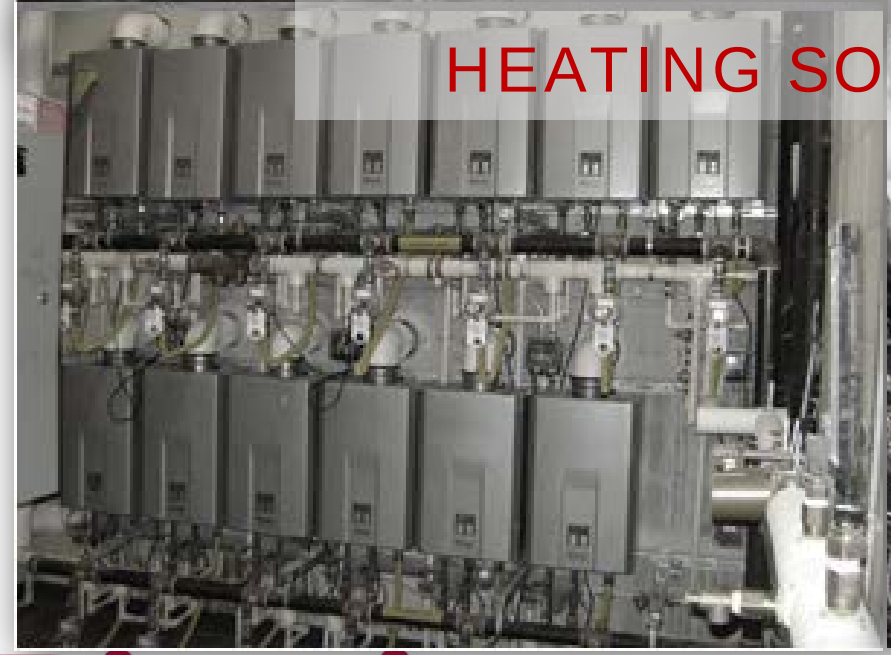
TANKLESS WATER HEATER HEATING SOLUTIONS



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TANKLESS WATER HEATERS

Revision 2 - 03.15.17

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TANKLESS WATER HEATERS

Purpose and Learning Objectives

Purpose: To provide an overview of tankless water heating technologies, including the features and functions, the energy and environmental benefits of a tankless system, as well as a discussion of how these benefits can be utilized in Commercial applications.

At the end of this program, participants will be able to:

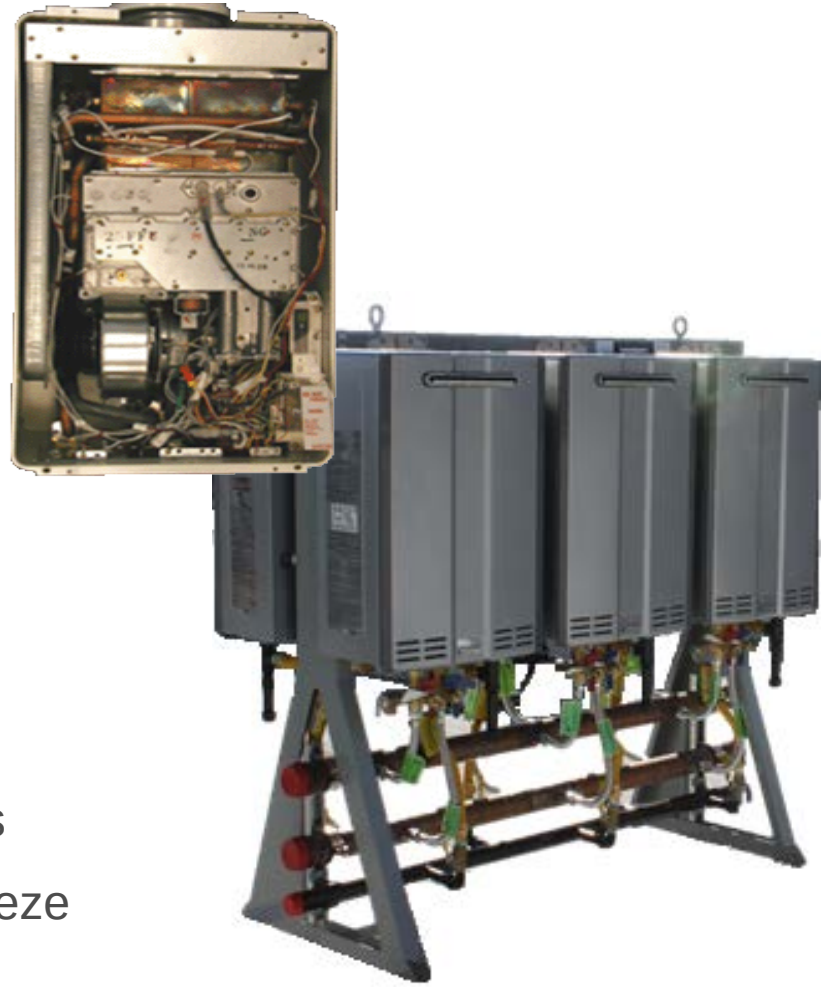
- explain how a tankless water heater works in comparison to other water heaters
- understand the advantages of specifying a tankless system as part of a sustainable design strategy
- state the components, operation, and energy saving benefits of tankless water systems and the acceptable circulating methods
- describe the many environmental benefits of using a tankless water heater over other water heating technologies, and

Features and Benefits of Tankless Water Heaters

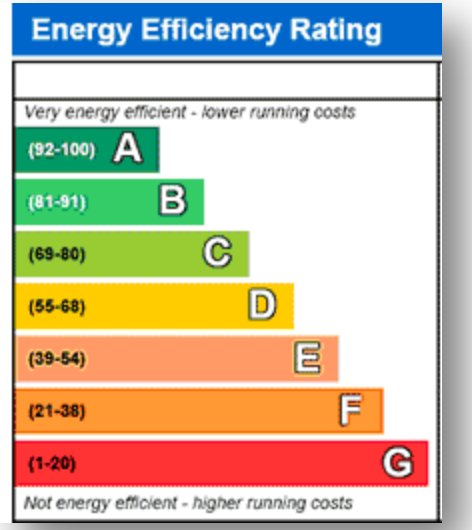
Introduction

Why consider tankless?

- Energy savings/space savings
- Green features
- Lower operating costs
- Tax incentives / rebates
- Ease of installation and maintenance
- Advanced Load Tracking (turndown ratio)
- Safer water temperatures
- Some provide no combustion air concerns
- Some tankless units are available with freeze protection
- Built in redundancy with multiple tankless engines



Energy Factor



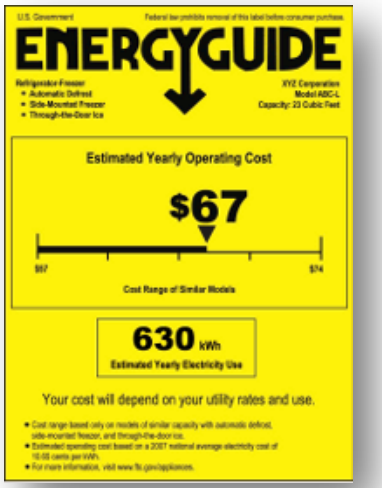
The energy factor (EF) indicates a water heater's overall energy efficiency based on the amount of hot water produced per unit of fuel consumed over a typical day.

