

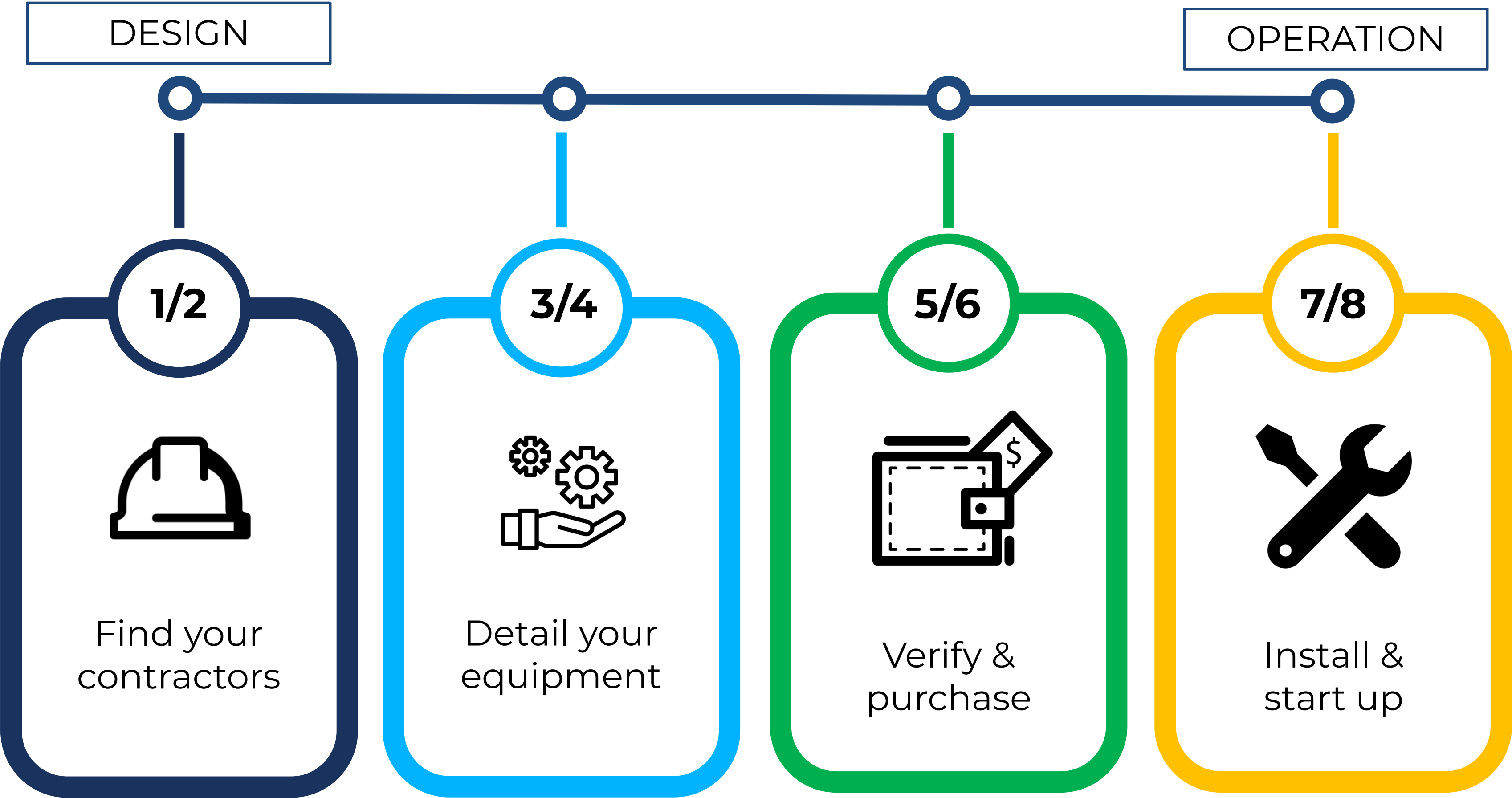
COMMERCIAL HEAT PUMP WATER HEATING:

DESIGN & MAINTENANCE



















*Colin Grist & Evan Green
Ecotope, Inc.*

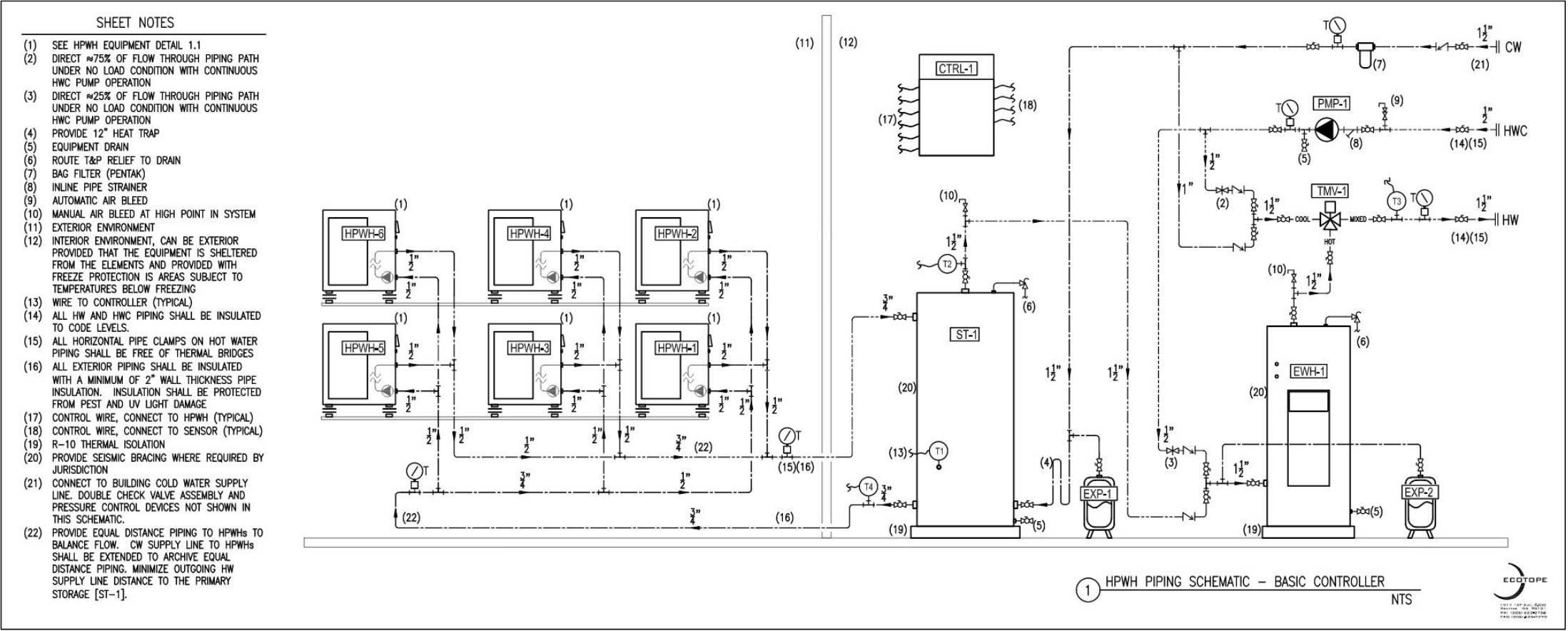
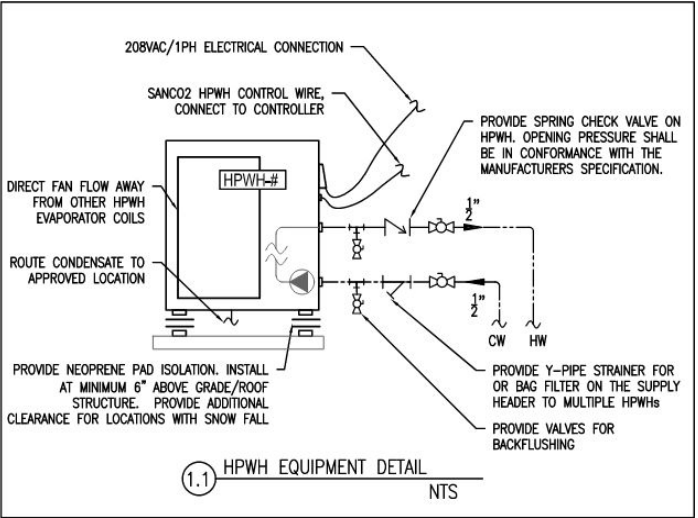


SESSION 3 **REVIEW**



BASIS OF DESIGN	
THE SYSTEM WAS SIZED FOR: <ul style="list-style-type: none">SANCO2 WITH SWING TANK CENTRAL HEAT PLANT DESIGNMARKET RATE MULTI-FAMILY BUILDING60 FULL TIME OCCUPANTS30 RESIDENTIAL DWELLING UNITS25 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 TIME90 WATTS/APT HWC LOSSES MINIMUM SYSTEM SIZE: <ul style="list-style-type: none">285 GALLONS OF PRIMARY STORAGE66.8 KBTU/HR OF PRIMARY HEAT CAPACITY80 GALLONS OF SWING TANK VOLUME4.7 KW SWING TANK RESISTANCE ELEMENT	EQUIPMENT SELECTION: <ul style="list-style-type: none">[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 STORAGE VOLUME AND THE VOLUME OF WATER IN THE HW DISTRIBUTION PIPING.

LEGEND			
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



KEY QUESTION:

How do I successfully start and maintain CHPWH operation?



CASE STUDY: **ELIZABETH JAMES**

ELIZABETH JAMES



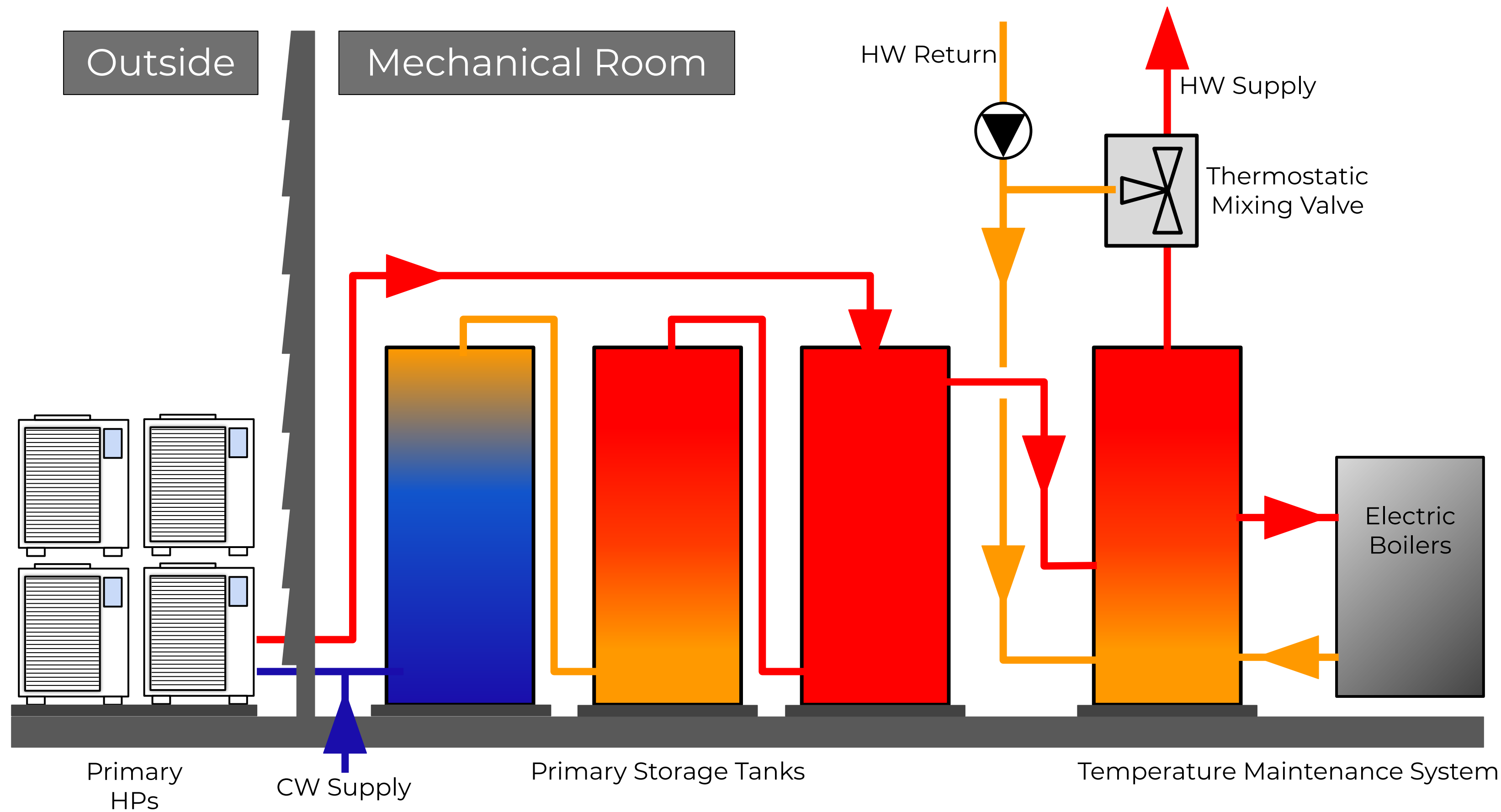
Elizabeth James House



Side view



Street view



ELIZABETH JAMES

Retrofit



(4) Sanden, single pass
(3) 120 gal tanks



Series (swing) configuration
(3) Elec. boilers; 175 gal “swing” tank



Split system; HP outside, on grade



Energy savings: 70%
Total energy: 1.05 kWh/day/person



KEY TAKEAWAY

Don't abandon existing equipment in retrofits - it can be recycled into the new installation.



