

# COMMERCIAL HEAT PUMP WATER HEATING:

## DESIGN & MAINTENANCE

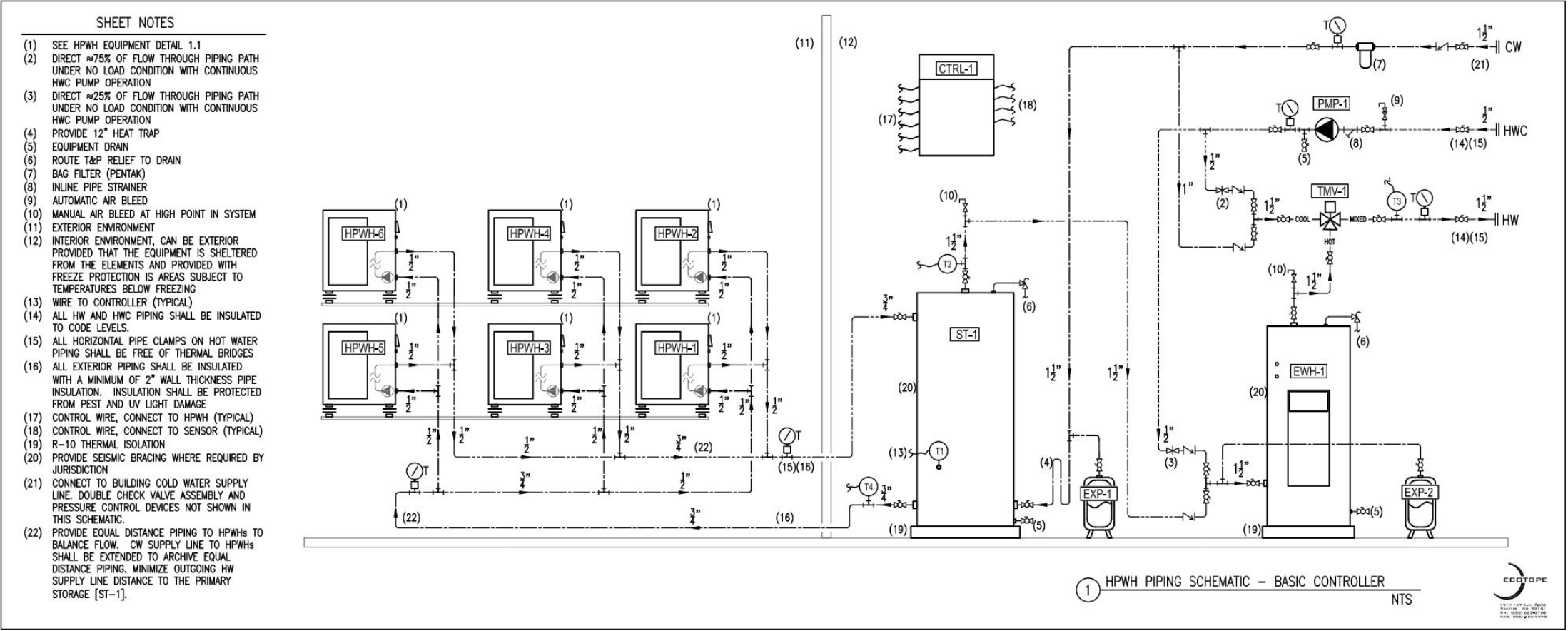
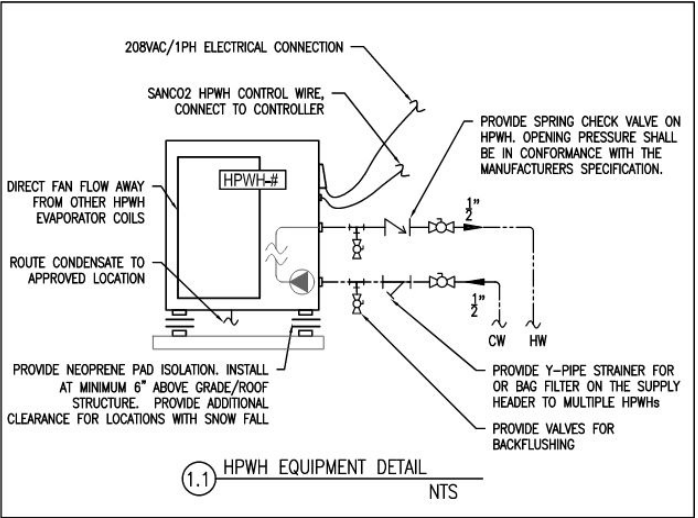
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*Colin Grist & Evan Green  
Ecotope, Inc.*



BASIS OF DESIGN	
THE SYSTEM WAS SIZED FOR: • SANCO2 WITH SWING TANK CENTRAL HEAT PLANT DESIGN • MARKET RATE MULTI-FAMILY BUILDING • 60 FULL TIME OCCUPANTS • 30 RESIDENTIAL DWELLING UNITS • 25 GALLONS OF HW PER PERSON PER DAY (PEAK DAILY HOT WATER USAGE) • 1,500 GALLONS OF 120F HW PER DAY (PEAK DAILY HOT WATER USAGE) • 16 HR PER DAY PRIMARY HPWH RUN TIME • 90 WATTS/APT HWC LOSSES  MINIMUM SYSTEM SIZE: • 285 GALLONS OF PRIMARY STORAGE • 66.8 KBTU/HR OF PRIMARY HEAT CAPACITY • 80 GALLONS OF SWING TANK VOLUME • 4.7 KW SWING TANK RESISTANCE ELEMENT	EQUIPMENT SELECTION: • [HPWH-1-6] PRIMARY HPWHs; SIX (6) SANCO2, GS4-45HPC; 5 NOMINAL, 1 REDUNDANT UNIT • [ST-1] PRIMARY STORAGE; ONE (1) SANCO2, ECO-285GLNST; 285 GALLONS OF STORAGE • [CTRL-1] CENTRAL HEAT PLANT CONTROLLER; SANCO2, ECO-MSCTRL-001 • [EWH-1] TEMPERATURE MAINTENANCE TANK (SWING TANK); 80 GALLONS, 6 KW ELEMENT • [PMP-1] 0.5 GPM PER RISER, TARGET 110F HOT WATER CIRCULATION RETURN WATER TEMP. • [TMV-1] RECOMMEND SIZING FOR 0.25 GPM PER PERSON PEAK, MINIMUM FLOWRATE SHALL BE LESS THAN THE CONTINUOUS FLOWRATE OF [PMP-1] • [EXP-1] SIZED FOR THE THERMAL EXPANSION OF THE PRIMARY STORAGE VOLUME • [EXP-2] SIZED FOR THE THERMAL EXPANSION OF THE TEMPERATURE MAINTENANCE VOLUME AND THE VOLUME OF WATER IN THE HW DISTRIBUTION PIPING.

LEGEND			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	PUMP		PIPE-T
	MIXING VALVE		T&P RELIEF VALVE
	EQUIPMENT TAG		MANUAL AND AUTOMATIC AIR BLEED
	TEMPERATURE SENSOR		PIPE UNION
	FLOW METER		PIPE FLOW DIRECTION
	BALL VALVE		PIPE SIZE
	BALANCING VALVE		CW PIPING
	SPRING CHECK VALVE		HW PIPING
	INLINE Y-STRAINER		HWC PIPING



- SHEET NOTES
- SEE HPWH EQUIPMENT DETAIL 1.1
  - DIRECT ~75% OF FLOW THROUGH PIPING PATH UNDER NO LOAD CONDITION WITH CONTINUOUS HWC PUMP OPERATION
  - DIRECT ~25% OF FLOW THROUGH PIPING PATH UNDER NO LOAD CONDITION WITH CONTINUOUS HWC PUMP OPERATION
  - PROVIDE 12" HEAT TRAP
  - EQUIPMENT DRAIN
  - ROUTE T&P RELIEF TO DRAIN
  - BAG FILTER (PENTAK)
  - INLINE PIPE STRAINER
  - AUTOMATIC AIR BLEED
  - MANUAL AIR BLEED AT HIGH POINT IN SYSTEM
  - EXTERIOR ENVIRONMENT
  - INTERIOR ENVIRONMENT, CAN BE EXTERIOR PROVIDED THAT THE EQUIPMENT IS SHELTERED FROM THE ELEMENTS AND PROVIDED WITH FREEZE PROTECTION IS AREAS SUBJECT TO TEMPERATURES BELOW FREEZING
  - WIRE TO CONTROLLER (TYPICAL)
  - ALL HW AND HWC PIPING SHALL BE INSULATED TO CODE LEVELS.
  - ALL HORIZONTAL PIPE CLAMPS ON HOT WATER PIPING SHALL BE FREE OF THERMAL BRIDGES
  - ALL EXTERIOR PIPING SHALL BE INSULATED WITH A MINIMUM OF 2" WALL THICKNESS PIPE INSULATION. INSULATION SHALL BE PROTECTED FROM PEST AND UV LIGHT DAMAGE
  - CONTROL WIRE, CONNECT TO HPWH (TYPICAL)
  - CONTROL WIRE, CONNECT TO SENSOR (TYPICAL)
  - R-10 THERMAL ISOLATION
  - PROVIDE SEISMIC BRACING WHERE REQUIRED BY JURISDICTION
  - CONNECT TO BUILDING COLD WATER SUPPLY LINE. DOUBLE CHECK VALVE ASSEMBLY AND PRESSURE CONTROL DEVICES NOT SHOWN IN THIS SCHEMATIC.
  - PROVIDE EQUAL DISTANCE PIPING TO HPWHs TO BALANCE FLOW. CW SUPPLY LINE TO HPWHs SHALL BE EXTENDED TO ARCHIVE EQUAL DISTANCE PIPING. MINIMIZE OUTGOING HW SUPPLY LINE DISTANCE TO THE PRIMARY STORAGE [ST-1].

# 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



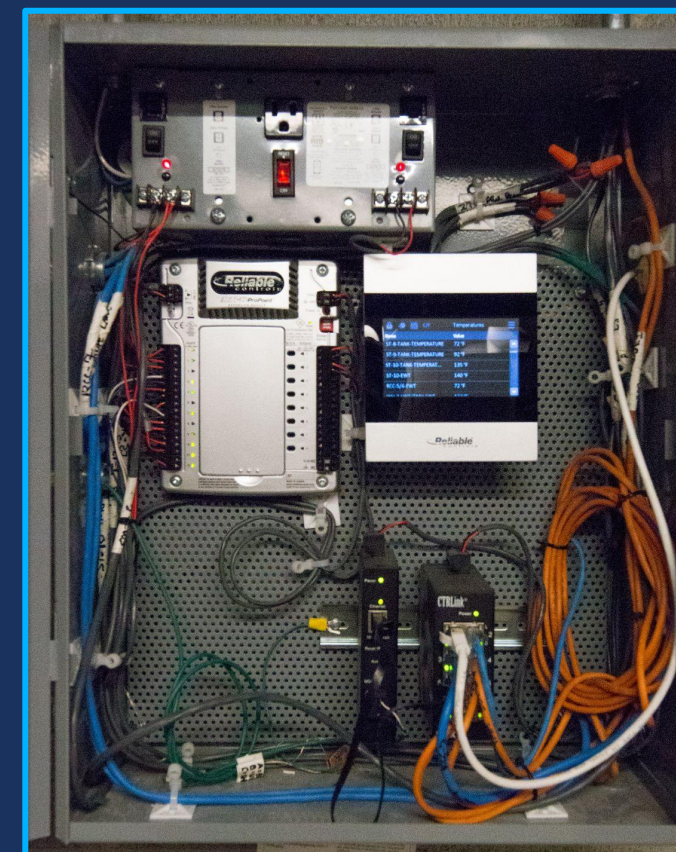
Parallel loop configuration  
(1) Colmac CxV-5; (1) 500 gal tank



