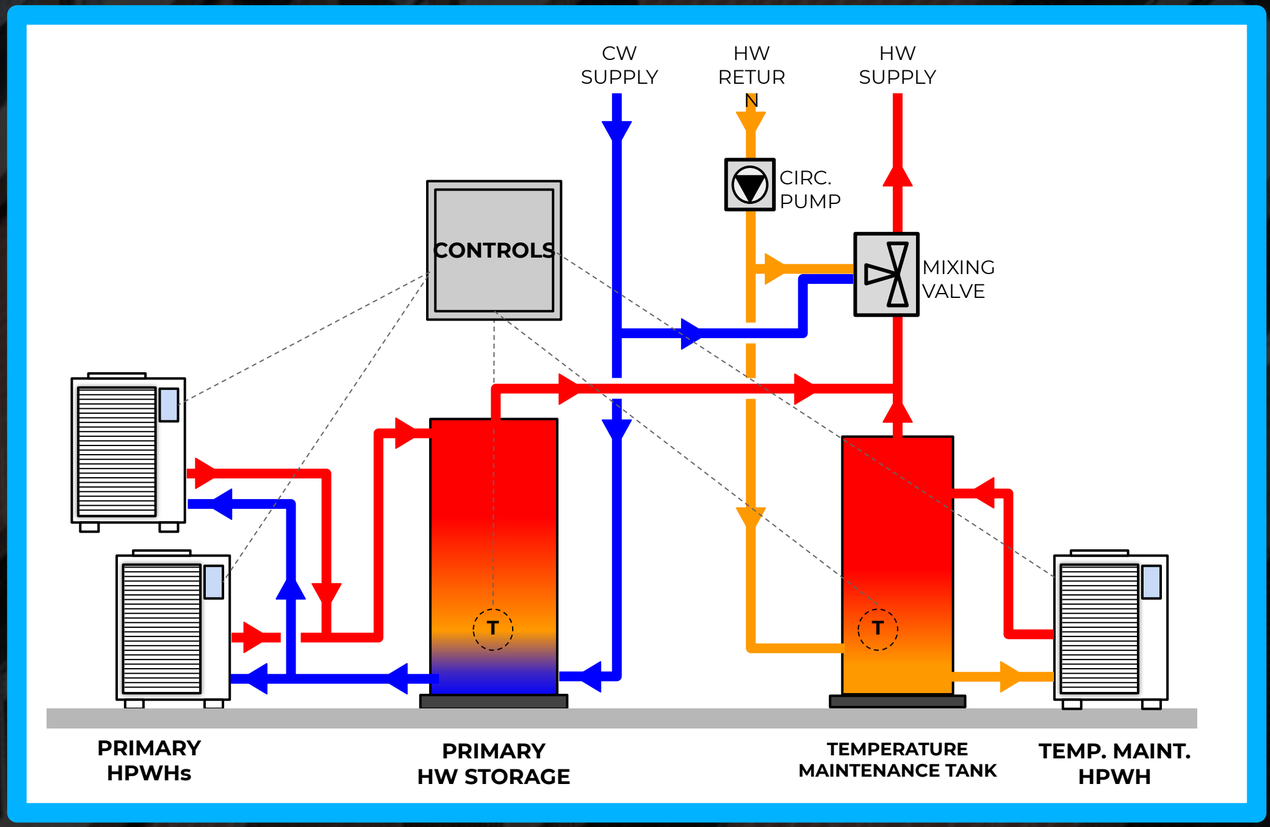
JACKSON **APARTMENTS**

Mechanical Room in Parking Garage



Mechanical Room

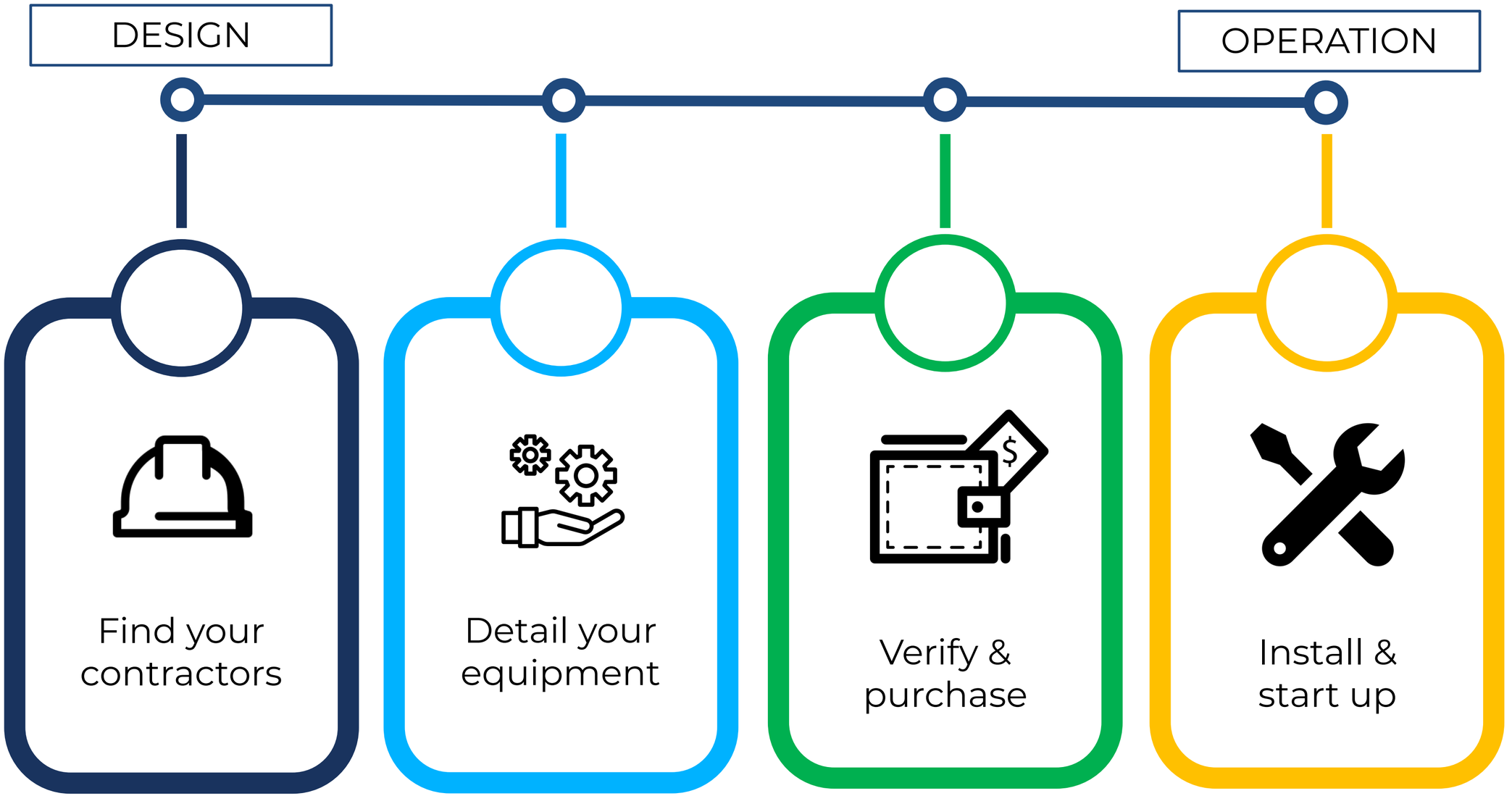
JACKSON **APARTMENTS**



KEY TAKEAWAY:

Improvements in energy efficiency do not have to come at the sacrifice of comfort.

BIRDS EYE **VIEW**



STEP 1:
FIND YOUR SUBCONTRACTORS

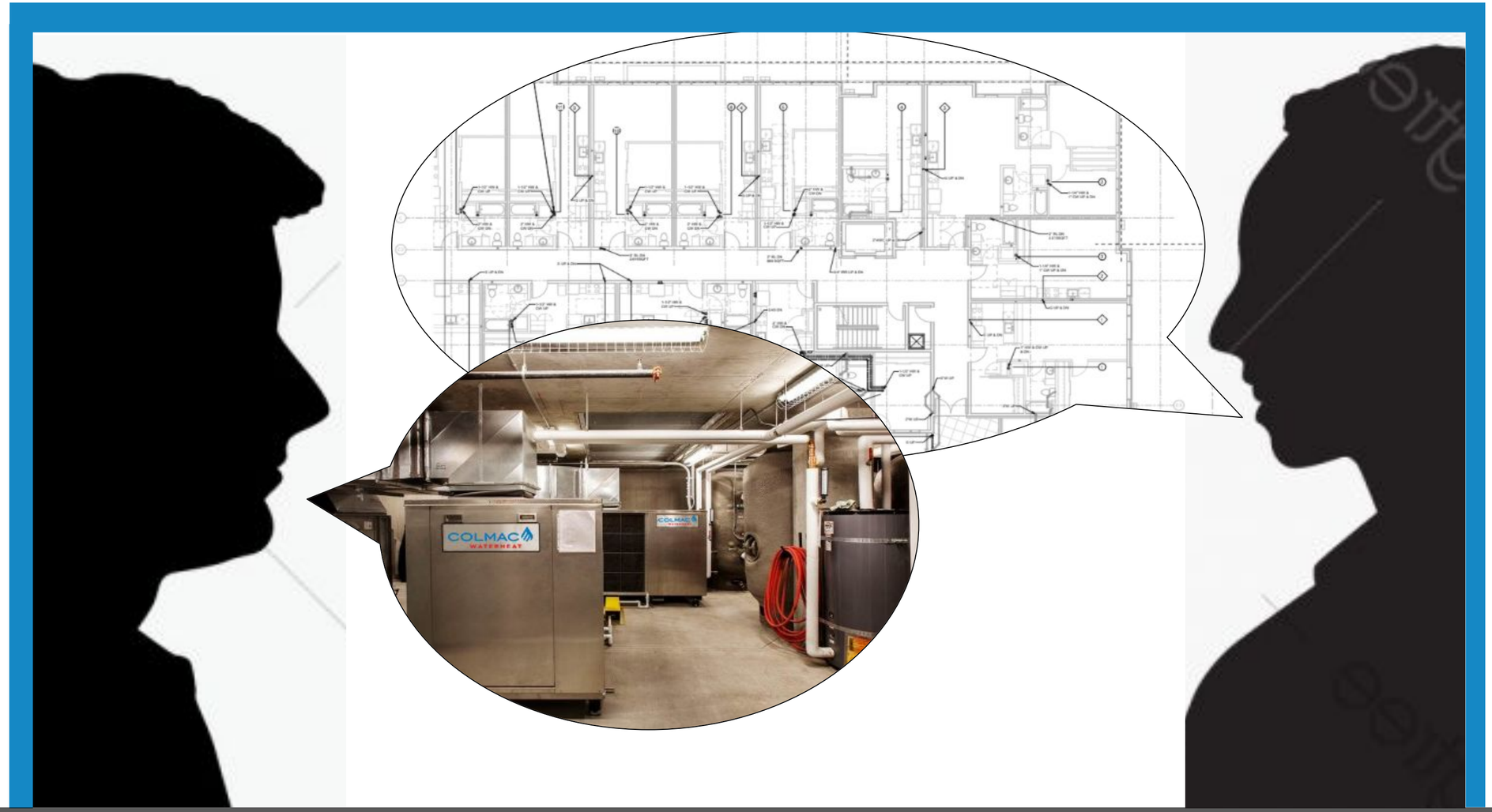
STEP 1: FIND YOUR **SUBCONTRACTORS**

Gauge subcontractors experience with HPWHS.

