GPTA Inc

Manufacturer's Instructions, Referenced Standards and the Codes

Manufacturer’s Installation Instructions.

This class looks at manufacturer’s instructions and what the ICC Codes says in regard to their importance for appliance and product installation.

Many installers and inspectors see the codes as the final authority on matters of product safety and correct installation procedures. This is not always the case. In some cases the code differs from what the manufacturer has required when using or installing their product.

The following slides show that the code refers to manufacturer’s instruction and gives them the authority on how their product are to be used and the installation process.

Manufacturer’s installation instructions.

Along with the codes there are two other documents that give requirements that must be followed. Many times only the codes are considered and used when performing inspections. The reason is as follows.

1.Codes are a basic document for all code enforcement and every department has them.

1.Referenced Standards generally cost money so very few department have a copy of most standards.

2.Manufacturer’s Instructions are ignored because they are considered secondary to codes.

Lets look at the three documents.

Manufacturer's installation instructions.

Three main documents to consider when applying the codes.

1.Georgia State Codes Minimum Standard Codes

Georgia has a total of 16 construction codes 9 of which called *Mandatory* codes. These cover all phases and part of construction and Georgia law requires all contractors and installers to comply with these on any construction project in the state. The current Mandatory codes are:

2012 International Building Code
2012 International Residential Building Code
2012 International Mechanical Code
2012 International Plumbing Code
2012 International Fuel Gas Code
2012 International Fire Code
2009 International Energy Conservation Code
2017 National Electrical Code
2012 International Pool and Spa Code

Manufacturer's installation instructions.

Three main documents to consider when applying the codes.

2. Referenced Standards

The codes require almost all products to have a third party certification and refer to *Referenced Standards.* These publications are written by a third party agency who is approved as a design and testing lab by the International Standards Organization (ISO). The main function and purpose of the groups are to make sure all products perform the same under similar conditions and to write approvals for their use.

Some of these agencies are:

American Society of Testing and Materials (ASTM)
American Gas Association (AGA)
Underwriters Lavatory (UL)
American National Safety Institute (ANSI)
International Code Congress (ICC)

Certified Testing and Approval Agencies

International Organization for Standardization

Why Referenced Standards Matter

Standards make an enormous and positive contribution to most aspects of our lives. Standards ensure desirable characteristics of products and services such as quality, environmental friendliness, safety, reliability, efficiency and interchangeability and at an economical cost. When products and services meet our expectations, we tend to take this for granted and are unaware of the role of standards. However, when standards are absent or not followed problems arise. Products that are unreliable or dangerous can find their way to our homes and places of work. Without standards products turn out to be of poor quality that do not fit or perform as designed or are incompatible with equipment that we already have. When products, systems, and machinery perform properly and safely, it is because they meet the appropriate standards.

Manufacturer’s installation instructions.

Three main documents to consider when applying the codes.

3. Manufacturer’s Instructions

Each manufacturer writes detailed information on the installation and use of their product. The codes include requirements to follow these instructions on almost all appliances and products. Following these instruction insures that the product will perform as designed. It is impossible for the code to include this information in their content so they refer you back to manufacturer.

Manufacturer’s instructions give specific information on their products that the code does not have. The next slide shows the expansion rate of CPVC piping and methods to allow for this in an installed system.