This includes:

- **recovery efficiency:**
  - how efficiently the heat from the energy source is transferred to the water
- **standby losses:**
  - the percentage of heat loss per hour from the stored water compared to the heat content of the water (water heaters with storage tanks), and
- **cycling losses:**
  - the amount of heat that is lost as the water circulates through a water heater tank, or inlet and outlet pipes.

Features and Benefits of Tankless Water Heaters

Energy Factor



The higher the energy factor, the more efficient the water heater. However, higher energy factor values don't always mean lower annual operating costs, especially when fuel sources are compared.

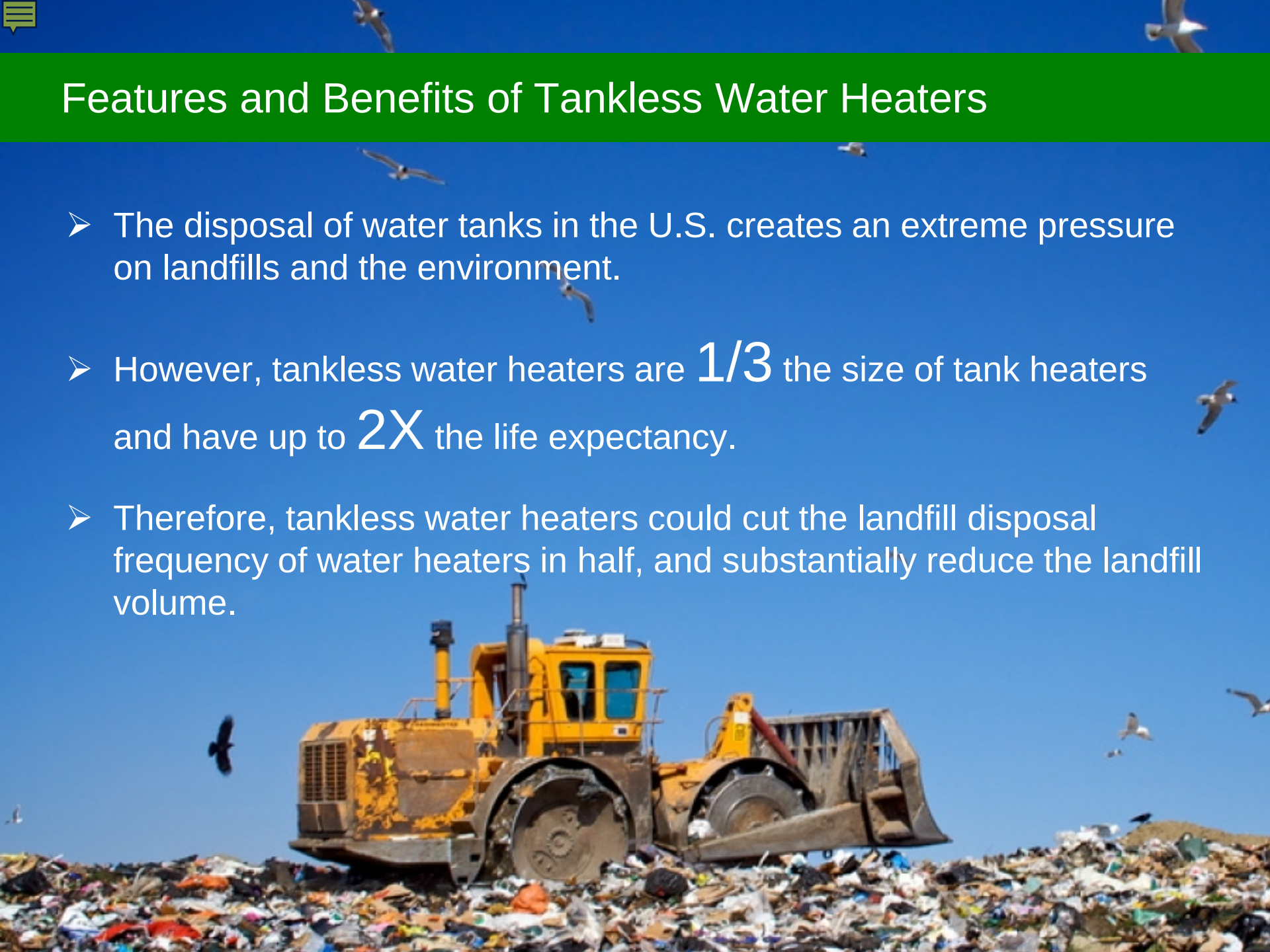
It is recommended not to choose a water heater model solely on its energy factor; but also

- Size of the heater
- Fuel type
- Overall cost
- First hour rating

Source: www.energysavers.gov

Features and Benefits of Tankless Water Heaters

- The disposal of water tanks in the U.S. creates an extreme pressure on landfills and the environment.
- However, tankless water heaters are 1/3 the size of tank heaters and have up to 2X the life expectancy.
- Therefore, tankless water heaters could cut the landfill disposal frequency of water heaters in half, and substantially reduce the landfill volume.



Features and Benefits of Tankless Water Heaters

Tank Water Heaters (The Old Way)		Tankless (The Future)
Energy Factor	48% - 62% (Average)	80% - 87% (Title 24 Compliant)
Recovery Efficiency	0.76 to 0.82	Continuous Flow (No Recovery Needed)
1ST Hour Rating	30 – 100 gallons	Never Ending Supply (However 1 unit can do up to 510 GPH)
Life Expectancy	5-13 years (Average 9)	Up to 20 years
Warranty	3-10 years Average	12 Years Heat Exchanger, 5 Parts, 1 Labor
Ignition	Standing Pilot	Electronic Ignition – No Standing Pilot
Safety Devices	Thermocouple	Over 1 Dozen Safety Devices (All Monitored by Computer)