Ask about previous installs they've done.

STEP 2:
OPEN COMMUNICATION

STEP 2: OPEN THE LINES OF **COMMUNICATION**



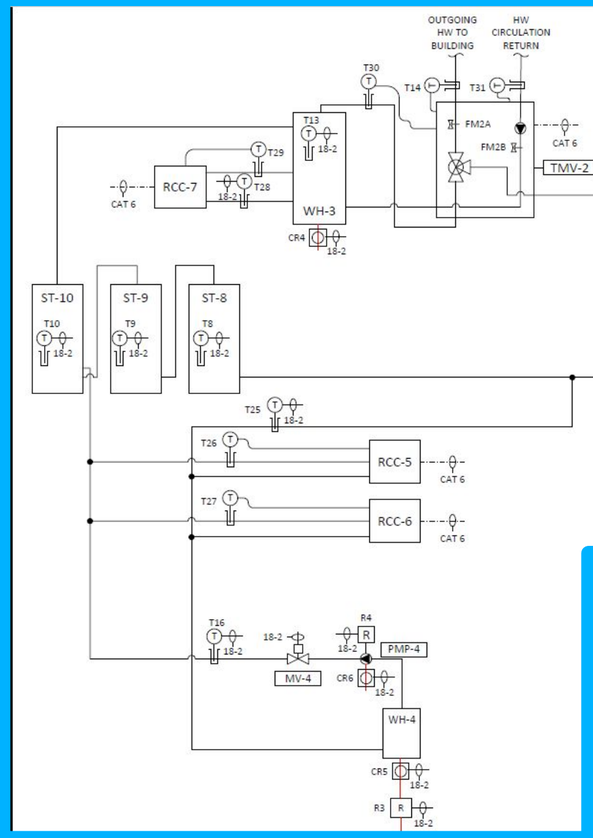
EDUCATION IS **KEY**

STEP 3:
EQUIPMENT SELECTION

STEP 3: EQUIPMENT SELECTION

Essential factors to consider:

- Design conformity
- Lead time
- Availability



SEQUENCE OF OPERATIONS, EAST BUILDING

A. PRIMARY DOMESTIC HOT WATER SYSTEM

1. RCC-5 AND RCC-6 ARE CONFIGURED IN SINGLE-PASS ARRANGEMENT TO DELIVER 135°F WATER TO HOT WATER STORAGE TANKS ST-6 THRU ST-60. RCCs SHALL BE CONFIGURED TO HANDLE ENTERING WATER TEMPERATURE SFROM 50-110°F.
2. CONTROLLER CYCLES RCCs IN LEAD/LAG CONFIGURATION. LEAD RCC ACTS AS STAGE 1. LAG RCCs ACTS AS STAGE 2. WH-4 ACTS AS BACK-UP OR AS HEATING STAGE IF RCC-5 OR RCC-6 ARE IN AN ALARM STATE, DISABLED, OR TURNED OFF (FAULT STATE).
   a. STAGE 1 TURNS ON WHEN T9 IN ST-9 DROPS BELOW 90°F SET POINT (ADJUSTABLE).
   b. STAGE 2 TURNS ON WHEN T9 IN ST-9 DROPS BELOW 85°F SET POINT (ADJ.).
   c. WH-4 IS ENABLED ON WHEN T10 IN ST-10 DROPS BELOW 125°F SET POINT (ADJ.).
      1) WH-4 IS SET TO MAINTAIN 135°F TANK TEMPERATURE WHEN ENABLED ON.
      2) PMP-WH4 IS ENABLED ON FIVE (5) MINUTES (ADJ.) AFTER WH-4 IS ENABLED ON.
         a) PMP-WH4 SHALL BE SET IN "SET POINT TEMPERATURE (T)" MODE WITH SET POINT TEMPERATURE OF 135°F (ADJ.).
      3) NORMALLY CLOSED MOTORIZED VALVE MV-WH4 IS OPENED WHEN PMP-WH4 IS RUNNING.
   d. WH-4 TURNS OFF WHEN T10 IN ST-10 RISES ABOVE 130°F SET POINT (ADJ.).
      1) PMP-WH4 IS TURNED OFF WHEN WH-4 IS TURNED OFF.
      2) MV-WH4 SHALL RETURN TO NORMALLY CLOSED POSITION WHEN WH-4 IS TURNED OFF.
   e. STAGES 1 AND 2 TURN OFF WHEN T8 IN ST-8 RISES ABOVE 100°F SET POINT (ADJ.).
3. IF RCC-5 OR RCC-6 ARE IN ALARM STATE, DISABLED, OR TURNED OFF (FAULT STATE), WH-4 SHALL REPLACE A RCC STAGE AND OPERATE PER A.2.a THRU A.2.c above.
   a. IF STAGE 1 RCC IS IN A FAULT STATE
      1) STAGE 2 RCC SHALL OPERATE AS STAGE 1 AND WH-4 SHALL OPERATE AS STAGE 2 PER SEQUENCE A.2.a THRU A.2.e.
   b. IF STAGE 2 RCC IS IN A FAULT STATE
      1) WH-4 SHALL OPERATE AS STAGE 2 PER SEQUENCE A.2.a THRU A.2.e.

B. DOMESTIC HOT WATER CIRCULATION REHEAT SYSTEM

1. RCC-7 SHALL BE CONTROLLED BY THE STAGING CONTROLLER.
2. RCC-7 IS CONFIGURED IN A MULTI-PASS ARRANGEMENT PROVIDING A 8-12°F LIFT.
   a. RCC-7 TURNS ON WHEN T13 IN WH-3 DROPS TO 125°F SET POINT (ADJ.).
   b. RCC-7 TURNS OFF WHEN T13 IN WH-3 RISES ABOVE 130°F SET POINT (ADJ.).
3. BACKUP RESISTANCE COIL IN WH-3, LOCATED IN UPPER THIRD OF TANK ABOVE WHERE PRIMARY HOT WATER ENTERS FINAL MIXING TANK, IS CONTROLLED WITH STANADLONE DURAWATT ELEMENT STAGING CONTROLS.

DOMESTIC HOT WATER SYSTEM SCHEDULES

DHW SYSTEM - REVERSE CYCLE CHILLER

TAG	MANUFACTURER	MODEL	SERVICE	HEAT CAP (BTU/HR @ 47F)	COP (SEASONAL)	PIPE	VOLT/PHASE	MCA (AMPS)	FLA (AMPS)	NOTES
RCC-1	COLMAC	CXA25	BUILDING WEST - HW	168691	2.78	1 1/2"	460VAC/3PH	59.1	47.6	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-2	COLMAC	CXA25	BUILDING WEST - HW	168691	2.78	1 1/2"	460VAC/3PH	59.1	47.6	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-3	COLMAC	CXA25	BUILDING WEST - HW	168691	2.78	1 1/2"	460VAC/3PH	59.1	47.6	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-4	COLMAC	CXA15	BUILDING WEST - HWC	109769	2.71	1 1/2"	460VAC/3PH	51.4	41.4	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-5	COLMAC	CXA15	BUILDING EAST - HW	169439	2.71	1 1/2"	460VAC/3PH	51.4	41.4	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-6	COLMAC	CXA15	BUILDING EAST - HW	169439	2.71	1 1/2"	460VAC/3PH	51.4	41.4	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-7	COLMAC	CXV5	BUILDING EAST - HWC	52000	2.5	3/4"	230VAC/1PH	36.8	30.4	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON VIBRATION ISOLATORS. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.

STEP 3: EQUIPMENT SELECTION

Support from a manufacturer is **more important** than a *lower price* on a HP.

EXPERT ADVICE

FIGURE THESE OUT **FIRST**

HP & STORAGE

CONTROLS

MIXING VALVE

AVAILABLE PRODUCTS

AO Smith
(2.5 ton)

Rheem
(> 1 ton)

Multi-Pass Integrated
Residential/Small Commercial
R-134a

SanCO$_2$
(1.25 ton)

Mitsubishi
(10 ton)

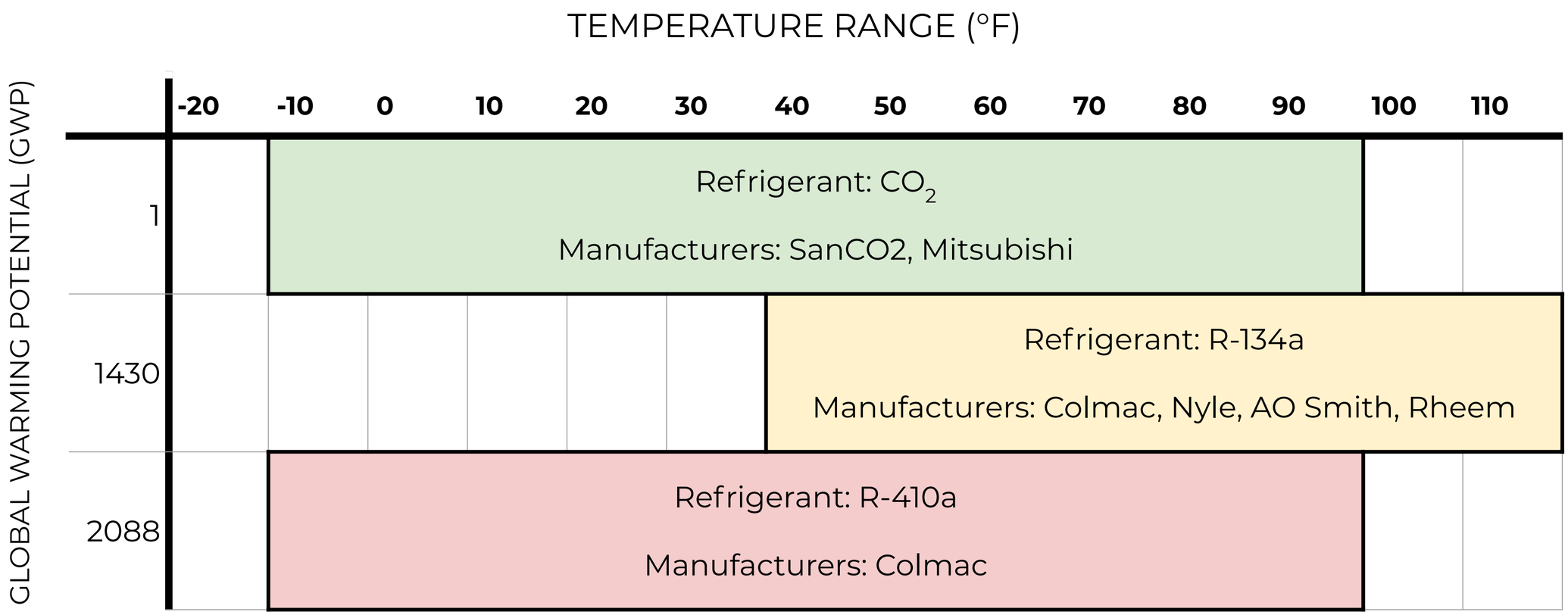
Single-Pass
CO_2/R-744

Colmac
(10 - 30 ton)

Nyle
(10 - 30 ton)

