



Intellihot

Modular Tankless Water Heaters

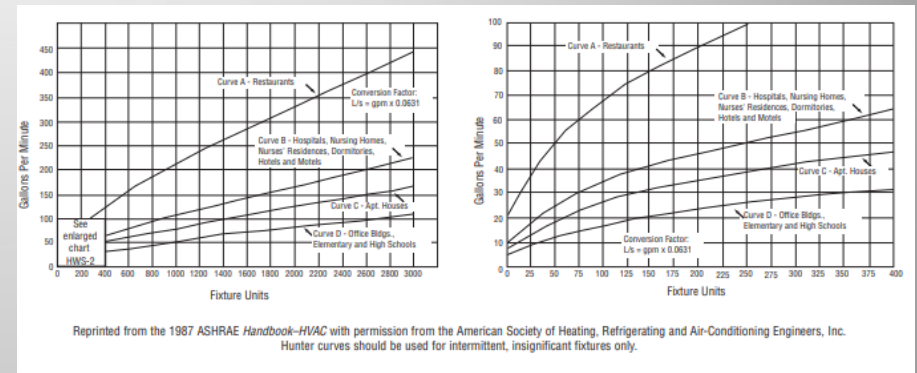
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Objectives

- Better understand the pros and cons of traditional sizing methods
- Learn how a modular tankless design can help you right-size your project without grossly over-sizing
- How tankless water heaters can help eliminate the use of mixing valves.

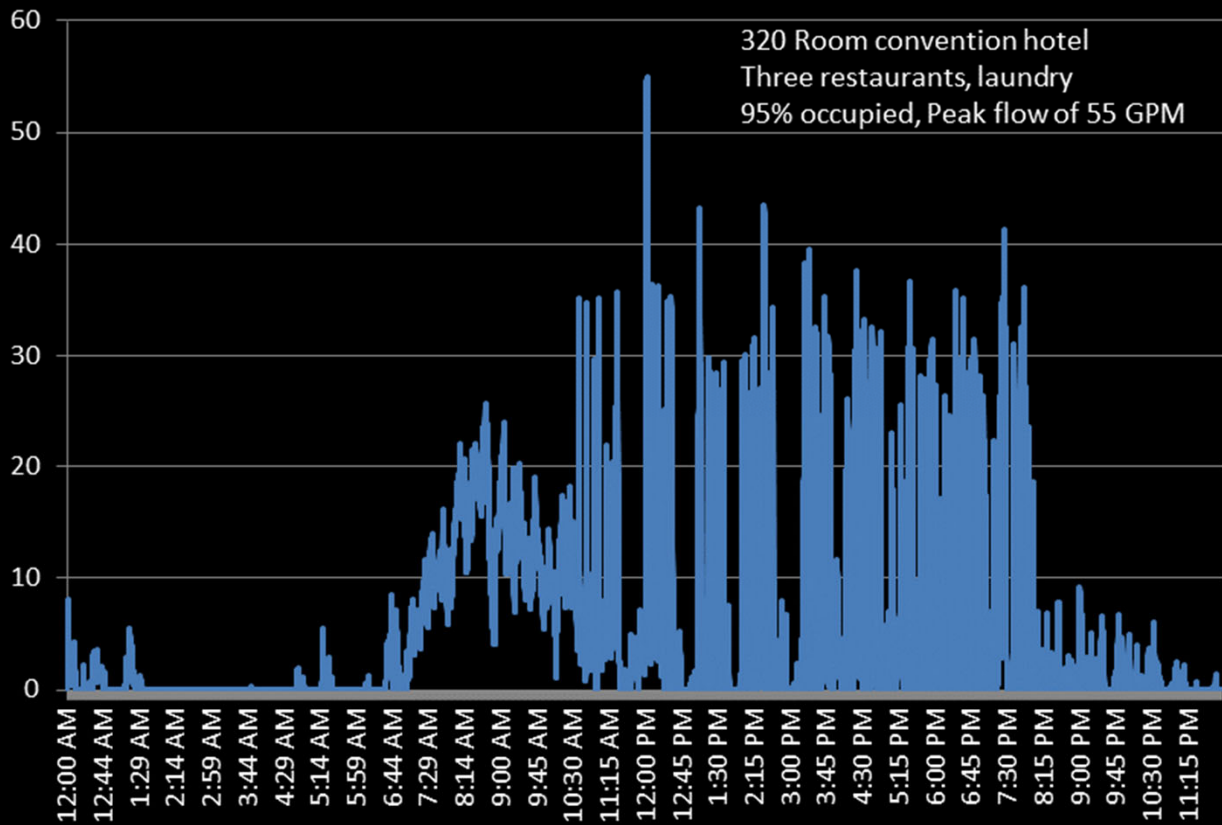
Traditional sizing methods

- Modified Hunter's Curve
- ASHRAE & industry suggestions
- Hard diversity numbers



How is water consumed?