INSTALLATION **LITE**

TOP 3



UNDERSTAND THE DESIGN

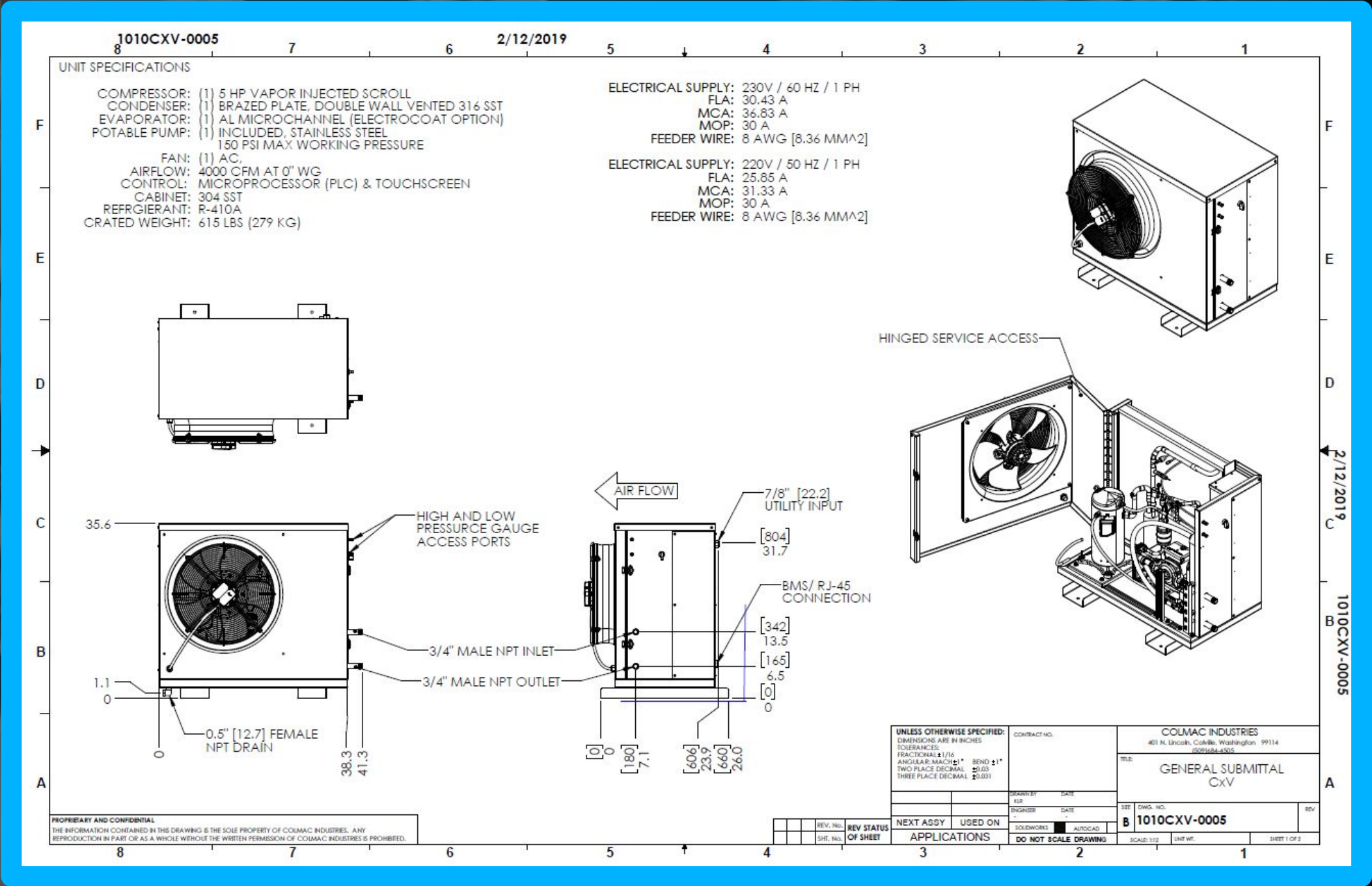
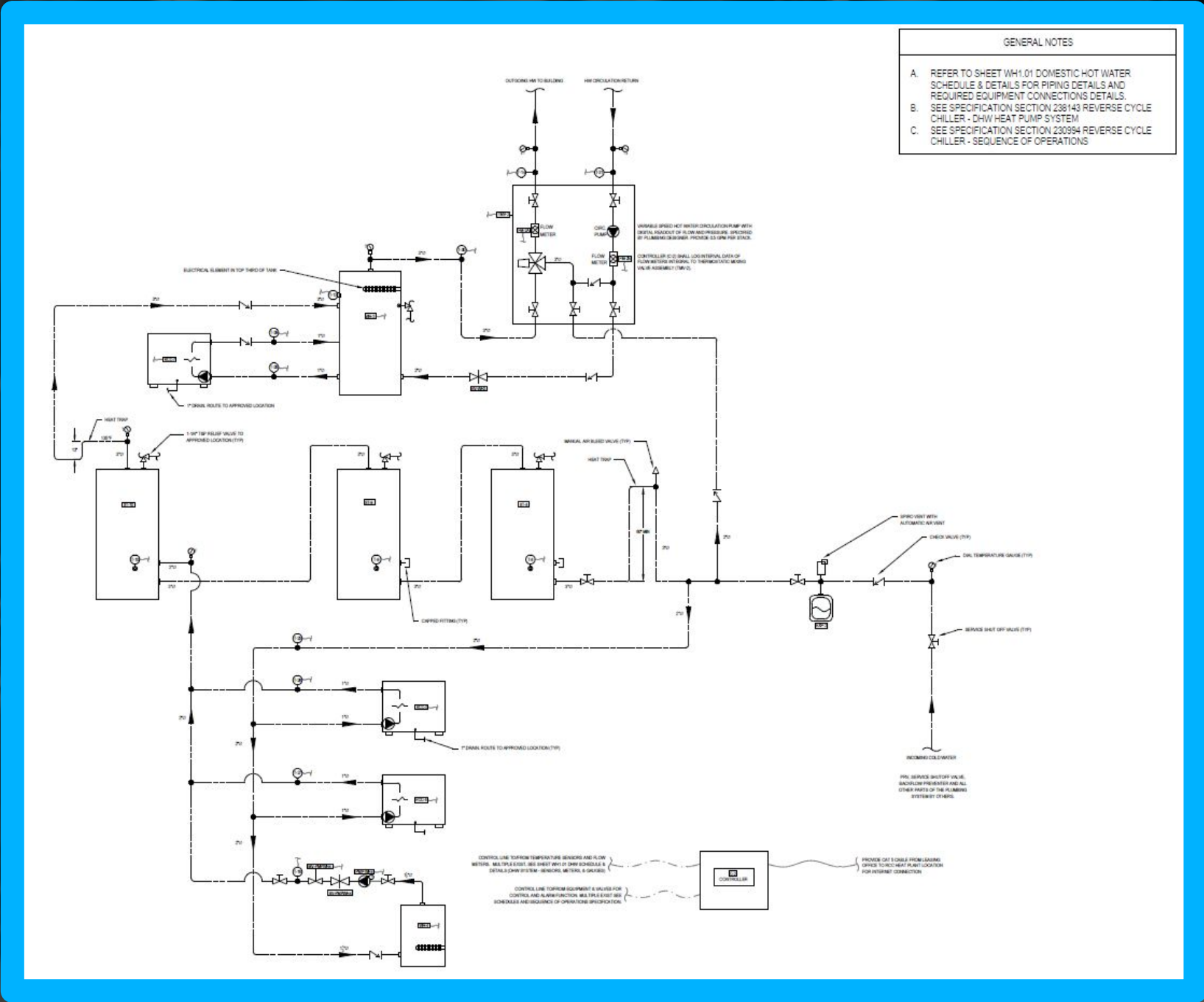


COORDINATION



PHYSICAL INSTALLATION

INSTALLATION: UNDERSTAND THE DESIGN



EXPERT ADVICE: If you're not sure, ASK.

INSTALLATION: UNDERSTAND THE **DESIGN**



Heat Pump & Storage Tank



Gas Water Heater

EXPERT ADVICE:

Heat pumps are not gas water heaters
Carefully consider “general” installation practices