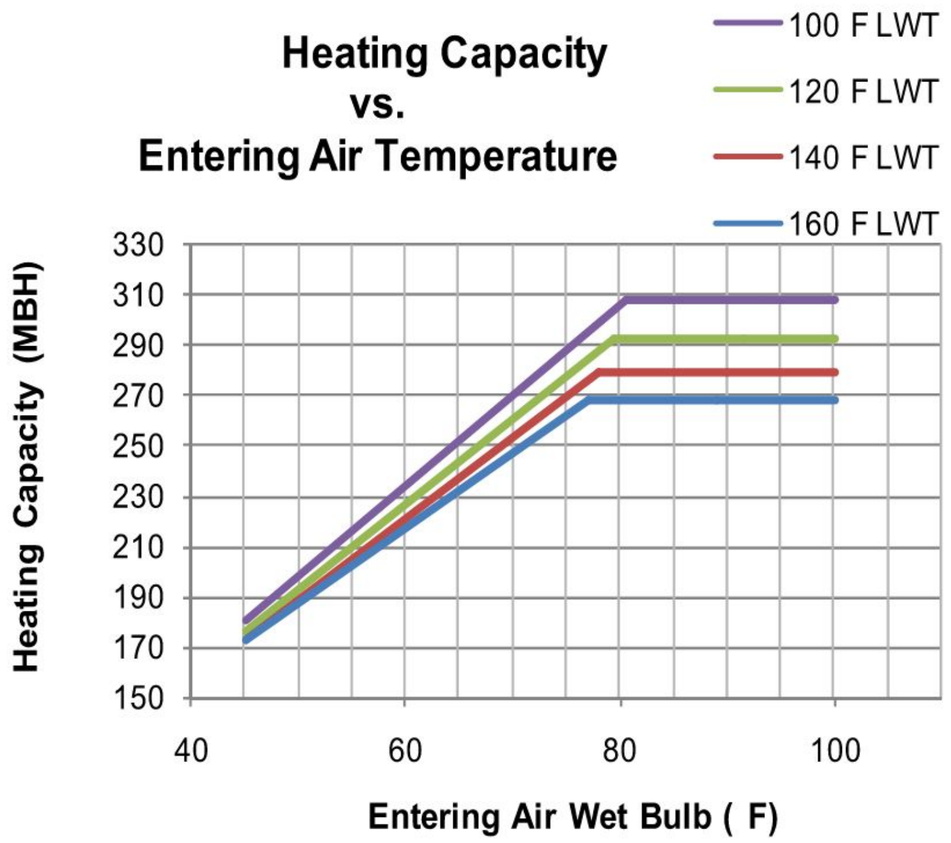
Single- or Multi-Pass
R-134a

HP SELECTION: **REFRIGERANTS**

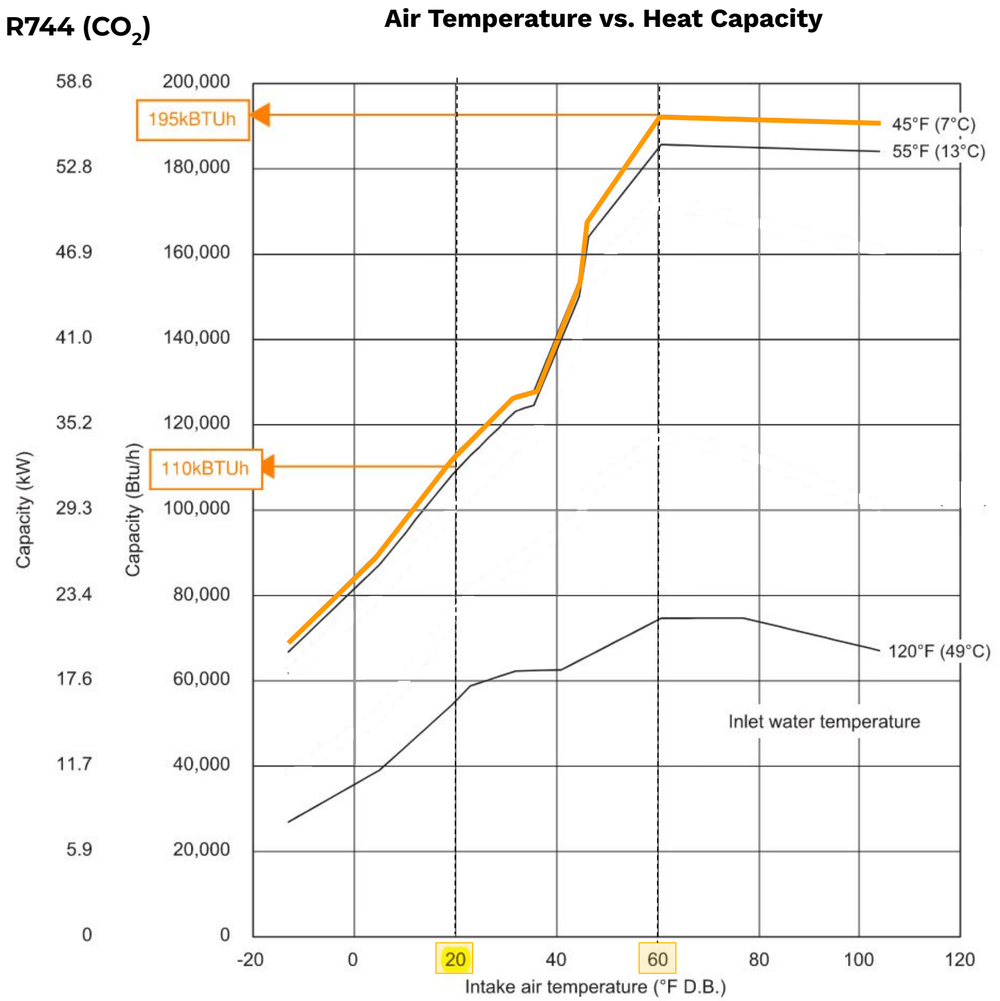


HP SELECTION: OTHER **ESSENTIAL CONSIDERATIONS**

R134a



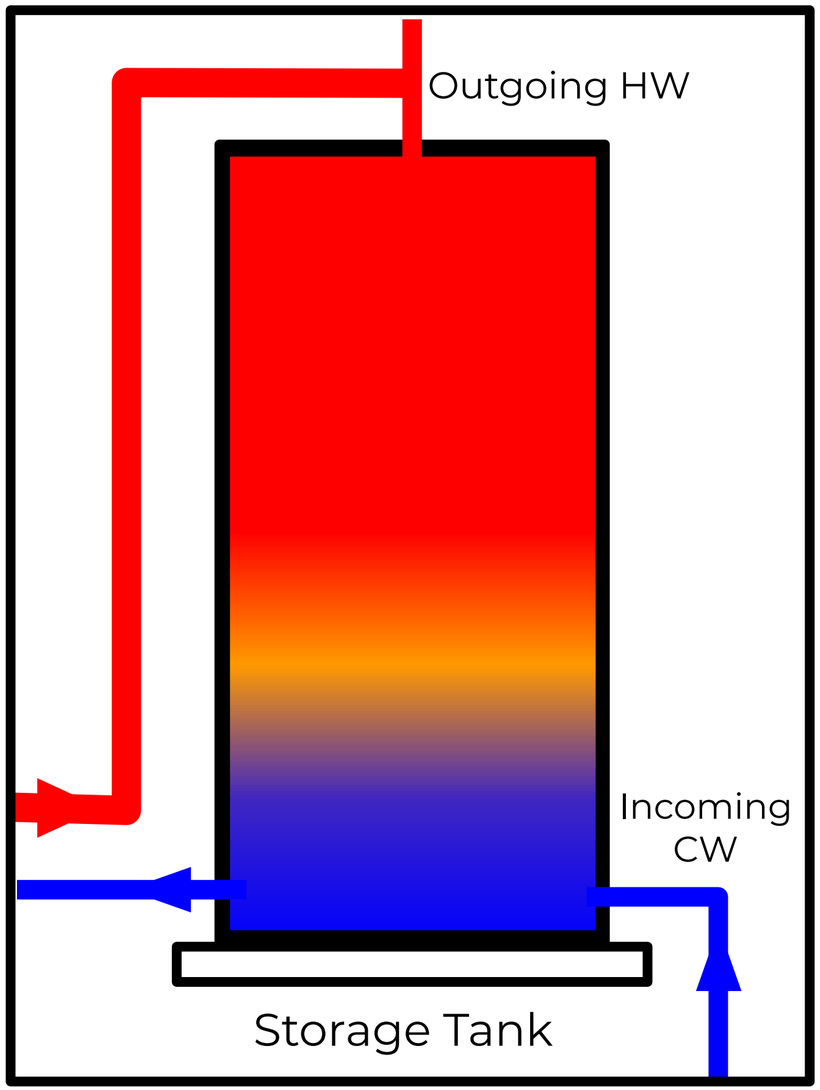
R744 (CO_2)