Garage



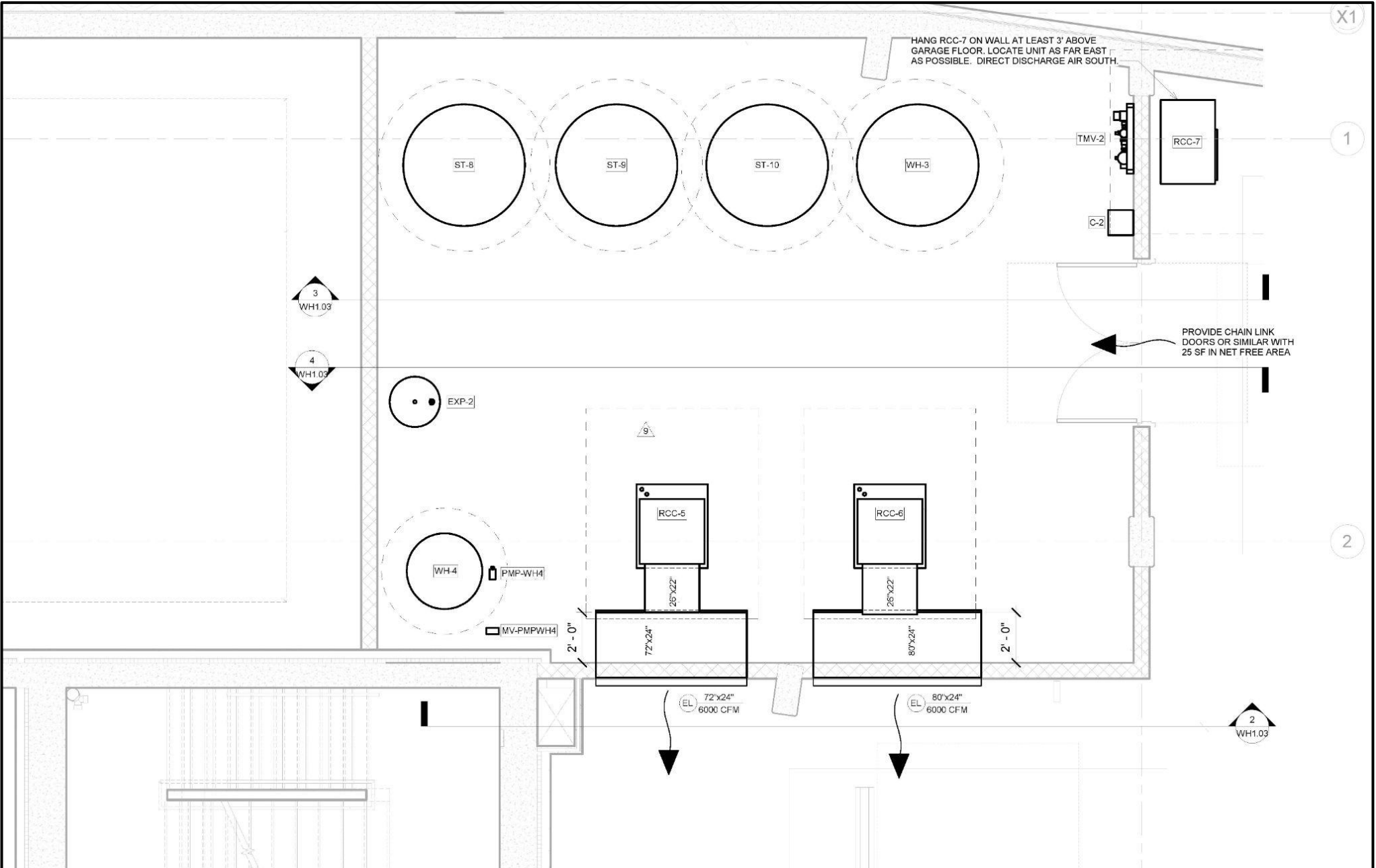
15.1 % annual energy savings



# JACKSON APARTMENTS

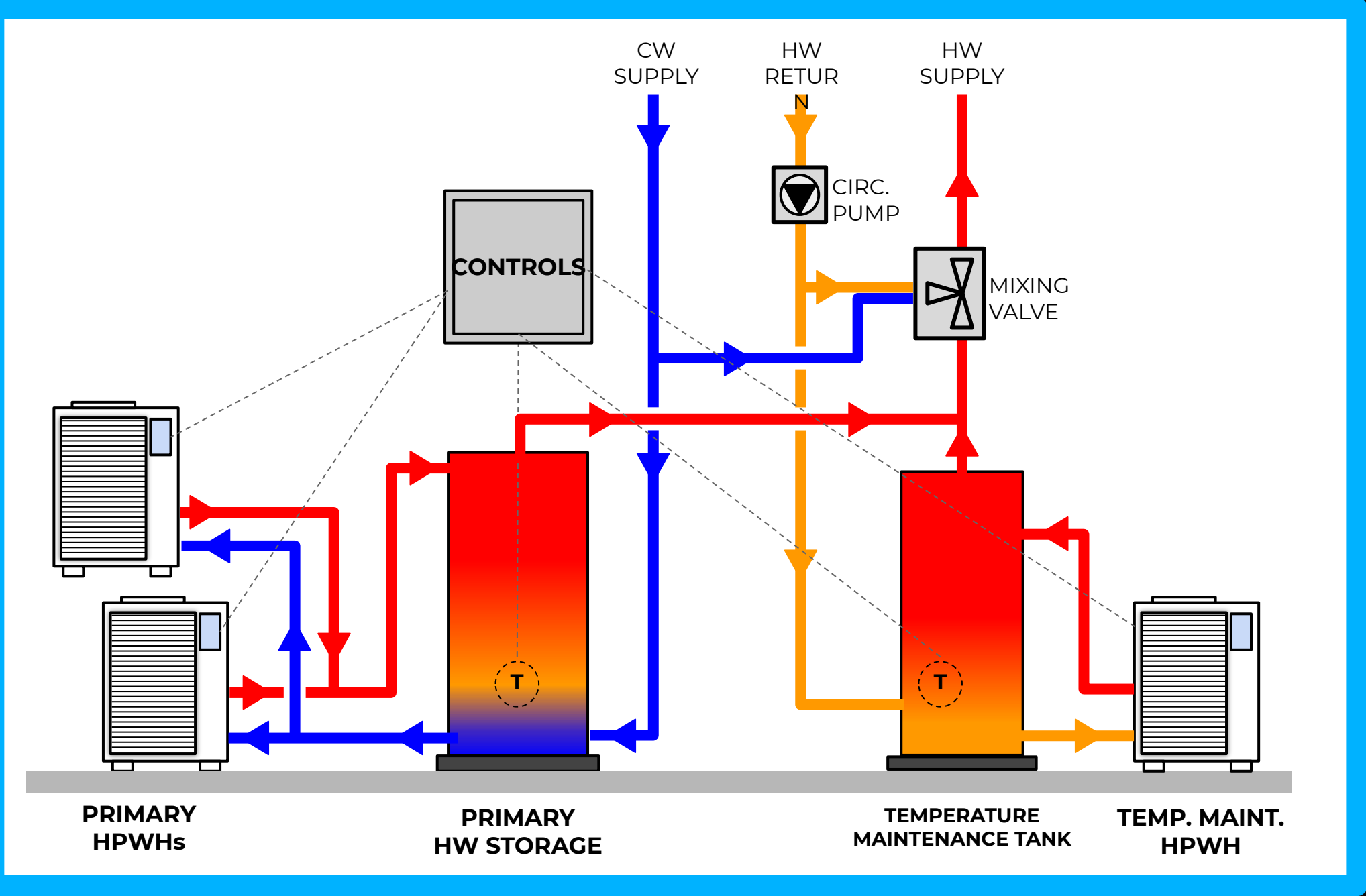
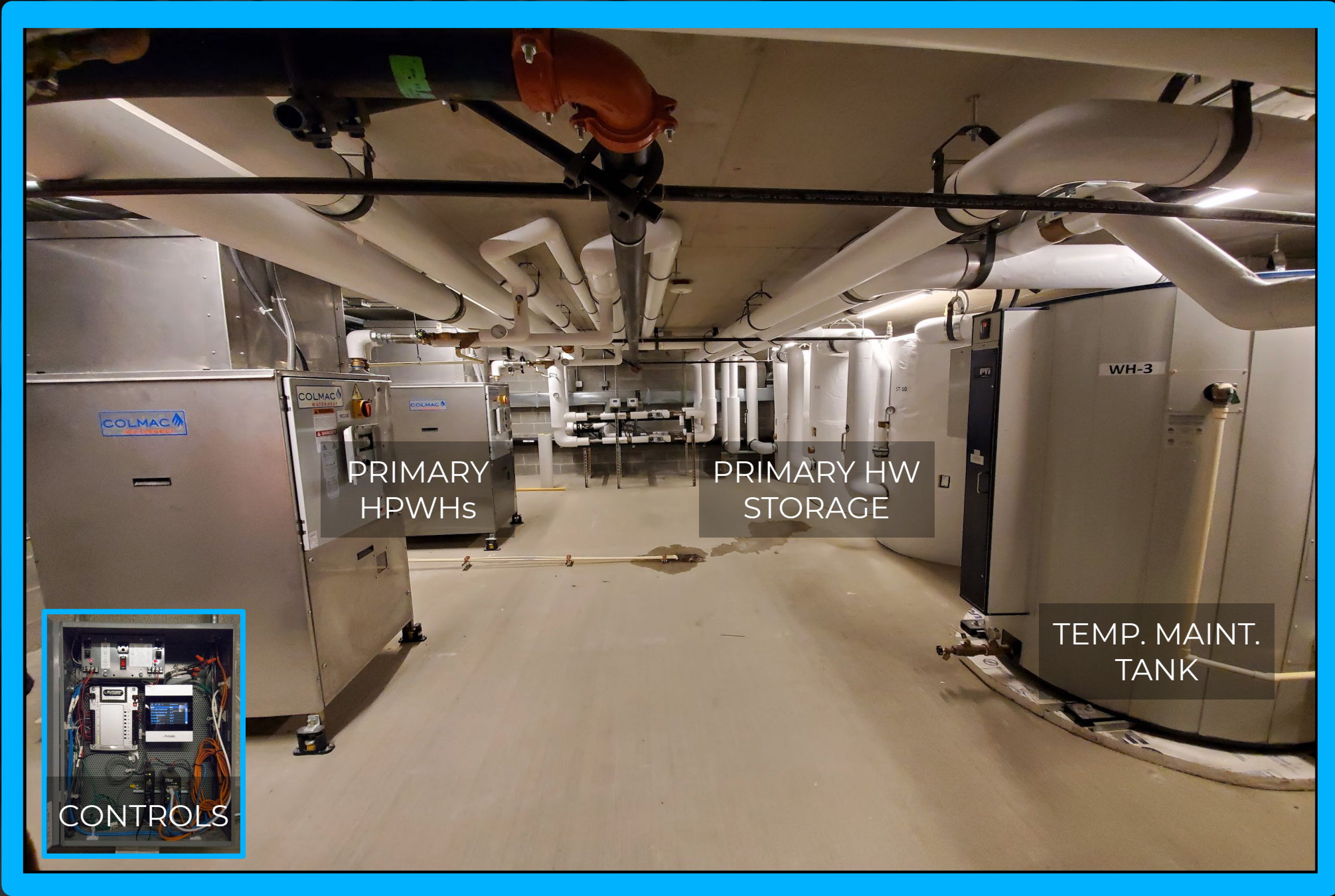