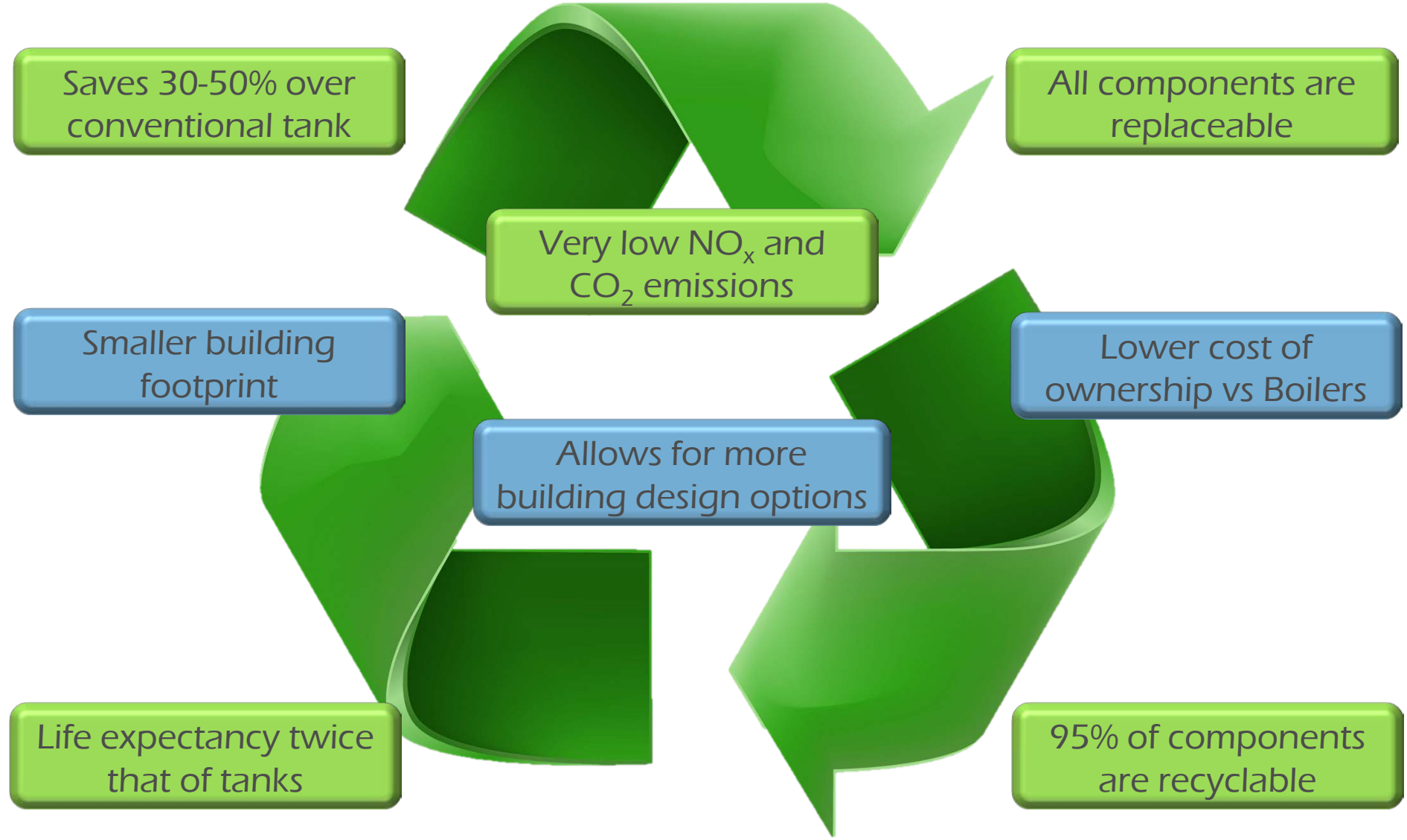
Gas Consumption

- Pilot is constantly using gas
- Every time hot water is used, the end user is paying to *Re-Heat* the several gallons of water remaining inside
- *When a tap is turned on for even 10 seconds, cold water is diluting the hot water you just paid to heat by as much as 25%*

Gas Consumption

- Gas is only used when hot water is demanded
- When fixture (s) are shut off unit returns to the standby mode.
- Fully Modulating Gas valve uses only the gas needed to heat the water

Features and Benefits of Tankless Water Heaters



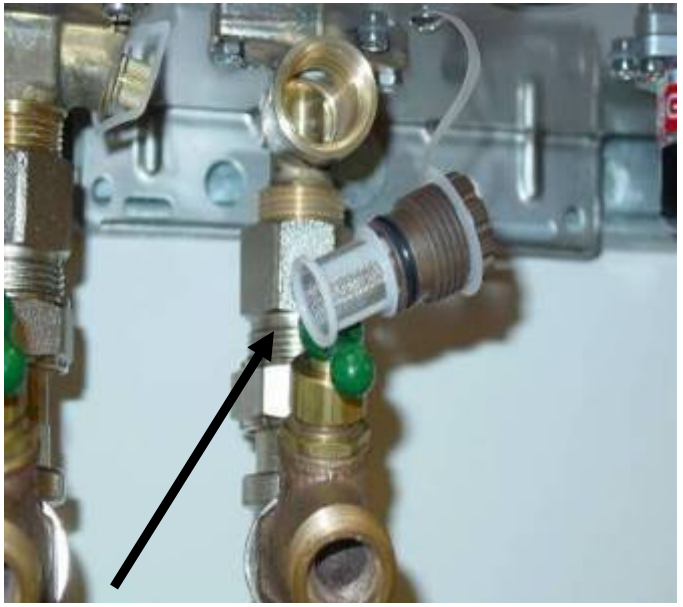
Features and Benefits of Tankless Water Heaters

Ease of Maintenance

Recommended periodically is the visual inspection of the water heater compartment, burner, and venting.

Most tankless water heaters include a filter on the cold inlet connection. It is recommended that the inlet water filter be cleaned prior to initial use and annually thereafter. If the owner experiences a problem with low hot water flow, this would be the first thing to check.

Some manufacturers provide a warning code on the controller that indicates when flushing is required. **An authorized service professional can flush the heat exchanger in approximately one hour.**



Water Filter - Before removing the filter for cleaning, ensure the water is turned off and the system has been drained by opening a hot water tap.

Tankless Technologies

Introduction

Innovations in technology led to the development of today's tankless units that offer an endless supply of hot water, with direct electronic ignition and fully modulating gas valves.

In this next section of the course, a review of topics pertaining to tankless systems is presented, including:

- components
- operation
- temperature controllers
- gas/water pressure requirements
- venting, and
- circulation methods.

Tankless Technologies

Sequence of Operation

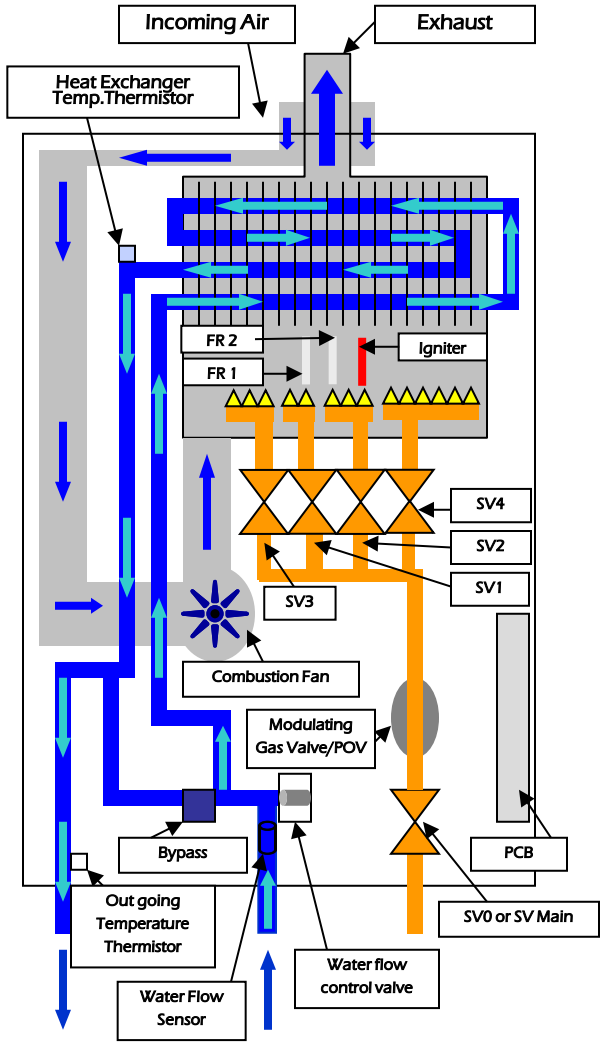
First, the temperature is set on the remote controller (recommended temperature is between 115-120 degrees Fahrenheit).

The hot water tap opens and water begins to flow.

Next, the turbine spins and sends a signal to the PC board via a flow sensor. The PC board determines the water flow, firing rate, and temperature of the water.

Then, the combustion fan motor starts and the burner is ignited by direct electronic ignition. Tankless units have no standing pilot.

The unit fires while the flame rod senses flame in the burner. When the hot water tap is turned off, the unit returns to standby mode.