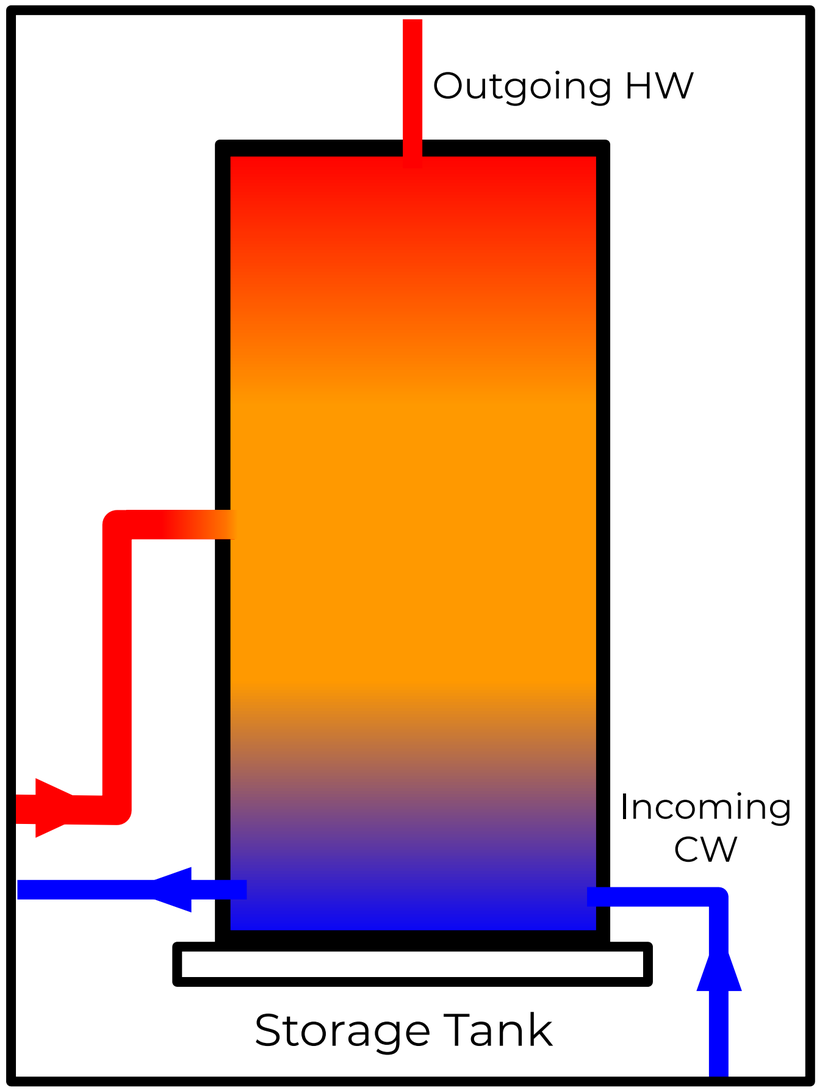


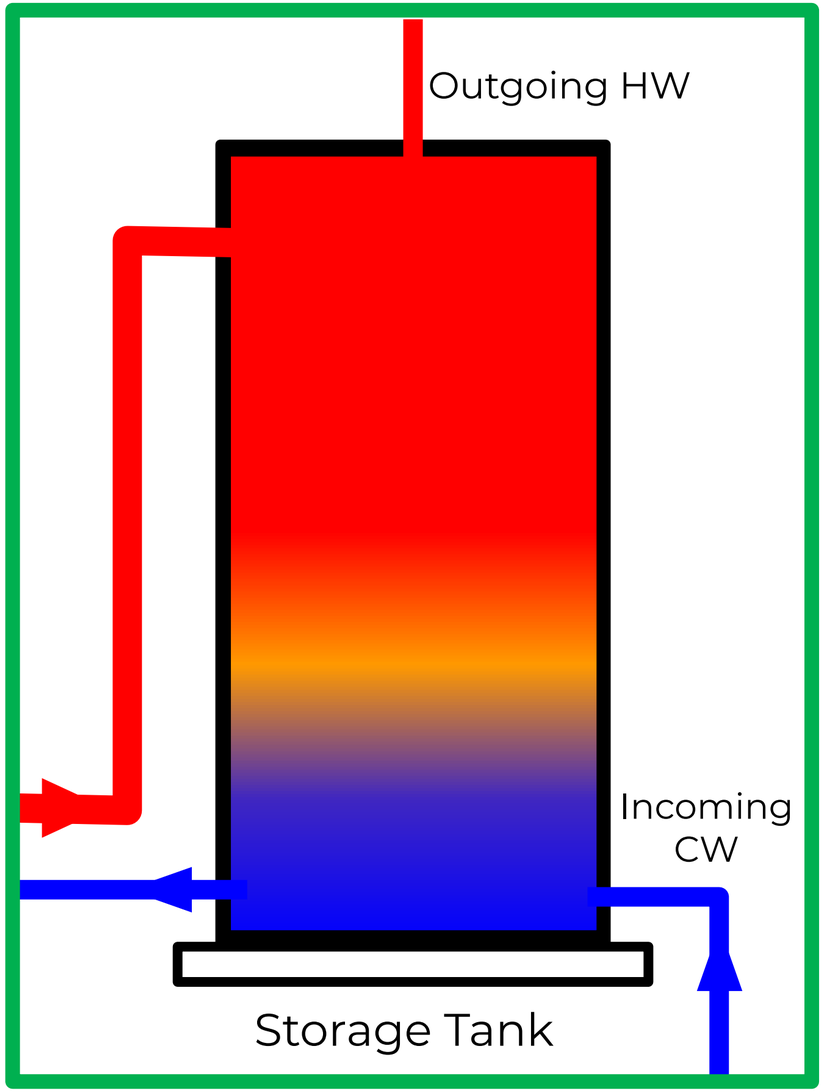
STORAGE TANK **SELECTION**

HP & **STORAGE**

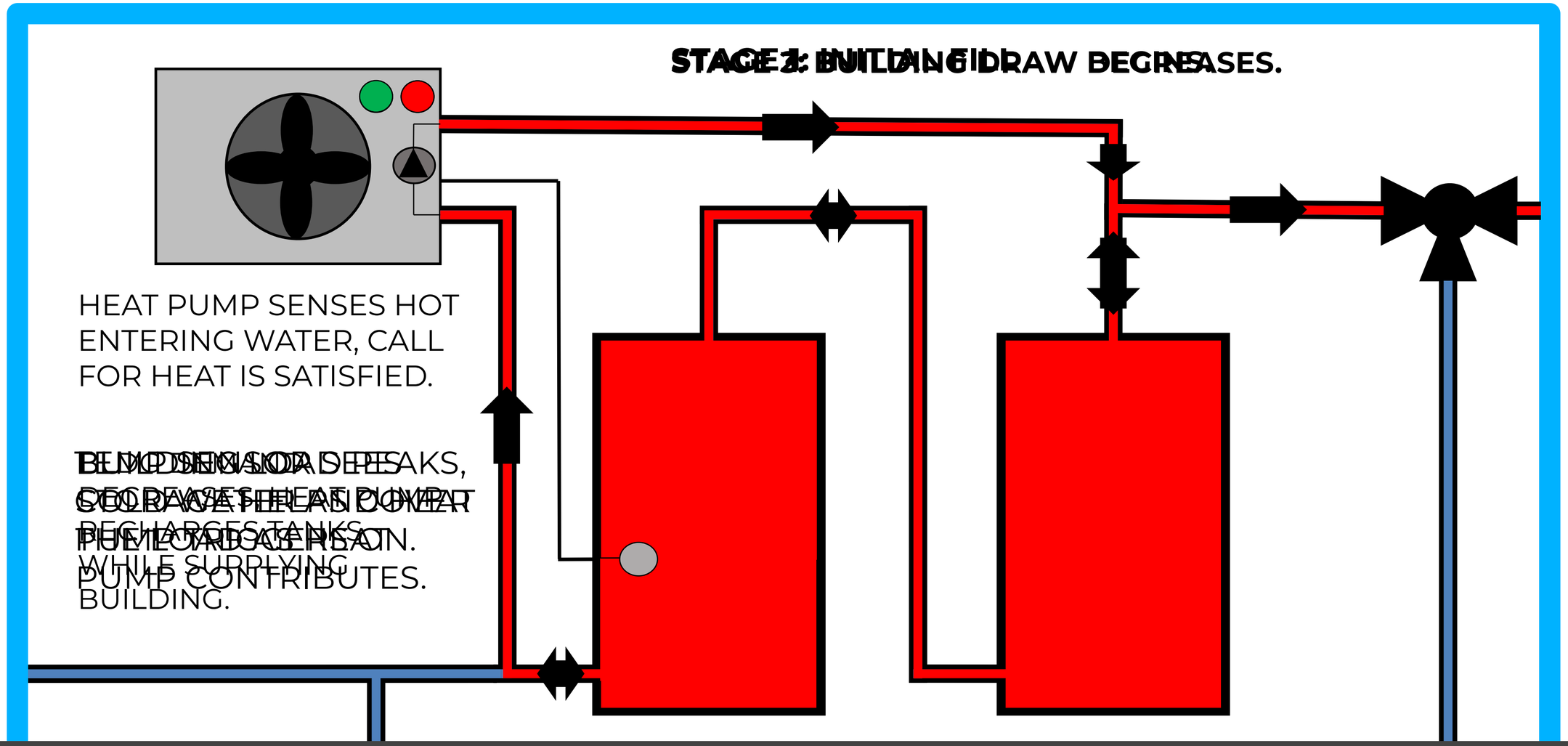
STORAGE TANK SELECTION: **PLUMBING REQUIREMENTS**







STORAGE TANK SELECTION: **PLUMBING REQUIREMENTS**



EXPERT ADVICE:

A CUSTOM TOP CONNECTION IS WORTH IT


ST-9
ST-10
WH-3
EXP-2

FIGURE THESE OUT **FIRST**

HP & STORAGE

CONTROLS

MIXING VALVE

CONTROLS **OPTIONS**

Equipment communicates through **CONTROLS** to fulfill design intent

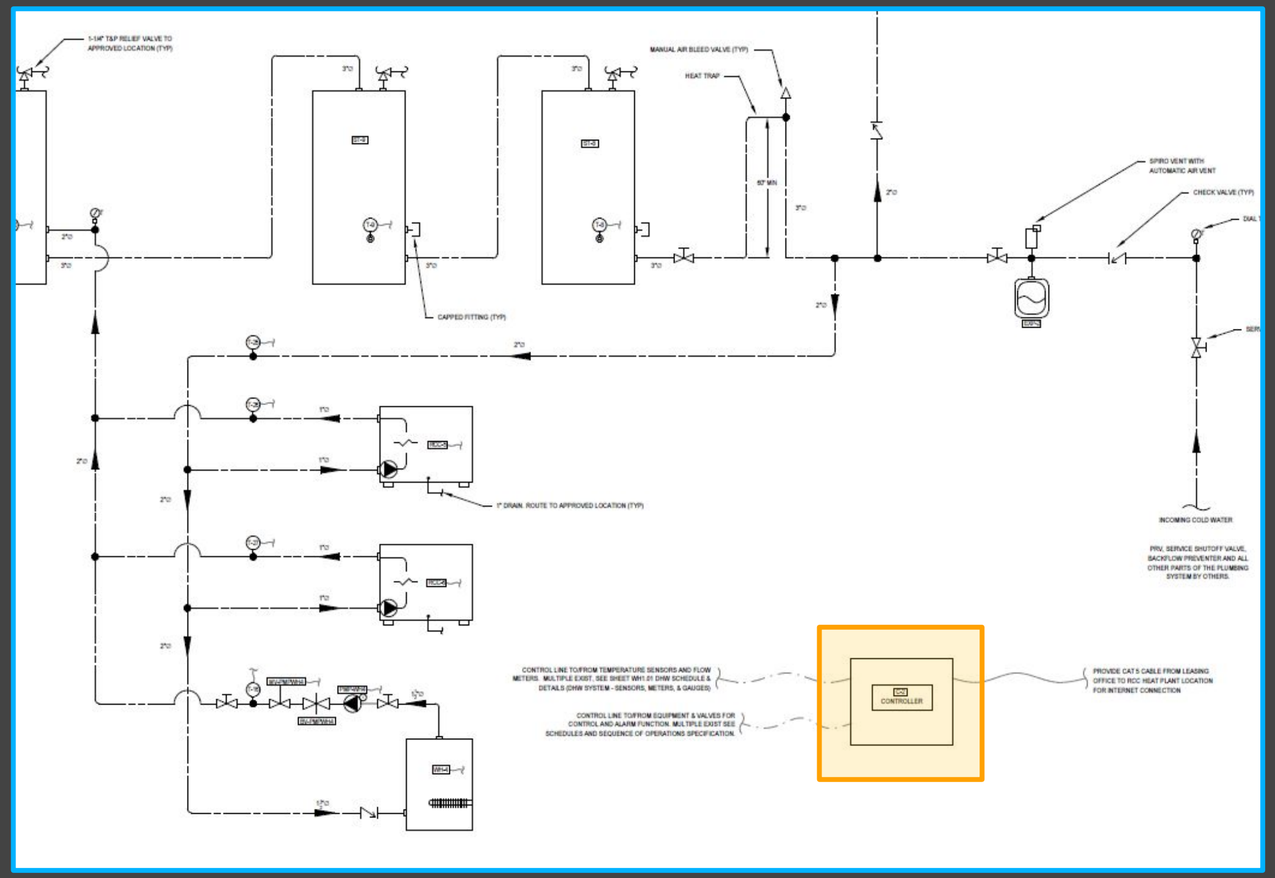


FIGURE THESE OUT **FIRST**

HP & STORAGE

CONTROLS

MIXING VALVE

THERMOSTATIC **MIXING VALVE**

Considerations:

- Minimum/maximum water flow to the building
- Depth of controls & monitoring incorporation
- Level of water temperature precision