Mechanical Room in Parking Garage



Mechanical Room

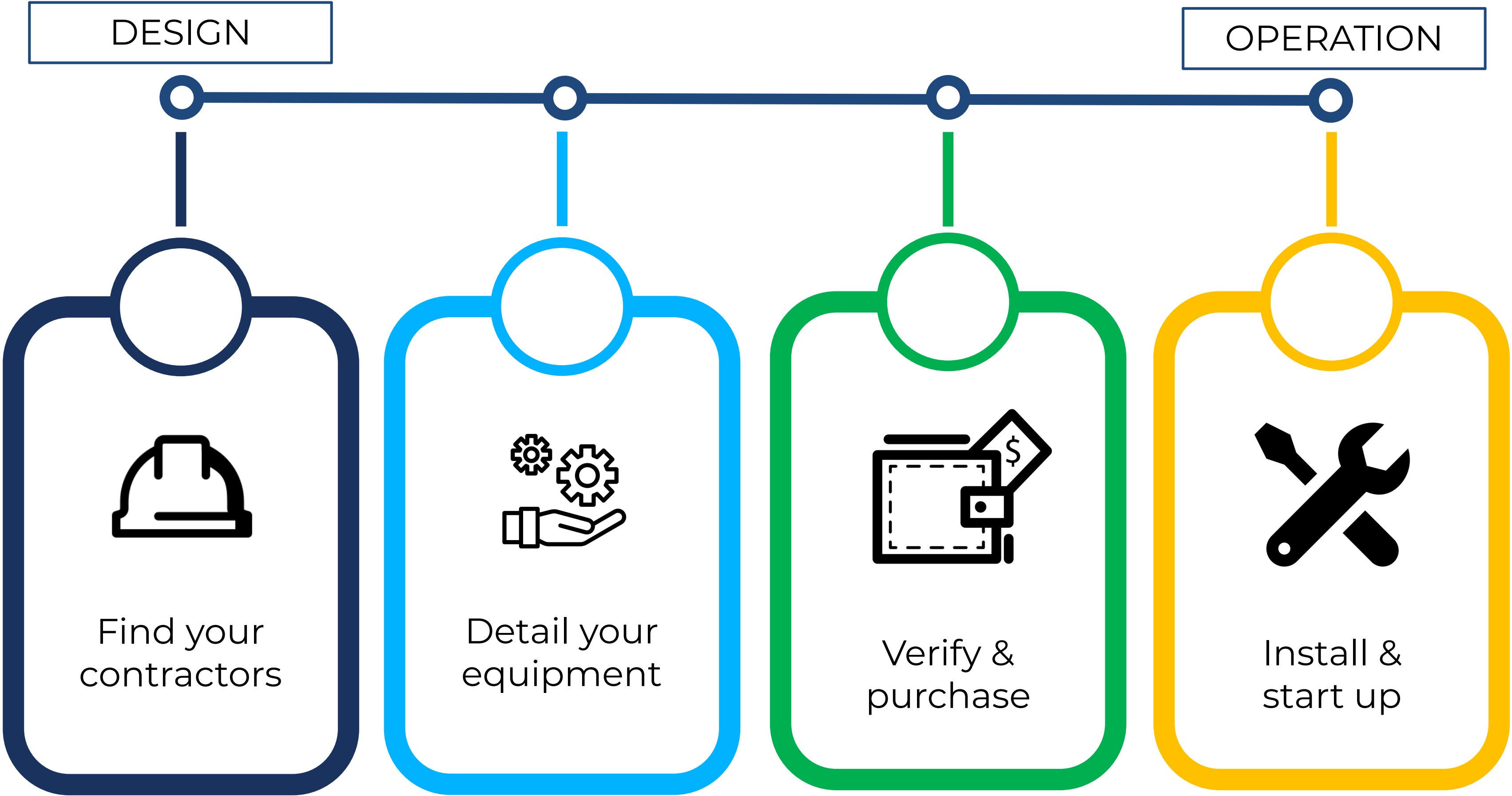
# JACKSON APARTMENTS



## **KEY TAKEAWAY:**

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

# BIRDS EYE **VIEW**



The background of the slide is a photograph of an industrial facility, likely a refinery or chemical plant. It features a complex network of large, dark-colored pipes and structural steel beams. The lighting is somewhat dim, with a blueish-grey tint, giving it a professional and technical appearance. The text is overlaid on the left side of the image.

# **STEP 1:** **FIND YOUR SUBCONTRACTORS**

## STEP 1: FIND YOUR **SUBCONTRACTORS**

Gauge subcontractors  
experience with HPWHS.

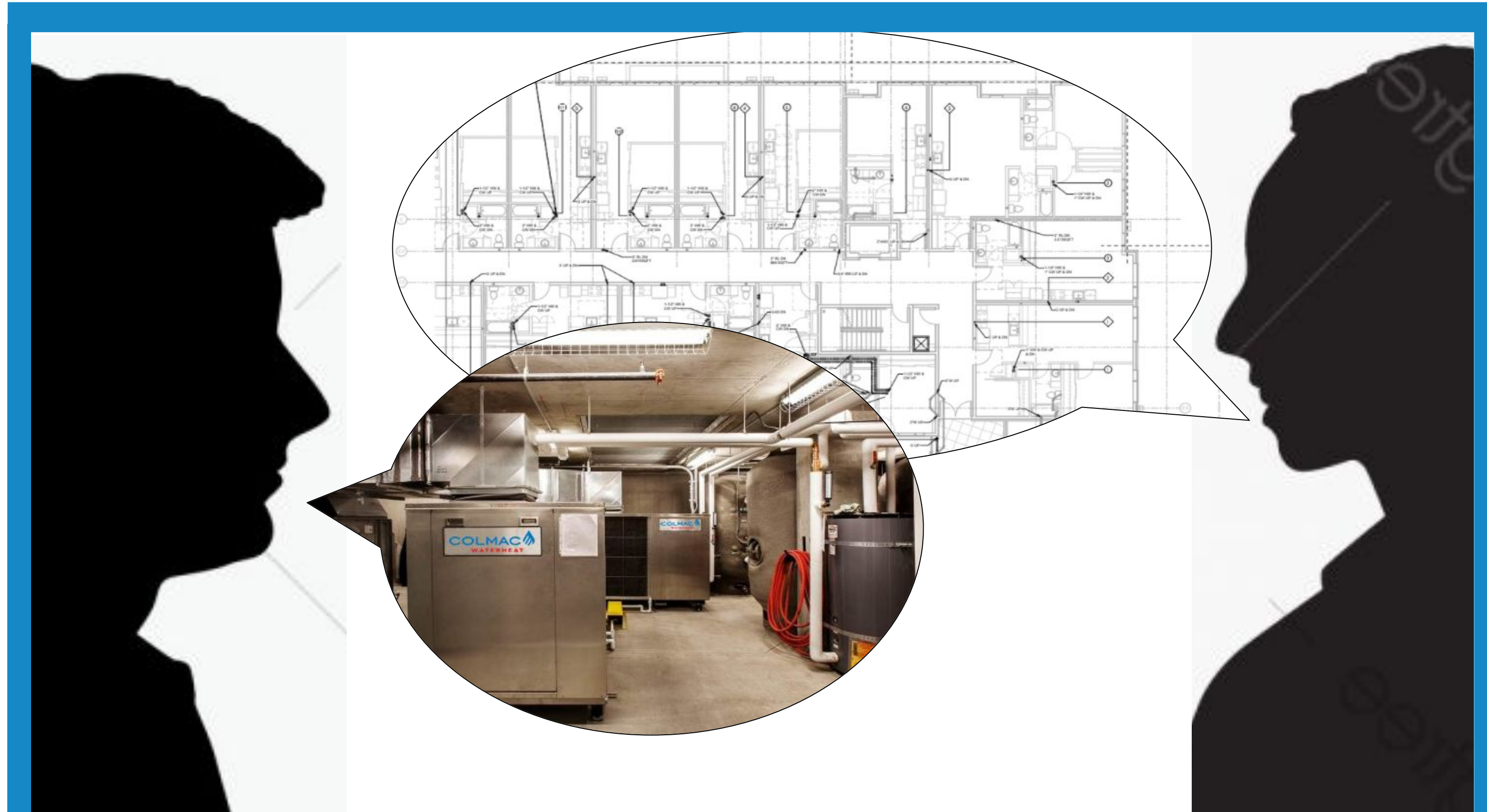
Ask about previous  
installs they've done.



A wide-angle photograph of a construction site. In the foreground, a construction worker wearing a blue uniform, a yellow safety vest, and a yellow hard hat stands on a concrete slab. The ground is covered with various construction materials, including long metal rods and stacks of concrete panels. In the background, several tall buildings are under construction, with extensive scaffolding and cranes visible. The sky is overcast. The text 'STEP 2: OPEN COMMUNICATION' is overlaid on the left side of the image.

## STEP 2: OPEN COMMUNICATION

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



EDUCATION IS **KEY**

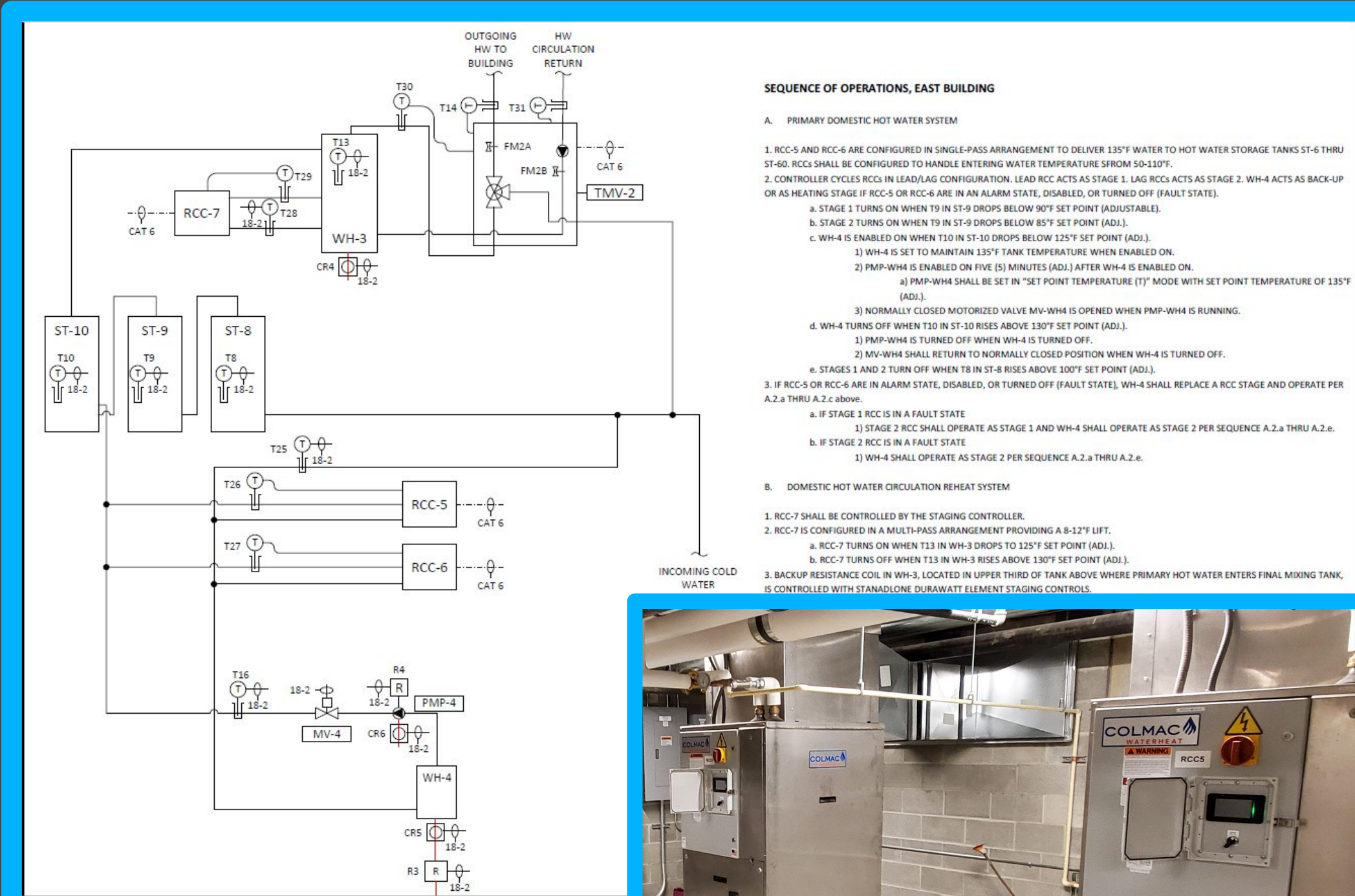
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# **STEP 3:** **EQUIPMENT SELECTION**

STEP 3: EQUIPMENT SELECTION

Essential factors to consider:

- Design conformity
- Lead time
- Availability



DOMESTIC HOT WATER SYSTEM SCHEDULES

DHW SYSTEM - REVERSE CYCLE CHILLER										NOTES
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. 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**

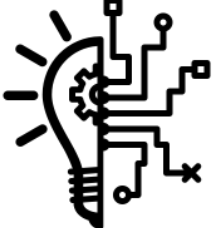
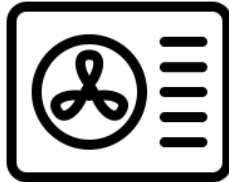
HP & STORAGE