Tankless Technologies

Temperature Controllers

Some tankless water heaters include a temperature controller which provides the ability to adjust the water temperature. It also performs diagnostics and alerts the user when maintenance is required.

When fixtures are in use, the controller provides the ability to check flow rate and water temperature. Note that some units provide temperature controls within +/- 2 degrees.

In many cases, indoor units include an integrated controller on the front panel, whereas outdoor units include a separate controller to be installed in an indoor location.

Some units provide interface with typical BMS systems or remote warning signal indicators.

Integrated Controller

Tankless Technologies

Gas and Water Pressure Requirements

Gas pressure for natural and propane gas is measured in inches of water column, expressed as WC.

Tankless units have a gas delivery pressure range from 4 to 10.5 inches WC for natural gas, and 8 to13.5 inches WC for propane.

The water pressure requirements for tankless heaters are 20 psig to 150 psig. Psig (pound-force per square inch gauge) is a unit of pressure relative to the surrounding atmosphere.

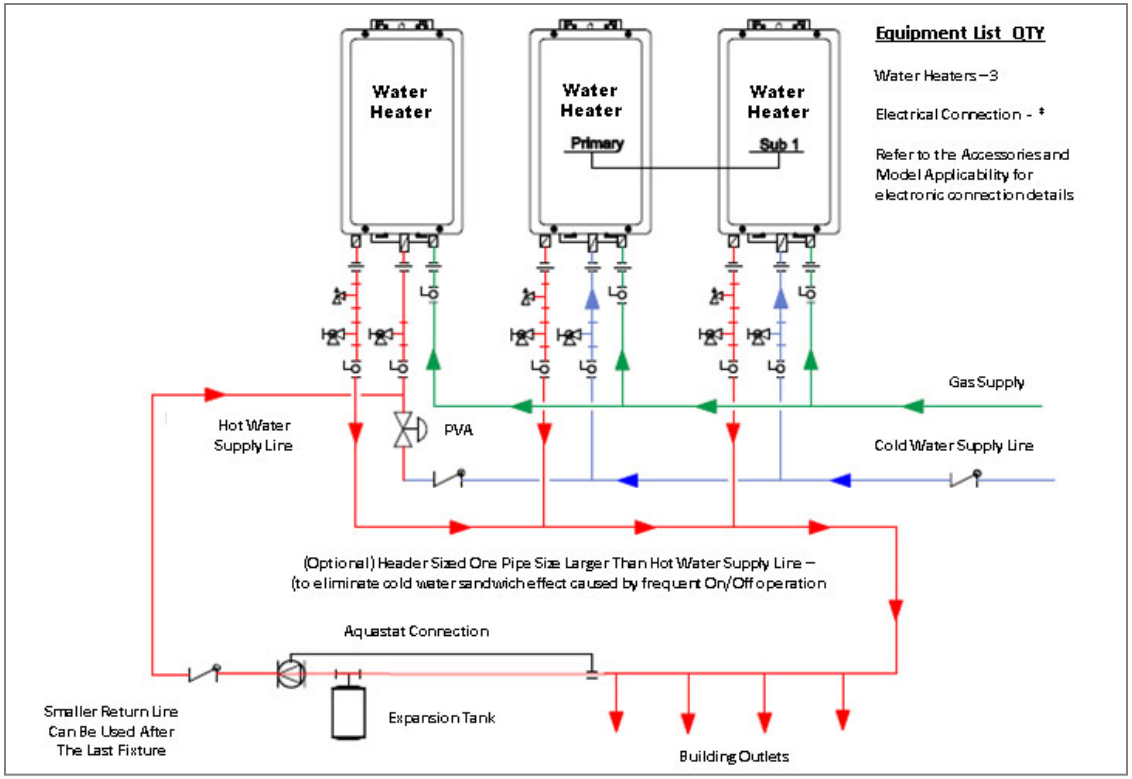
Tankless Technologies

Circulation Methods

Circulation methods of tankless water heaters vary.

This section of the course ends with a review of the acceptable circulation methods including:

- circulating through the tankless water heater
- circulating through a small tank, and
- demand type circulaton systems.



For this application: Pump should be controlled by an aquastat, timer or combination aquastat and timer. Pump to be sized to maintain circulation loop temperature. The pump should be sized to overcome the pressure loss through the tankless water heater and supply/return piping in the circulation loop. Pump to be of bronze or stainless construction. PVA to remain at factory default setting. Circulation unit should not be connected electronically to the multiple system controller(s).

Tankless Technologies

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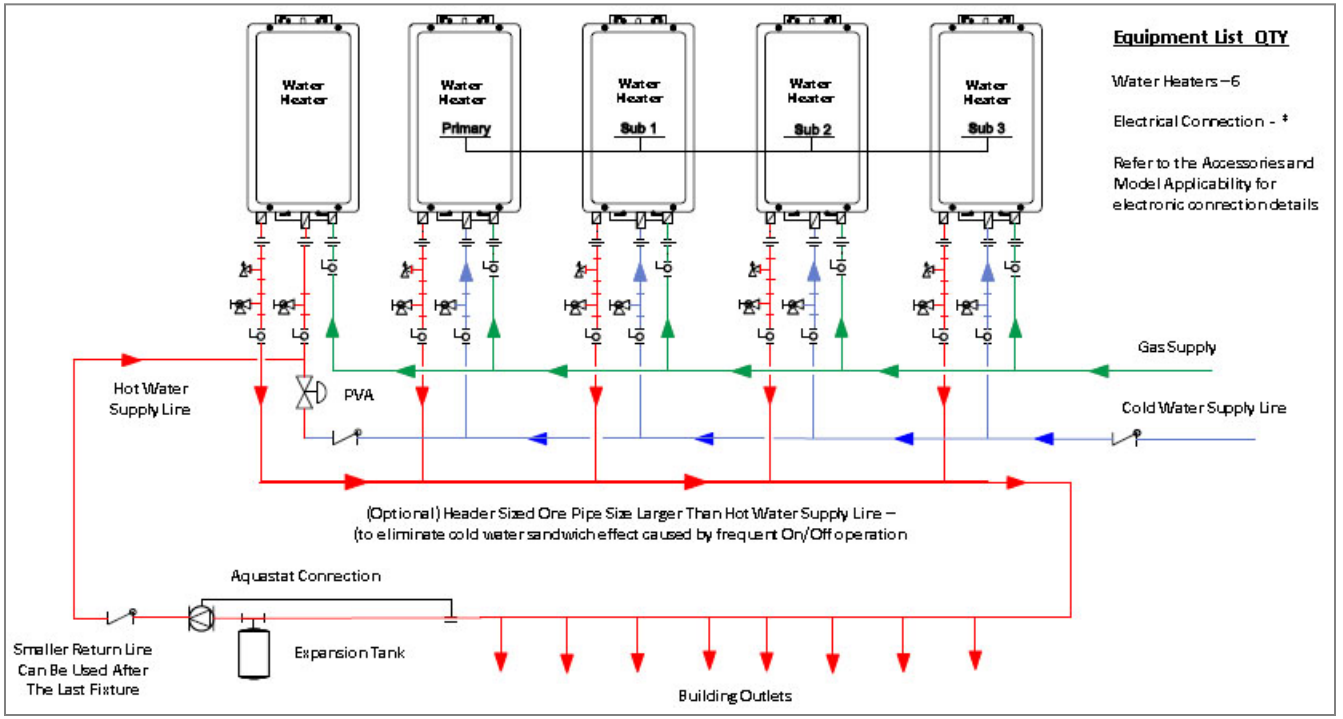


Illustrated above is a typical commercial application that has a requirement for hot water at each fixture with minimal delay. Note the number of fixtures as indicated by the arrows.