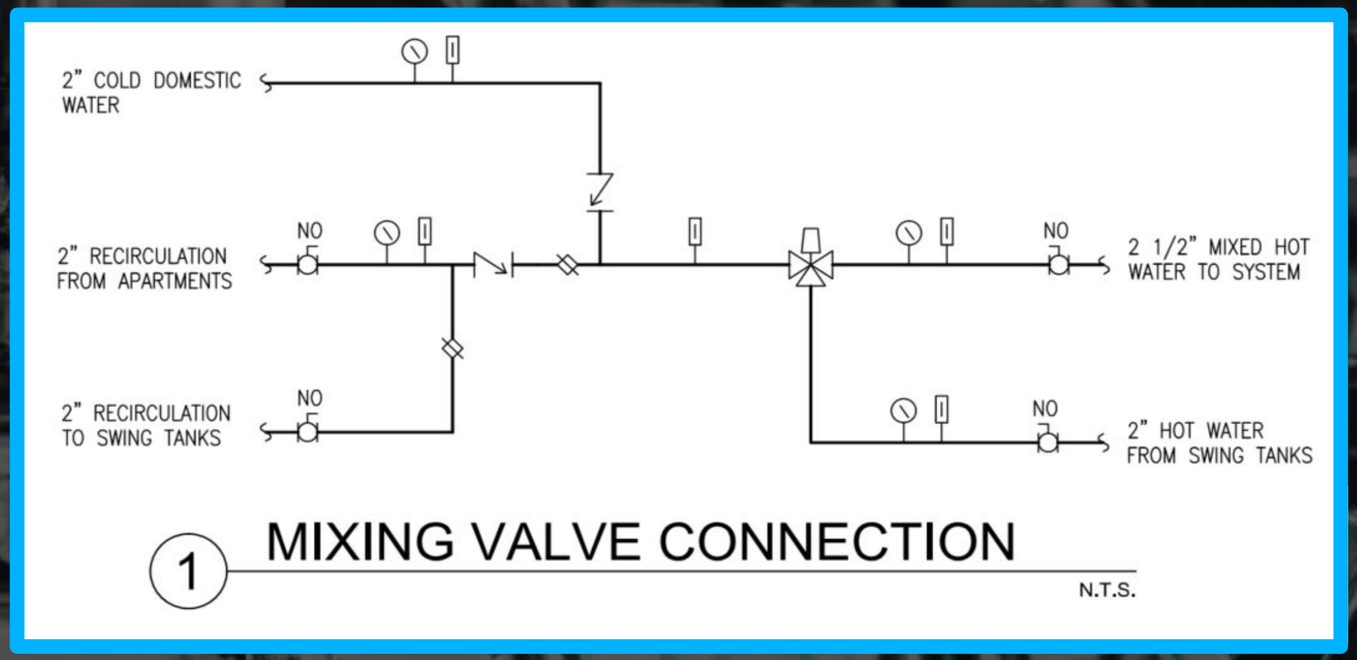


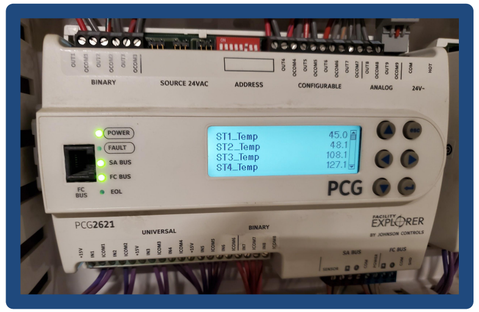
FIGURE THESE OUT **LAST**

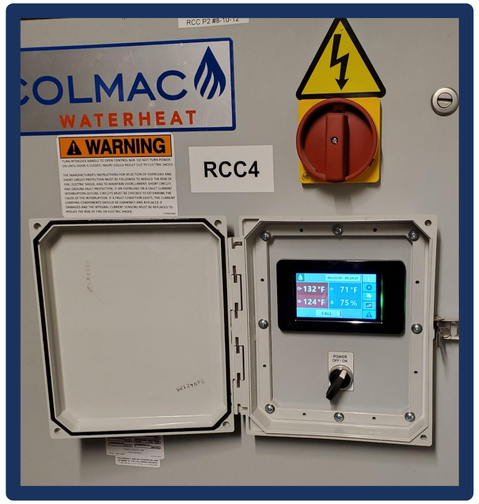
STEP 4:
CONTROLS, CONVERSATIONS, & CONSIDERATIONS

STEP 4: **CONTROLS**

Controls are important!

Don’t assume the equipment will satisfy the sequence of operation on it’s own.





EXPERT ADVICE

CONTROLS: **SCOPE & OPERATION**

Define controls commitments

Requirements

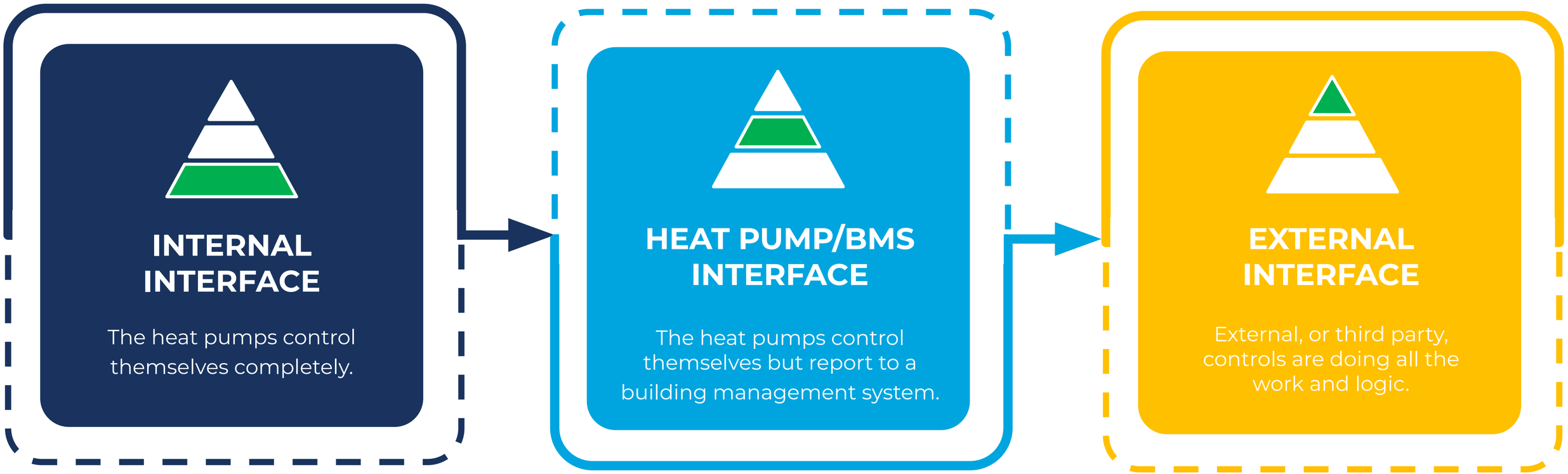
What is needed beyond spec'd equipment?

Scope

Who will employ required controls?

Based off the sequence of operation, could a factory technician start up this equipment without making any assumptions?

TIERS OF **CONTROLS**

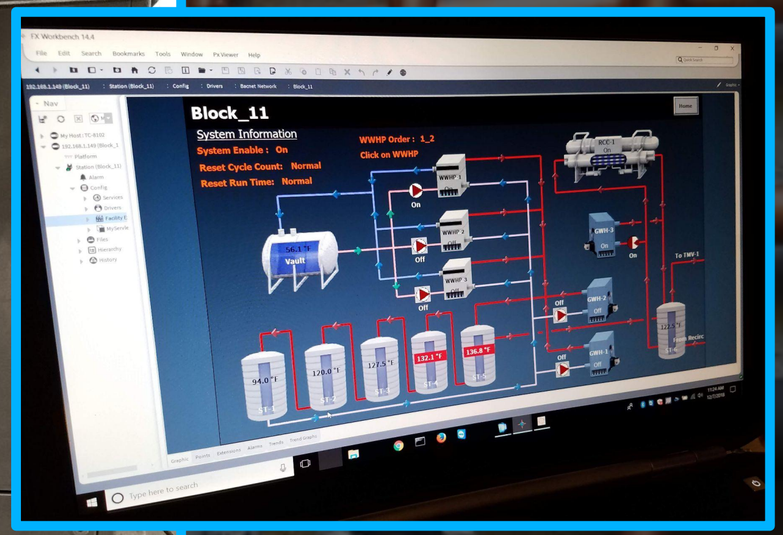


CONTROLS: **INTERNAL INTERFACE**

- Heat pumps control themselves
- No BMS or external controller
- The temperature maintenance system will run independently.

CONTROLS: **HEAT PUMP/BMS INTERFACE**

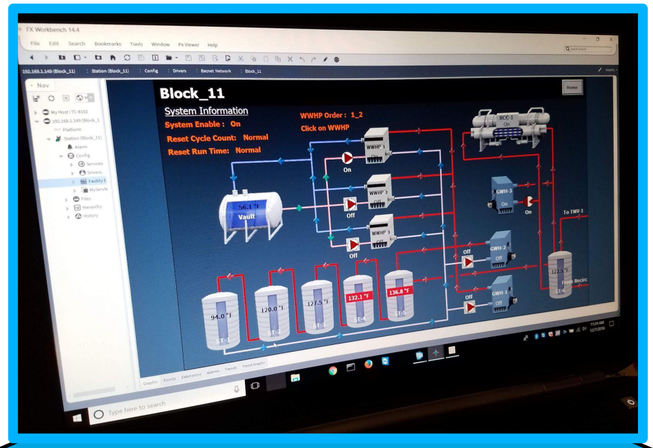
- Heat pumps control themselves but report to a BMS.
- The BMS confirms operation.
- The temperature maintenance system will also report to BMS.



CONTROLS: **EXTERNAL INTERFACE**

- External/third party controls are doing all the work and logic.
- Tell the heat pump and temperature maintenance system when to run.

TIERS OF **CONTROLS**



INTERNAL INTERFACE

HEAT PUMP/BMS INTERFACE

EXTERNAL INTERFACE

CONTROLS EXAMPLE: **Jackson**

Jackson Apartments

Using its own logic, a third party controller handles the sequence of operation, tank temperatures & HPs.