TOP 3



UNDERSTAND THE DESIGN



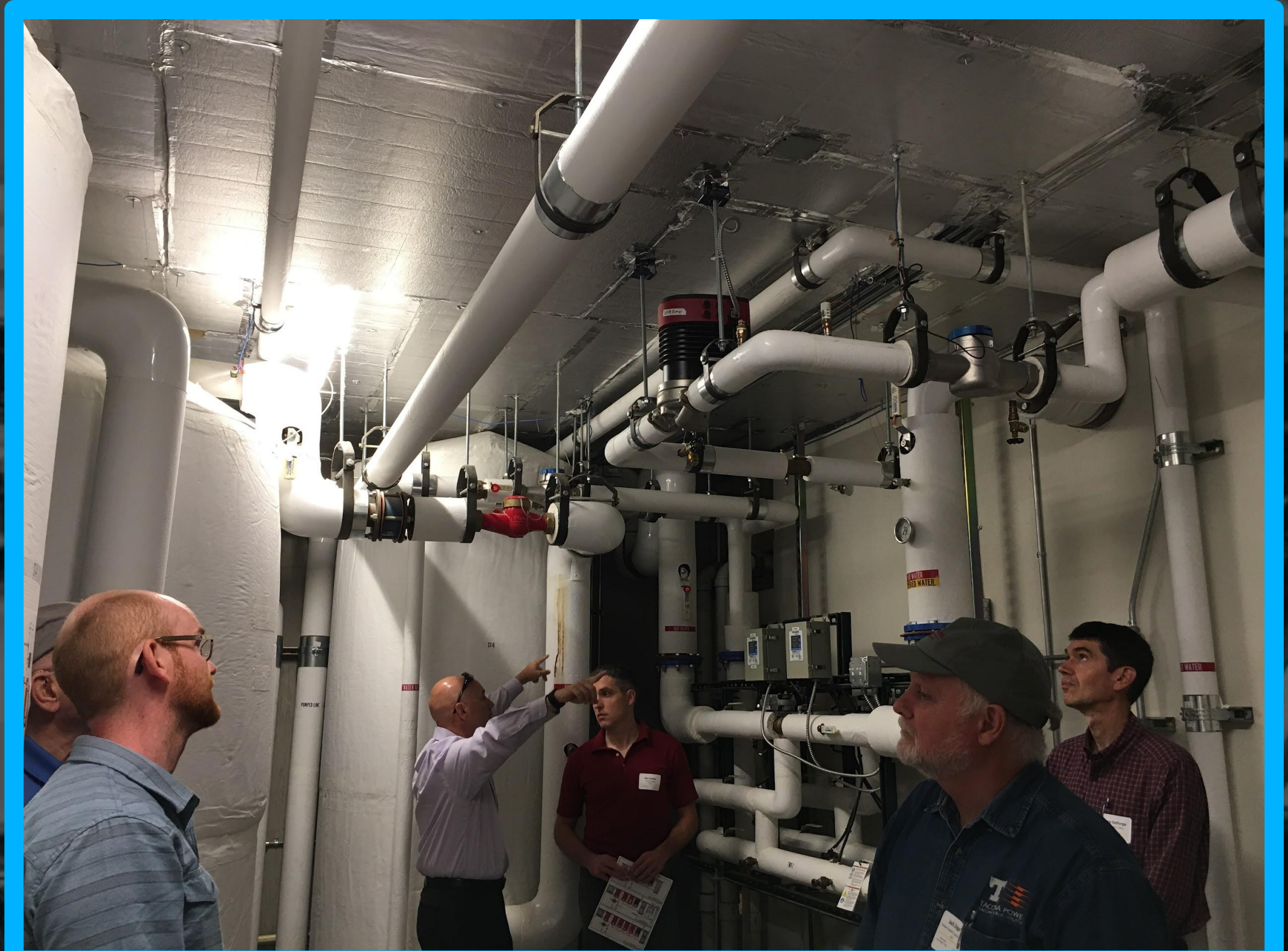
COORDINATION



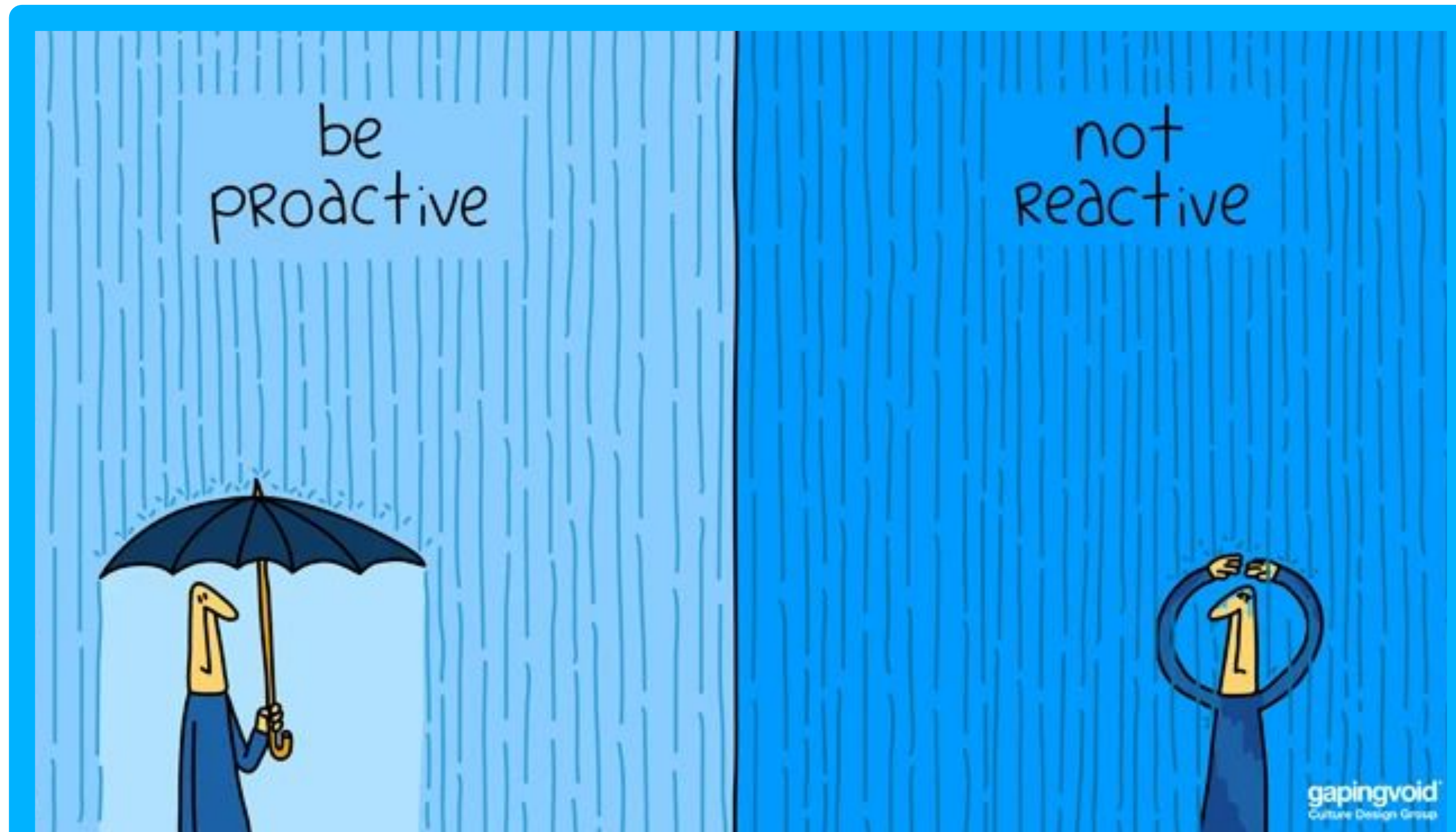
PHYSICAL INSTALLATION

INSTALLATION: **COORDINATION**

EXPERT ADVICE:
It takes a team.

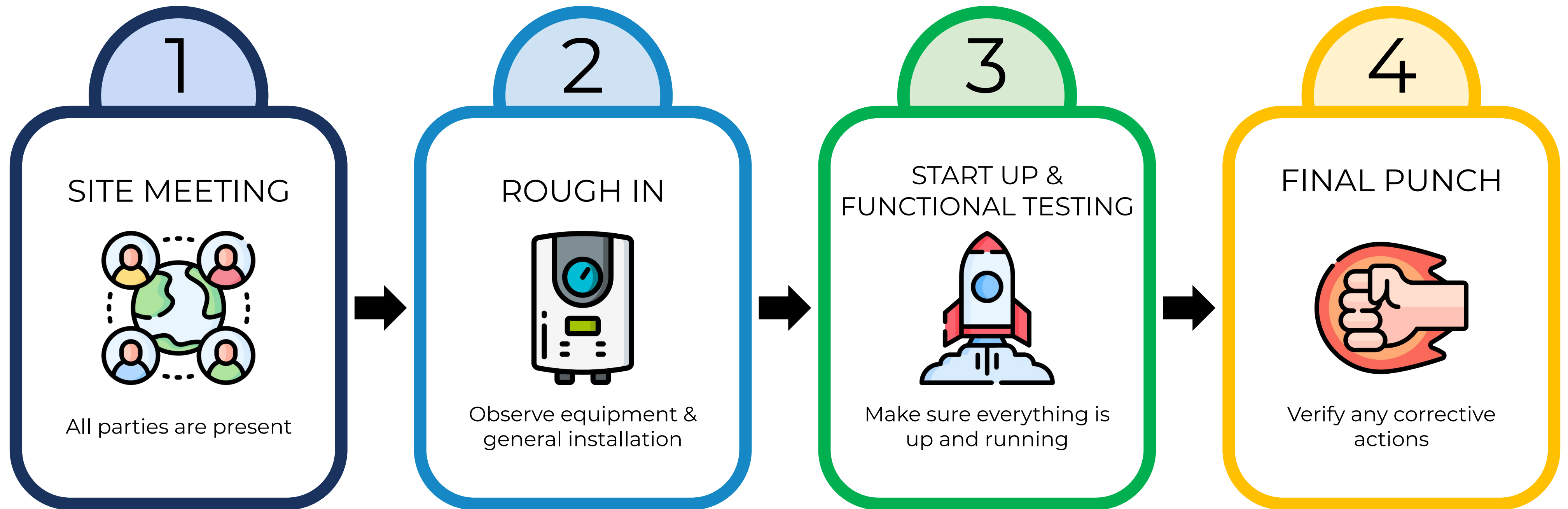


INSTALLATION: **COORDINATION**



Be **PROACTIVE**, not reactive.

INSTALLATION: **COORDINATION**



Ecotope Commissioning Process

TOP 3



UNDERSTAND THE DESIGN



COORDINATION



PHYSICAL INSTALLATION

INSTALLATION: PHYSICAL CONSIDERATIONS

- Do I have access?
- Do I need to remove doors?
- Is there a crane available?
- How do I mount it to the ground?
- Do I need seismic restraints?
- What about maintenance & electrical clearance?



The background of the image is a photograph of industrial machinery, specifically a complex network of pipes and structural beams. The image is split into two main color zones: a reddish-brown on the left and a dark blue on the right. A bright blue rectangular border frames the central portion of the image, which contains the text.

MAINTENANCE

MAINTENANCE **NEEDS**

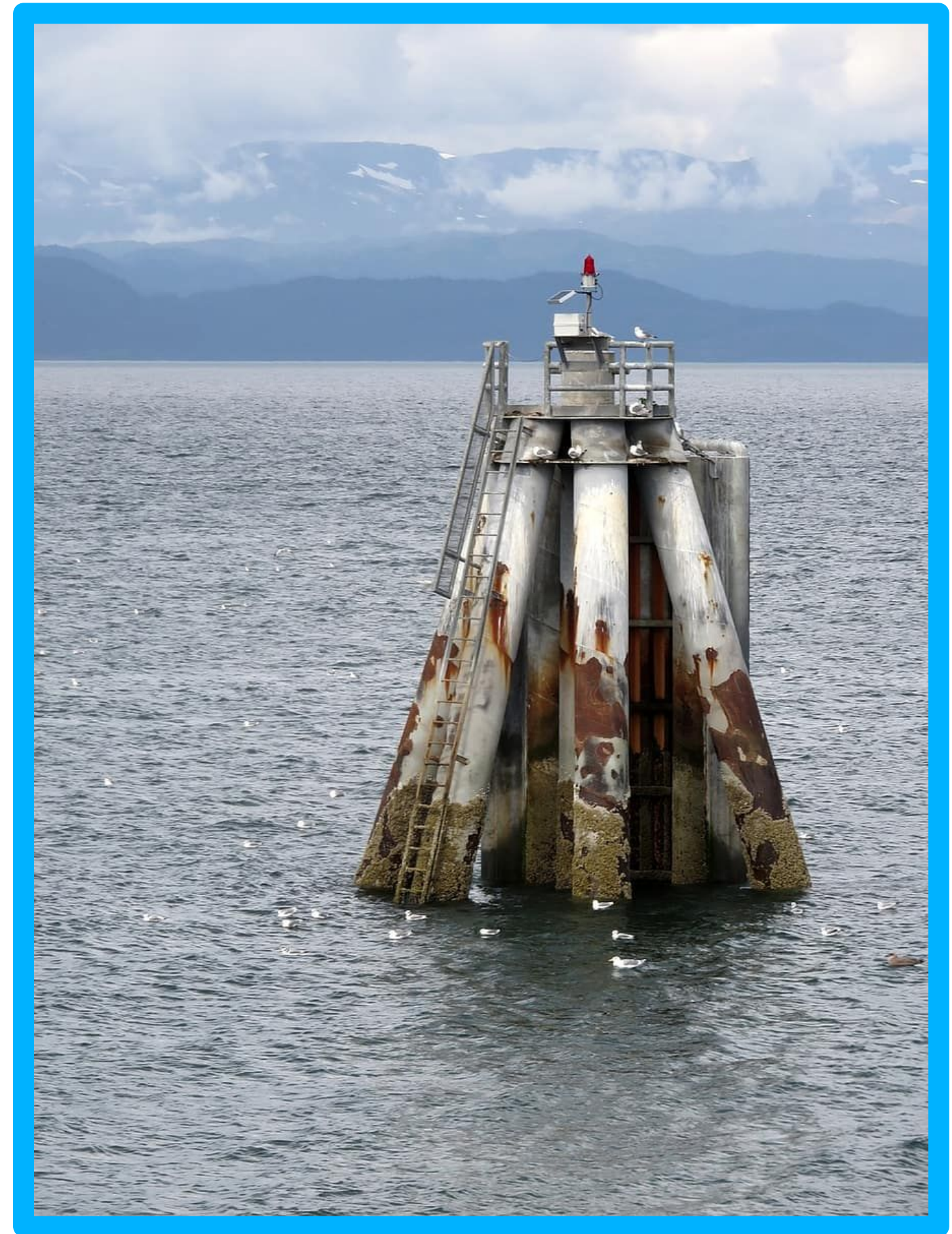
Keep an eye out for
alarms, notifications &
warranty requirements



Needs will vary based on the equipment

MAINTENANCE **INTERVALS**

Maintenance intervals often depend on site conditions, water and air quality.