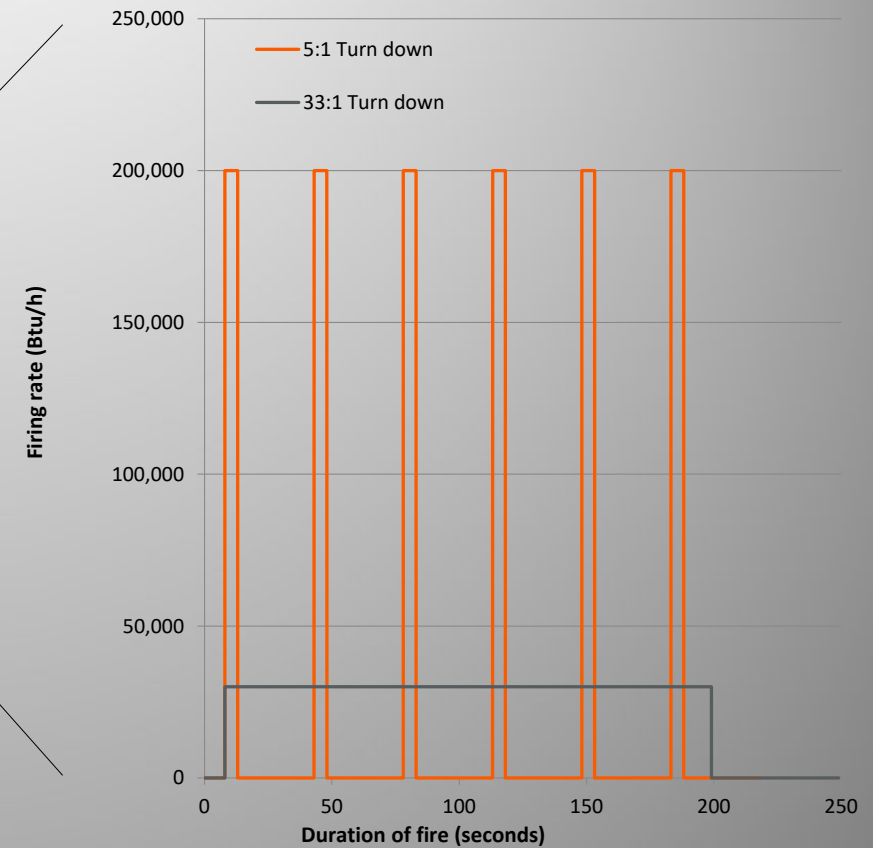
Transiently, follows statistical law



Draw profile impact on equipment

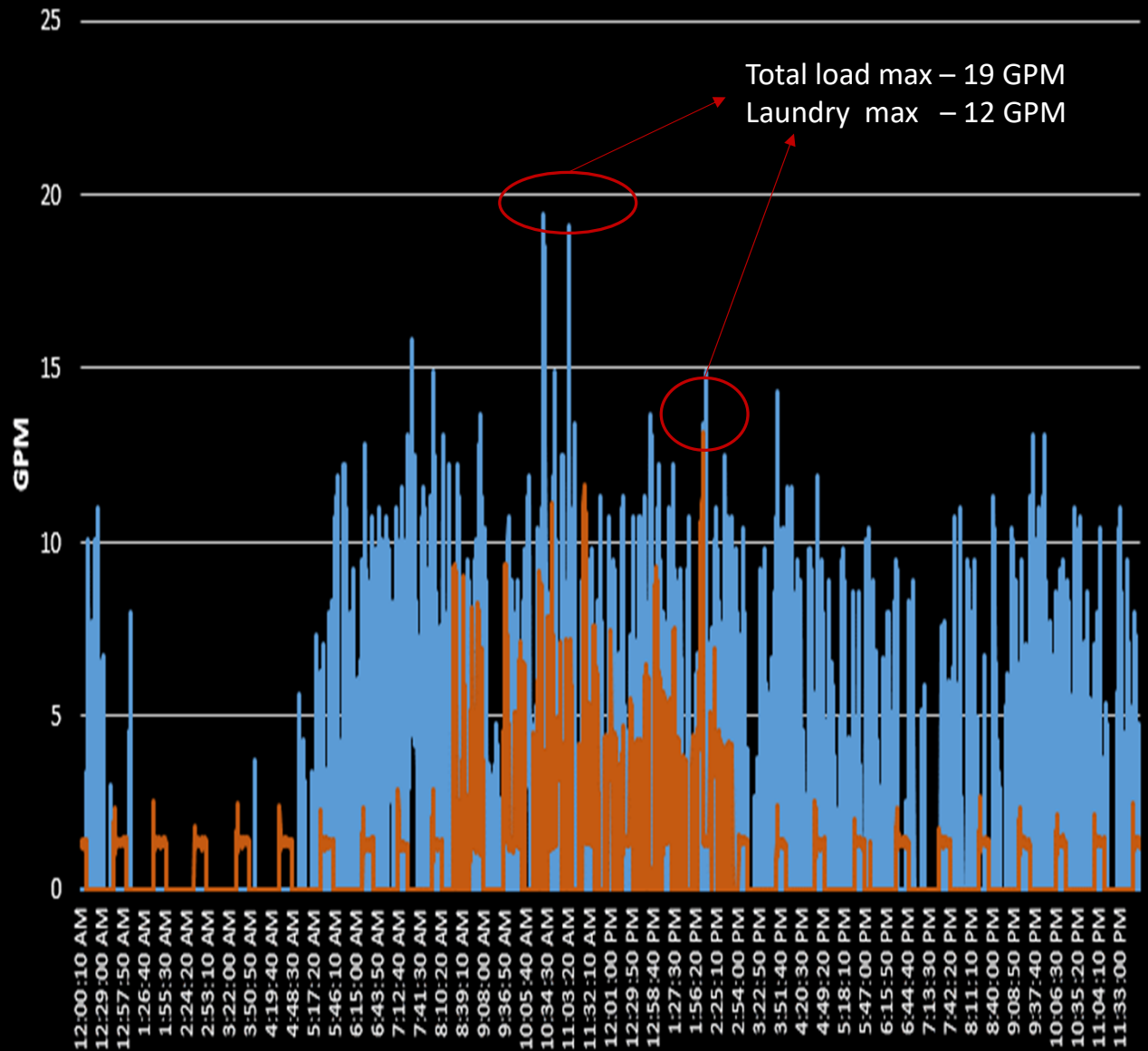
94% of operations occur at low or small flows

	Flow range		Duration	%	Cumulative flow
	GPM				
Low draw	0	5	1019	71%	1,321
Small draw	5	20	333	23%	3,473
Medium draw	20	35	78	5%	2,139
High draw	35	50	9	1%	359



81 room hotel

Measured at 85% occupancy



81 Room Hotel

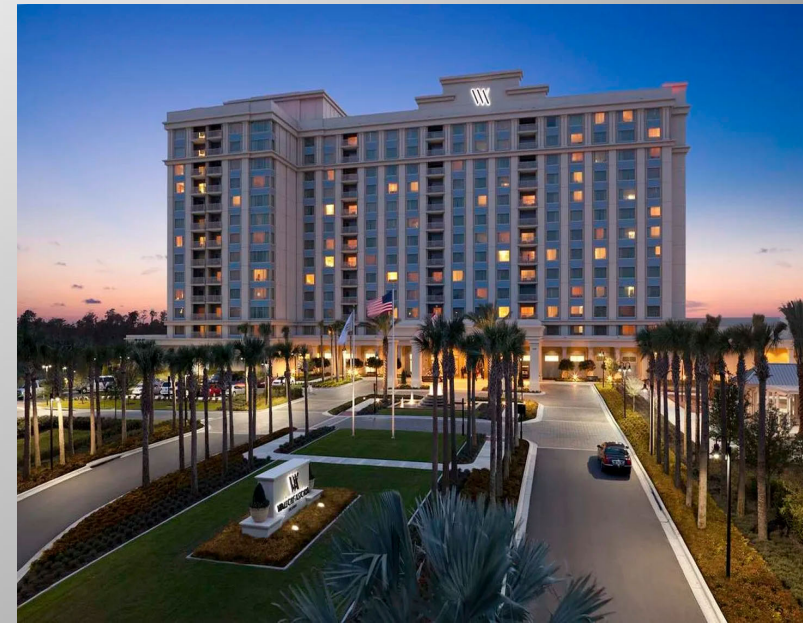
Operates 96% of the time at low or small flows