STEP 5:
SUBMITTAL SIGN OFF

STEP 5: SUBMITTAL SIGN **OFF**

Engineer of record signs off

Submittal

Colmac Heat Pump Water Heaters

Unit Tag	Model	Nominal Tons	Qty.
RCC1	CxA-25	25	1
RCC-2	CxA-25	25	1
RCC-3	CxA-25	25	1
RCC-4	CxA-15	15	1
RCC-5	CxA-15	15	1
RCC-6	CxA-15	15	1
RCC-7	CxV-5	5	1

General Notes:

- This submittal is for approval. Approval is **required** in order for equipment to be released for fabrication

Submitted By:

Dean Winchester — Sign

5/1/2021 — Date

☑ Approved as Noted
☐ Approved with Comments
☐ Revise and Re-submit

ELECTRICAL SPECIFICATIONS*

VOLTAGE:	460V / 60Hz / 3Ph
TOTAL PANAL AMPACITY (FLA):	47.6 A
MINIMUM CIRCUIT AMPACITY (MCA):	59.1 A
FEEDER WIRE GAUGE:	8 AWG (8.36 mm^2)
MAXIMUM OVERCURRENT PROTECTION:	45.0 A

*APPROXIMATE VALUES, SUBJECT TO CHANGE

OPERATING CONDITIONS

ENTERING SOURCE TEMPERATURE:	45°F DB / 40°F WB
ENTERING POTABLE WATER TEMP:	50 °F
LEAVING POTABLE WATER TEMP:	140 °F
POTABLE FLOW RATE:	3.75 GPM (225 GPH)
MAX POTABLE FLOW RATE (FOR PIPING DESIGN)**:	22.64 GPM (1,358 GPH)

NDICTIVE PIPING SHOULD BE SIZED FOR THE POTABLE FLOW RATE AT MINIMUM LIFT CONDITIONS; FAILURE TO DO SO MAY RESULT IN PREMATURE PIPE WEAR

PERFORMANCE SPECIFICATIONS***

HEATING CAPACITY:	168,691 Btu/hr
HEATING CAPACITY:	14 TONS
SUCTION TEMPERATURE:	23.3 °F
COOLING CAPACITY:	107,923 Btu/hr
POWER DRAW:	17.8 kW
ESTIMATED COMPRESSION RATIO:	6.4
HEATING COP:	2.78 (EER: 9.5)
COOLING COP:	1.78
COMBINED COP:	4.56

***APPROXIMATE VALUES, SUBJECT TO CHANGE. VALUES BASED ON CONDITIONS SPECIFIED

MAC
TERHEAT

E: Johnson Barrow — JOB NAME: 23rd and Jackson
O: — NUMBER OF UNITS: 3 — ORDER DATE:
T: Brian Cullier — REQUESTED SHIP DATE:

CxA-25

FRAME CONSTRUCTION

CABINET MATERIAL:	304 STAINLESS
FIN MATERIAL:	ELECTRO-COATED
FAN TYPE:	PLENUM

ELECTRICAL SPECIFICATIONS*

VOLTAGE:	460V / 60Hz / 3Ph
TOTAL PANAL AMPACITY (FLA):	47.6 A
MINIMUM CIRCUIT AMPACITY (MCA):	59.1 A
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POTABLE FLOW RATE:	3.75 GPM (225 GPH)
POTABLE FLOW RATE (FOR PIPING DESIGN)**:	22.64 GPM (1,358 GPH)

PIPING SHOULD BE SIZED FOR THE POTABLE FLOW RATE AT MINIMUM LIFT CONDITIONS; FAILURE TO DO SO MAY RESULT IN PREMATURE PIPE WEAR OR EQUIPMENT DAMAGE.

PERFORMANCE SPECIFICATIONS***

HEATING CAPACITY:	168,691 Btu/hr
HEATING CAPACITY:	14 TONS
SUCTION TEMPERATURE:	23.3 °F
COOLING CAPACITY:	107,923 Btu/hr
POWER DRAW:	17.8 kW
ESTIMATED COMPRESSION RATIO:	6.4
HEATING COP:	2.78 (EER: 9.5)
COOLING COP:	1.78
COMBINED COP:	4.56

**APPROXIMATE VALUES, SUBJECT TO CHANGE. VALUES BASED ON CONDITIONS SPECIFIED ABOVE.
IF ACTUAL CONDITIONS DIFFER, PERFORMANCE AND EFFICIENCIES WILL ALSO DIFFER.

S:
1/3 HP (60 HZ), BMS PROTOCOL: NONE

S/ADDITIONAL SERIAL NUMBERS:
D

Date Generated: 2/18/2019

COLMAC
WATERHEAT

UNIT OPTIONS

COMPRESSOR WARRANTY:	☒
MULTIPASS:	☐
HIGH SOURCE KIT:	☐
VFD:	☑
SOUND BLANKET ON COMPRESSOR:	☐
SEISMIC FEET:	☐
ISPM CRATING:	☐
LON ADAPTER ASSEMBLY:	☐
DOUBLE WALL EVAPORATOR:	☐
SINGLE WALL CONDENSER:	☐
HIGH PRESSURE PUMP:	☐
MULTI-MODULE ELECTRICAL DROP:	☐
COLMISSION:	☐

ESTIMATED VFD PERFORMANCE (HEATING)

FREQ.	HEATING (Btu/hr)	FLOW (GPM)	POWER (kW)	HEATING COP (EER)
60 Hz	168,691	3.75	17.8	2.78 (9.5)
55 Hz	152,261	3.38	15.6	2.85 (9.7)
50 Hz	136,163	3.03	13.5	2.95 (10.1)
45 Hz	120,412	2.68	11.6	3.05 (10.4)
40 Hz	105,026	2.33	9.7	3.18 (10.8)
35 Hz	90,029	2.00	7.9	3.33 (11.3)

DOMESTIC HOT WATER SYSTEM SCHEDULES

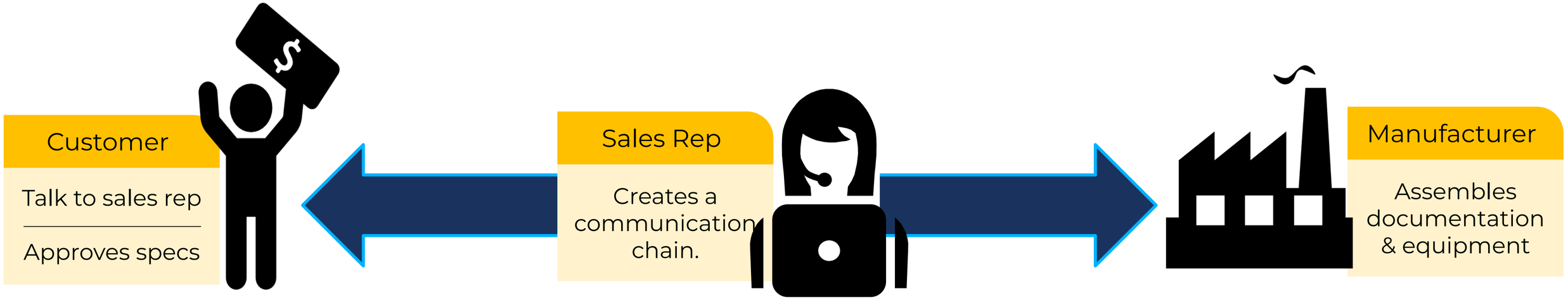
DHW SYSTEM - REVERSE CYCLE CHILLER

TAG	MANUFACTURER	MODEL	SERVICE	HEAT CAP (BTU/HR @ 47F)	COP (SEASONAL)	PIPE	VOLT/PHASE	MCA (AMPS)	FLA (AMPS)	NOTES
RCC-1	COLMAC	CXA25	BUILDING WEST - HW	168691	2.78	1 1/2"	460VAC/3PH	59.1	47.6	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.
RCC-2	COLMAC	CXA25	BUILDING WEST - HW	168691	2.78	1 1/2"	460VAC/3PH	59.1	47.6	INCLUDE COMPRESSOR VFD OPTION. PROVIDE BACK DRAFT DAMPER. INSTALL ON 2" STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR SHALL BE MFG. STANDARD SIZE. FAN SHALL PROVIDE 3/4" ESP AT RATED FLOW.

TAG	MANUFACTURER	MODEL	SERVICE	HEAT CAP (BTU/HR @ 47F)	COP (SEASONAL)	PIPE	VOLT/PHASE	MCA (AMPS)	FLA (AMPS)	
RCC-1	COLMAC	CXA25	BUILDING WEST - HW	168691	2.78	1 1/2"	460VAC/3PH	59.1	47.6	INCLUDE COMPRESSOR VFD OPTION. SHALL BE MFG. STANDARD SIZE. FAN

STEP 6:
VERIFY & PURCHASE

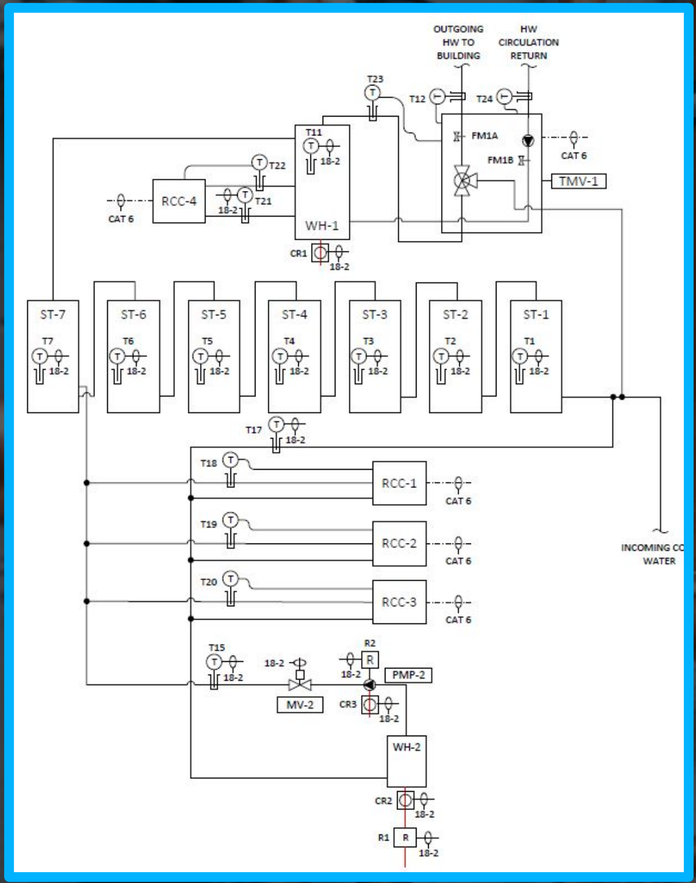
STEP 6: VERIFY & **PURCHASE**

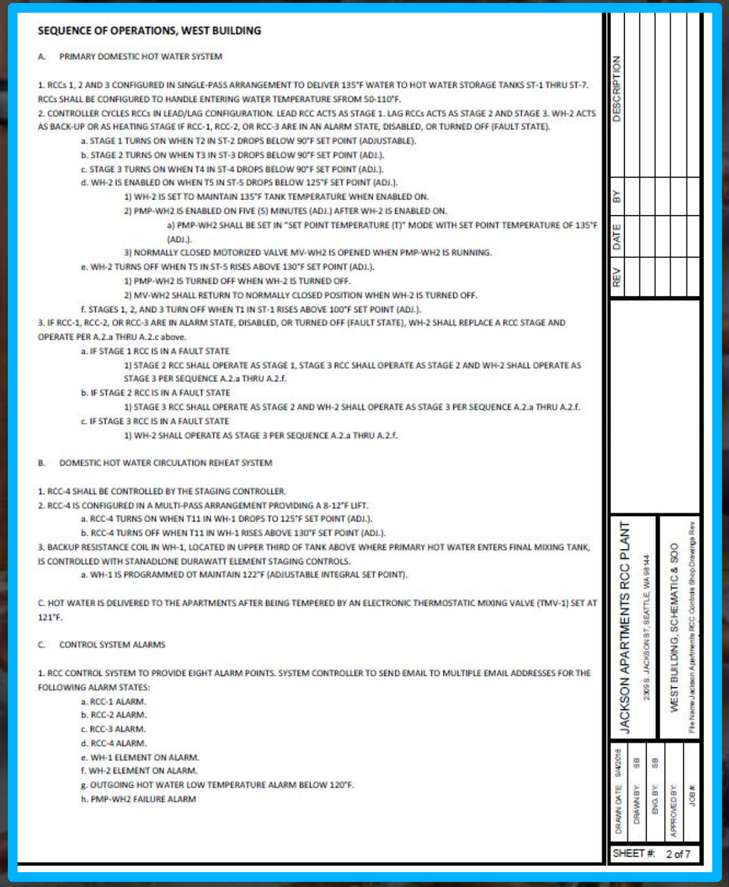


Double check that information hasn't changed from the time of the original design.