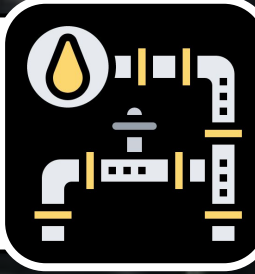
MAINTENANCE CHECKLIST & GPS



Heat Pumps
(Primary & Temperature Maintenance)



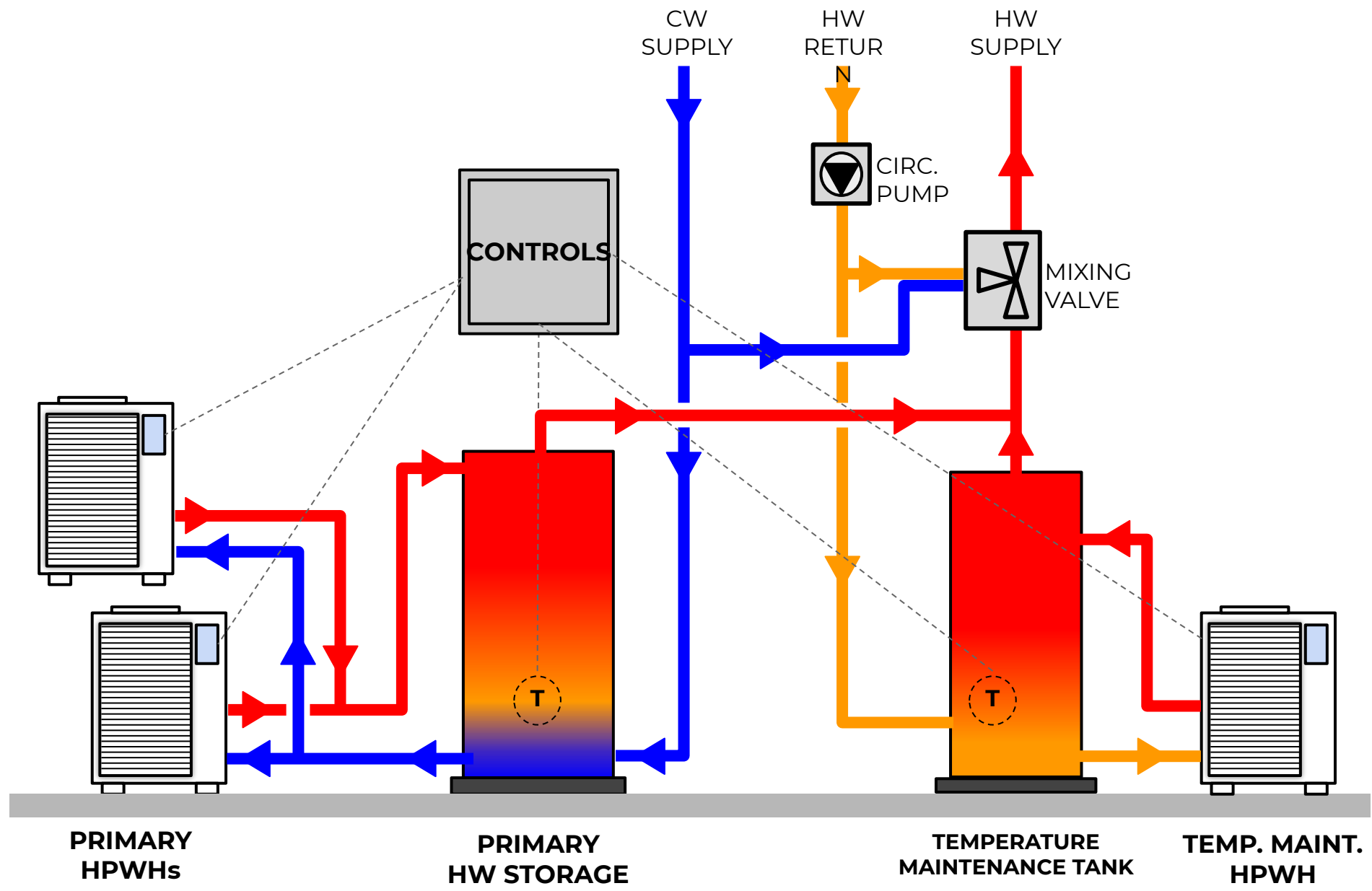
Storage Tanks
(Primary & Temperature Maintenance)



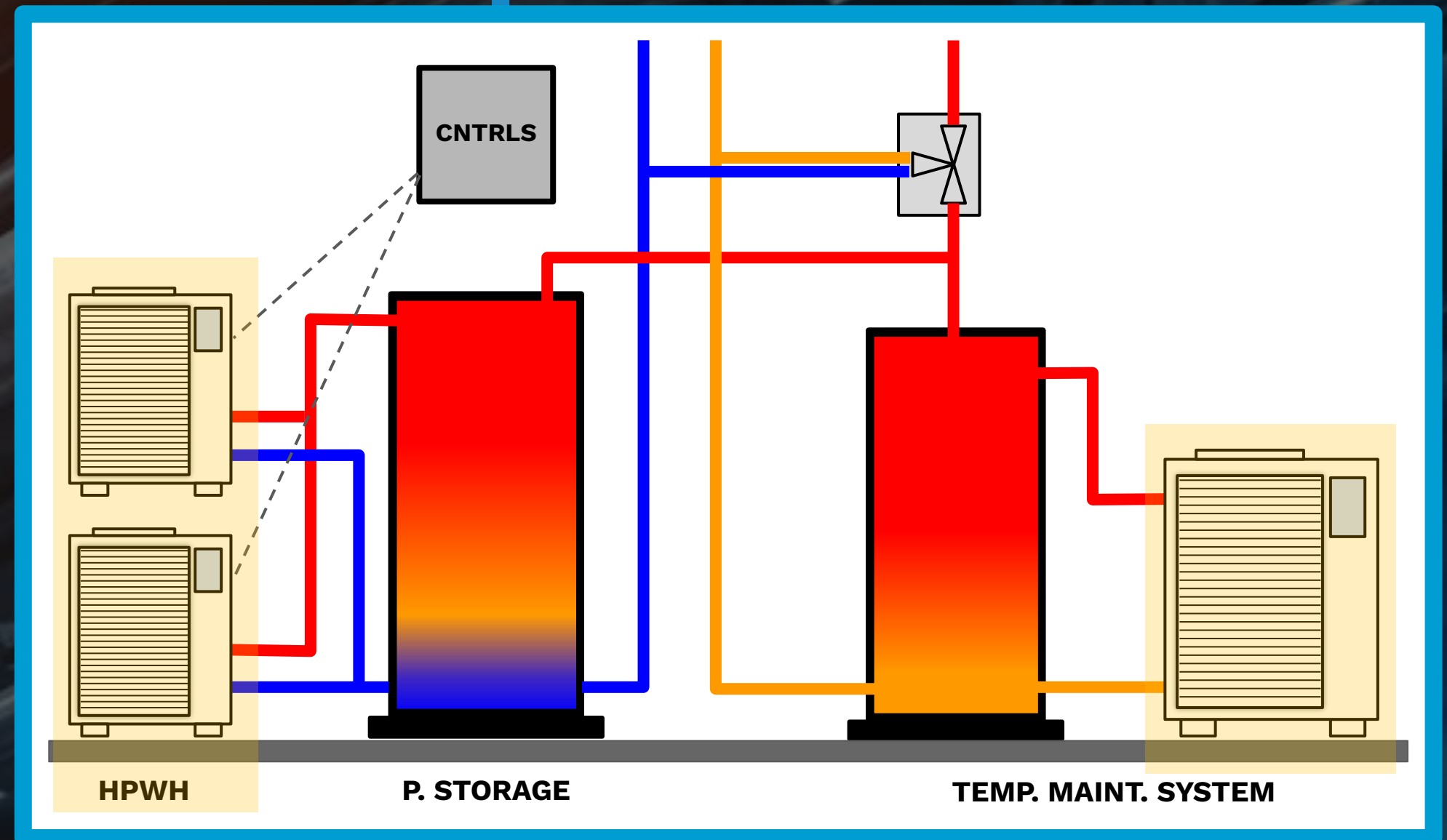
Temperature Maintenance System:
Tank, Distribution Piping & Mixing Valve