Flow rate (GPM)	Duration %	
0 – 5	87%	Low flows
5 – 10	9%	Small flows
10 – 15	3%	Medium flows
15 – 20	Less than 1 %	Large flows
20 – 25	Less than 0.02 %	Peak flows

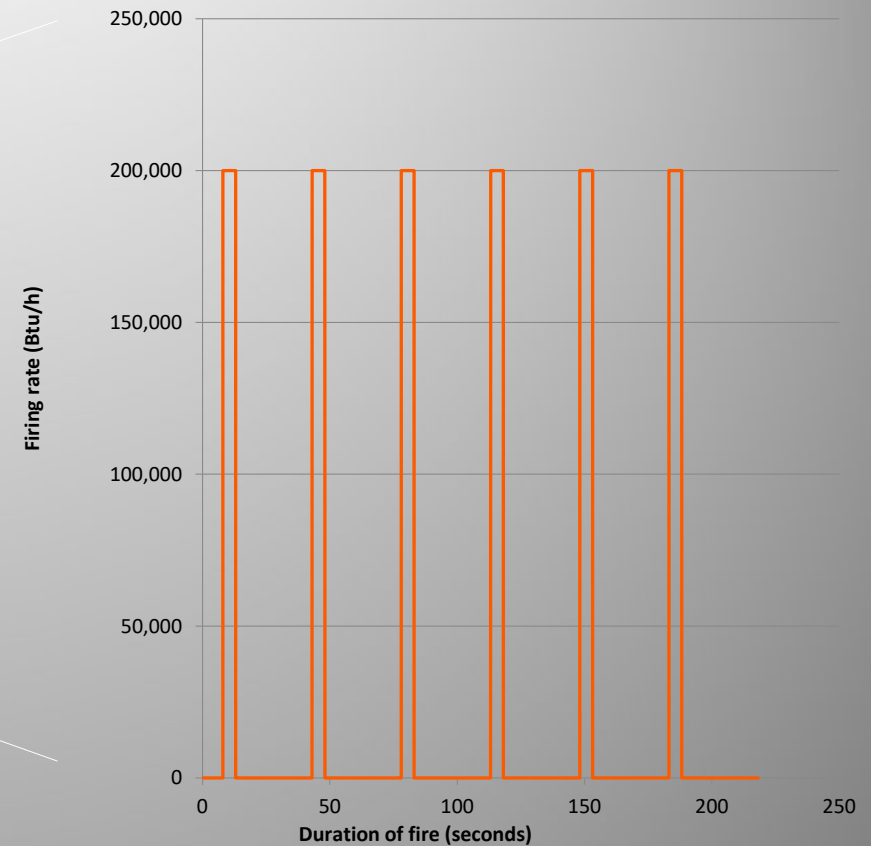
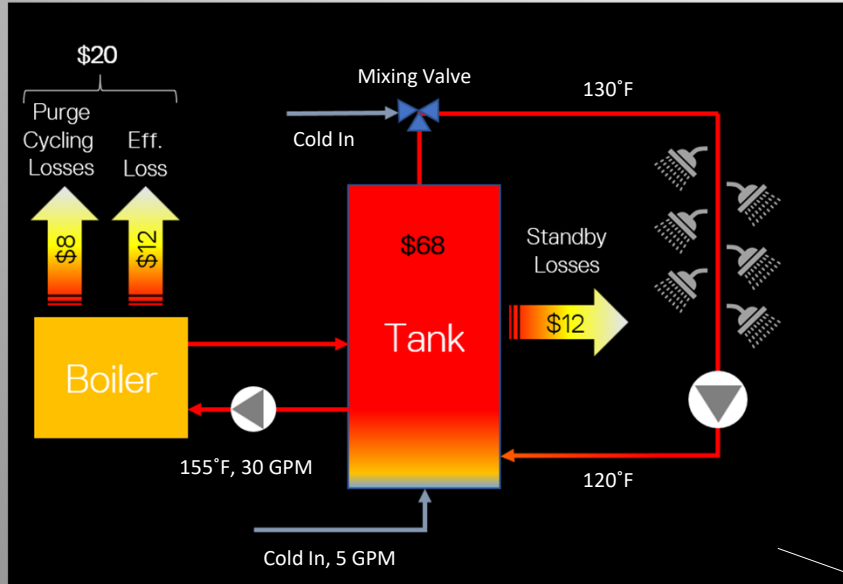
Waldorf Astoria – Bonnet Creek/Orlando, FL

Flow Type	Flow Rate (GPM)	Daily Duration (Min)	Percentage
Low Flow	< 10	1,254	87.1%
Medium Flow	10-25	170	11.8%
High Flow	25-40	14	1.0%
Peak Flow	40+	1	0.1%