EXPERT ADVICE

DOCUMENTATION





SEQUENCE OF OPERATIONS, WEST BUILDING

A. PRIMARY DOMESTIC HOT WATER SYSTEM

1. RCCs 1, 2 AND 3 CONFIGURED IN SINGLE-PASS ARRANGEMENT TO DELIVER 135°F WATER TO HOT WATER STORAGE TANKS ST-1 THRU ST-7. RCCs SHALL BE CONFIGURED TO HANDLE ENTERING WATER TEMPERATURE SFROM 50-110°F.
2. CONTROLLER CYCLES RCCs IN LEAD/LAG CONFIGURATION. LEAD RCC ACTS AS STAGE 1. LAG RCCs ACTS AS STAGE 2 AND STAGE 3. WH-2 ACTS AS BACK-UP OR AS HEATING STAGE IF RCC-1, RCC-2, OR RCC-3 ARE IN AN ALARM STATE, DISABLED, OR TURNED OFF (FAULT STATE).
   a. STAGE 1 TURNS ON WHEN T2 IN ST-2 DROPS BELOW 90°F SET POINT (ADJUSTABLE).
   b. STAGE 2 TURNS ON WHEN T3 IN ST-3 DROPS BELOW 90°F SET POINT (ADJ.).
   c. STAGE 3 TURNS ON WHEN T4 IN ST-4 DROPS BELOW 90°F SET POINT (ADJ.).
   d. WH-2 IS ENABLED ON WHEN T5 IN ST-5 DROPS BELOW 125°F SET POINT (ADJ.).
      1) WH-2 IS SET TO MAINTAIN 135°F TANK TEMPERATURE WHEN ENABLED ON.
      2) PMP-WH2 IS ENABLED ON FIVE (5) MINUTES (ADJ.) AFTER WH-2 IS ENABLED ON.
         a) PMP-WH2 SHALL BE SET IN "SET POINT TEMPERATURE (T)" MODE WITH SET POINT TEMPERATURE OF 135°F (ADJ.).
      3) NORMALLY CLOSED MOTORIZED VALVE MV-WH2 IS OPENED WHEN PMP-WH2 IS RUNNING.
   e. WH-2 TURNS OFF WHEN T5 IN ST-5 RISES ABOVE 130°F SET POINT (ADJ.).
      1) PMP-WH2 IS TURNED OFF WHEN WH-2 IS TURNED OFF.
      2) MV-WH2 SHALL RETURN TO NORMALLY CLOSED POSITION WHEN WH-2 IS TURNED OFF.
   f. STAGES 1, 2, AND 3 TURN OFF WHEN T1 IN ST-1 RISES ABOVE 100°F SET POINT (ADJ.).
3. IF RCC-1, RCC-2, OR RCC-3 ARE IN ALARM STATE, DISABLED, OR TURNED OFF (FAULT STATE), WH-2 SHALL REPLACE A RCC STAGE AND OPERATE PER A.2.a THRU A.2.c above.
   a. IF STAGE 1 RCC IS IN A FAULT STATE
      1) STAGE 2 RCC SHALL OPERATE AS STAGE 1, STAGE 3 RCC SHALL OPERATE AS STAGE 2 AND WH-2 SHALL OPERATE AS STAGE 3 PER SEQUENCE A.2.a THRU A.2.f.
   b. IF STAGE 2 RCC IS IN A FAULT STATE
      1) STAGE 3 RCC SHALL OPERATE AS STAGE 2 AND WH-2 SHALL OPERATE AS STAGE 3 PER SEQUENCE A.2.a THRU A.2.f.
   c. IF STAGE 3 RCC IS IN A FAULT STATE
      1) WH-2 SHALL OPERATE AS STAGE 3 PER SEQUENCE A.2.a THRU A.2.f.

B. DOMESTIC HOT WATER CIRCULATION REHEAT SYSTEM

1. RCC-4 SHALL BE CONTROLLED BY THE STAGING CONTROLLER.
2. RCC-4 IS CONFIGURED IN A MULTI-PASS ARRANGEMENT PROVIDING A 8-12°F LIFT.
   a. RCC-4 TURNS ON WHEN T11 IN WH-1 DROPS TO 125°F SET POINT (ADJ.).
   b. RCC-4 TURNS OFF WHEN T11 IN WH-1 RISES ABOVE 130°F SET POINT (ADJ.).
3. BACKUP RESISTANCE COIL IN WH-1, LOCATED IN UPPER THIRD OF TANK ABOVE WHERE PRIMARY HOT WATER ENTERS FINAL MIXING TANK, IS CONTROLLED WITH STANADLONE DURAWATT ELEMENT STAGING CONTROLS.
   a. WH-1 IS PROGRAMMED OT MAINTAIN 122°F (ADJUSTABLE INTEGRAL SET POINT).

C. HOT WATER IS DELIVERED TO THE APARTMENTS AFTER BEING TEMPERED BY AN ELECTRONIC THERMOSTATIC MIXING VALVE (TMV-1) SET AT 121°F.

C. CONTROL SYSTEM ALARMS

1. RCC CONTROL SYSTEM TO PROVIDE EIGHT ALARM POINTS. SYSTEM CONTROLLER TO SEND EMAIL TO MULTIPLE EMAIL ADDRESSES FOR THE FOLLOWING ALARM STATES:
   a. RCC-1 ALARM.
   b. RCC-2 ALARM.
   c. RCC-3 ALARM.
   d. RCC-4 ALARM.
   e. WH-1 ELEMENT ON ALARM.
   f. WH-2 ELEMENT ON ALARM.
   g. OUTGOING HOT WATER LOW TEMPERATURE ALARM BELOW 120°F.
   h. PMP-WH2 FAILURE ALARM

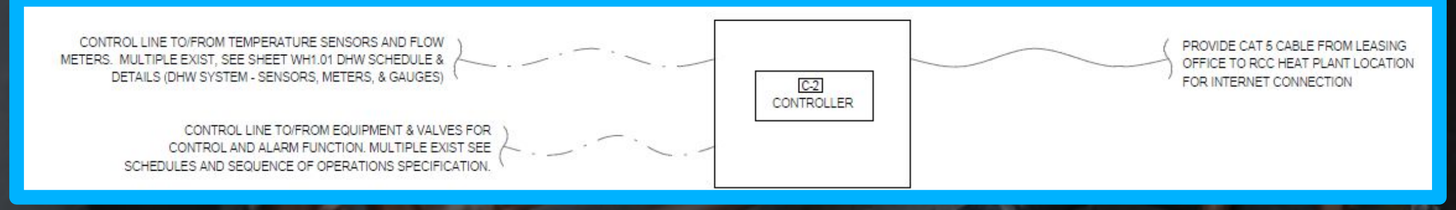
REV	DATE	BY	DESCRIPTION

JACKSON APARTMENTS RCC PLANT
2909 S. JACKSON ST. SEATTLE, WA 98144

WEST BUILDING, SCHEMATIC & SOO
File Name:Jackson Apartments RCC Controls Shop Drawings Rev.

DRAWN DATE: 04/2018
DRAWN BY: BB
ENG. BY: BB
APPROVED BY:
JOB #:

SHEET #: 2 of 7



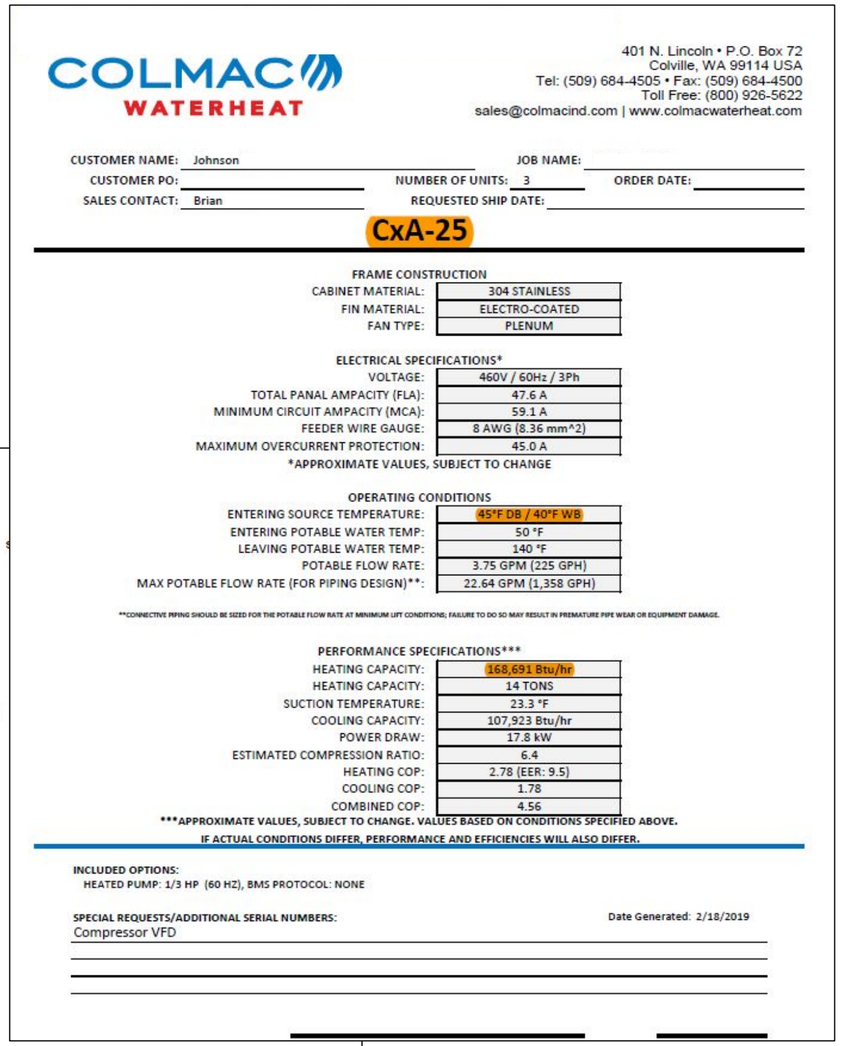
Share with the manufacturer:

- Sequence of operation
- Plumbing schematics
- Equipment schedule
- Controls schematics
- Submittal docs

PURCHASE **EQUIPMENT**

Purchase orders should:

- lay out all equipment options to make the HP work
- include communications cards, low-temp packages, et.



COLMAC WATERHEAT

401 N. Lincoln • P.O. Box 72
Colville, WA 99114 USA
Tel: (509) 684-4505 • Fax: (509) 684-4500
Toll Free: (800) 926-5622
sales@colmacind.com | www.colmacwaterheat.com

CUSTOMER NAME: Johnson
JOB NAME:
CUSTOMER PO:
NUMBER OF UNITS: 3
ORDER DATE:
SALES CONTACT: Brian
REQUESTED SHIP DATE:

CxA-25

FRAME CONSTRUCTION

CABINET MATERIAL:	304 STAINLESS
FIN MATERIAL:	ELECTRO-COATED
FAN TYPE:	PLENUM

ELECTRICAL SPECIFICATIONS*

VOLTAGE:	460V / 60Hz / 3Ph
TOTAL PANAL AMPACITY (FLA):	47.6 A
MINIMUM CIRCUIT AMPACITY (MCA):	59.1 A
FEEDER WIRE GAUGE:	8 AWG (8.36 mm^2)
MAXIMUM OVERCURRENT PROTECTION:	45.0 A

*APPROXIMATE VALUES, SUBJECT TO CHANGE

OPERATING CONDITIONS

ENTERING SOURCE TEMPERATURE:	45°F DB / 40°F WB
ENTERING POTABLE WATER TEMP:	50 °F
LEAVING POTABLE WATER TEMP:	140 °F
POTABLE FLOW RATE:	3.75 GPM (225 GPH)
MAX POTABLE FLOW RATE (FOR PIPING DESIGN)**:	22.64 GPM (1,358 GPH)

**CONNECTIVE PIPING SHOULD BE SIZED FOR THE POTABLE FLOW RATE AT MINIMUM LIFT CONDITIONS; FAILURE TO DO SO MAY RESULT IN PREMATURE PIPE WEAR OR EQUIPMENT DAMAGE.