Tankless Technologies

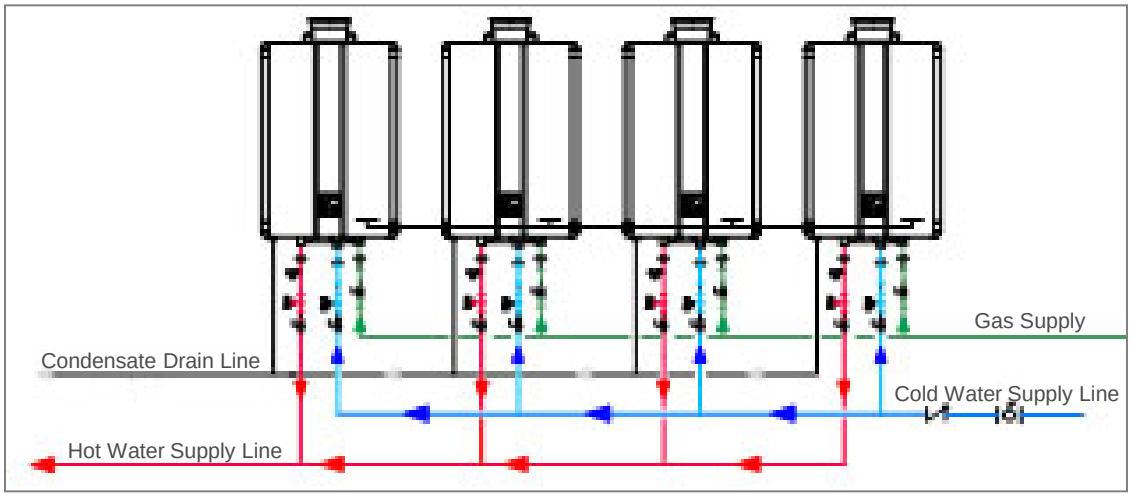
Multiple Unit Plumbing Diagram

Note: Condensate piping shall be CPVC or PVC material and shall not be smaller than the drain connection on the appliance.

Components of the condensate drainage shall be CPVC or PVC material. All components shall be selected for the pressure and temperature rating of the installation.

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes.

Condensate must be disposed of according to local codes.



This type of application is used where a high volume of hot water is needed based on the fixture count, fixture type, and size of the structure; however, because there is not a recirculation system installed, there may be a lag time before hot water is supplied to the fixtures.

Tankless Technologies

Condensing Tankless Water Heaters

As a result of new technologies, condensing tankless water heaters are available in the market that deliver up to 96% thermal efficiency with an energy factor rating of .93. For even greater capacity, condensing tankless water heaters can be banked.

These units boast an industry leading activation rate of 0.4 gpm and lower minimum gas input rate of 10,000 Btu. This allows ignition for smaller amounts of water at higher incoming temperatures. Water flow deactivation is 0.3 gpm.

Delivering superior energy efficiency and performance, these new products are ENERGY STAR qualified and eligible for various utility and tax incentives.

Tankless Technologies

Condensing Technology

Condensing appliances capture the extra heat (or latent heat) before it escapes into the vent system and transfers it, in the case of a water heater, into the water being heated.

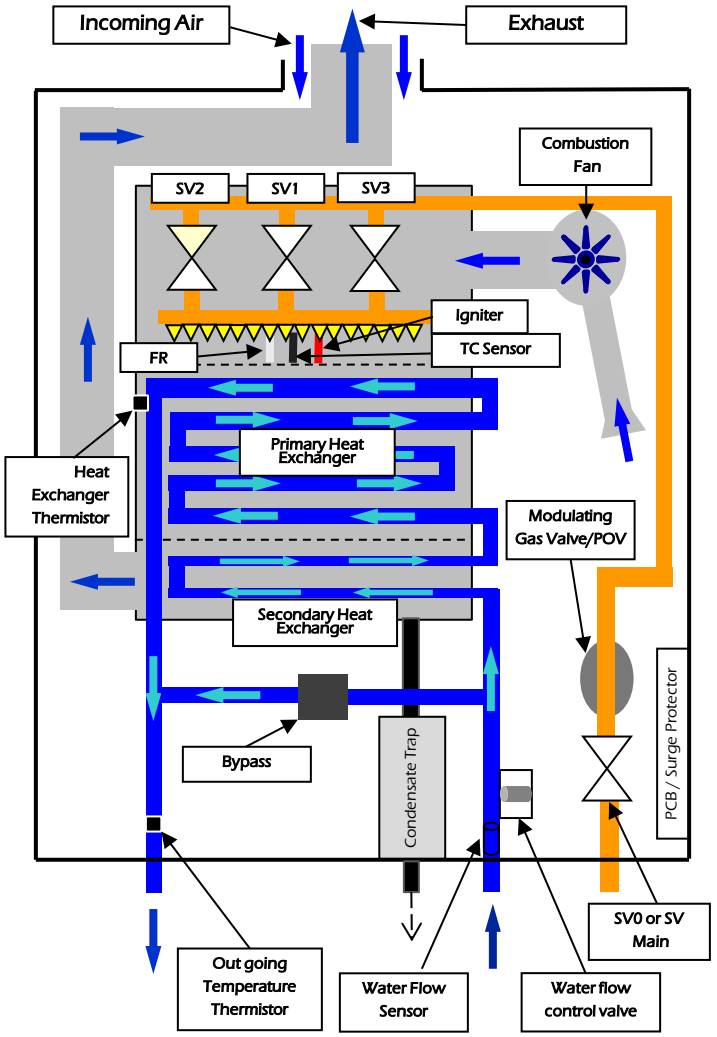
Condensation occurs when the water created in the combustion process cools below the dew point. As this water vapor condenses, it combines with other combustion by-products to form an acid solution.

Condensing appliances are designed to properly drain this condensation.

When vented combustion occurs, there will always be some level of heat loss in the form of exhaust exiting through the vent system.

Note that the thermal efficiency of a gas-fired appliance is measured by how much heat is actually transferred to the heating medium (water, air, etc.) and how much is lost through the vent system.