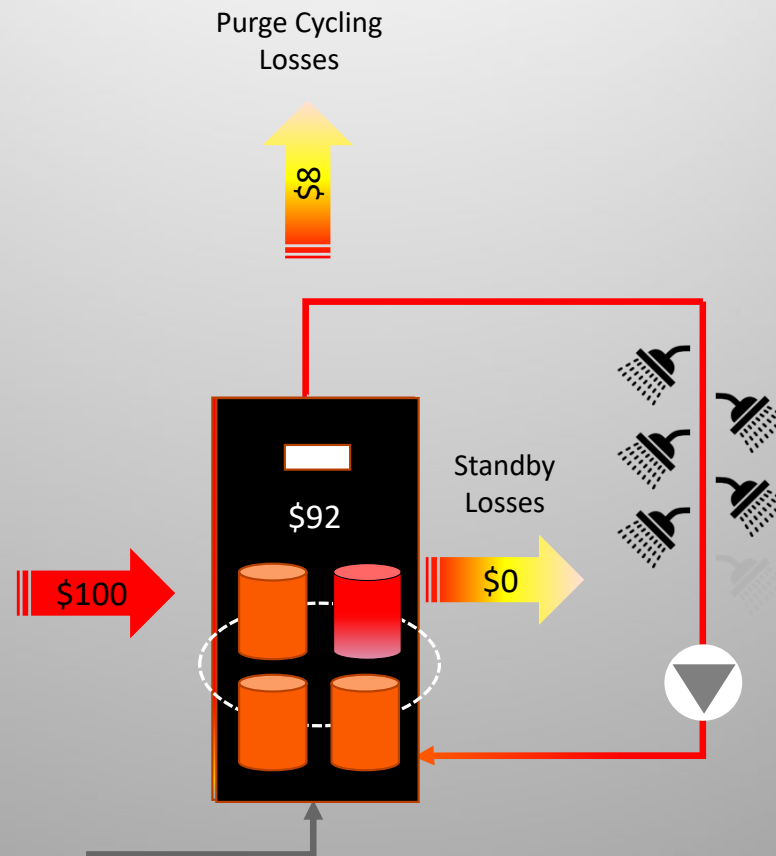
100 years of total mismatch

Traditional boiler or tank heaters are load matched 14 mins every 24 hours

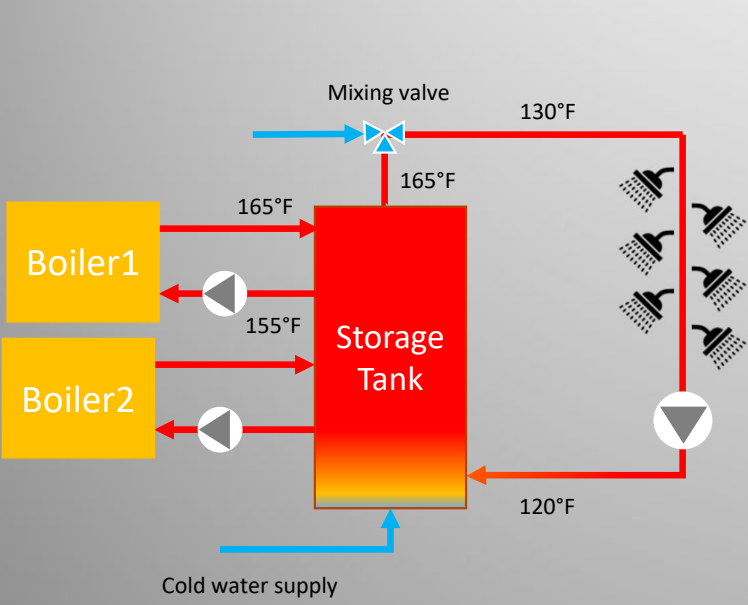


With Modular Tankless

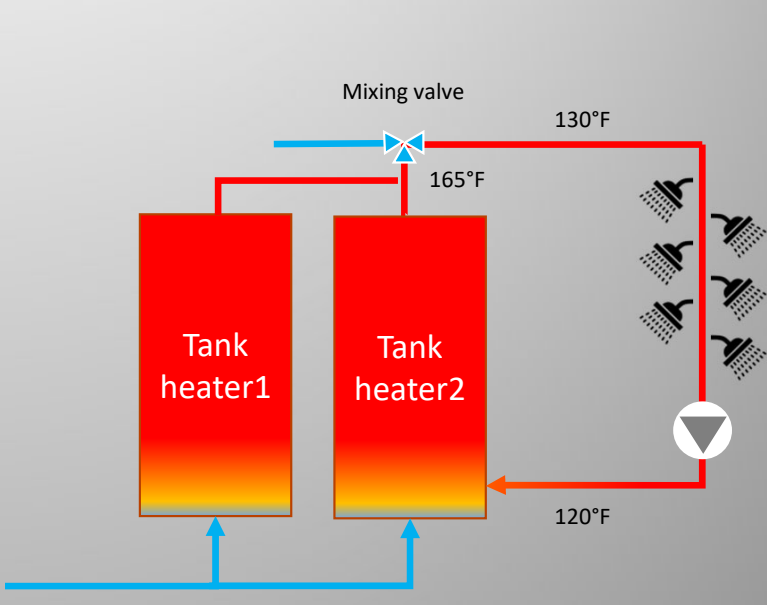
For every \$100 spent, \$92 is used



Conventional approach to heating water



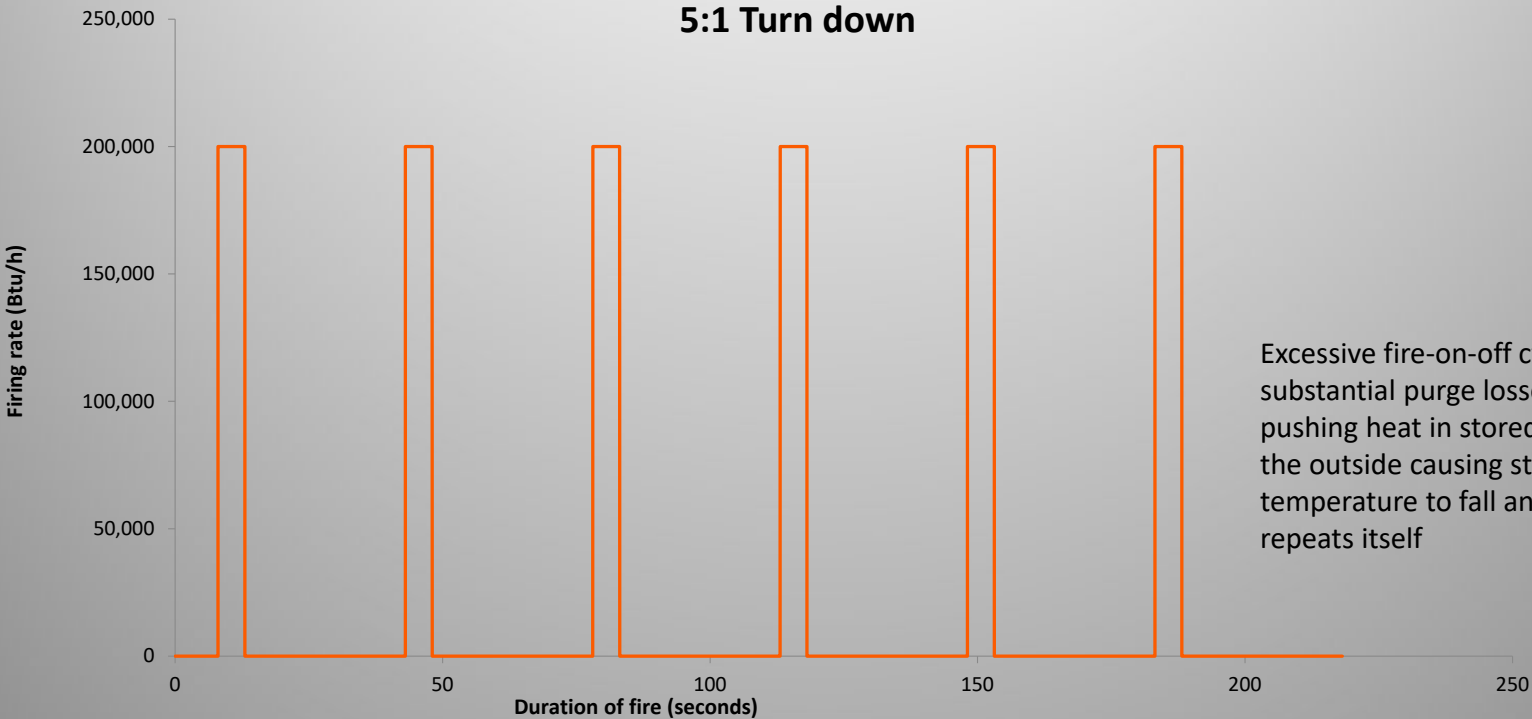
Multiple boilers with large storage



Multiple tank heaters

Effect of draw profile

Conventional equipment which is “sized” for peak flow short-cycles 23 out of 24 hours



How can we eliminate
master mixing valves?

Why is water stored so hot?