Expansion and Contraction of CTS CPVC

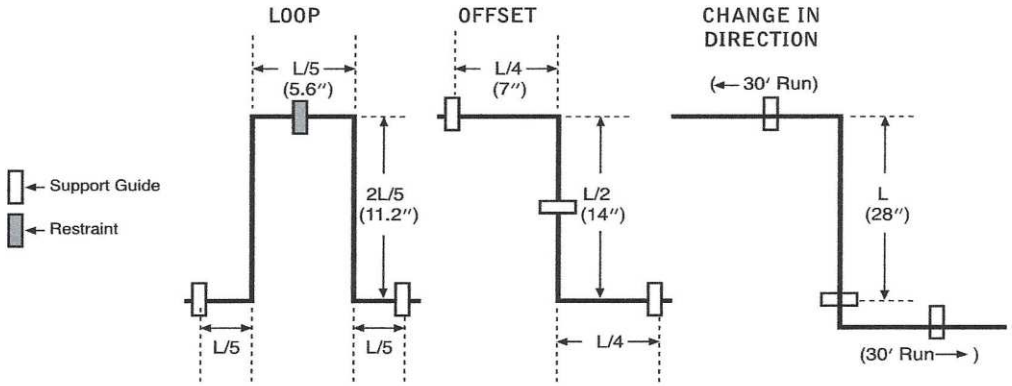
Basic expansion loop requirements for FlowGuard Gold® and ReUze® CTS CPVC are described below. One or more expansion loops, properly sized, may be required in a single straight run. The following charts can be used to determine expansion loop and offset lengths.

Expansion Loop Length (L), inches
for
100°F Temperature Change

Length of Run in Feet

Nominal Dia., In.	20′	40′	60′	80′	100′
½	16	23	28	32	36
¾	19	29	33	38	43
1	22	31	38	44	49
1¼	24	34	42	48	54
1½	26	37	45	52	59
2	30	42	52	60	67

Example: Tubing Size = 1/2″ Length of run = 60′ L = 28″ (from table)



NOTICE

Failure to compensate for expansion and contraction caused by temperature change may result in system failure and property damage.

- Do not restrict expansion or contraction. Restraining movement in piping systems is not recommended and may result in joint or fitting failure.
- Use straps or clamps that allow for piping system movement.
- Align all piping system components properly without strain. Do not bend or pull pipe into position after being solvent welded.
- Do not terminate a pipe run against an immovable object (example: wall or floor joist)

Manufacturer’s installation instructions.

How many Mandatory Construction Codes are listed in State Law?

a. 5
b.6
c.9
d.16

Answer c. 9

Manufacturer’s installation instructions.

Manufacturer’s instructions and Referenced Standards first mentioned in Chapter one of all Codes

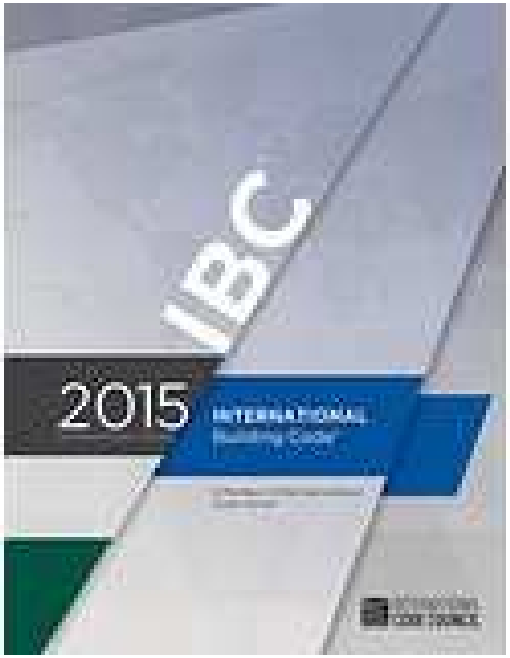
Manufacturer's installation instructions.

R102.4 Referenced codes and standards. The codes and standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference. Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

Exception: Where enforcement of a code provision would violate the conditions of the listing of the equipment or appliance, the conditions of the listing and Manufacturer's instructions shall apply.

Manufacturer’s installation instructions.

Manufacturer’s instructions and Referenced Standards are also included in general requirements of all codes



Chapter 3
Materials

IPC 303.2 Installation of materials. All materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved. In the absence of such installation procedures, the manufacturer's installation instructions shall be followed. Where the requirement of referenced standards or manufacturer's installation instructions do not conform to minimum provisions of this code, the provisions of this code shall apply.