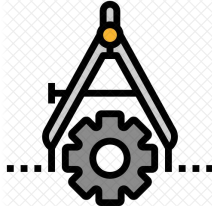
CONTROLS





MIXING VALVE





# AVAILABLE PRODUCTS



**Rheem**  
(> 1 ton)



**AO Smith**  
(2.5 ton)

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





**SanCO<sub>2</sub>**  
(1.25 ton)



**Mitsubishi**  
(10 ton)



Single-Pass  
CO<sub>2</sub>/R-744



**Colmac**  
(10 - 30 ton)

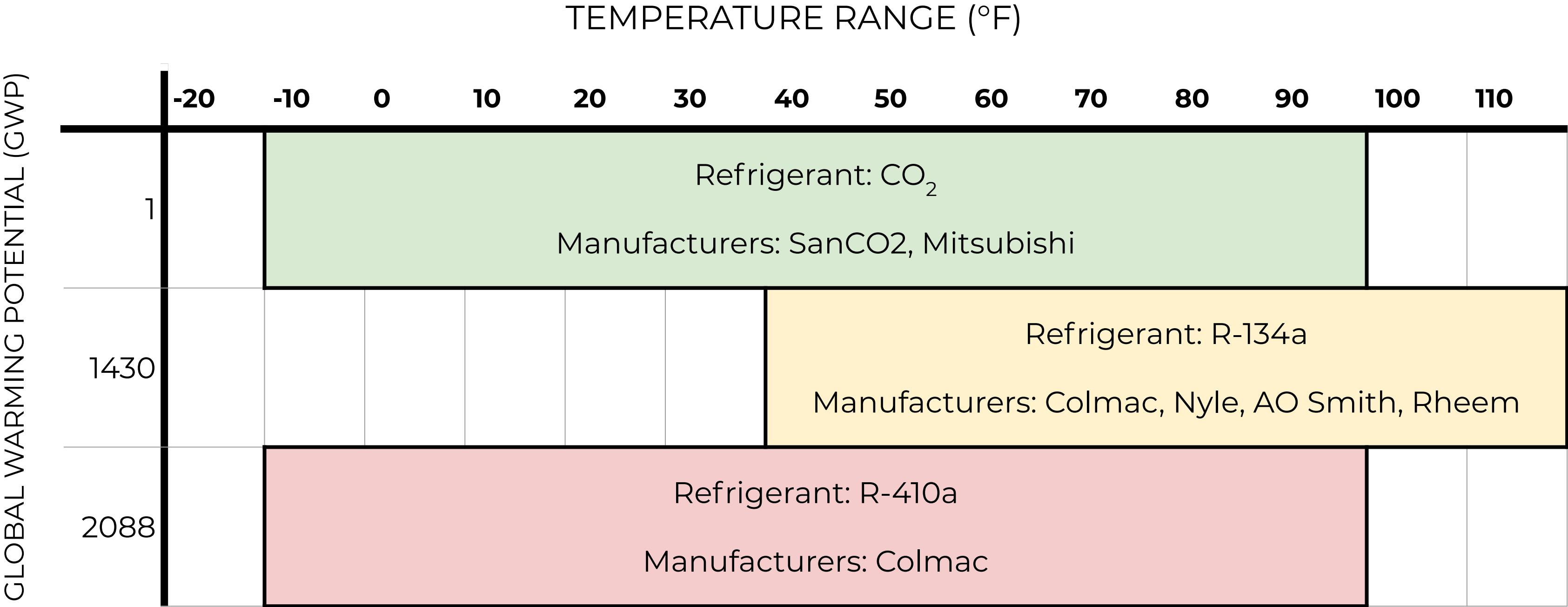


**Nyle**  
(10 - 30 ton)

Single- or Multi-Pass  
R-134a

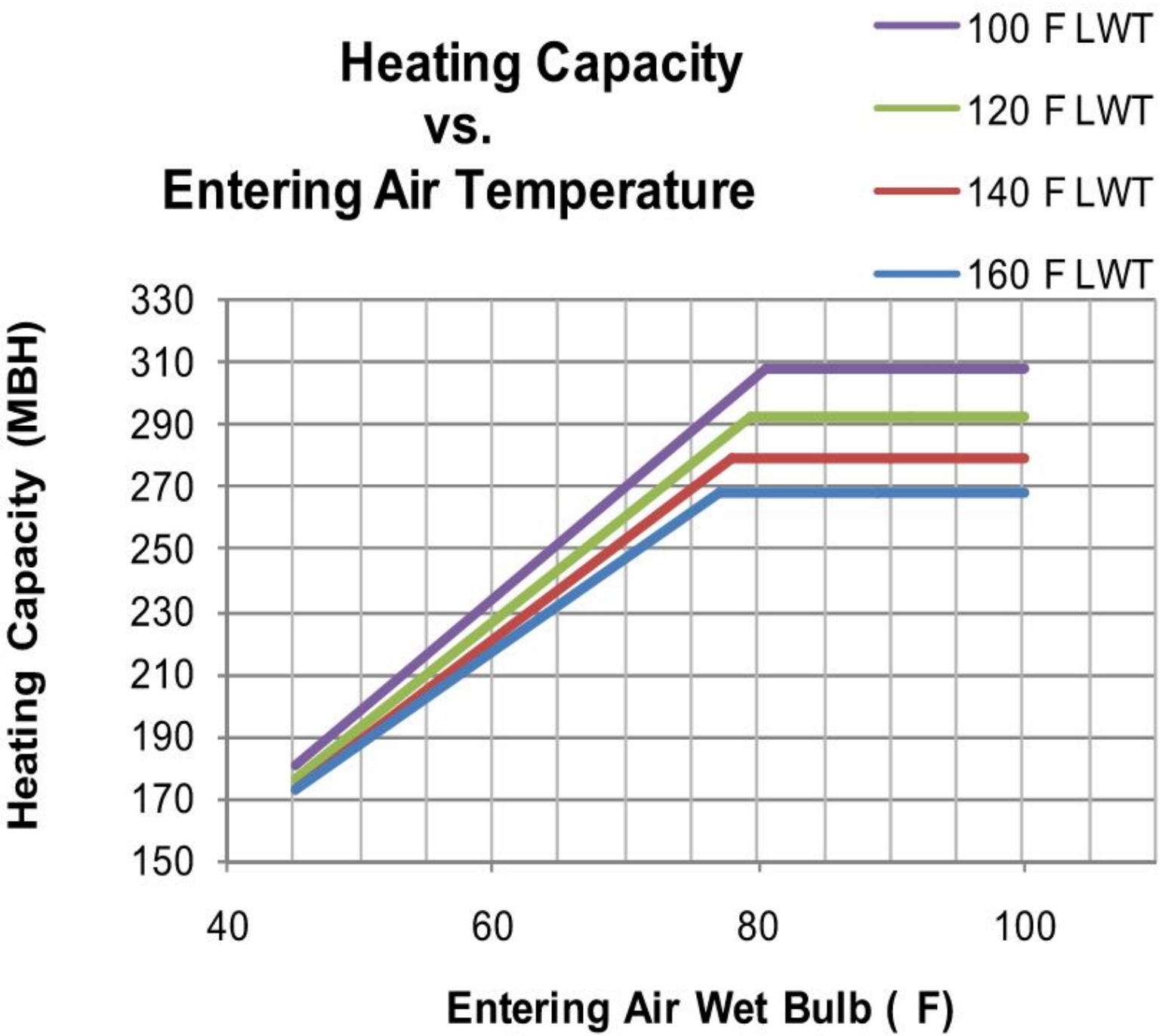


# HP SELECTION: REFRIGERANTS



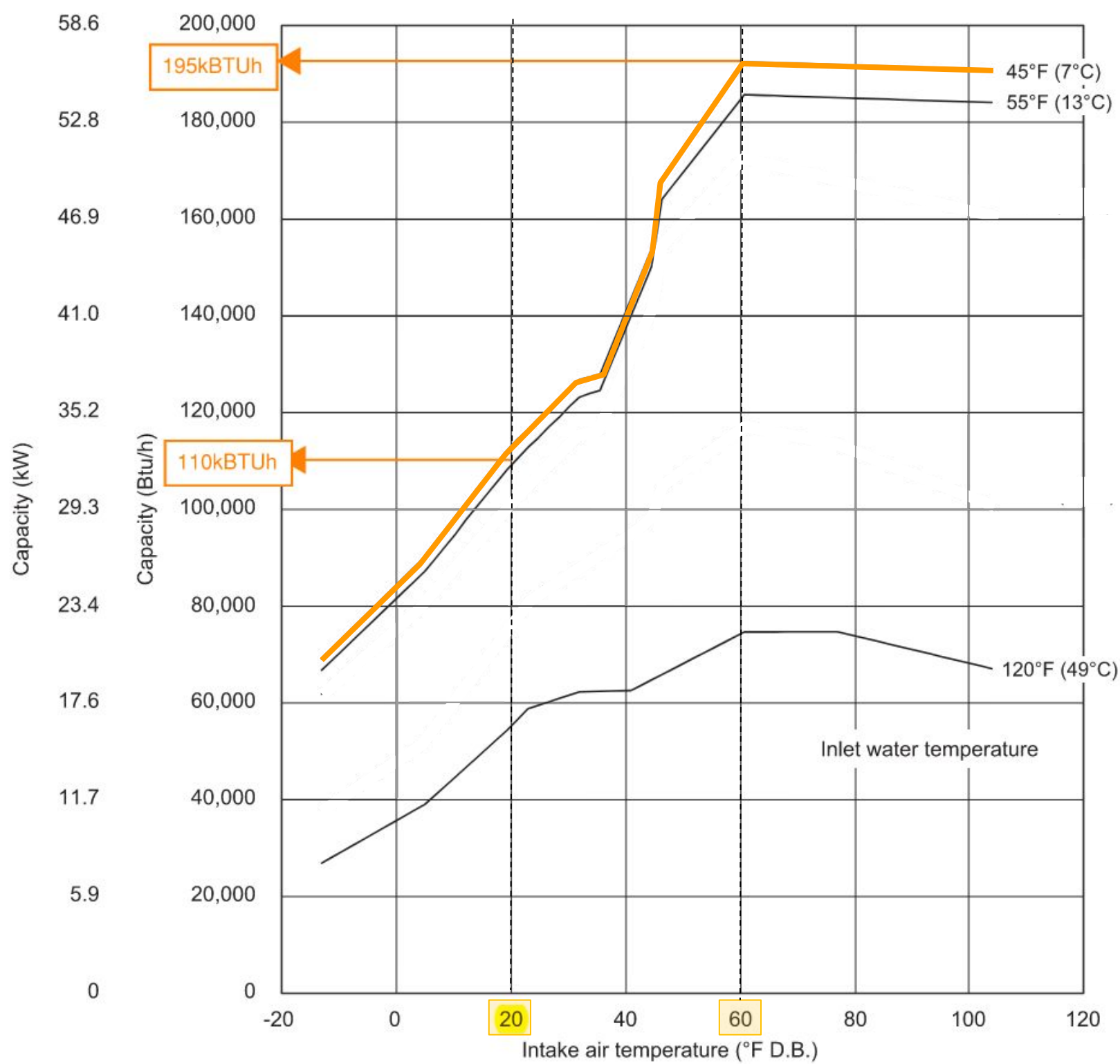
# HP SELECTION: OTHER ESSENTIAL CONSIDERATIONS

R134a



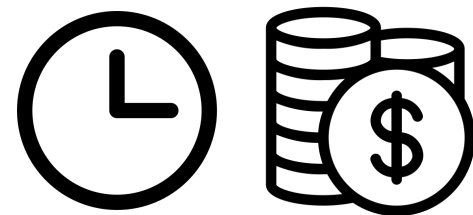
R744 (CO<sub>2</sub>)