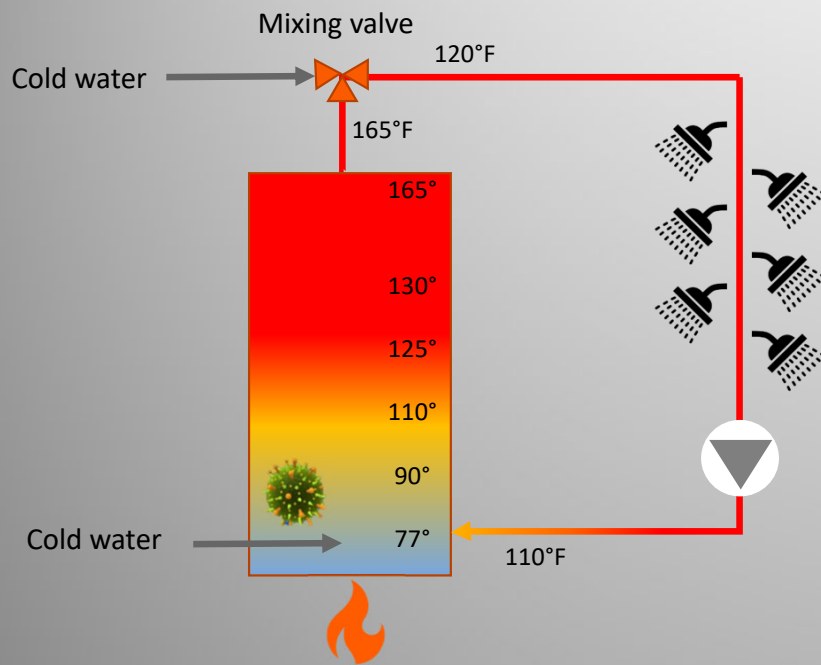
Historically set at 160°F, so that there was always “plenty” hot water when needed - the higher the temperature, the more 1st hour capacity of the system

After 1973 oil embargo, engineering society reduced max. required temp. to 140°F to help reduce energy consumption

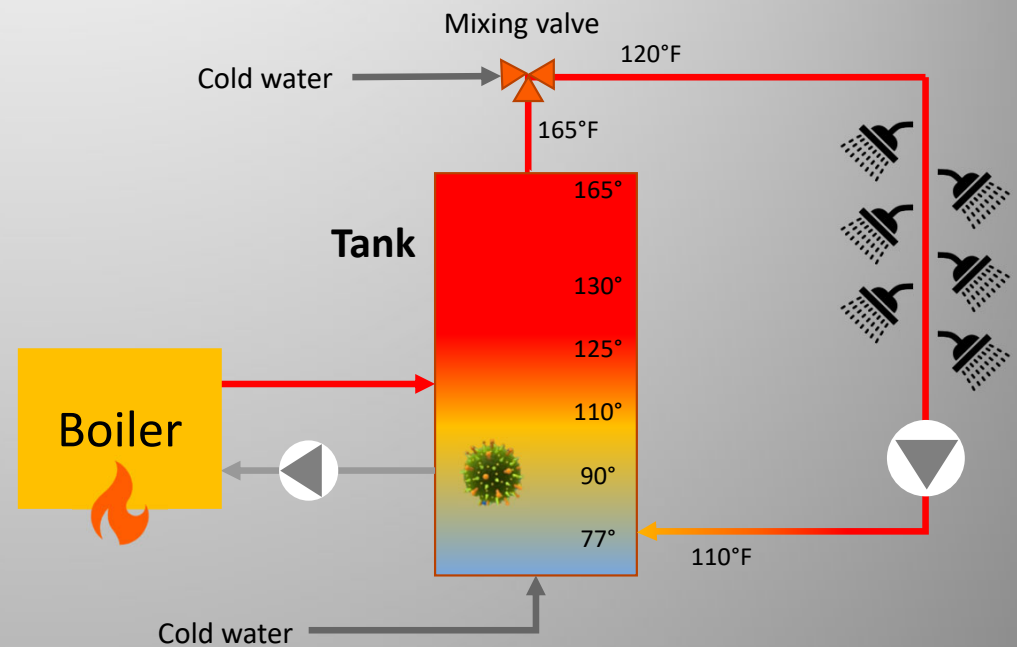
1981 Building Officials Code Association’s Basic Plumbing Code reduced definition of hot water to 110°F, but because of storage, the issue of bacteria arose

Tank Stratification – temperature variation

High level of temperature variation leads to optimal conditions for legionella growth*