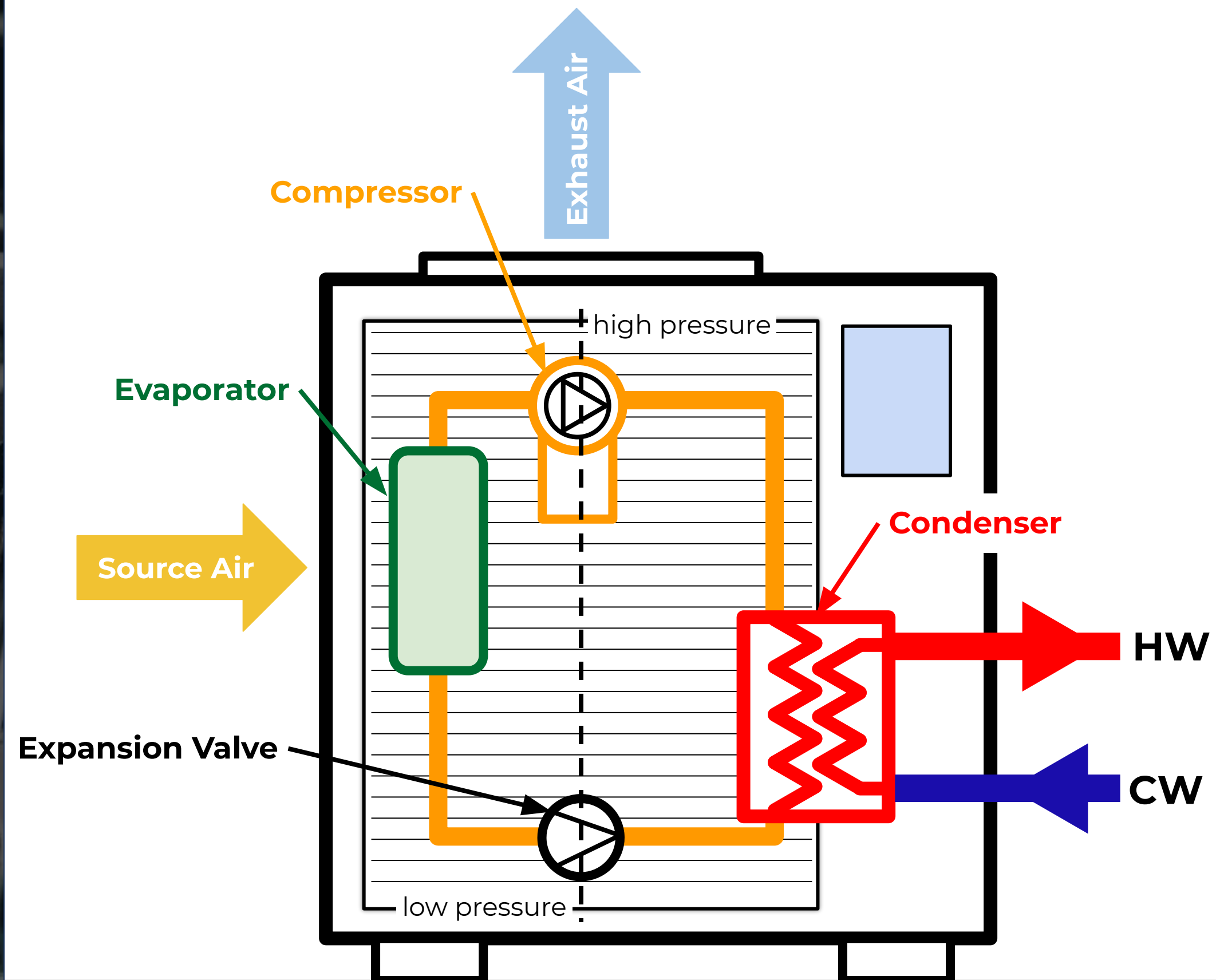
Controls



MAINTENANCE: HEAT PUMPS



REVIEW: HOW HEAT PUMPS **WORK**



CHECKLIST & GPS: **HPWHs**

INSPECT



Inspect evaporator,
refrigerant pressures &
metering valve

CLEAN



Clean filters &
strainers

MAINTAIN



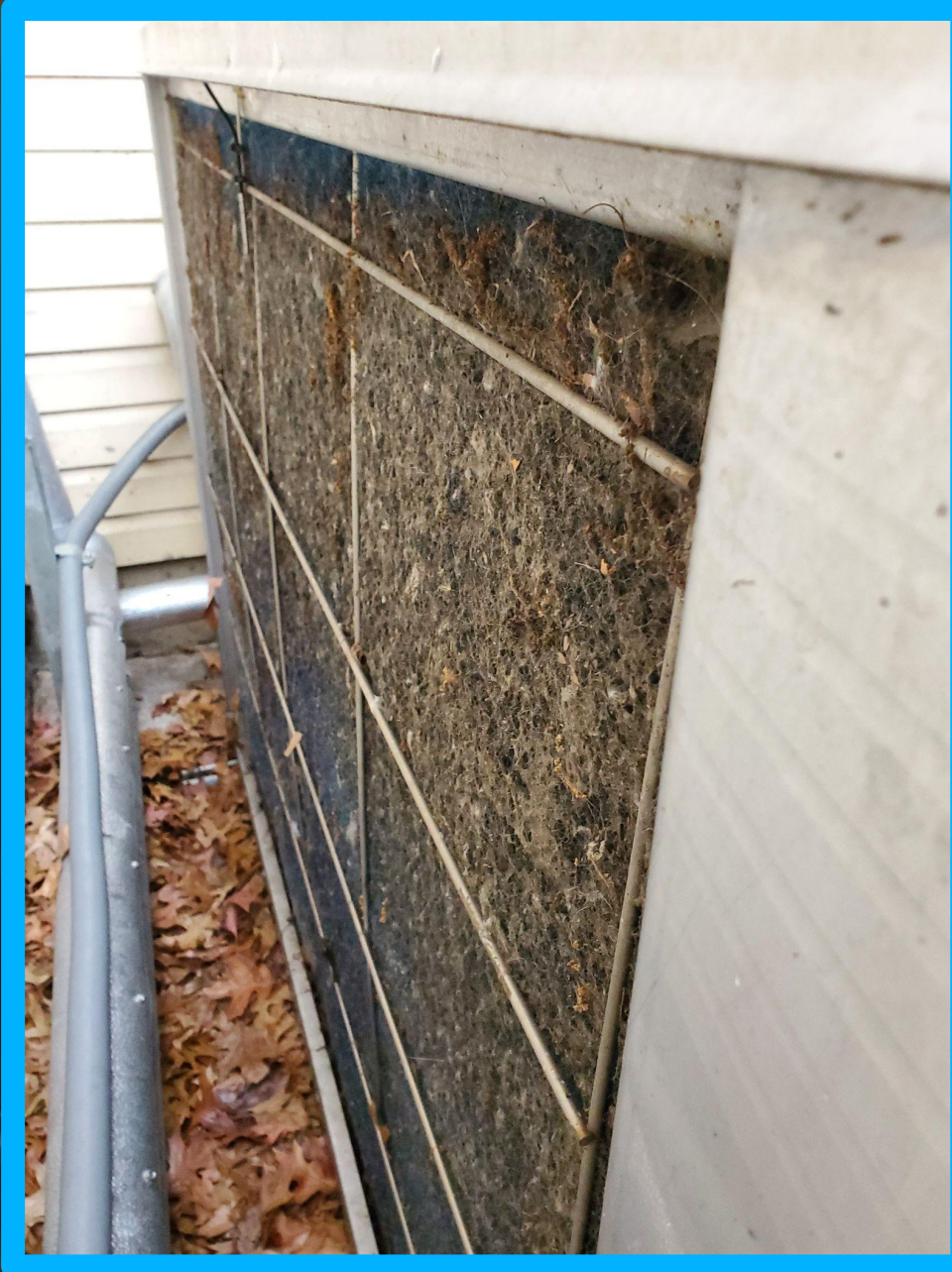
Descale & flush heat
exchanger


HPWH MAINTENANCE: **INSPECT**

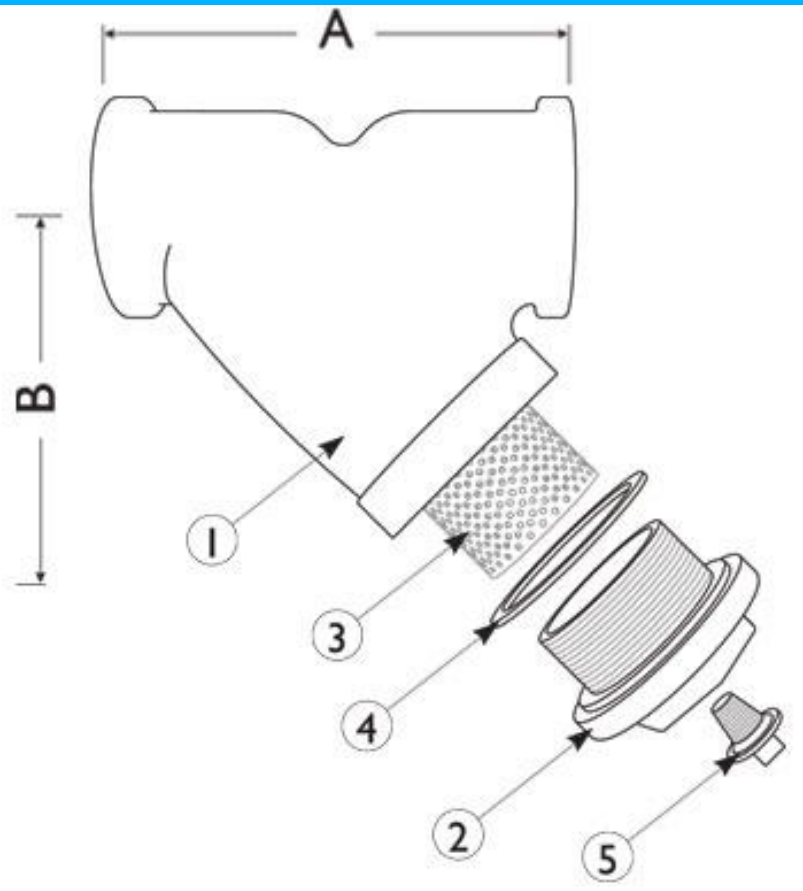


Talk to your manufacturer; each system is unique

HPWH MAINTENANCE: CLEAN







STANDARD SCREENS		
SERVICE	SIZES	SCREEN OPENING
LIQUID	1/4" - 2"	20 MESH

DESIGN SPECIFICATIONS		
WOG (NON-SHOCK)		200PSI at 150F

ITEM	PART	MATERIAL
1	BODY	BRONZE C84400
2	CAP	BRONZE C84400
3	SCREEN	STAINLESS STEEL TYPE 304
4	GASKET	NON-ASBESTOS
5	PLUG	BRASS

Clean regularly!