Air Temperature vs. Heat Capacity



# STORAGE TANK SELECTION

HP & STORAGE



# STORAGE TANK SELECTION: **PLUMBING REQUIREMENTS**

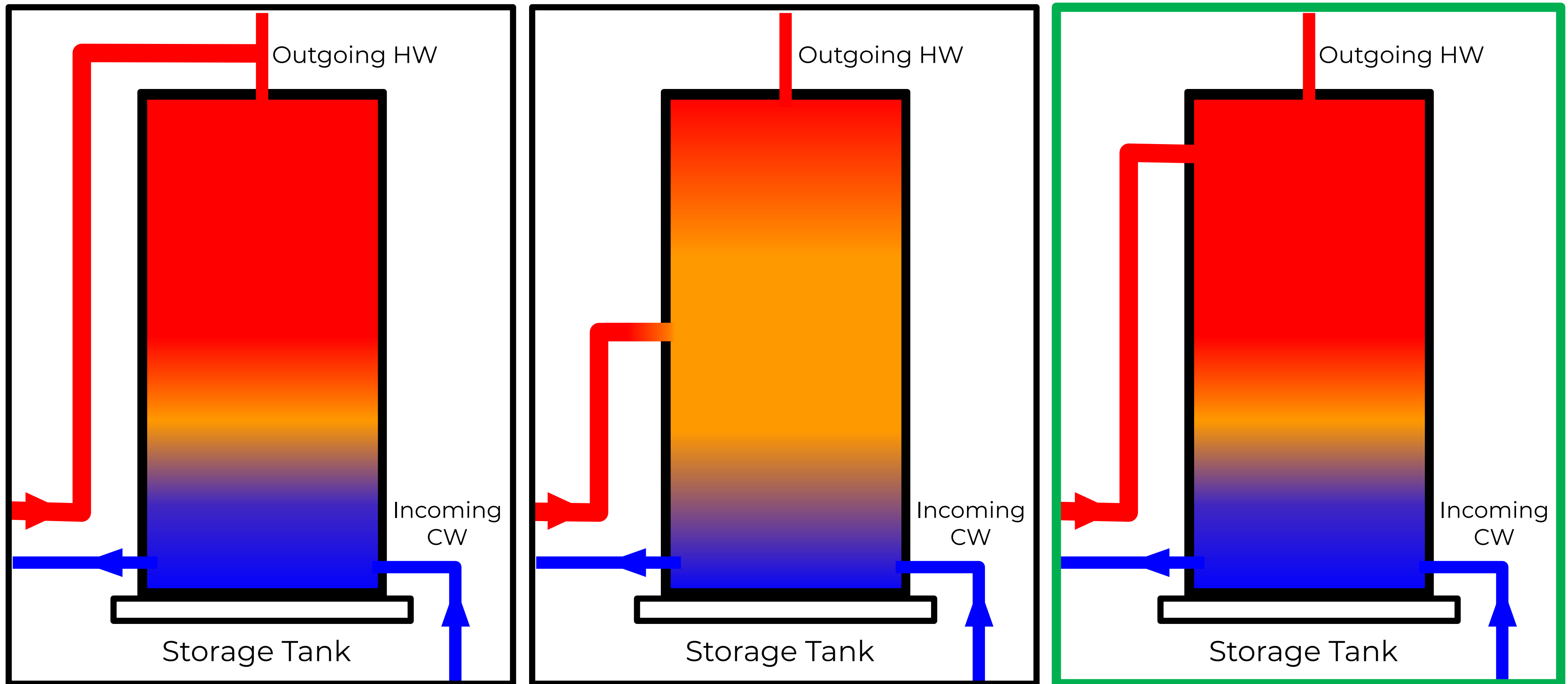




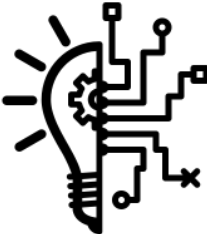
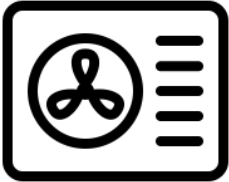
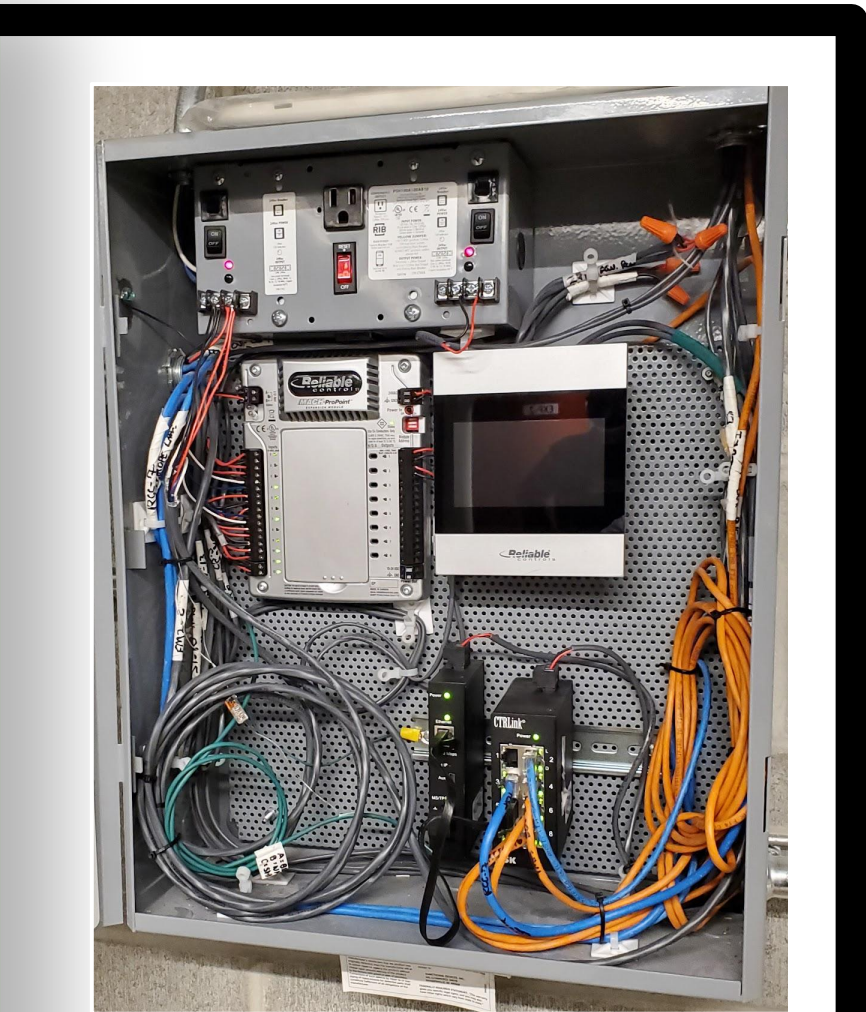


FIGURE THESE OUT **FIRST**


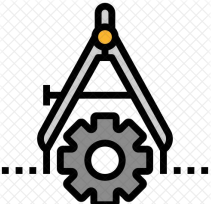

HP & STORAGE



CONTROLS



MIXING VALVE



# CONTROLS OPTIONS

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

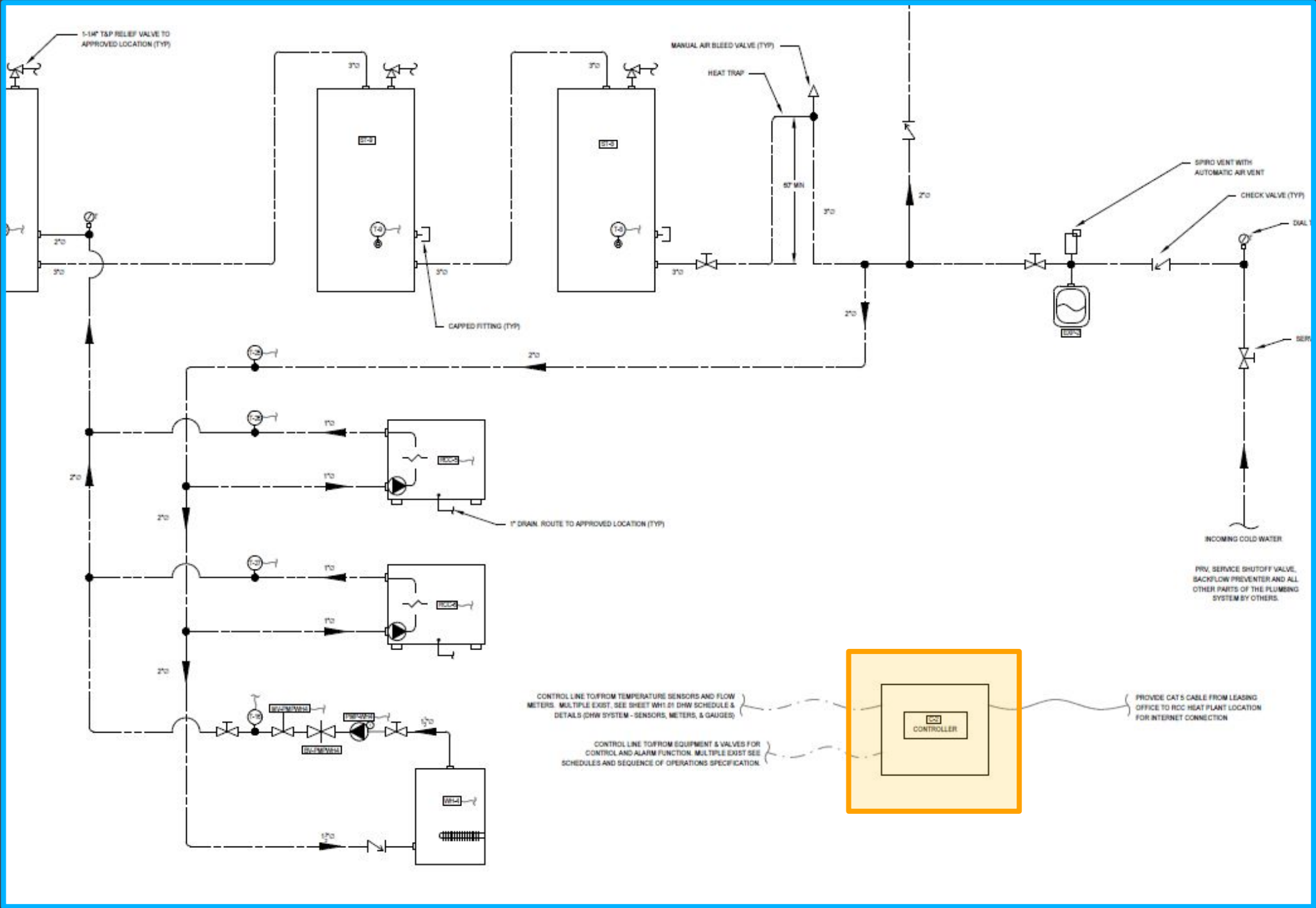



FIGURE THESE OUT **FIRST**

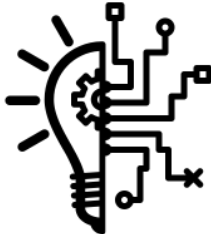
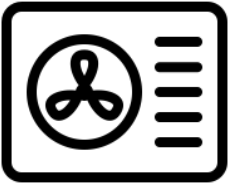
HP & STORAGE