Sequence of Operation: Indoor Unit



Tankless Technologies

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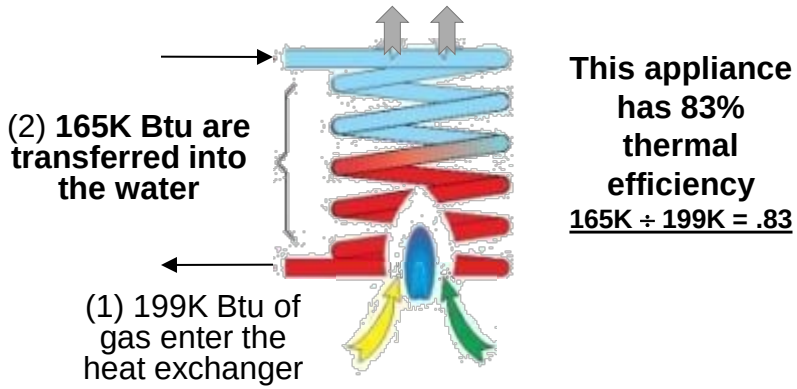
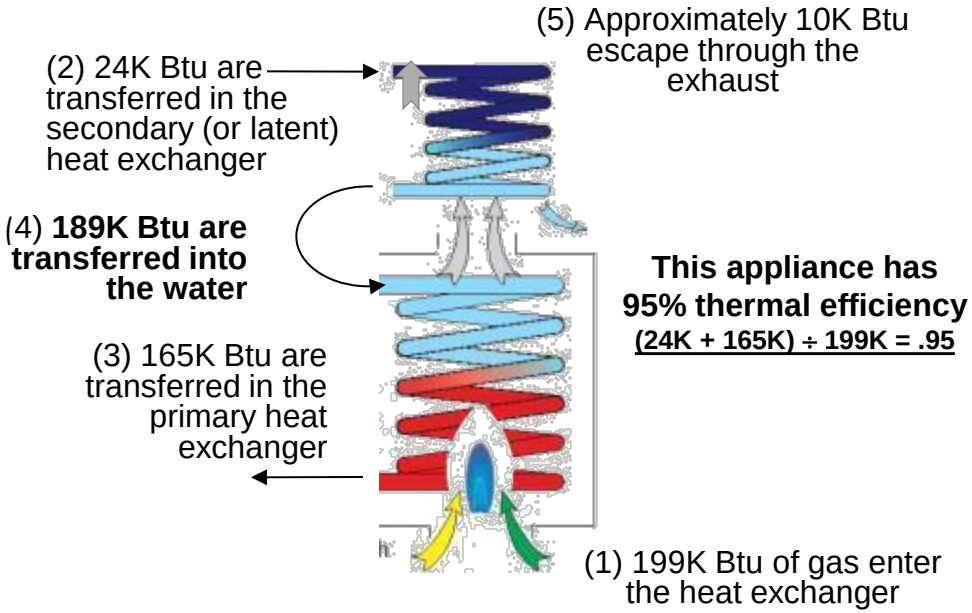
Tankless Technologies

Condensing Technology vs. Non-Condensing Technology

Non-condensing Water Heater



Condensing Water Heater



Non-Condensing Water Heater: This appliance has 83% thermal efficiency 165K ÷ 199K = .83

Condensing Water Heater: This appliance has 95% thermal efficiency (24K + 165K) ÷ 199K = .95

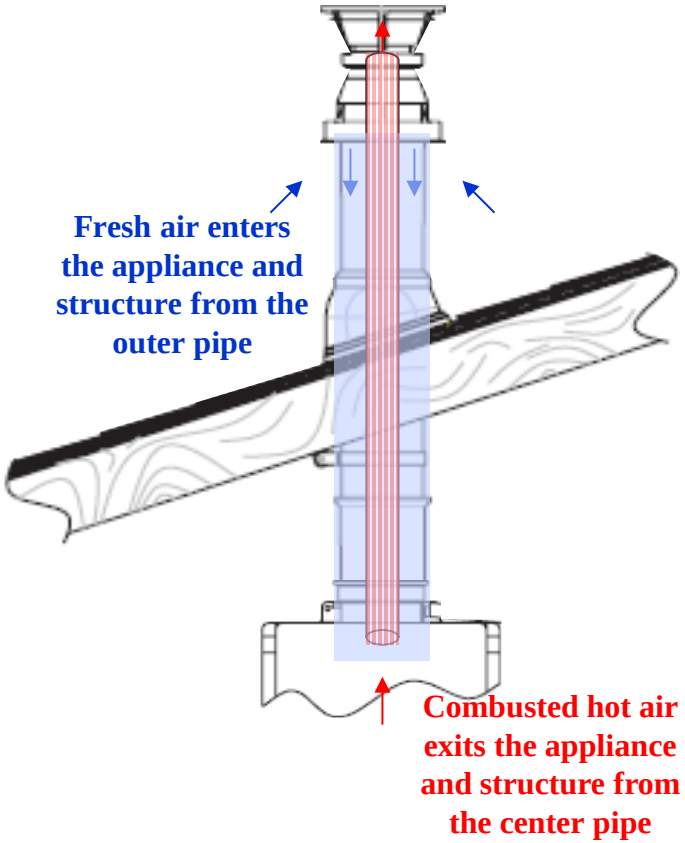
Tankless Technologies

Venting System

Some tankless water heaters use concentric venting (pipe within a pipe) which allows zero clearance from combustibles around vent penetrations.

Cautions:

- Do not connect the venting system with an existing vent or chimney.
- Do not common vent with the vent pipe of any other water heater or appliance, and
- Do not use a Class B vent.



Example of a balanced flue system. The incoming air keeps the pipe cool, allowing zero clearance for the venting system.

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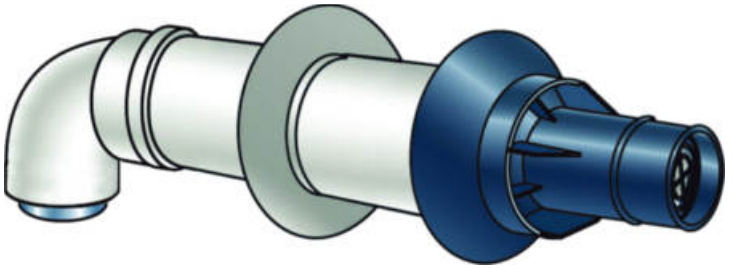
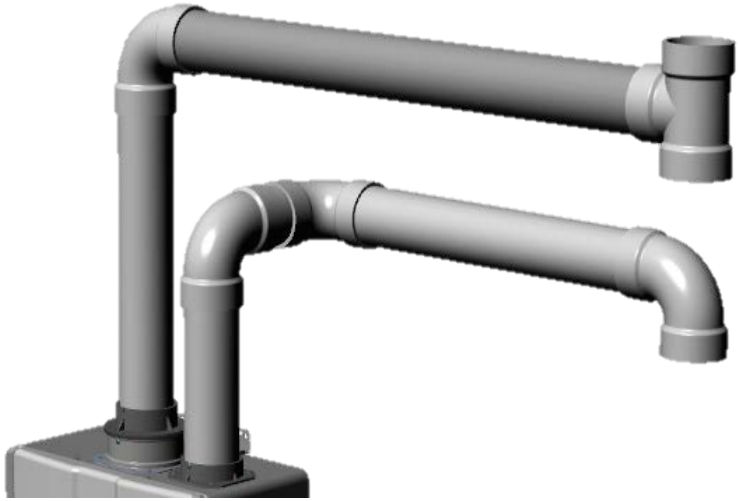
Intake / Exhaust Guidelines



Indoor tankless water heaters are direct vent water heaters and therefore are certified and listed with the vent system. It is important that only vent components that are certified and listed with the water heater model should be used.

Some vent systems use gaskets to ensure all seals are secure; therefore, no gluing or cure time is required.