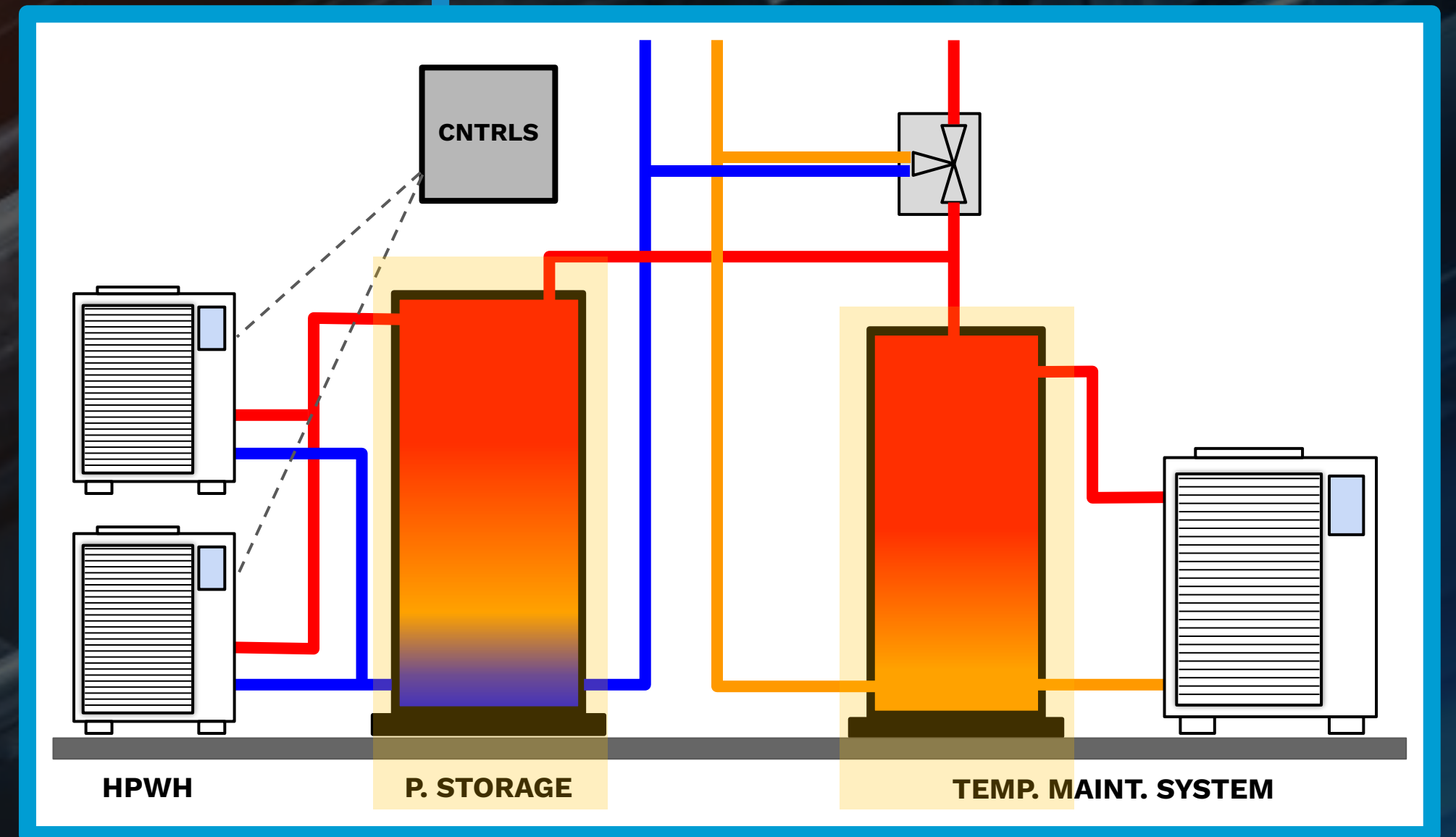
HPWH MAINTENANCE: **MAINTAIN**

- Flush/descale the condenser



EXPERT ADVICE: Use food-grade descaling solution

MAINTENANCE: STORAGE TANKS



CHECKLIST & GPS: **STORAGE TANKS**

INSPECT



Pressure relief valve

CLEAN



Flush sediment
build-up

REPLACE



Anode rods

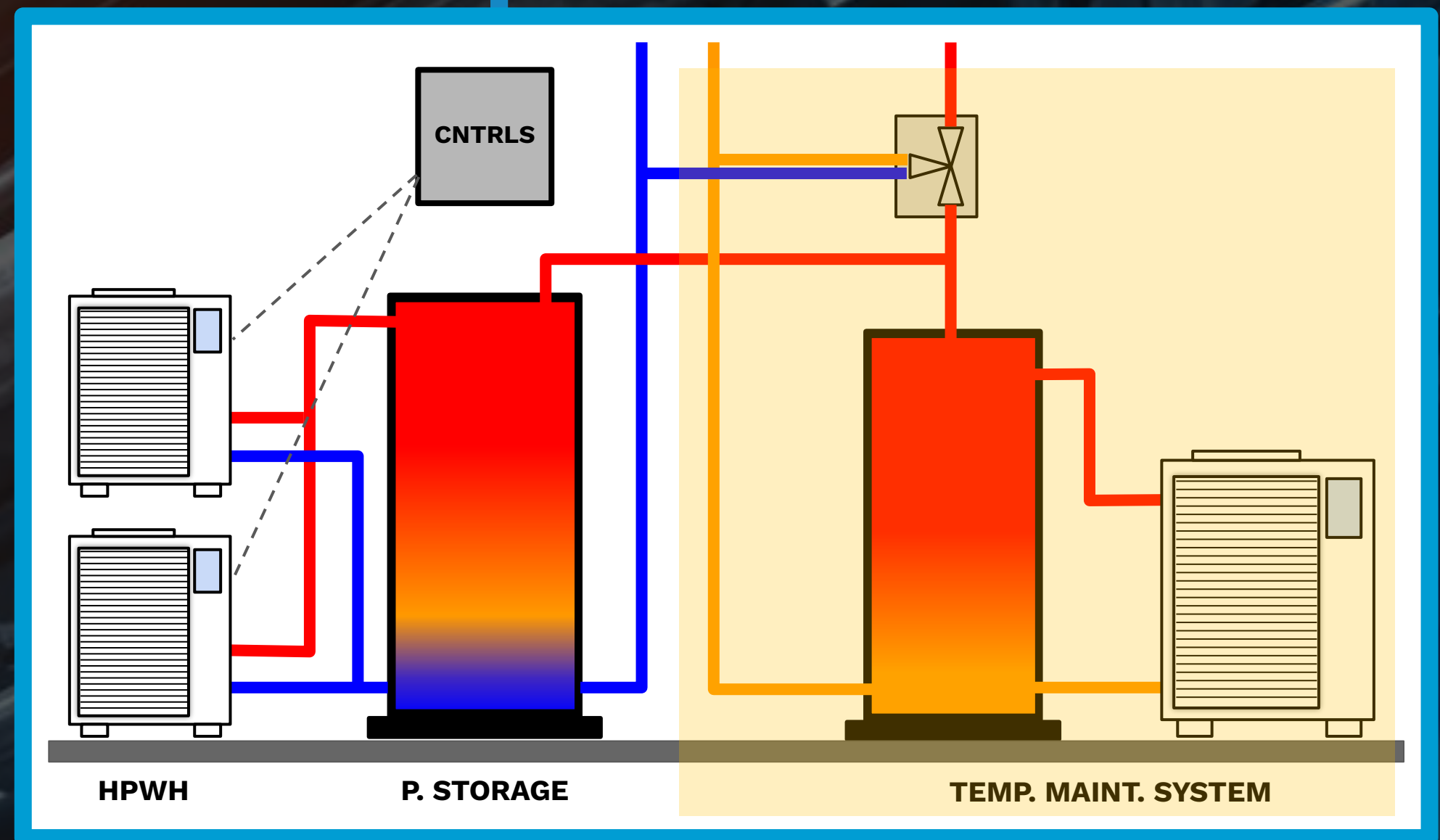
STORAGE TANK MAINTENANCE

Replace old anode rods



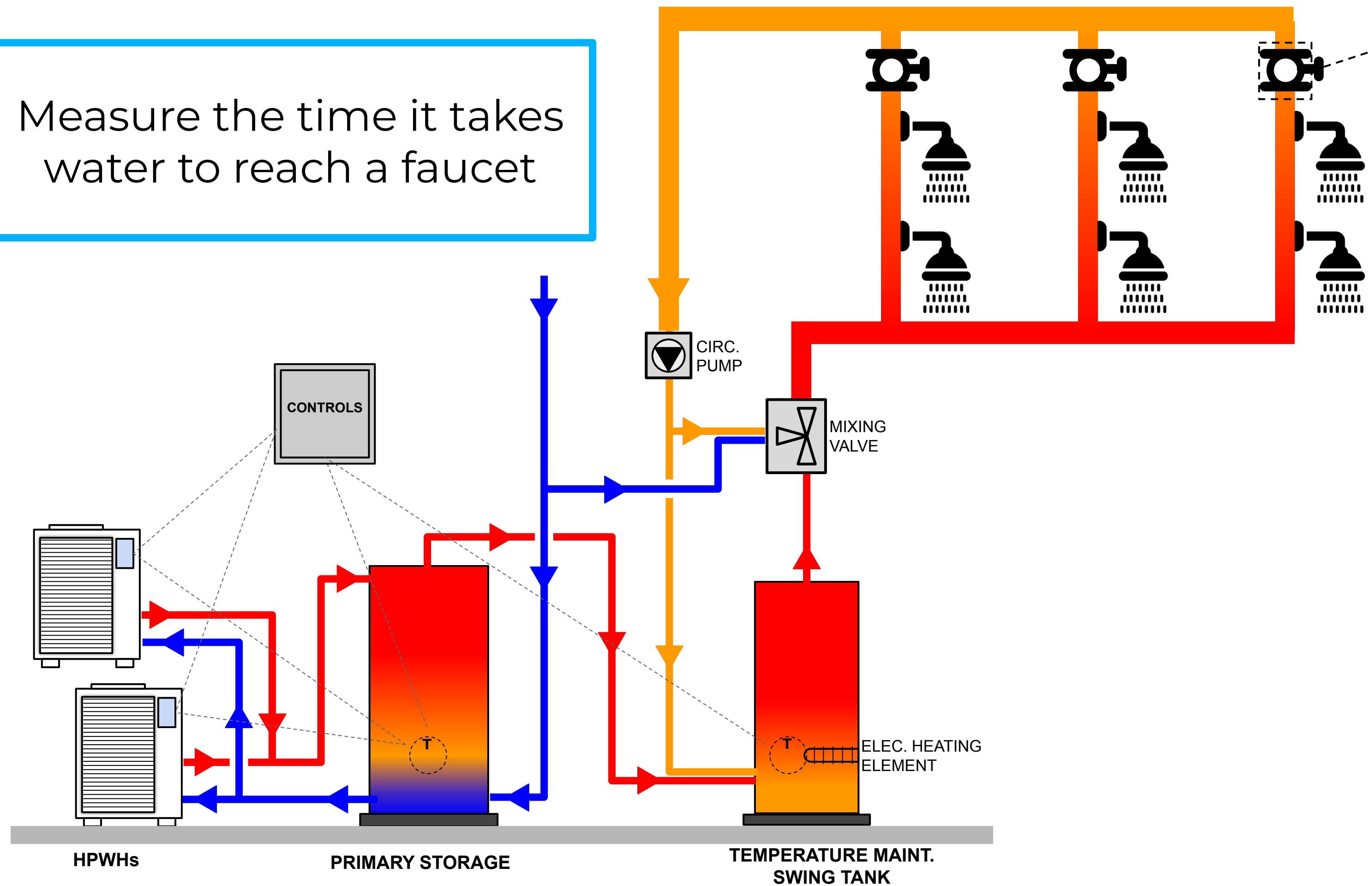
Flush sediment from tank bottom & inspect pressure relief valve regularly

MAINTENANCE: TEMPERATURE MAINTENANCE SYSTEM



TEMPERATURE MAINTENANCE SYSTEM: **REVIEW**

Measure the time it takes
water to reach a faucet



CHECKLIST & GPS: TEMPERATURE MAINTENANCE SYSTEM

INSPECT



Check the water supply temperature, resistance elements & distribution system.

REPLACE



Anode rods

CLEAN



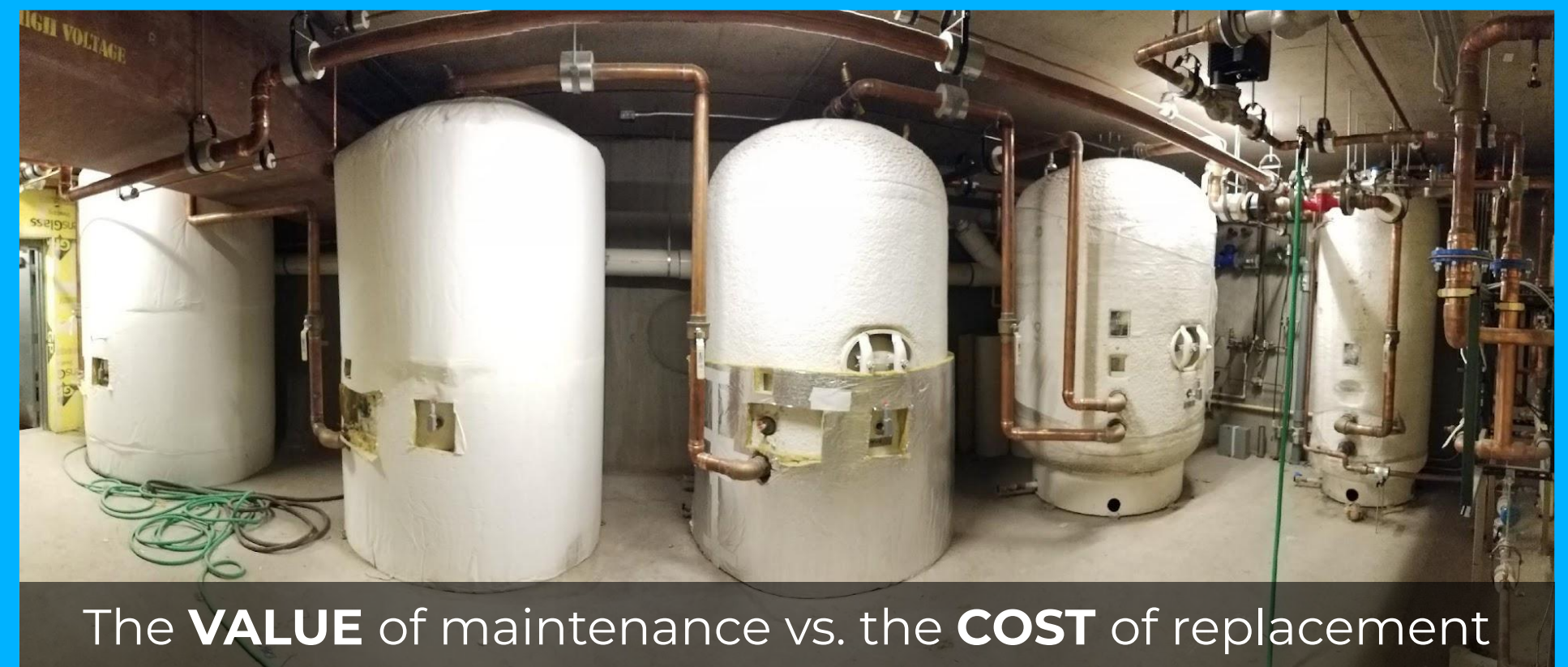
Disassemble and clean the mixing valve.

TEMPERATURE MAINTENANCE **SYSTEM**

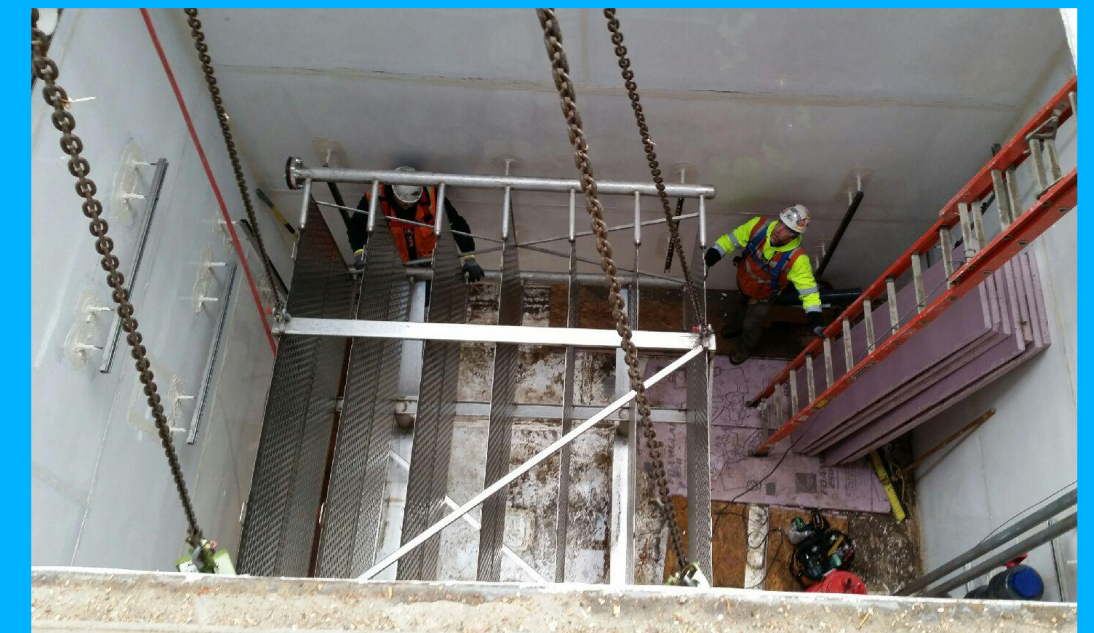


Inspect the resistance elements;
keep up with regular maintenance

WHY?



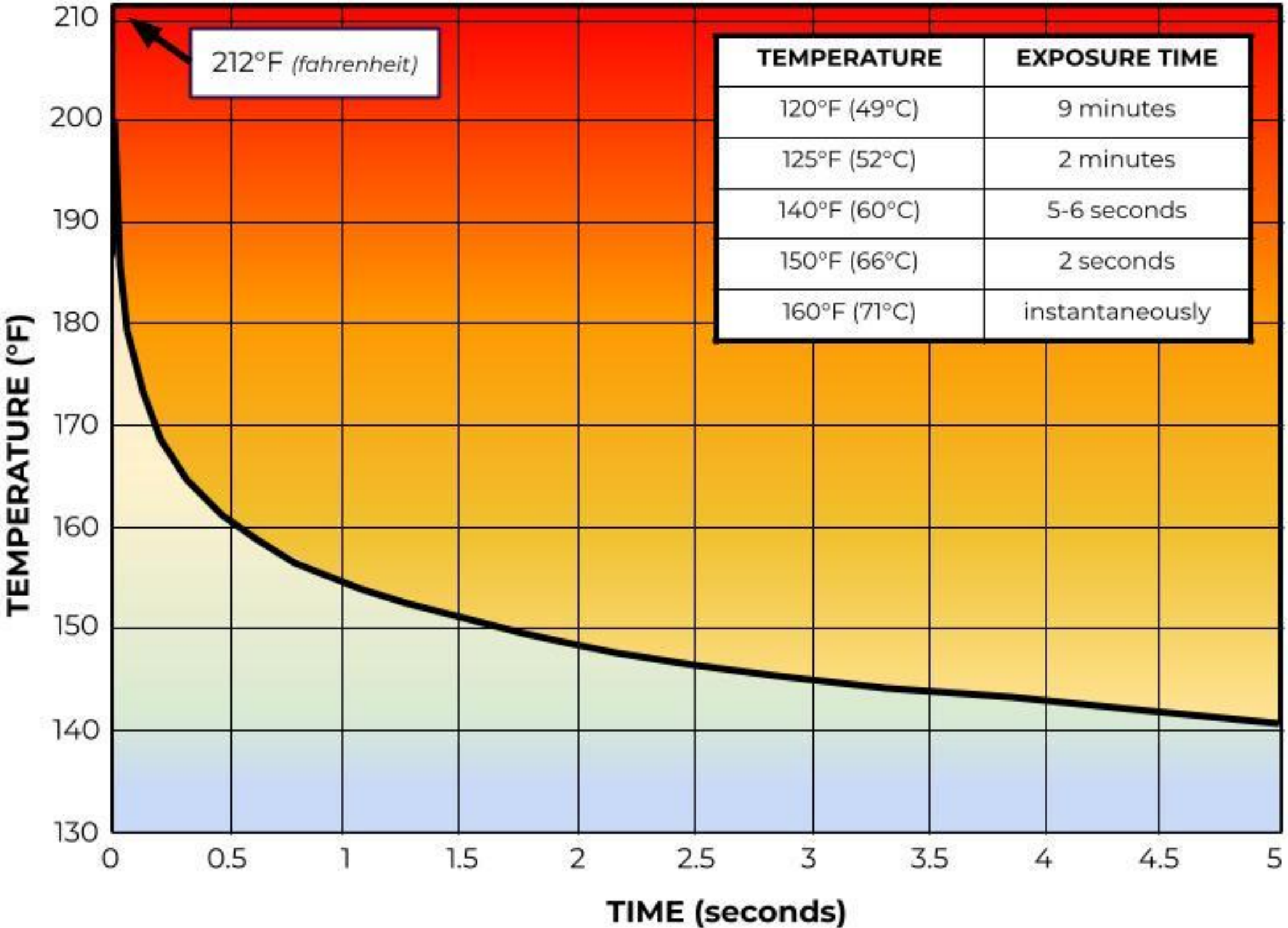
The **VALUE** of maintenance vs. the **COST** of replacement



THERMOSTATIC MIXING VALVE **MAINTENANCE**



HOT WATER BURN & SCALDING GRAPH



THERMOSTATIC MIXING VALVE MAINTENANCE

Don't skip the maintenance!