Tank type water heater system

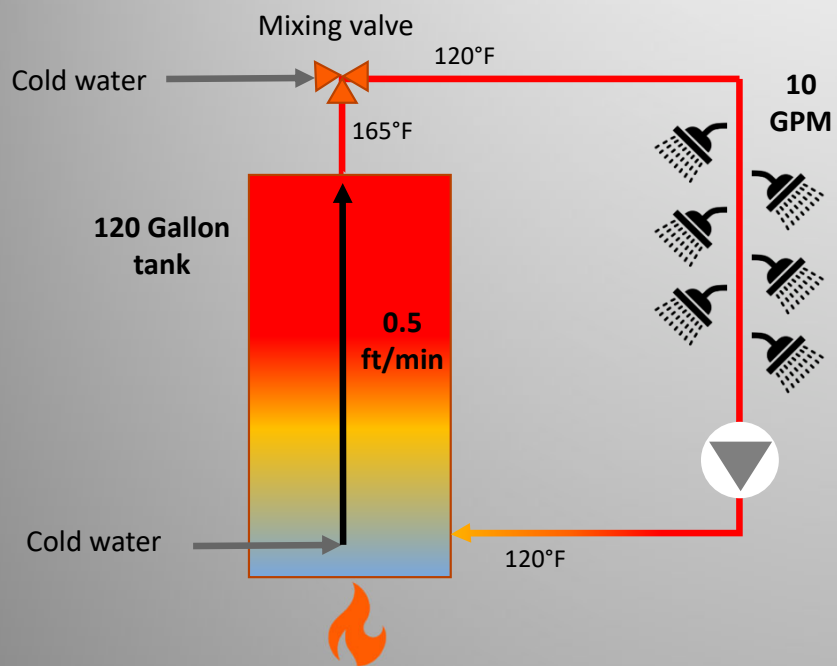


Boiler-storage tank type systems

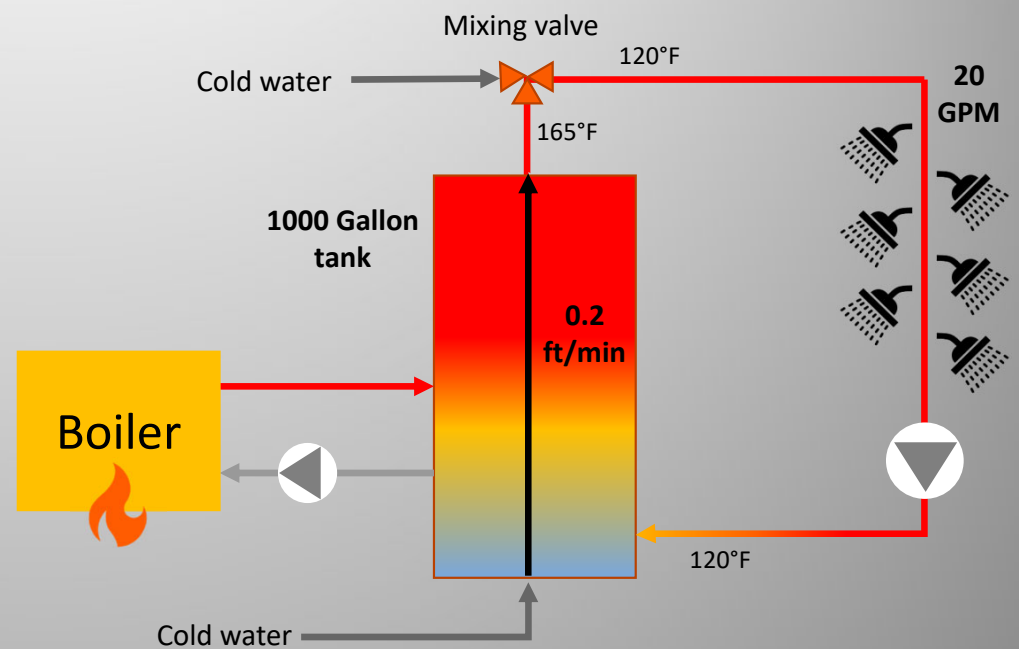
*<https://www.cdc.gov/legionella/about>

Tank – stagnation

Stagnant water creates optimal conditions for Legionella growth*



Tank type water heater system

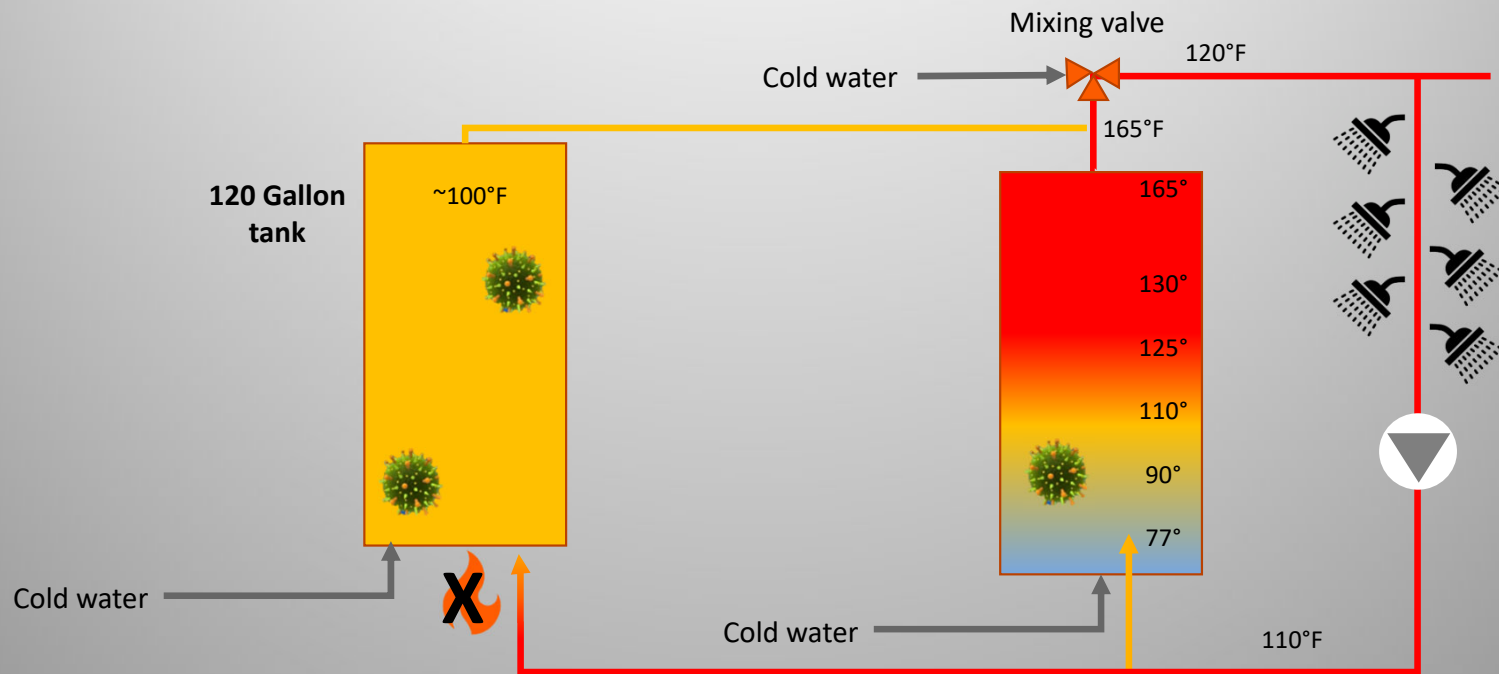


Boiler-storage tank type systems

*<https://www.cdc.gov/legionella/about>

Tank failure

Tank failure creates the ideal conditions for Legionella growth



Tank type water heater system (one failed)