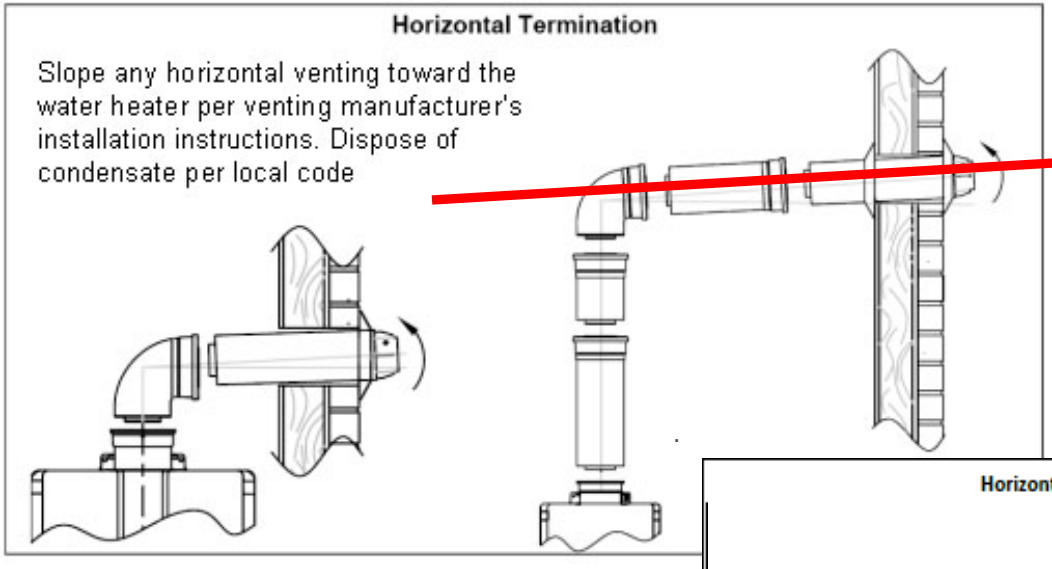


Depending on the type of water heater being used, concentric (pipe within a pipe) vent or PVC venting may be used.

Some Commercial systems use Common Vent (CV) design specially for the application and appliance.

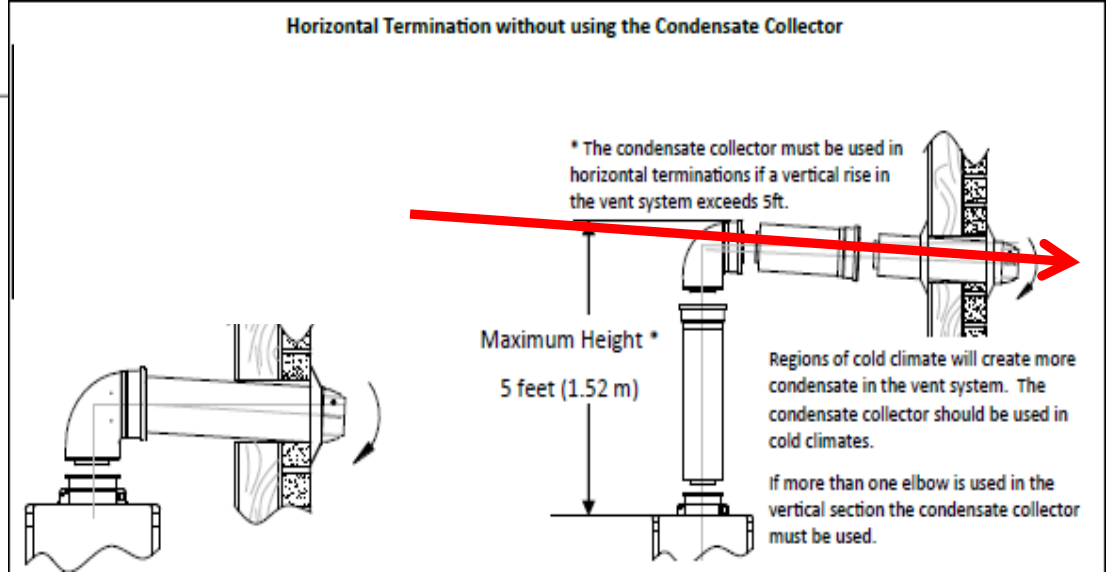
Tankless Technologies

Horizontal Termination



Condensing Models

Non-Condensing Models



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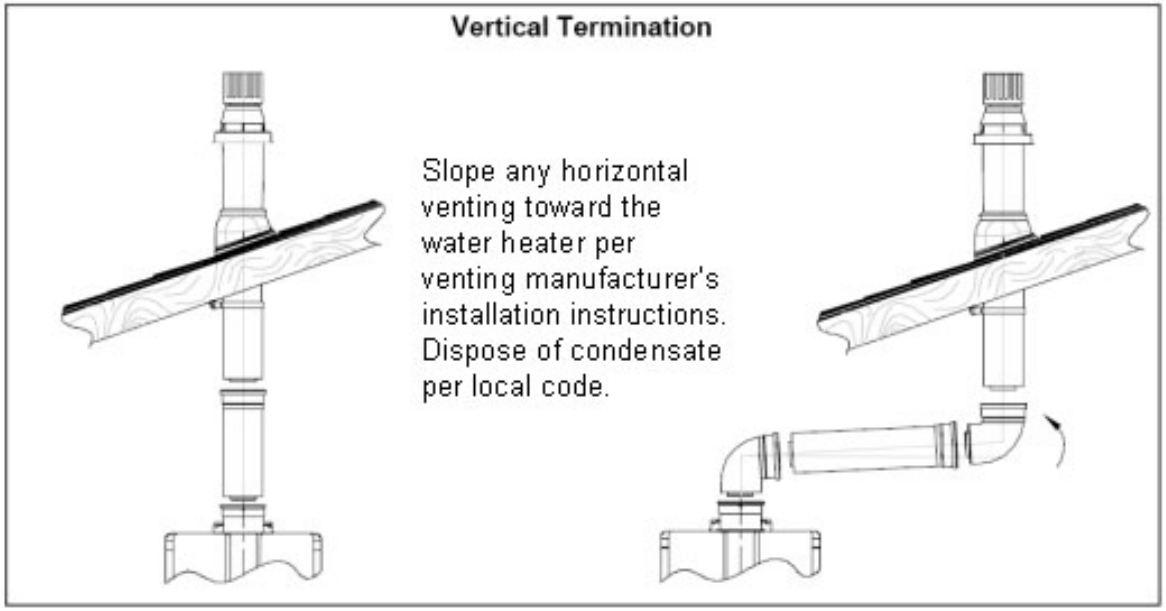
Vertical Termination

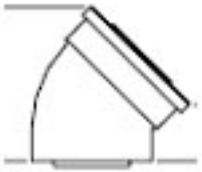
A vertical termination is illustrated in this diagram. Condensing tankless water heaters have an integrated condensation trap inside the water heater; as a result, no condensation collector in the vent system is needed.



Tankless Technologies

Indoor - Air Intake and Exhaust Vent Pipe Length

Each 90° elbow is equivalent to 6 feet of vent pipe



Each 45° elbow is equivalent to 3 feet of vent pipe

Vent Length Calculator

Total equivalency cannot exceed 41 feet.

Add the total length of all vent pipe and the equivalency of all bends.