PERFORMANCE SPECIFICATIONS***

HEATING CAPACITY:	168,691 Btu/hr
HEATING CAPACITY:	14 TONS
SUCTION TEMPERATURE:	23.3 °F
COOLING CAPACITY:	107,923 Btu/hr
POWER DRAW:	17.8 kW
ESTIMATED COMPRESSION RATIO:	6.4
HEATING COP:	2.78 (EER: 9.5)
COOLING COP:	1.78
COMBINED COP:	4.56

***APPROXIMATE VALUES, SUBJECT TO CHANGE. VALUES BASED ON CONDITIONS SPECIFIED ABOVE.
IF ACTUAL CONDITIONS DIFFER, PERFORMANCE AND EFFICIENCIES WILL ALSO DIFFER.

INCLUDED OPTIONS:
HEATED PUMP: 1/3 HP (60 HZ), BMS PROTOCOL: NONE

SPECIAL REQUESTS/ADDITIONAL SERIAL NUMBERS:
Compressor VFD

Date Generated: 2/18/2019

COLMAC WATERHEAT

UNIT OPTIONS

COMPRESSOR WARRANTY:	☒
MULTIPASS:	☐
HIGH SOURCE KIT:	☐
VFD:	☑
SOUND BLANKET ON COMPRESSOR:	☐
SEISMIC FEET:	☐
ISPM CRATING:	☐
LON ADAPTER ASSEMBLY:	☐
DOUBLE WALL EVAPORATOR:	☐
SINGLE WALL CONDENSER:	☐
HIGH PRESSURE PUMP:	☐
MULTI-MODULE ELECTRICAL DROP:	☐
COLMISSION:	☐

ESTIMATED VFD PERFORMANCE (HEATING)

FREQ.	HEATING (Btu/hr)	FLOW (GPM)	POWER (kW)	HEATING COP (EER)
60 Hz	168,691	3.75	17.8	2.78 (9.5)
55 Hz	152,261	3.38	15.6	2.85 (9.7)
50 Hz	136,163	3.03	13.5	2.95 (10.1)
45 Hz	120,412	2.68	11.6	3.05 (10.4)
40 Hz	105,026	2.33	9.7	3.18 (10.8)
35 Hz	90,029	2.00	7.9	3.33 (11.3)

STEP 7:
INSTALLATION

STEP 7: INSTALLATION

EXPERT ADVICE:

Maintain an open dialog with the manufacturer and engineer during installation.

STEP 7: **INSTALLATION**

Communication

Correct Installation

Not a Gas Water Heater

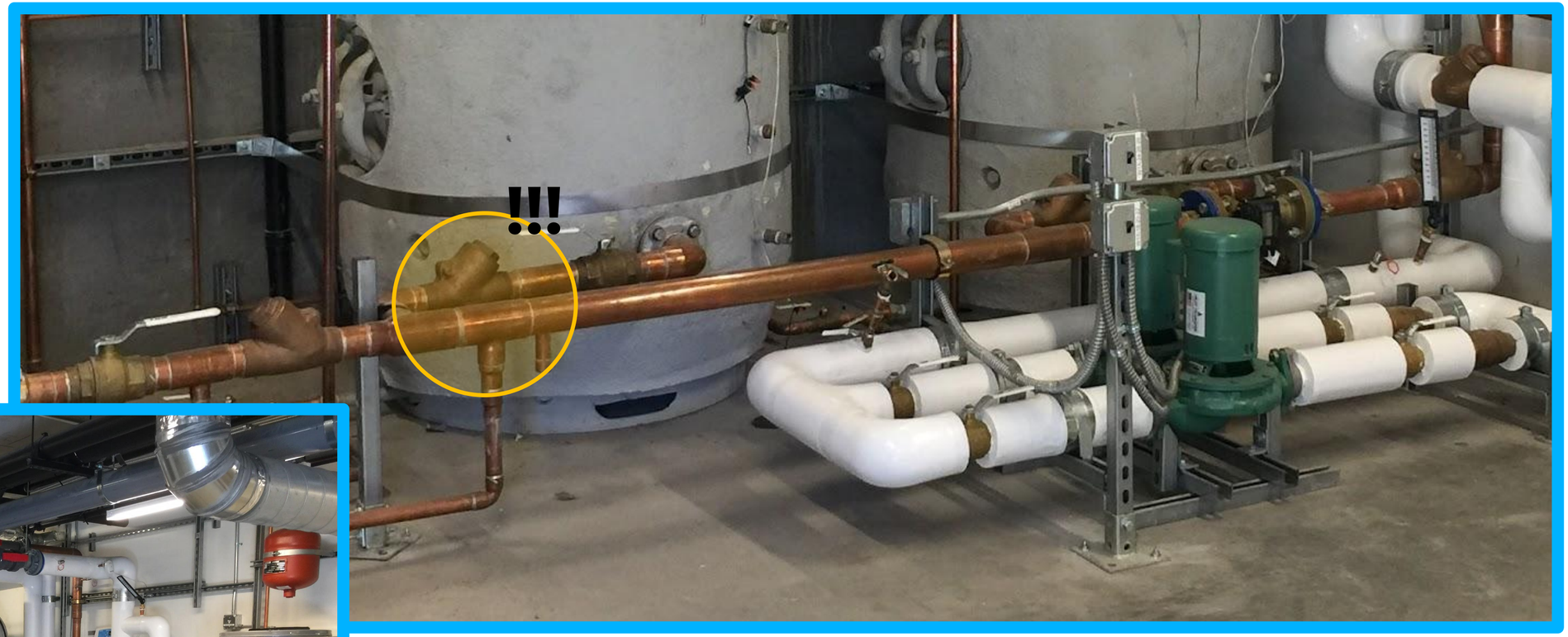
INSTALLATION: **COMMUNICATION**

Talk to the manufacturer to get installation details

INSTALLATION: **CORRECT INSTALLATION IS ESSENTIAL**

EDUCATE YOUR TEAM

INSTALLATION: **NOT A GAS WATER HEATER**



Heat pumps *move* heat.

STEP 8:
START UP

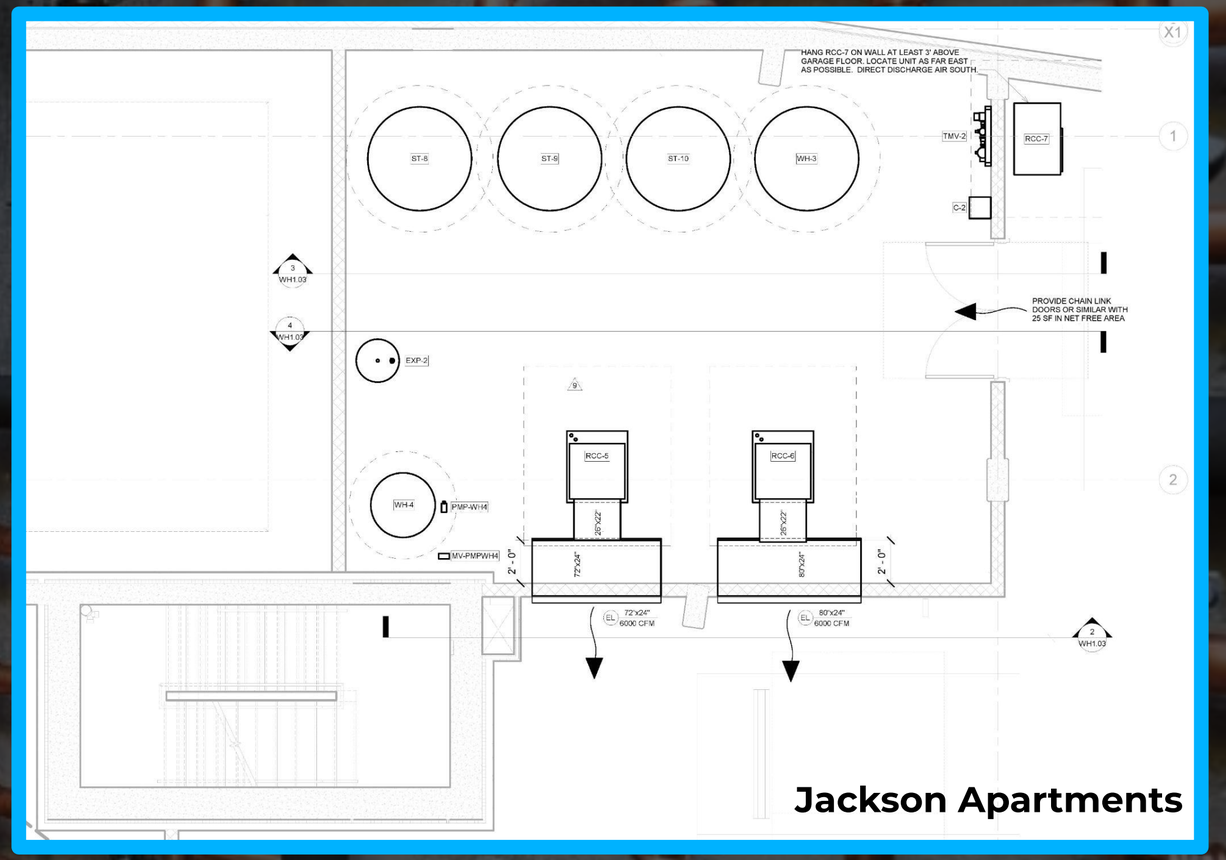
STEP 8: START **UP**

- Schedule ASAP
- Maintain scheduling updates when timeline shifts
- Also consider:
  - Will they be driving, flying or traveling to your site?

EXPERT ADVICE: Plan ahead with your start-up tech.

START UP **HURDLES**

- Coordinate with all trades
- Often, small changes need to be made
- Sensors must be in place to test the system



BIRDS EYE **VIEW**

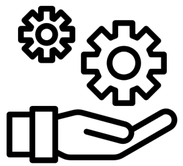
DESIGN

OPERATION

1/2

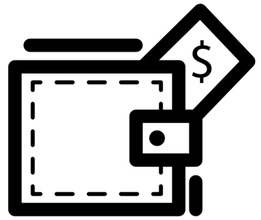
Find your contractors

3/4



Detail your equipment

5/6



Verify & purchase

7/8

Install & start up

How do I choose the right equipment?
What steps do I need to take to implement a CHPWH system?

UPCOMING **TRAINING & RESOURCES**

Seattle City Light, in collaboration with the Lighting Design Lab 2021

(https://www.lightingdesignlab.com/education)

CHPWH: Design, Operations, and Maintenance

(8-hour seminar)

Oct 26, Nov. 3, 10, 17

10am-12pm

To host a training session, or for more information, contact:
Lauren Bhaskar at: **LBHASKAR@DRINTL.COM**

lighting® design lab

Seattle City Light

D+R LEARN

ECOTOPE


THANK YOU
D+R LEARN
ECOTOPE