Chapter 3

Materials

Referenced Standards and Manufacturer's Instructions are important tools for accepting new products or alternative methods of construction

Codes are updated every three years and new products are placed on the market everyday. While the codes are updated every three years Georgia updates their construction code on a six year cycle. In the six years between code changes hundreds of new products hit the market. This is the reason codes include requirements for following manufacturer's instructions on almost all products.

Manufacturer’s installation instructions.

The code gives the building official the right to allow these new products as long as they are installed to comply with the manufacturer’s instructions and meet the standard under which they are approved. He can also allow modifications of the code or allow alternative methods and materials to be used as long as approved standards and manufacturer’s instructions are met.

R104.9 Approved materials and equipment. Materials, equipment and devices approved by the building official shall be constructed and installed in accordance with such approval.

Manufacturer’s installation instructions.

R104.10 Modifications.
Wherever there are practical difficulties involved in carrying out the provisions of this code, the building official shall have the authority to grant modifications for individual cases, provided the building official shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety or structural requirements. The details of action granting modifications shall be recorded and entered in the files of the department of building safety.

Manufacturer’s installation instructions.

R104.11 Alternative materials, design and methods of construction and equipment.

The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. Compliance with the specific performance-based provisions of the International Codes in lieu of specific requirements of this code shall also be permitted as an alternate.

Manufacturer’s installation instructions.

Many new product are being introduced on the market everyday. The code cannot address the installation of these product so it refers back to the manufacturer’s instruction. To give the inspector the information they need to perform the inspection the code requires that installation instruction be available on the job site at the time of inspection. The following slides show some of the new products where this would be the case

R106.1.2 Manufacturer’s installation instructions.

Manufacturer’s installation instructions, as required by this code, shall be available on the job site at the time of inspection.

Vertex Condensing Water Heater

Vertex

A **Commercial Grade PermaGlas® Ultra Coat™ Glass Lining** protects the tank and helical heat exchanger against corrosion and leaks.

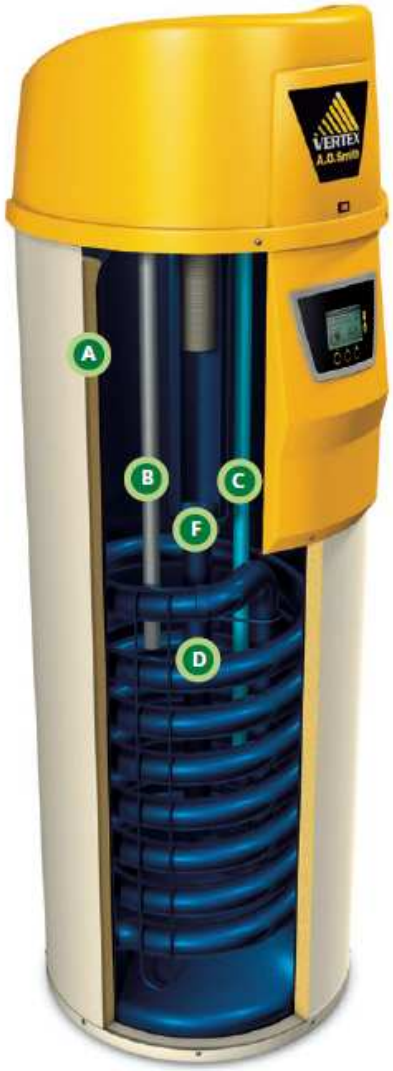
B **Two Heavy-Duty Commercial-Grade Anode Rods** provide even more protection against corrosion.

C **Long-Lasting PEX Cross-Link Polymer Diffuser Dip Tube** withstands long-term exposure to water up to 400°F.

D **Helical Internal Heat Exchanger** is completely surrounded by water in the tank, providing a greater heat transfer surface.

E **Condensate Outlet** conveniently located for piping of flue condensate to floor drain or outside of home.

F **Eco-Friendly Green Choice® Gas Burner Design** reduces NOx emissions and complies with Ultra Low NOx emission standards scheduled to be implemented in 2012.