Follow the manual recommendations.

MGR-1000
12/91

IMPORTANT!!

MAINTENANCE GUIDE & RECORD

AFTER INSTALLATION, DELIVER TO THE OWNER'S MAINTENANCE PERSONNEL

PLEASE DO NOT SIMPLY INSTALL THIS VALVE AND THEN FORGET IT!!

MODEL AND SERIAL NO.: _____

DATE INSTALLED: _____

DATE INSPECTED	BY (NAME)	DISPOSITION WAS VALVE CLEANED? WERE PARTS REPLACED? (WHICH PARTS)?	WAS THE LIMIT STOP CHECKED?	DATE OF NEXT INSPECTION

DO NOT DISCARD!!

MGR-1000
12/91

IMPORTANT!!

MAINTENANCE GUIDE & RECORD

AFTER INSTALLATION, DELIVER TO THE OWNER'S MAINTENANCE PERSONNEL

All water temperature control valves require regular maintenance, depending upon usage and local water conditions. The steps below provide a guide to the proper care of all thermostatic and pressure actuated mixing valves manufactured by Leonard Valve Company.

1. After 30 to 60 days of normal operation, check the performance of the valve, disassemble the valve (per the instructions) and inspect the internal parts. Make certain the moving parts operate freely and that no foreign deposit has collected on any of the internal parts of the valve.

2. If the valve operates properly and there is no evidence of any deposit, reassemble the valve, recheck and if necessary reset the high temperature limit (per Warning Tag).

ESTABLISH A PERIODIC MAINTENANCE SCHEDULE TO REINSPECT THIS VALVE AT INTERVALS NO GREATER THAN EVERY SIX TO TWELVE MONTHS! SEE THE MAINTENANCE FORM ON THE REVERSE SIDE OF THIS CARD.

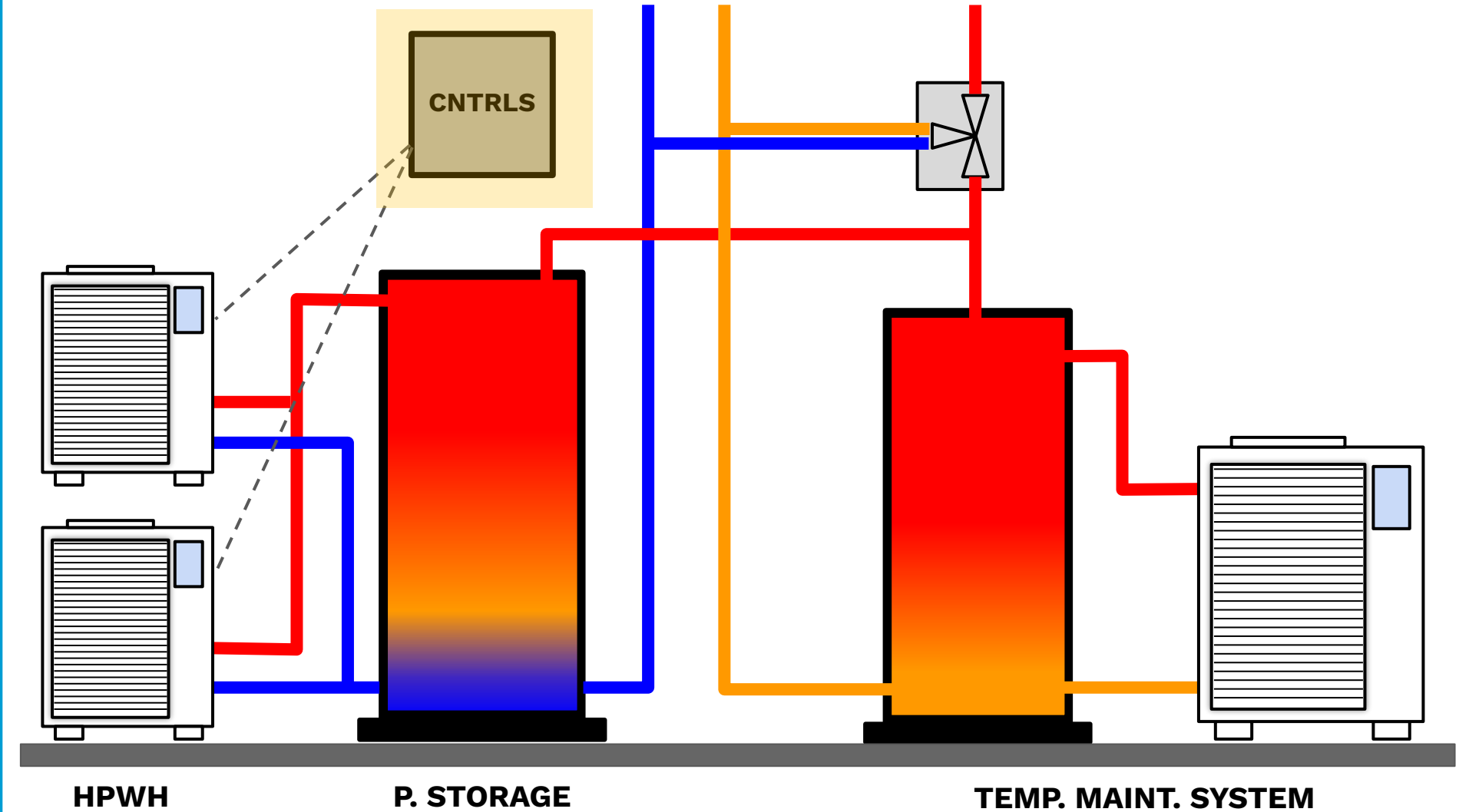
3. If there is evidence of inconsistent performance or of any deposit on the internal parts, clean the valve thoroughly (per the instructions), replace parts if necessary, reassemble the valve and make certain it is functioning properly. Recheck and if necessary reset the high temperature limit stop (per Warning Tag).

ESTABLISH A REGULAR MAINTENANCE SCHEDULE TO REINSPECT THIS VALVE WITHIN 60 DAYS (PER STEP 1 ABOVE). THE FREQUENCY OF REINSPECTION SHOULD THEN BE BASED UPON THE CONDITION OF THE INTERNAL PARTS AT THE MOST RECENT REINSPECTION. IN NO CASE SHOULD REINSPECTION INTERVALS EXCEED EVERY SIX TO TWELVE MONTHS. SEE THE MAINTENANCE RECORD FORM ON THE REVERSE SIDE OF THIS CARD.

These recommendations provide a guide for scheduling timely maintenance of water temperature control devices.

DO NOT DISCARD!!

MAINTENANCE: CONTROLS



CHECKLIST & GPS: **CONTROLS**

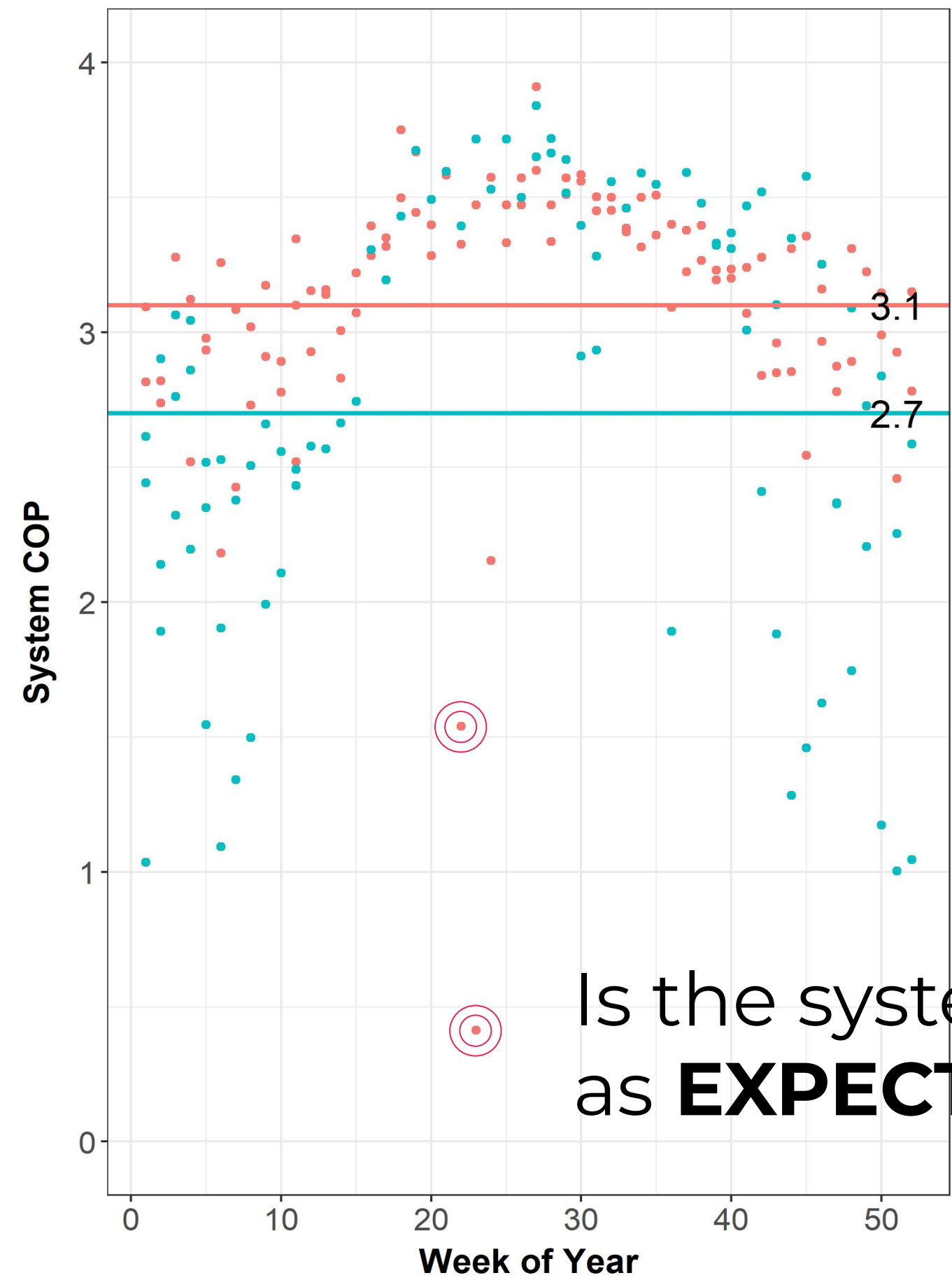
INSPECT



Check the hardware
and software.

CONTROLS MAINTENANCE

LOOK
...don't touch!