Higher temperature – energy waste

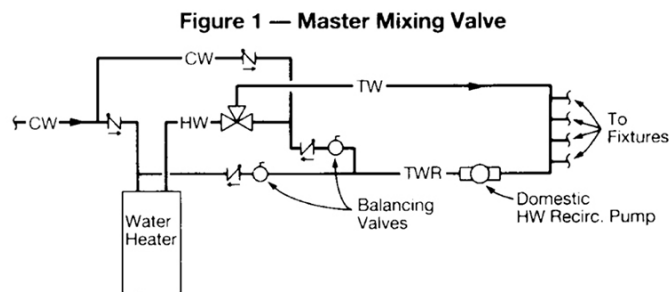
Reducing temperature can save energy and extend life of the equipment

For example, lowering setpoint temperatures from 140°F to 120°F can save up to 22% annually on energy cost

Legacy tempering standards

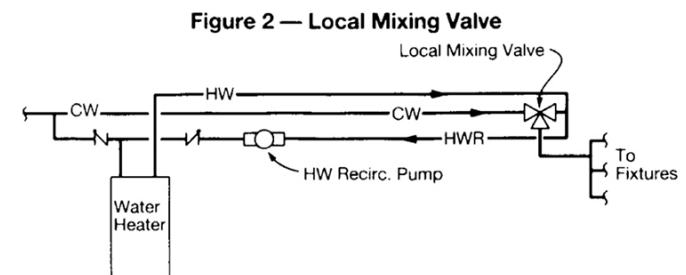
ASSE 1017

- Valves utilized at hot water source
- Recommended to be supplemented by point-of-use device at fixture
- NOT an anti-scald device



ASSE 1070

- Valves at individual fixtures
- Provide a maximum temperature supply at each fixture
- Anti-scald device



The ASSE 1082

Effective 2021 - Water Heaters with Integral Temperature Control Devices for Hot Water Distribution Systems

Equates tankless water heaters to thermostatic mixing valves and temperature limiting devices

Tankless water heaters certified to ASSE 1082 standards can control water temperature to the same tolerances as ASSE 1017 and 1070

No more external mixing valves are required if using tankless water heaters that are certified to ASSE 1082 standard

This also helps eliminate the need for tanks and associated space and costs

ASSE 1017 vs ASSE 1082

The permissible temperature variations are identical

ASSE 1017 ¹

Flow @ 10 psi ± 0.5 psi (69 kPa ± 3.4 kPa) Differential		Permissible Temperature Variation Above or Below Set Point	
GPM	L/min	° F	° C
3.0 - 5.0	11.4 - 18.9	3.0	1.7
Over 5.0 - 40.0	Over 18.9 - 151.4	5.0	2.8
Over 40.0	Over 151.4° F	7.0	3.9

ASSE 1082 ²

Maximum Flow Rate (Q) at a +70°F (+38.9°C) Temperature Rise		Maximum Permissible Variation from Initial Output Temperature	
GPM	L/min	°F	°C
0 < Q ≤ 5	(0 < Q ≤ 18.9)	±3	(±1.7)
5 < Q ≤ 50	(18.9 < Q ≤ 189.3)	±5	(±2.8)
Q > 50	(Q > 189.3)	±7	(±3.9)

¹ ASSE Standard #1017-2009 "Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems"

² ASSE Standard #1082-2018 "Performance Requirements for Water Heaters with Integral Temperature Control Devices for Hot Water Distribution Systems"

What does the plumbing codes say?

2021 International Plumbing Code[®] (IPC)

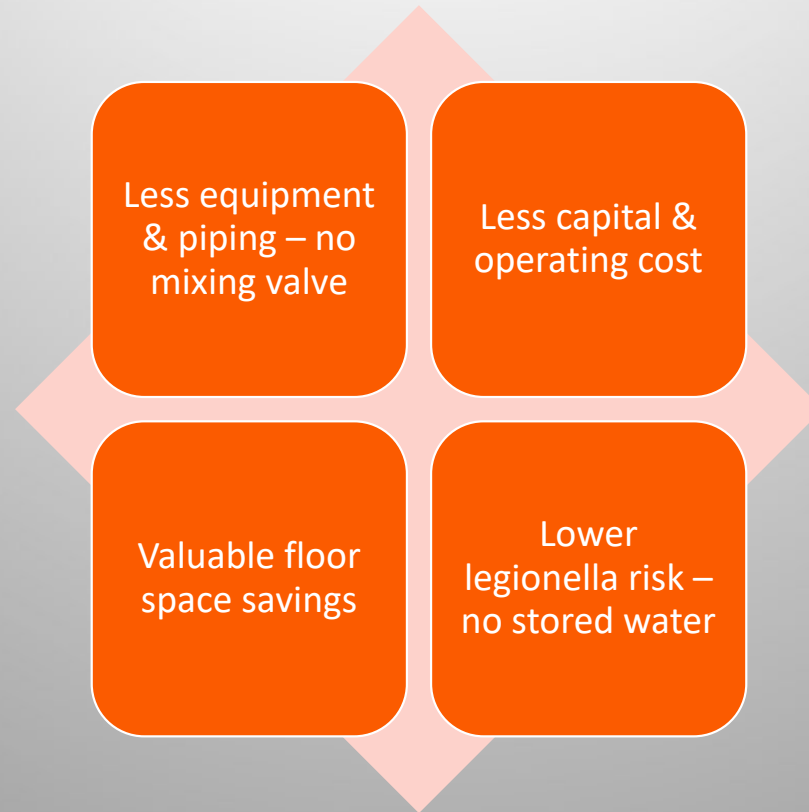
- Tempered water can be safely controlled without an external mixing valve
- Understand temperature control of certain water heaters exceeds traditional tanks

607.1.1 Temperature limiting means. A thermostat control for a water heater shall only serve as the temperature limiting means for the purposes of complying with the requirements of this code for maximum allowable *hot* or *tempered water* delivery temperature at fixtures where the water heater complies with ASSE 1082 or ASSE 1085.