Vertex 100

Vertex Condensing Water Heater

- *Intelligent Control System with LCD display*
- *Models ranging from 50-gallon / 76,000 BTU to 130-gallon / 500,000 BTU with up to 96% thermal efficiency*
- *Venting flexibility for versatility and easy serviceability*
- *Industry-first powered anodes for superior tank protection*

Total Control TC

Cyclone Xi LCD

The intelligent control system, with easy to navigate menu, provides precise temperature control and unit operating information.

- *Detailed heater status information: blower, igniter, igniter current, gas valve, flame detection, air inlet restrictions, exhaust vent restrictions, acceptable gas supply pressure*
- *Precise temperature setting with actual tank temperature at upper and lower probes*
- *Alerts the user to any potential corrosion-related leak*
- *Maintains constant log of the number of cycles and burner operating time*
- *Communicates fault details and gives diagnostic information*
- *Maintains a log of any fault occurrence and the time a fault occurred*

Powered Anodes* PA

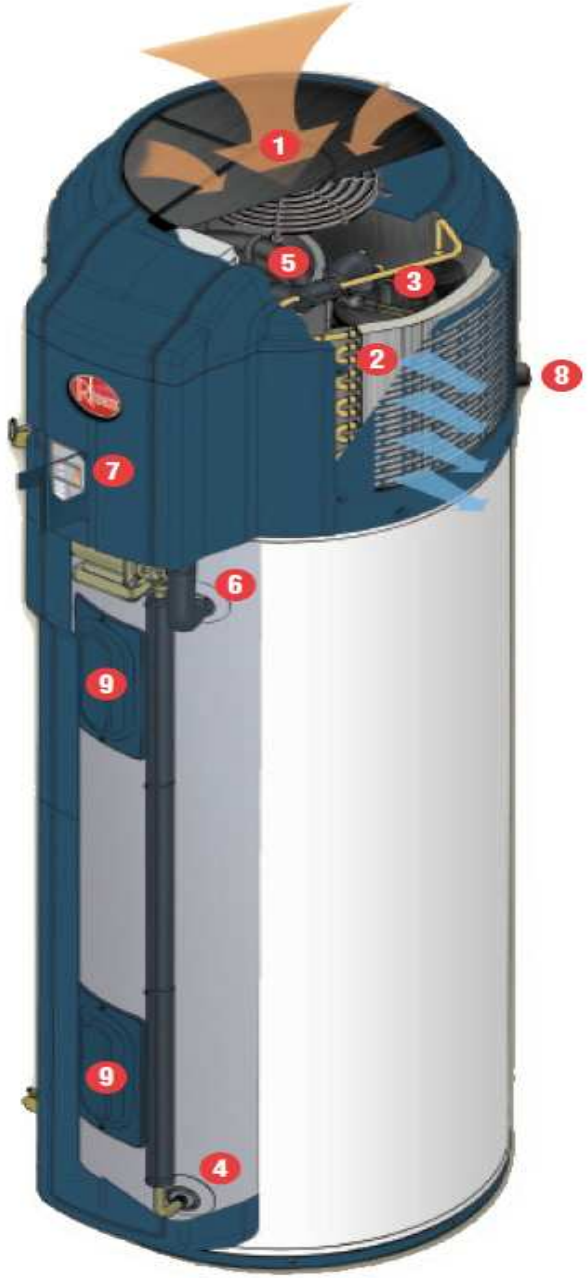
The A. O. Smith powered anode system provides the most modern and innovative technology available to provide long-lasting tank protection.

**Not on 76,000 and 100,000 BTU models*

- *Non-sacrificial anode does not require maintenance or inspection*
- *Provides superior tank protection to traditional aluminum or magnesium anodes*
- *Power level adjusts to changes in water conditions for optimum protection*
- *Offers superior protection in various water conditions*
  - *— Better protection in water with low conductivity*
  - *— Eliminates the occurence of hydrogen sulfide gas production (rotten egg odor)*

The Rheem Heat Pump Water Heater

How it works!