MAINTENANCE CHECKLIST & GPS



Heat Pumps
(Primary & Temperature Maintenance)



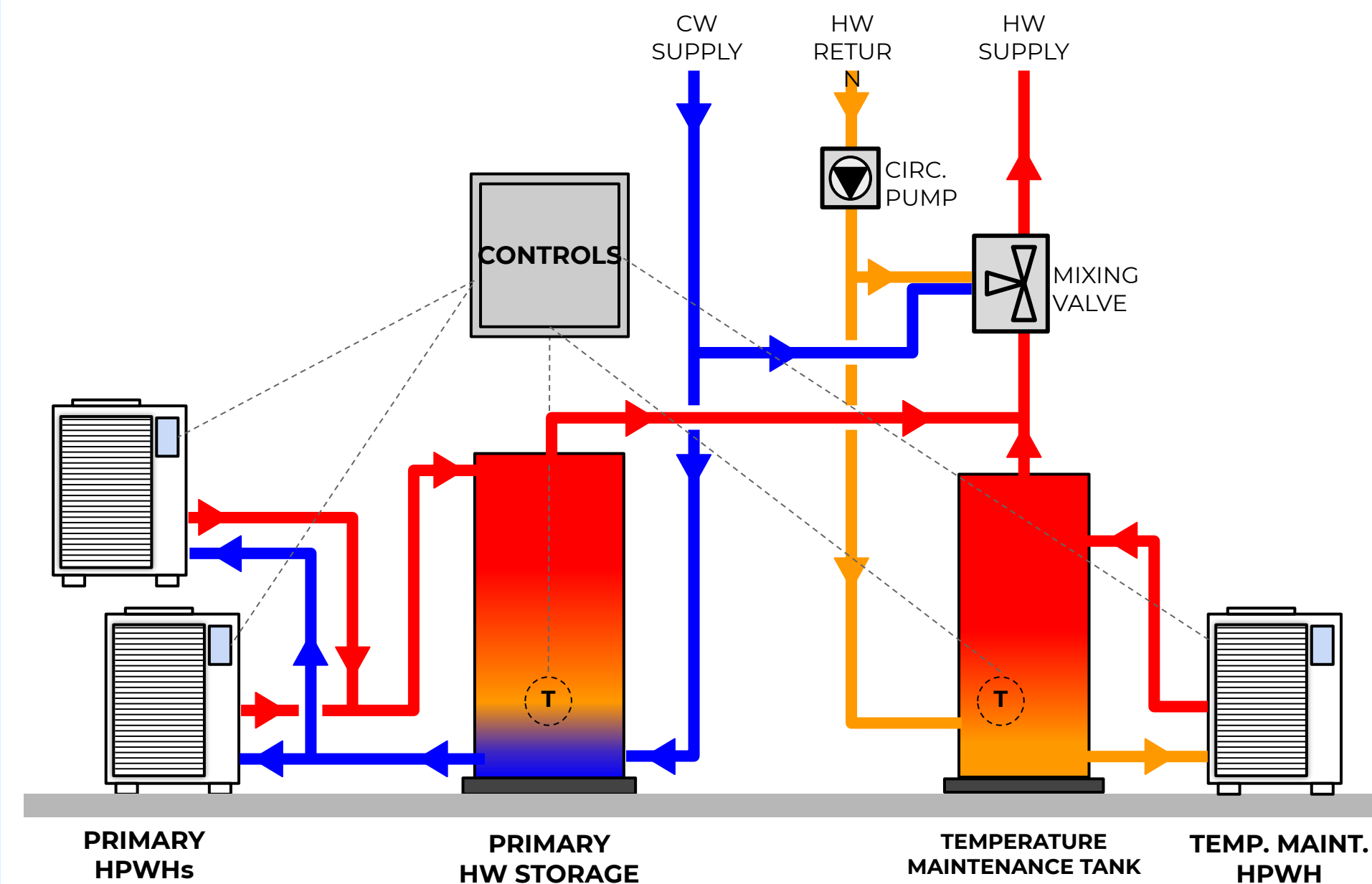
Storage Tanks
(Primary & Temperature Maintenance)



Temperature Maintenance System:
Tank, Distribution Piping & Mixing Valve



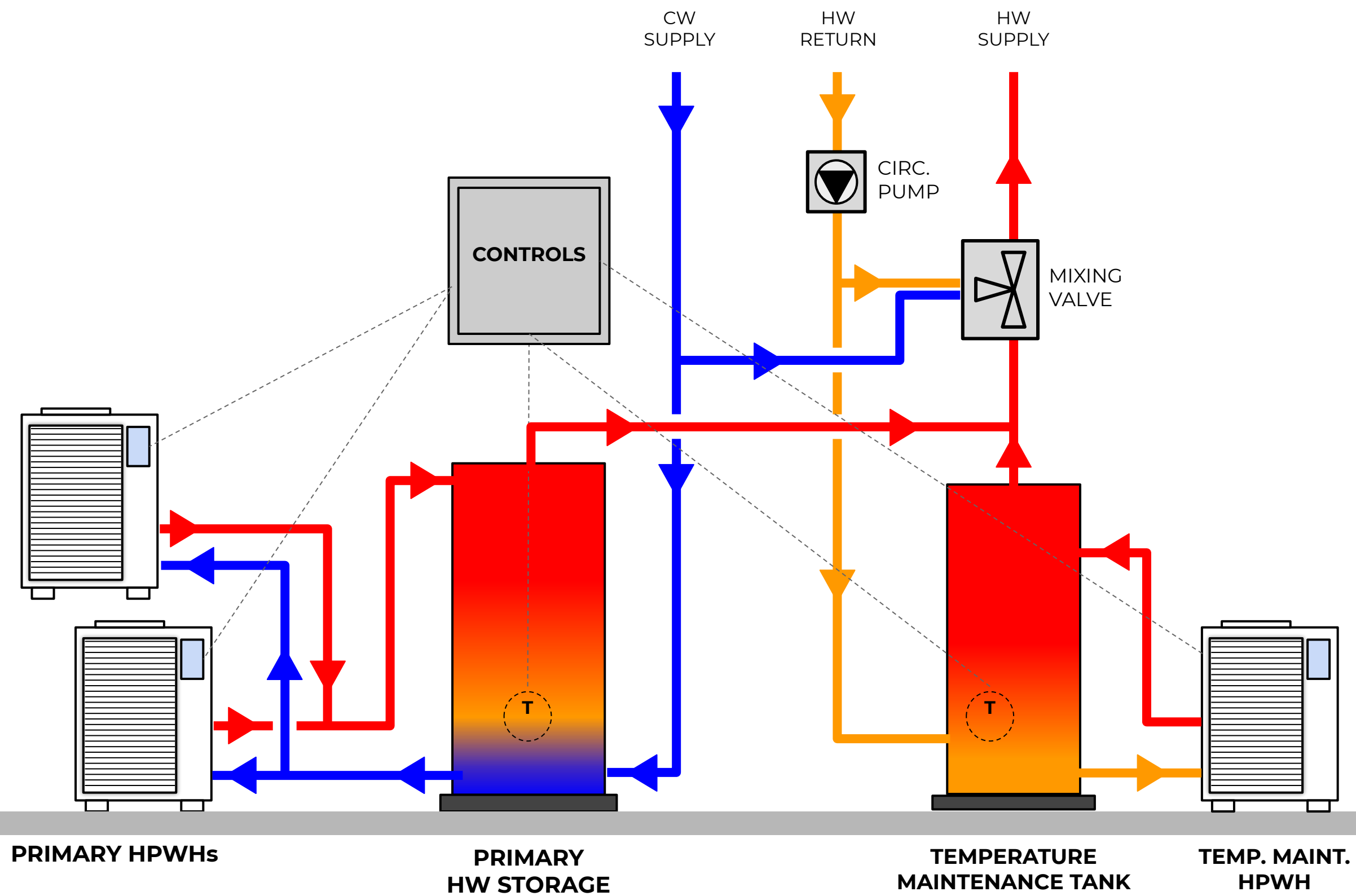
Controls





REVIEW

RECAP: FOUR **CHPWH** SYSTEM COMPONENTS



- Primary heat pump water heater (HPWH)
- Primary storage tank
- Temperature maintenance system
- Controls

RECAP: TEMPERATURE MAINTENANCE **SYSTEMS**

01 **Dedicated Parallel**

Dedicated HPWH connected by parallel piping

02 **Dedicated Series**

Dedicated swing tank connected in series

03 **Combined**

Primary & Temperature Maintenance System are combined

04 **No Recirculation**

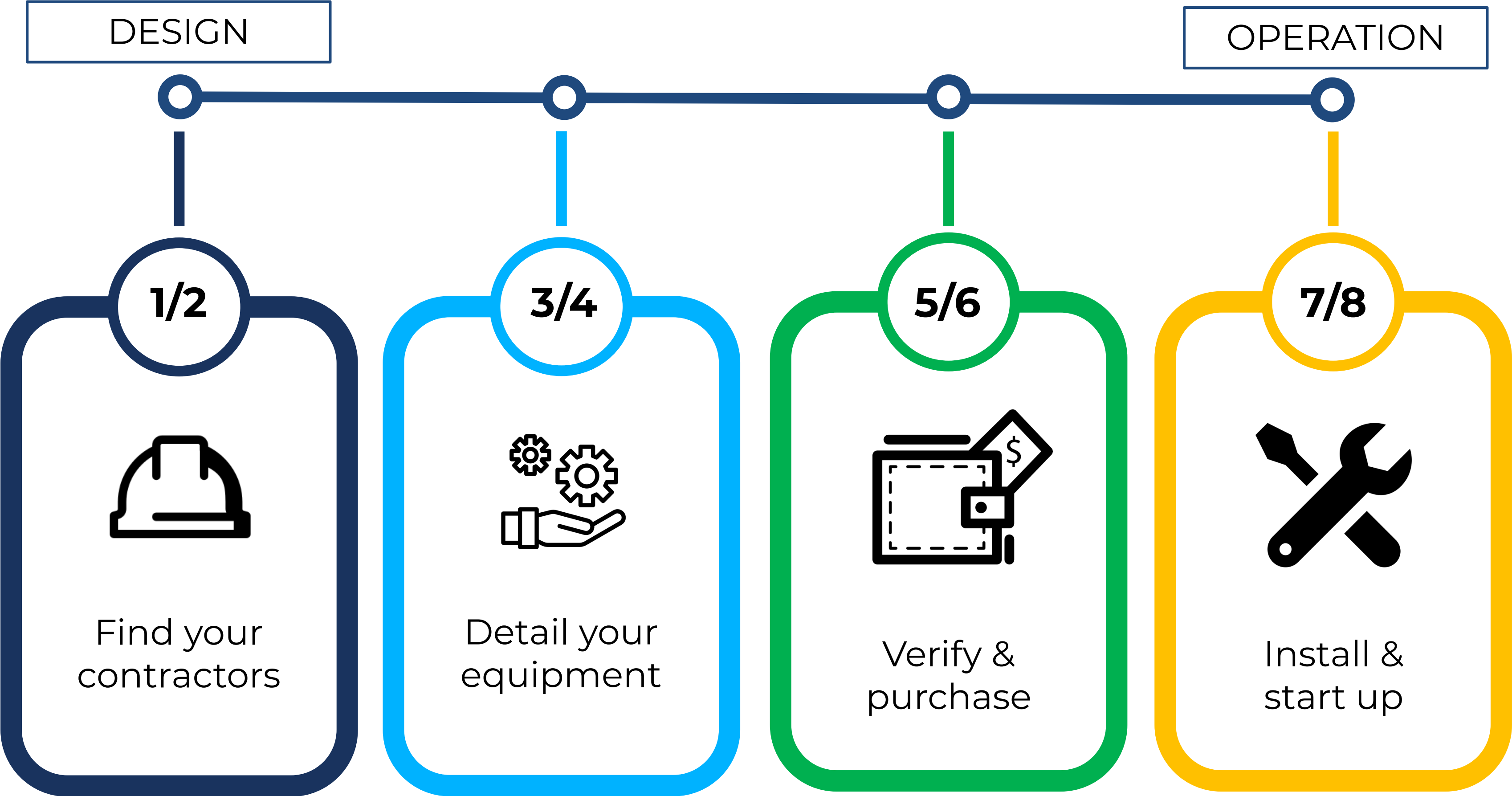
Heat Tape

CASE STUDIES



	New construction	New construction	Retrofit
	(13) Sanden, single pass (11) 120 gal + (2) 84 gal tanks	(2) Colmac CxA-15, single pass (3) 500 gal tanks	(4) Sanden, single pass (3) 120 gal tanks
	Trace Tape; no HW recirculation	Parallel loop configuration (1) Colmac CxV-5; (1) 500 gal tank	Series (swing) configuration (3) Elec. boilers; 175 gal “swing” tank
	Rooftop	Garage	Outside
	Total energy: 1.22 kWh/day/person	15.1 % annual energy savings	Total energy: 1.05 kWh/day/person

RECAP: DESIGN TO **OPERATION**



RECAP: MAINTENANCE

CLEAN



MAINTAIN



INSPECT



REPLACE



THANK YOU