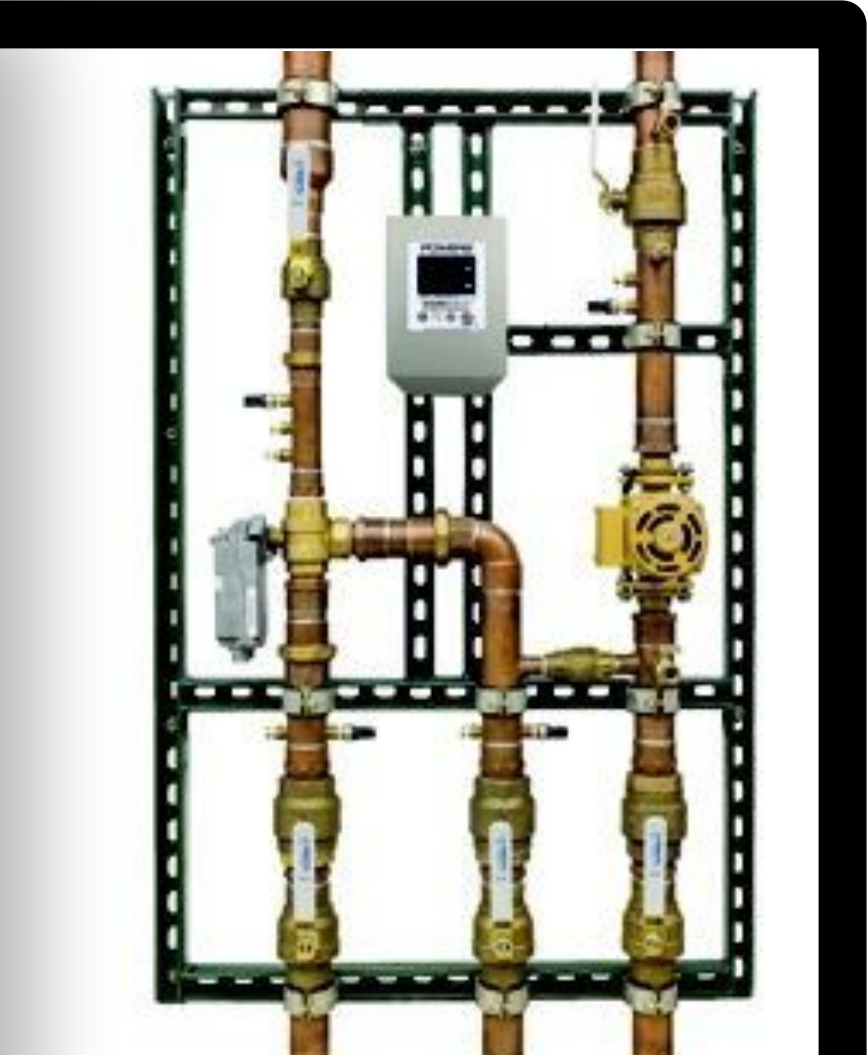



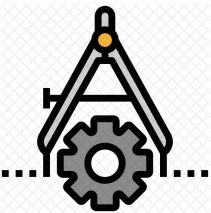
CONTROLS





MIXING VALVE





# THERMOSTATIC MIXING VALVE

## Considerations:

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

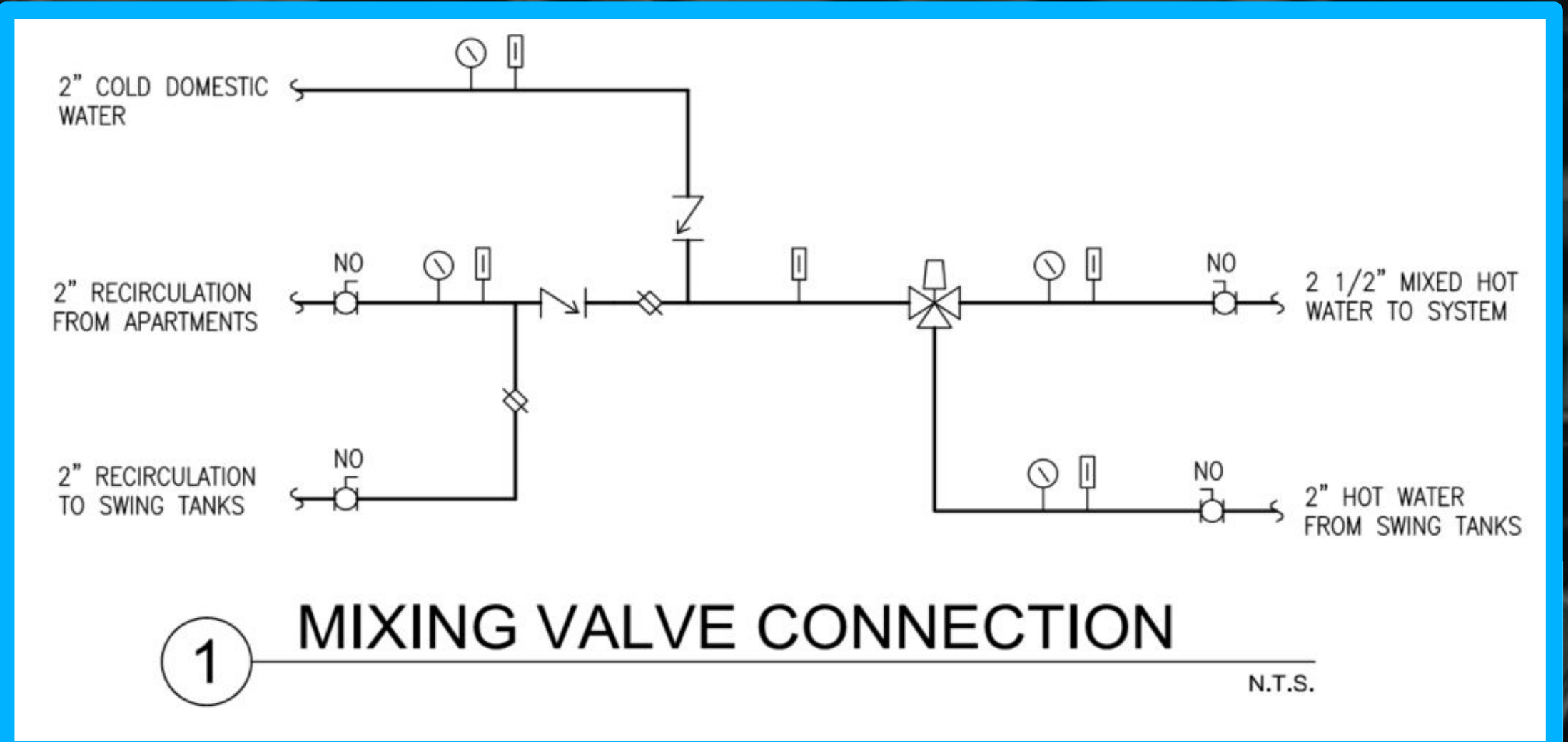
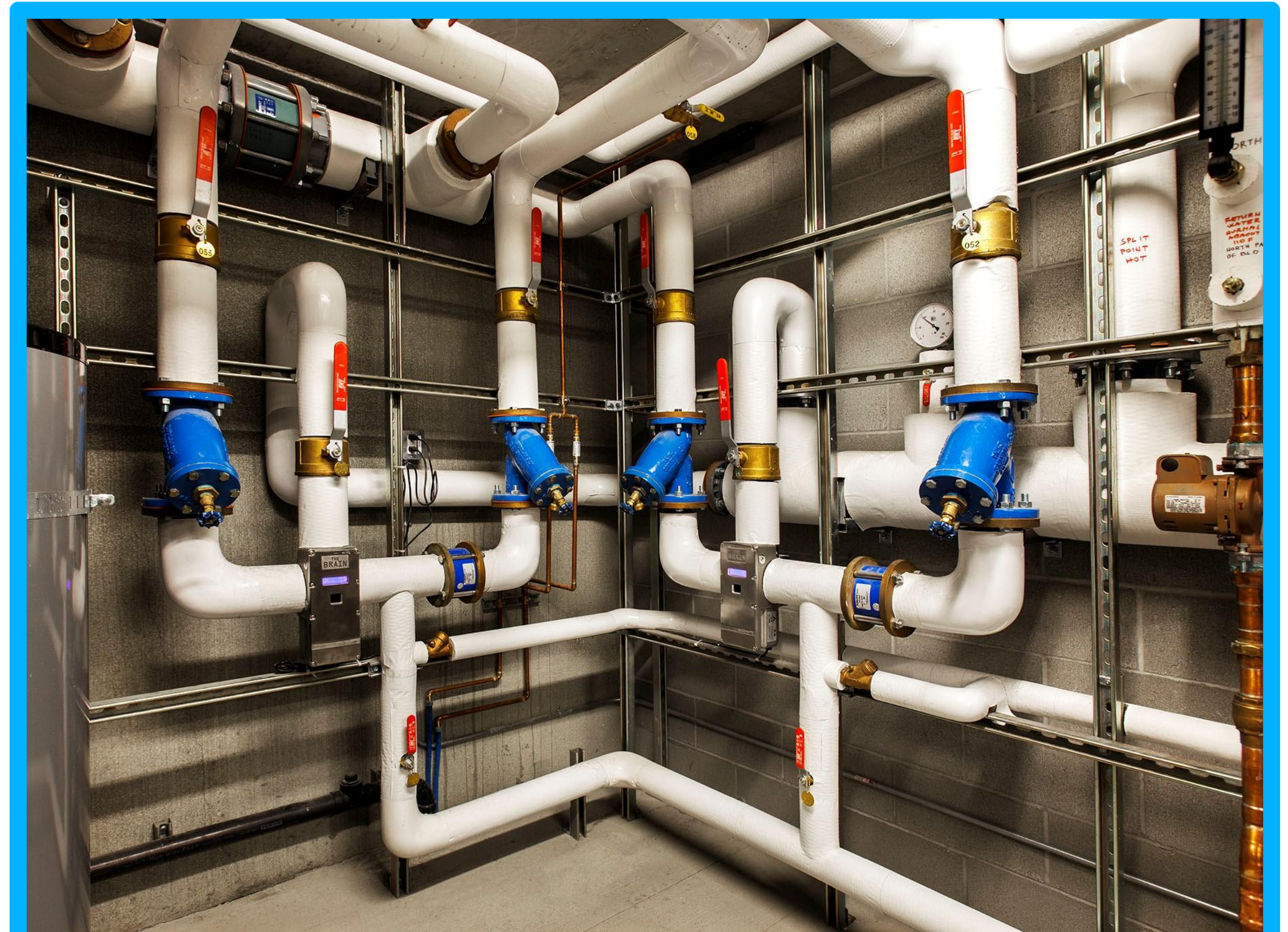


FIGURE THESE OUT **LAST**



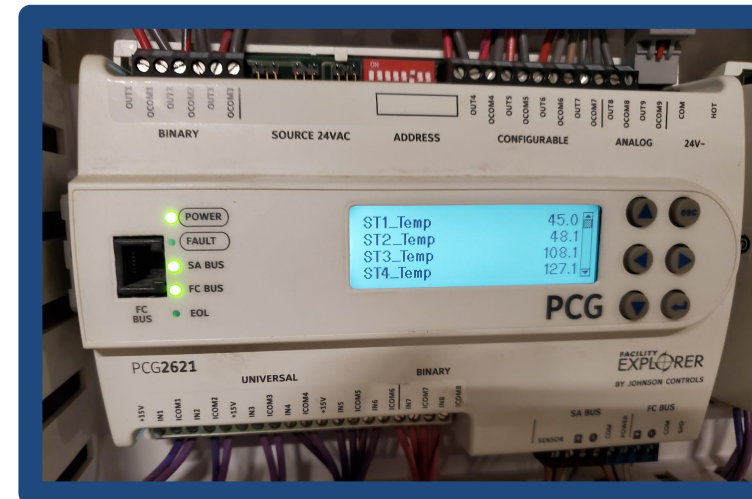
The background of the slide is a photograph of an industrial facility, likely a refinery or chemical plant. It features a complex network of large, dark-colored pipes, valves, and structural steel beams. The lighting is somewhat dim, with a blueish-grey tint, giving it a technical and industrial feel. The text is overlaid on the left side of the image.

# **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?

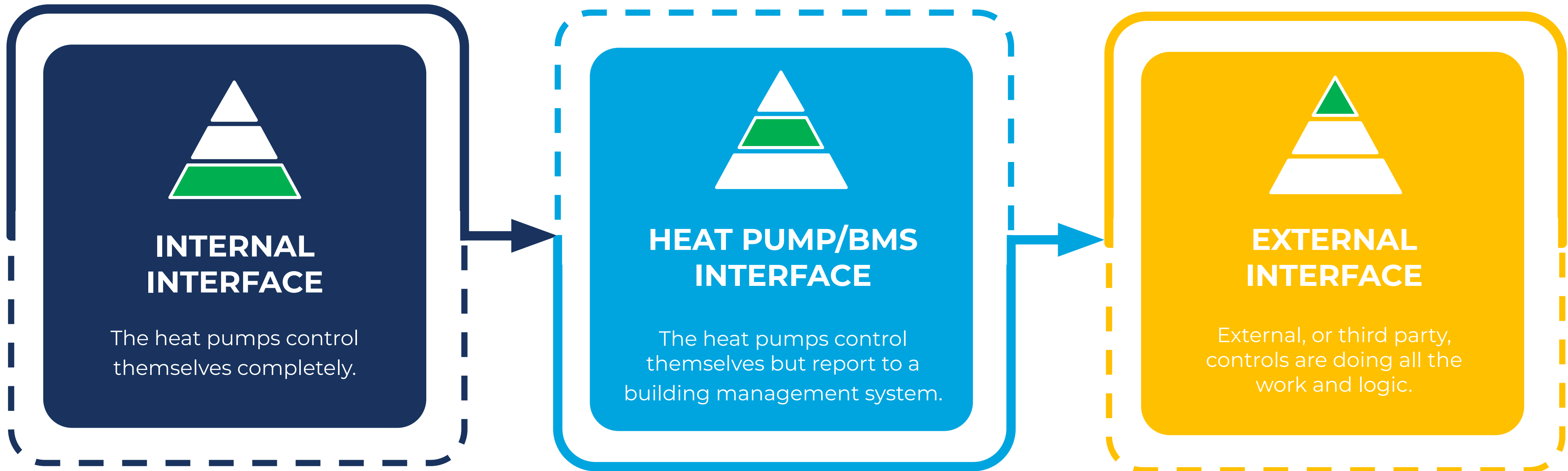


#### **Scope**

Who will employ required controls?