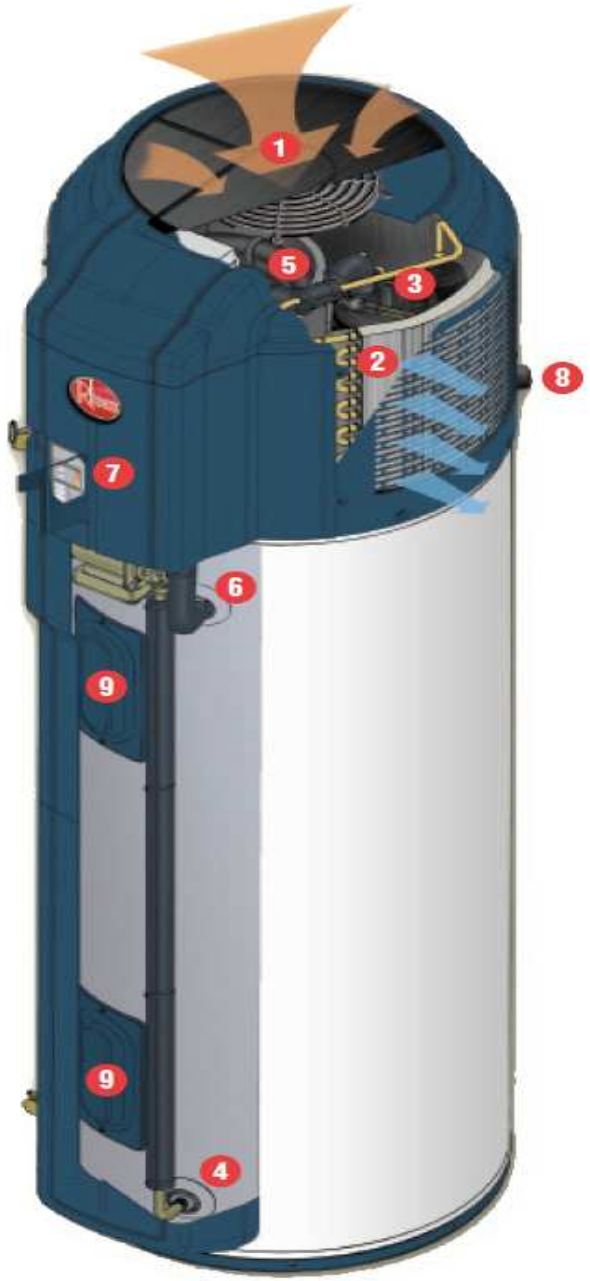
In “Energy Saver” mode, this water heater’s high efficiency heat pump operates automatically for hot water storage in this sequence:

1. A fan pulls air through the top air filter.
2. Heat in the air is absorbed by eco-friendly refrigerant inside the evaporator coil and cool (dehumidified) air is exhausted.
3. Refrigerant is pumped through a compressor, which increases the temperature.
4. Simultaneously the cooler water from the bottom of the tank is pumped to the top of the appliance, where it circulates through a patented condenser coil.
5. Hot refrigerant transfers its heat to the water inside the condenser coil.
6. Heated water is returned back to the top of the tank.
7. All functions are controlled simultaneously by an advanced circuit board located behind the user touch pad.

   In “Normal” mode, the heat pump can run in tandem with an electric element during periods of high demand.

   In “Electric Heat Only” mode, the heat pump is disabled and the appliance operates like a standard electric water heater with two elements.

8. Condensate drain connection.
9. Backup electric heating elements.



Tank Less Condensing Water Heater

Tank Less Condensing Water Heater

*With **Navien Condensing 98%**, you get the best of both worlds: the **Best Value** and **"Ultra Condensing Efficiency,"** which offers substantial savings and contributes to a green-friendly environment. Plus, the installation and venting processes are easy, cost effective, and Navien's products are simply the best in quality and performance.*