In this example:

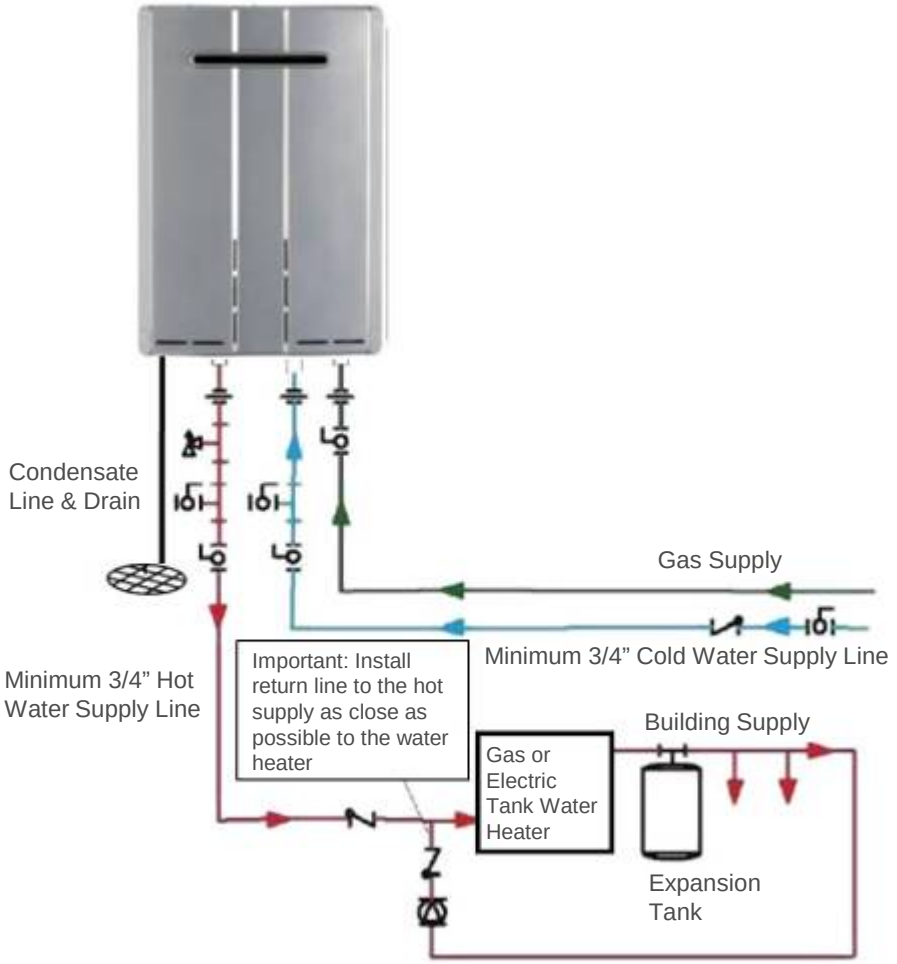
3’ (termination)
+3’ (elbow)
+2’ (extension)
+3’ (elbow)
+2’ (extension)
13 feet equivalency

Tankless Water Heaters with Recirculation

Recommended Piping - Recirculation

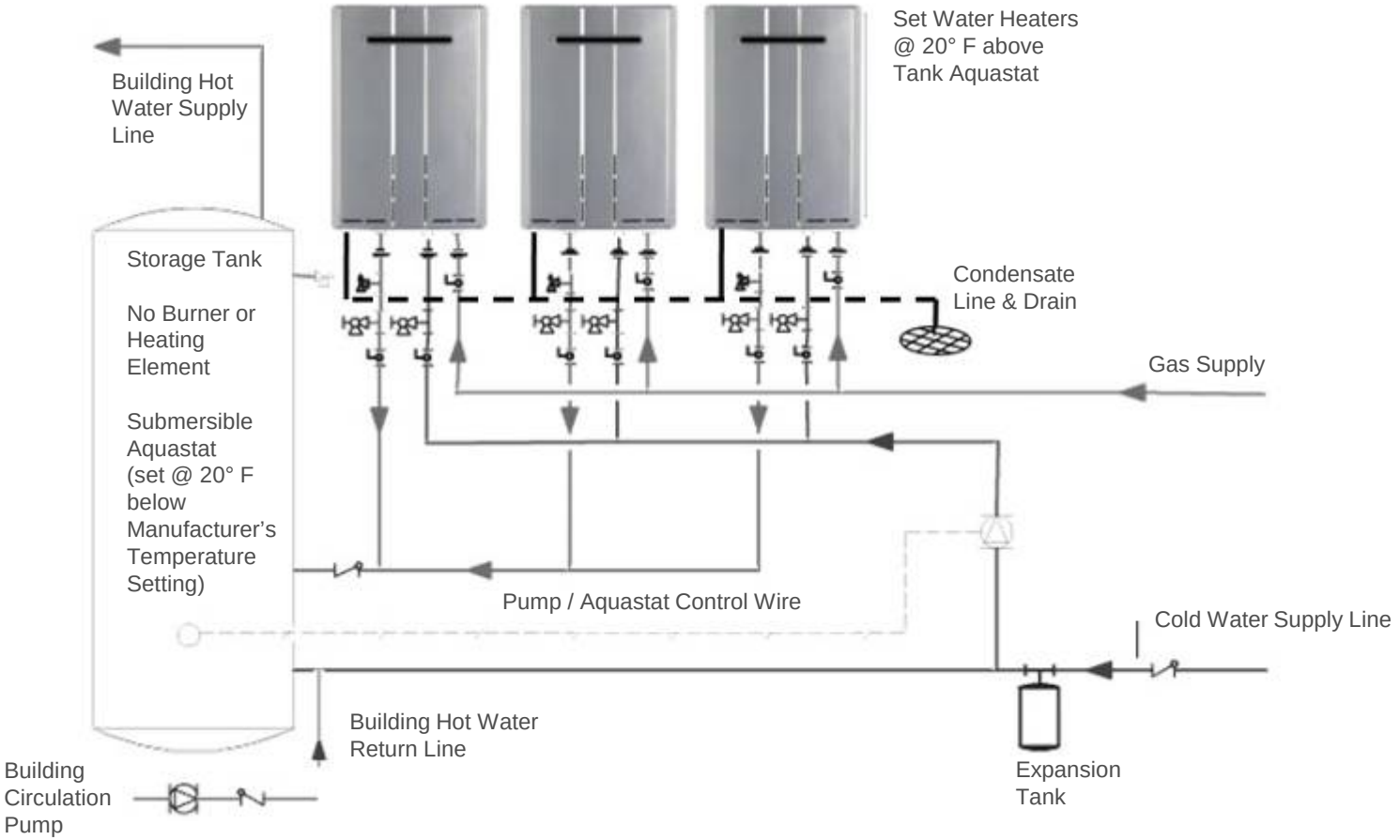
For this application:

- Pump should be of bronze or stainless construction and controlled by an aquastat or timer, or combination of both.
- Pump to be sized to maintain circulation loop temperature.
- The pump should be sized to overcome the pressure loss through the tank water heater, and supply and return plumbing in the circulation loop.



Tankless Water Heaters with Recirculation

Backup Storage / Circulation Example



Summary

- Tankless water heaters are environmentally sound appliances as they produce very low NO_x and CO_2 emissions.
- Components of some tankless systems are replaceable, unlike standard tank water heaters that are typically replaced when they fail or leak.
- Tankless systems offer twice the service life over a standard tank type water heater.
- Tankless systems provide space savings, energy savings, and lower operating costs.

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Thank you for your time!

QUESTIONS?

This concludes the educational content of this activity

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Evaluation

PART 1: CONTENT

1. Were the program learning objectives stated clearly and concisely? Y P N **(Required)**
Comment _____

2. Did this program meet your expectations? Y P N **(Required)**
Comment _____

3. Are you confident that you could accomplish these learning objectives? **(Required)**
(List learning objective one) Y P N
(List learning objective two) Y P N
(List learning objective three) Y P N
(List learning objective four, etc.) Y P N

4. Did you find the program content current and relevant? Y P N **(Required)**
Comment_____

PART 2: PRESENTER

5. Did the presenter(s) help you understand the content? Y P N **(Required)**
Comment _____

6. Were the audio and visual materials effective? Y P N **(Required)**
Comment _____