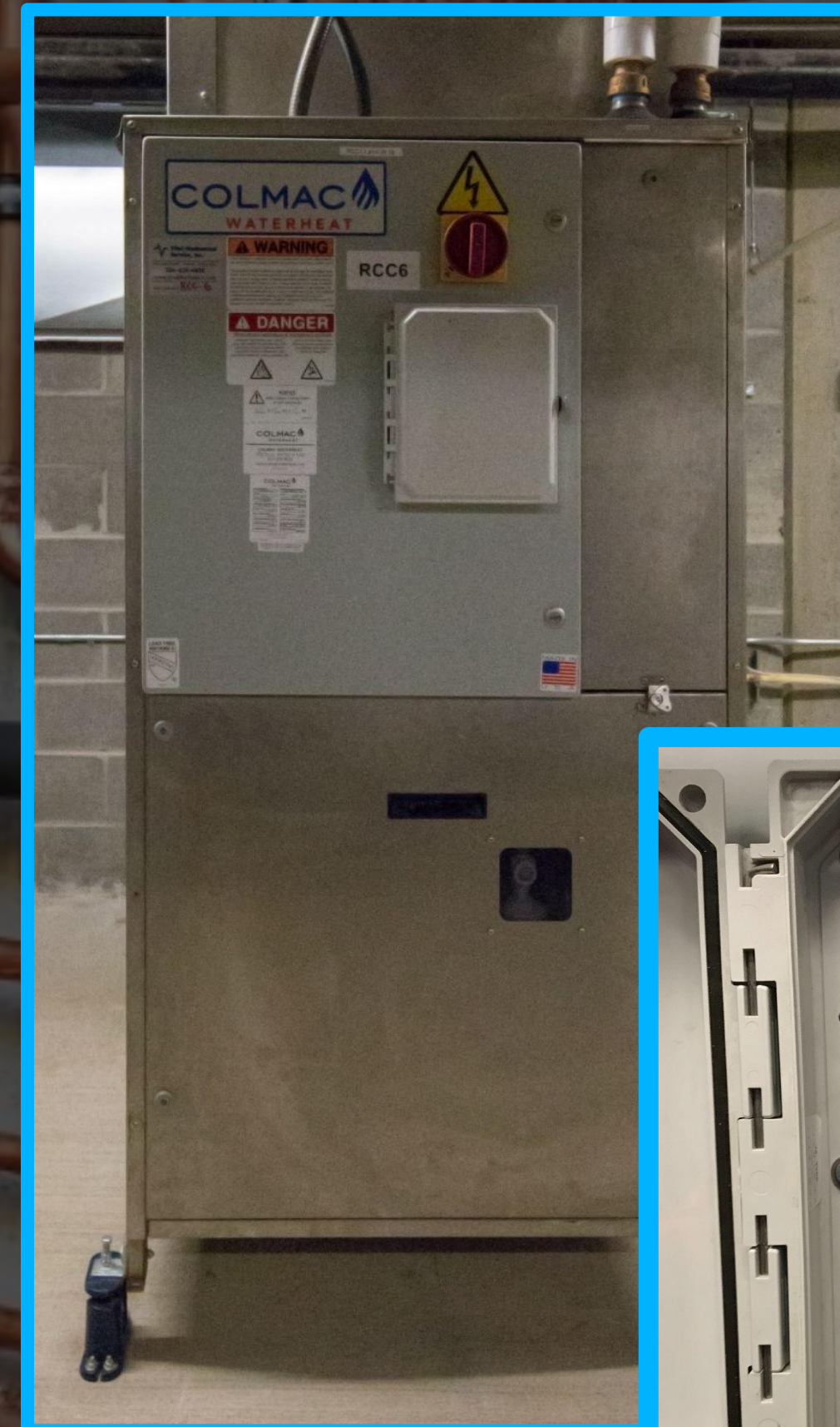
Based off the sequence of operation, could a factory technician start up this equipment without making any assumptions?

# 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.

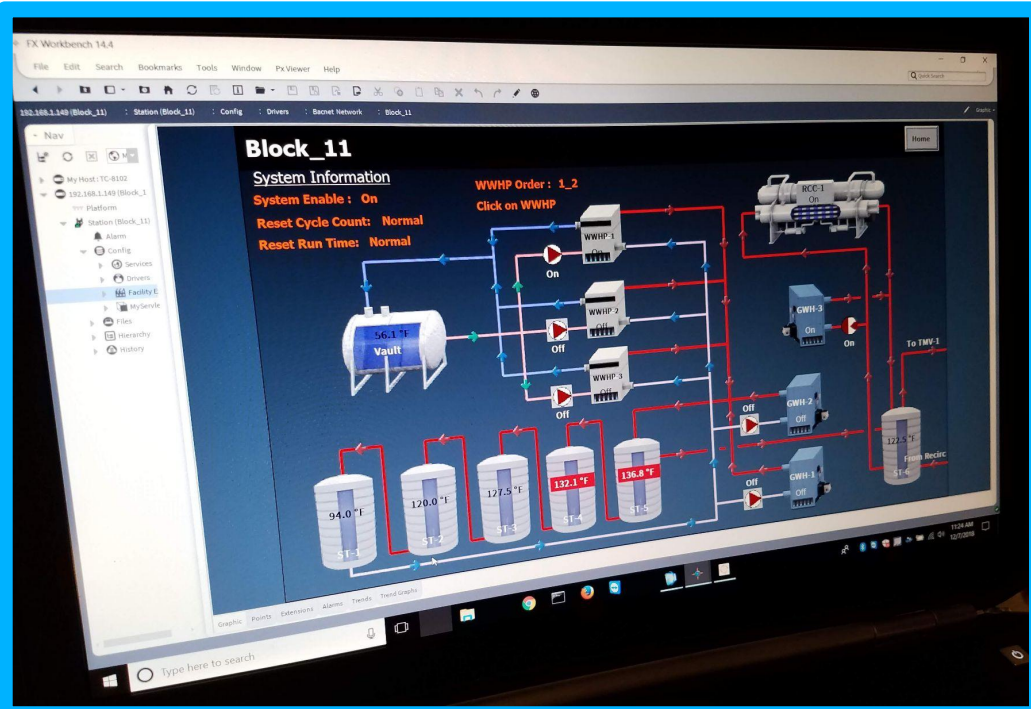


## CONTROLS: **EXTERNAL INTERFACE**

- 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.

A wide-angle photograph of a construction site. In the foreground, a worker wearing a blue uniform and a yellow safety vest stands on a concrete slab, surrounded by construction materials like rebar and wooden formwork. The background features a dense urban skyline with several tall buildings under construction, some with cranes attached. The sky is overcast. The text 'STEP 5: SUBMITTAL SIGN OFF' is overlaid on the left side of the image.

# 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

5/1/2021

Sign

Date

☒

☐

☐

Approved as Noted  
Approved with Comments  
Revise and Re-submit



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

CxA-25

## FRAME CONSTRUCTION

ELECTRICAL SPECIFICATIONS*	
VOLTAGE:	460V / 60Hz / 3Ph
TOTAL PANEL AMPACITY (FLA):	47.6 A
MINIMUM CIRCUIT AMPACITY (MCA):	59.1 A
FEEDER WIRE GAUGE:	8 AWG (8.36 mm <sup>2</sup> )
MAXIMUM OVERCURRENT PROTECTION:	45.0 A

### OPERATING CONDITIONS

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

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
ATED COMPRESSION RATIO:	6.4
HEATING COP:	2.78 [EER: 9.5]
COOLING COP:	1.78
COMBINED COP:	4.56

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

S/ADDITIONAL SERIAL NUMBERS:

Date Generated: 2/18/2019

## UNIT OPTIONS

COLMISSION: ☐

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)

## DHW SYSTEM - REVERSE CYCLE CHILLER

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

STATIC DEFLECTION SPRING ISOLATION. FAN MOTOR

ELECTRIC DEFLECTION SPRING ISOLATION, FAN MOTOR

ELECTRIC DEFLECTION SPRING ISOLATION, FAN MOTOR

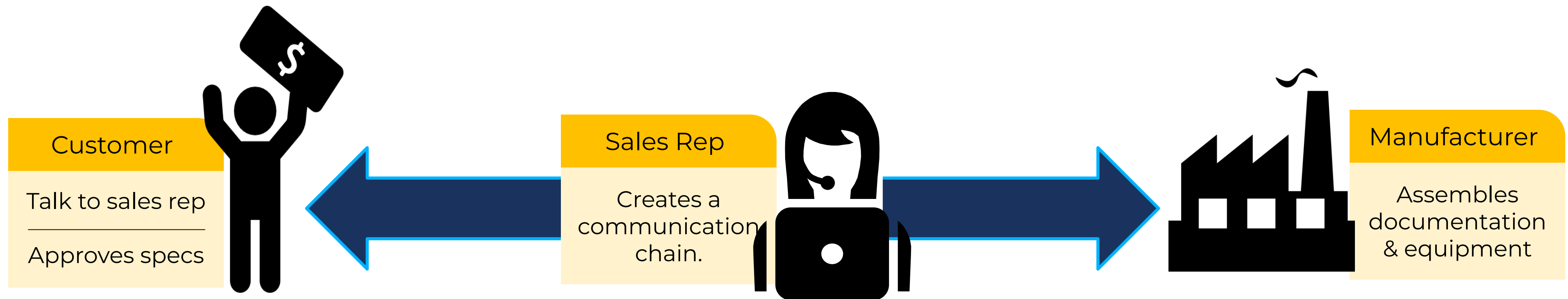
### STATIC DEFLECTION SPRING ISOLATION: FAN MOTOR

ION ISOLATORS. FAN MOTOR SHALL BE MEG.

The background of the slide is a photograph of an industrial facility, likely a refinery or chemical plant. It features a complex network of large, dark-colored pipes and structural steel beams. The lighting is somewhat dim, with a blueish tint, and there are some reflections on the surfaces. The overall impression is one of a large-scale industrial operation.

## **STEP 6:** **VERIFY & PURCHASE**

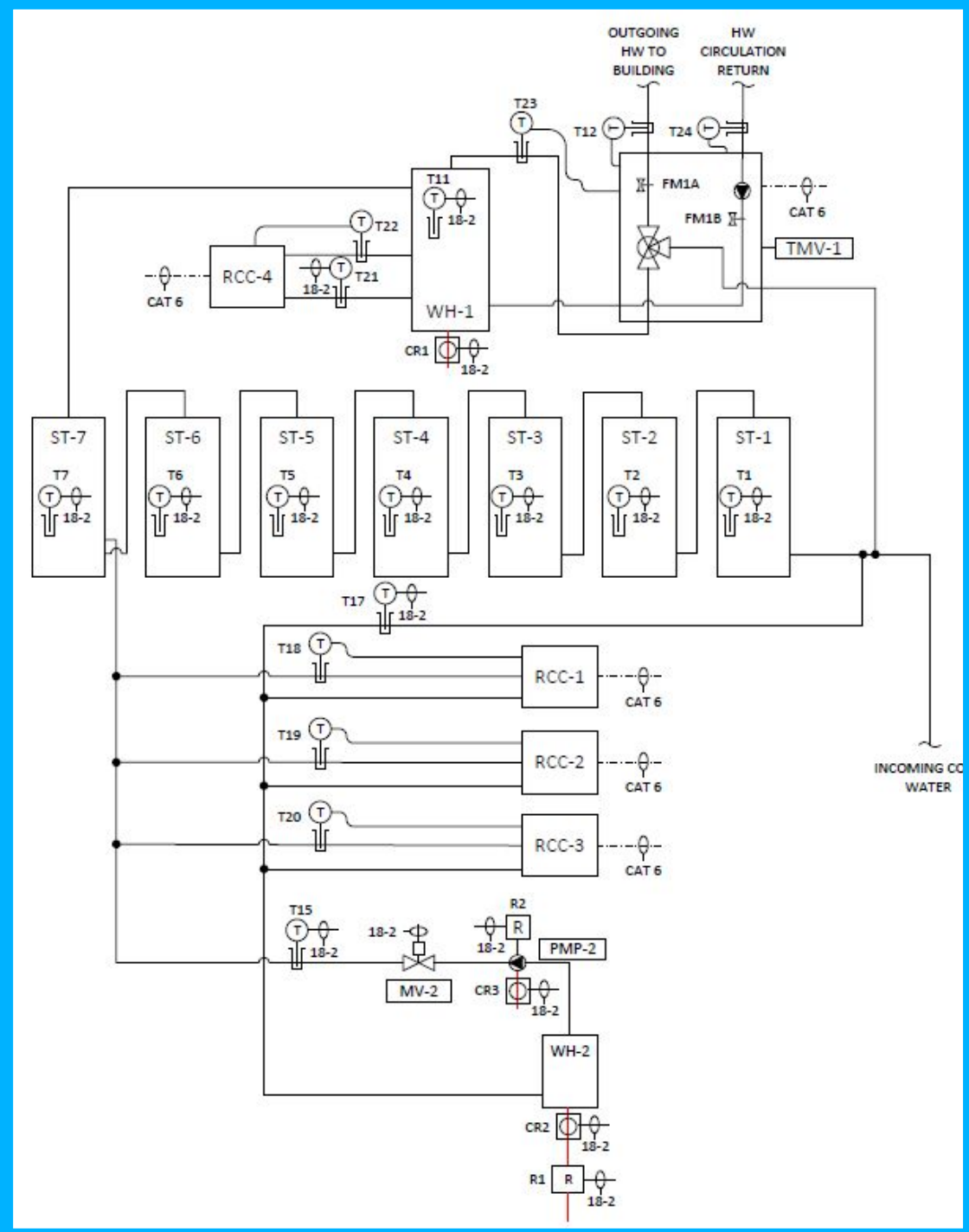
## STEP 6: VERIFY & **PURCHASE**



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 (ADJ.).