Tank Less Condensing Water Heater

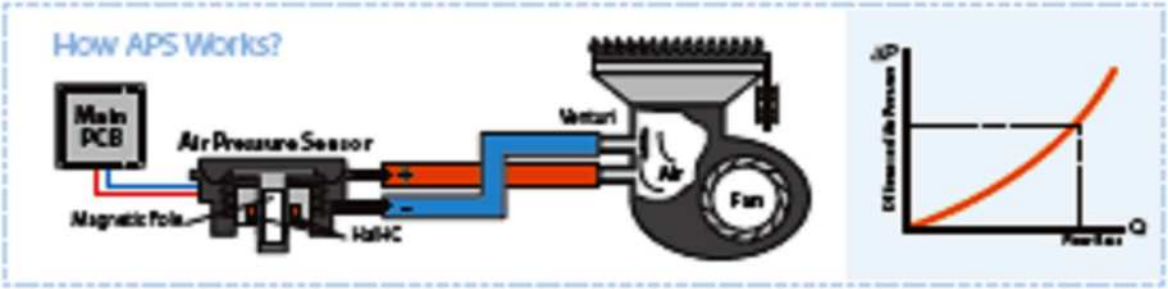
Advanced Technology

1 Enhanced Safety with Dual Microprocessors

Navien's two microprocessors offer better control and safer operation by continuously cross monitoring each other's performance to assure proper operation at all times. These two microprocessors not only control the burner for ideal combustion but also maintain the steady hot water temperature.

2 Optimal and Stable Combustion with APS and GPS

APS (Air Pressure Sensor) maximizes combustion efficiency by sensing and controlling the air required for optimal combustion even in high-wind locations and installations with long vent runs.



GPS (Gas Pressure Sensor) offers stable combustion by sensing gas pressure and controlling the fan speed to maintain optimal combustion, even under a wide range of gas-pressure changes.

Tank Less Condensing Water Heater

3 *Three-phased, Pre-Mixed Burner*

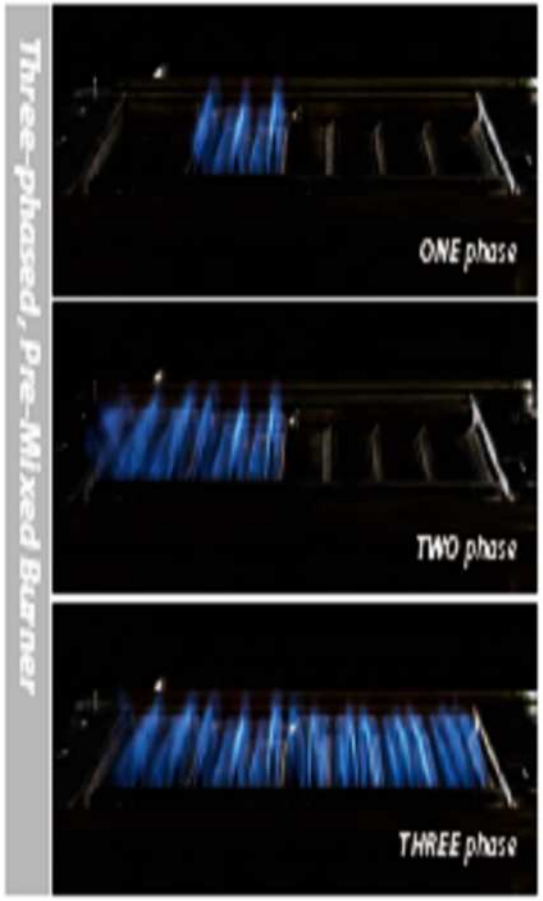
Controls flame by pre-mixing optimal ratio of gas and air before combustion, reducing emissions and enhancing heat efficiency.

4 *Leak Detector*

Built-in leak detector prevents damage to water heater as well as personal property.

5 *Air Intake Filter*

An air intake filter prevents foreign substances, such as dust or insects, from entering the system, freeing the burner from elements that would normally cause unstable combustion or energy inefficiency.