607.1.2 Tempered water temperature control. *Tempered water* shall be controlled by one the following:

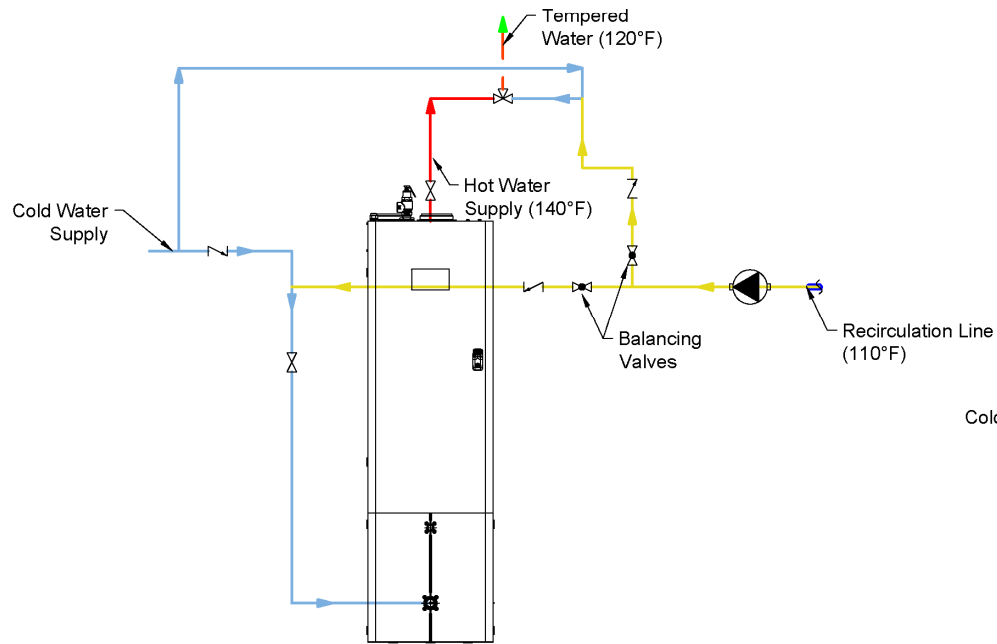
1. A limiting device conforming to ASSE 1070/ASME A112.1070/CSA B125.70 and set to not greater than 110°F (43°C).
2. A thermostatic mixing valve conforming to ASSE 1017.
3. A water heater conforming to ASSE 1082.
4. A water heater conforming to ASSE 1084.

Why utilize ASSE 1082?



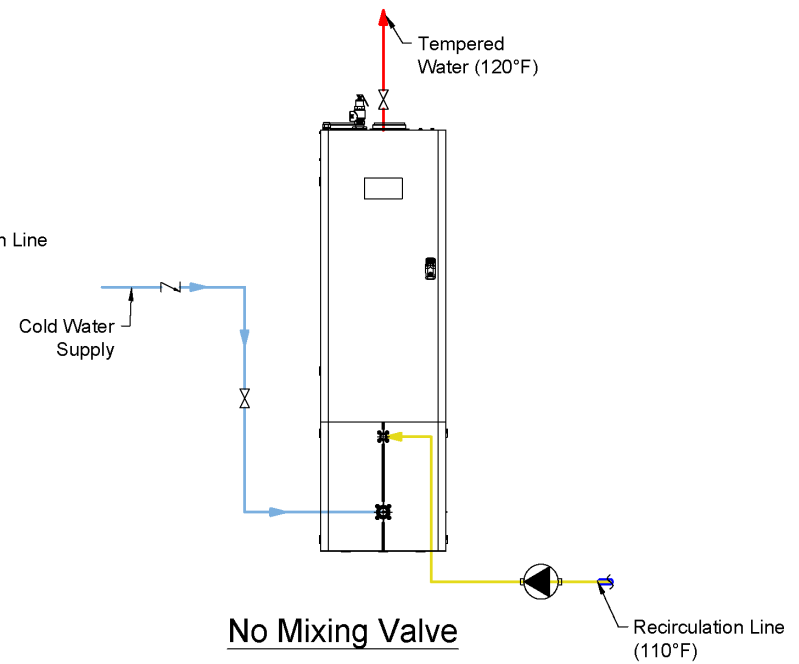
Comparing piping systems

ASSE 1017



With Mixing Valve

ASSE 1082



No Mixing Valve

Benefits of using ASSE 1082

Cut CAPEX 10% or more
- by eliminating mixing
valve depending on
style or type of valve
eliminated

Save 40% on energy
costs by lowering
setpoint temperatures,
not storing water, and
heating on demand

Improve overall hot
water system reliability
by eliminating mixing
valves and balancing
valves

By eliminating hot water storage, floor space needs can be cut by 83%

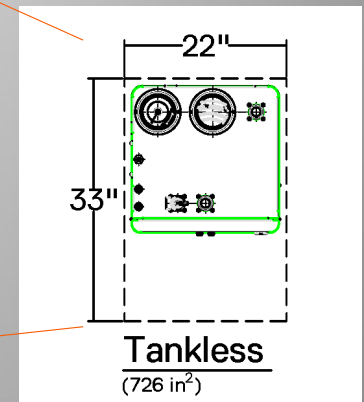
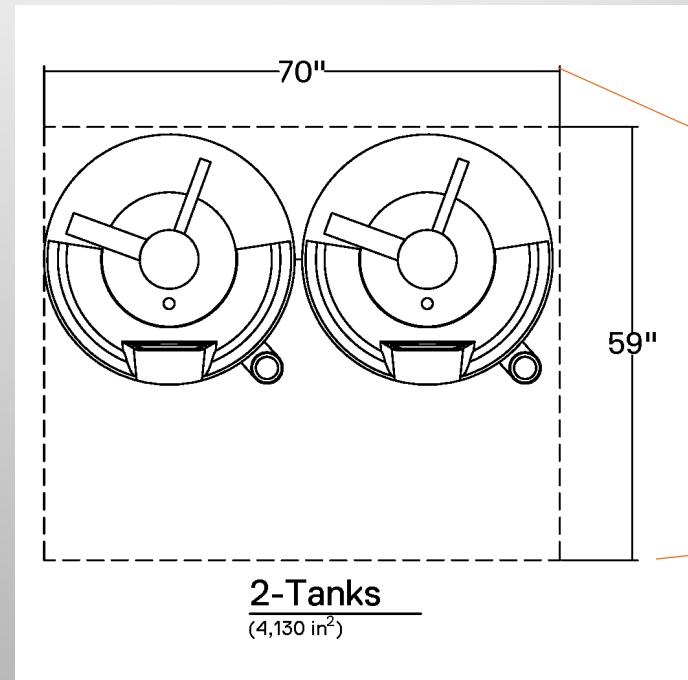


Illustration for a typical restaurant or lodging application

QUESTIONS?