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 STANDALONE 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.

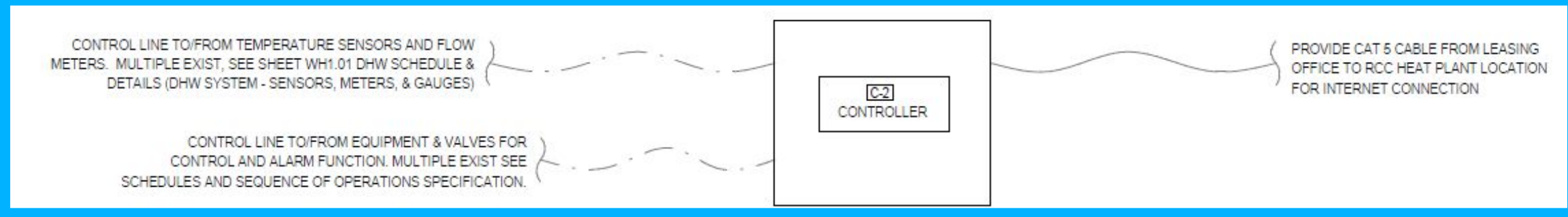
h. PMP-WH2 FAILURE ALARM

REV	DATE	BY	DESCRIPTION

JACKSON APARTMENTS RCC PLANT  
2008 JACOBSON ST SEATTLE WA 98144

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


DRAWN DATE	9/4/2018	DRAWN BY	SB	ENG BY	SB	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.



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: ☐

UNIT OPTIONS



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

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.

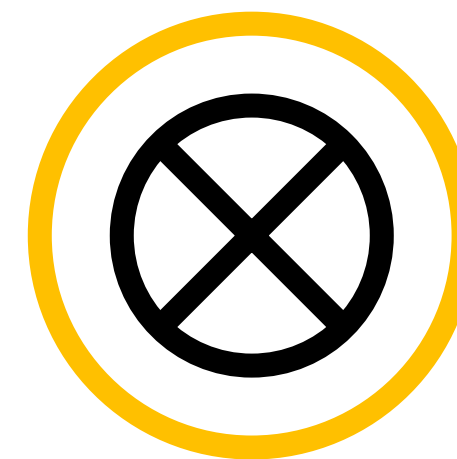
## STEP 7: INSTALLATION



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.

The background of the slide is a photograph of an industrial facility, likely a refinery or chemical plant. It features a complex network of large, dark-colored pipes and structural steel beams. The lighting is somewhat dim, with a blueish tint, suggesting an indoor or nighttime setting. The pipes are arranged in a crisscrossing pattern, creating a sense of depth and complexity.

# **STEP 8:** **START UP**

## STEP 8: START **UP**

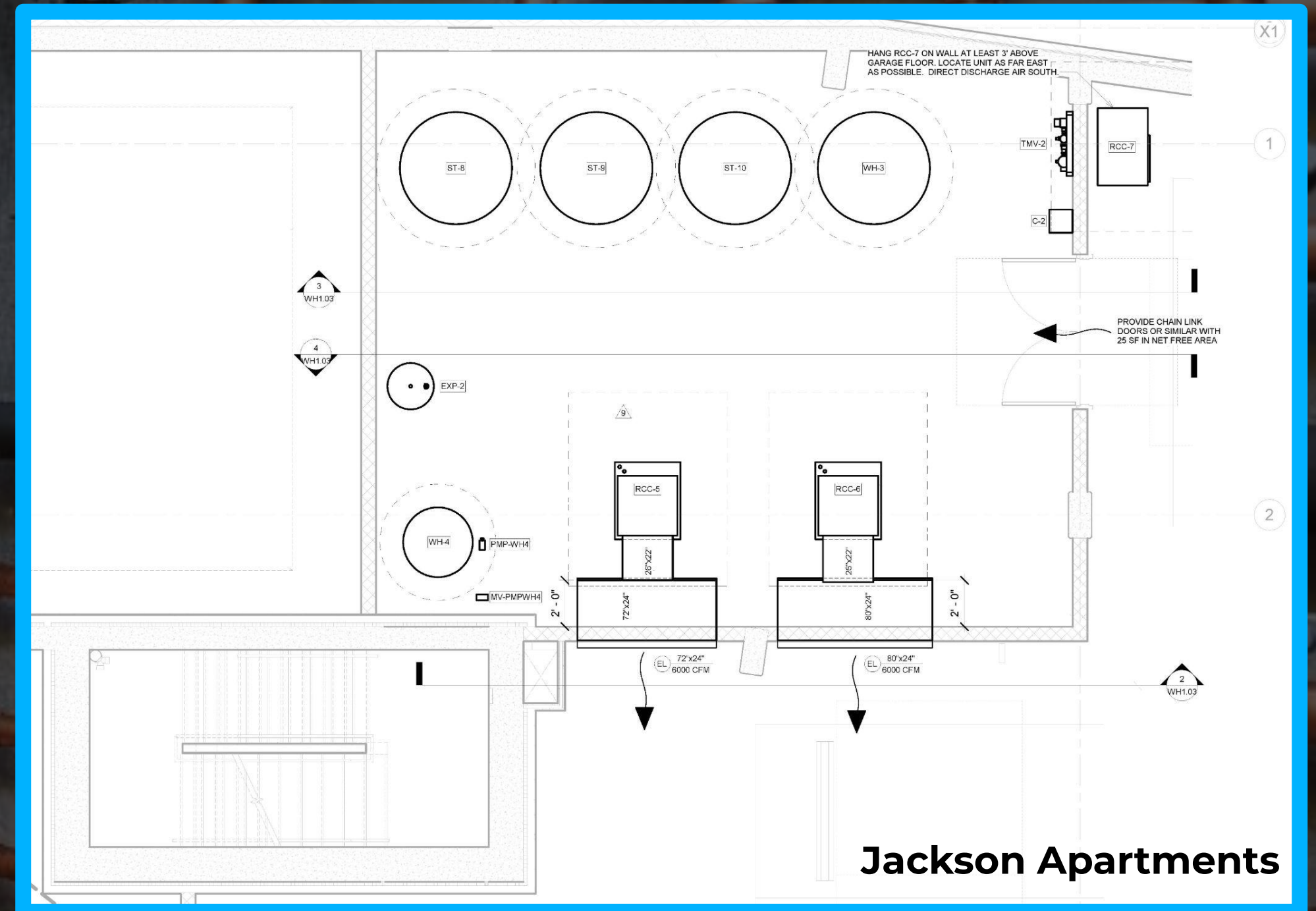


- Schedule ASAP
- Maintain scheduling updates when timeline shifts
- Also consider:
  - Will they be driving, flying or traveling to your site?

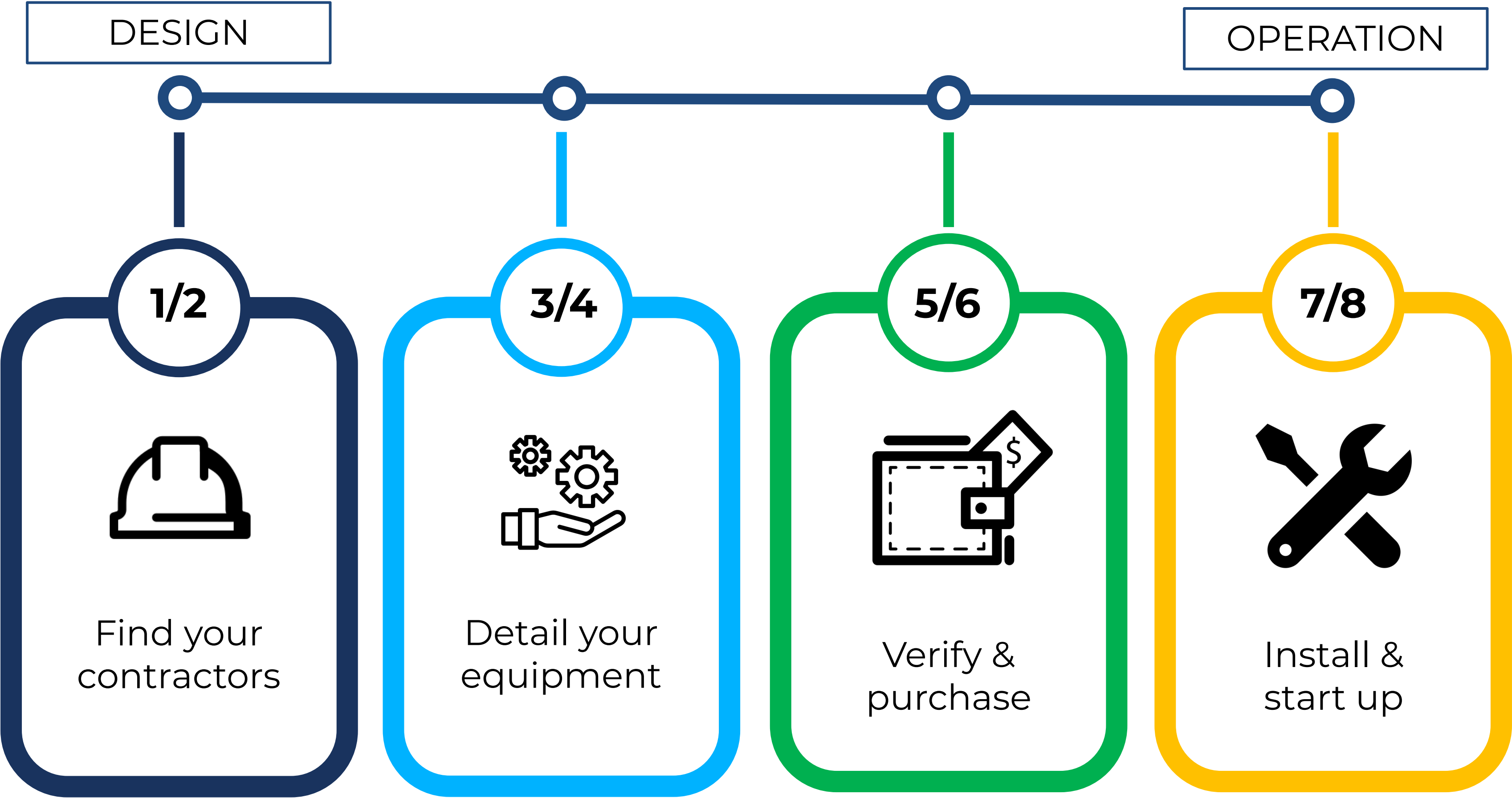
EXPERT ADVICE: Plan ahead with your start-up tech.

# 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**



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](mailto:LBHASKAR@DRINTL.COM)



**Seattle City Light**



THANK YOU