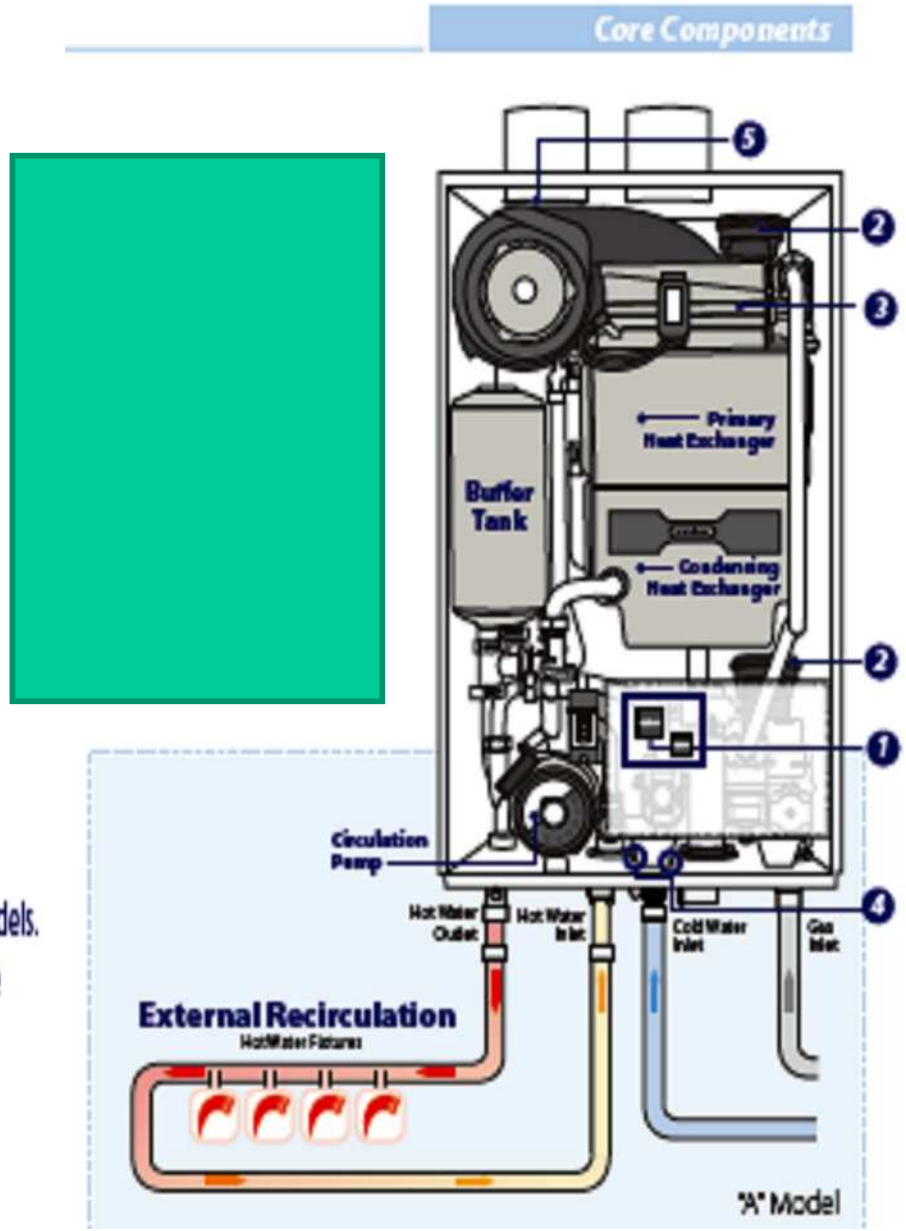


Tank Less Condensing Water Heater

Optional Circulation Pump and Mini Buffer Tank (Model "A")

- No minimum flow rate required with optional internal circulation mode
- Minimize hot/cold/hot stacking, the so called "Cold Water Sandwich"
- Save installation cost with optional circulation pump and buffer tank

- More than one water heaters in Ready-Link® System are with "A" models, the remaining are "Non-A" models. Combining multiple "A" or/and multiple "Non-A" models with "A" create a hot water circulating cascade system, resulting in water conservation and money savings.



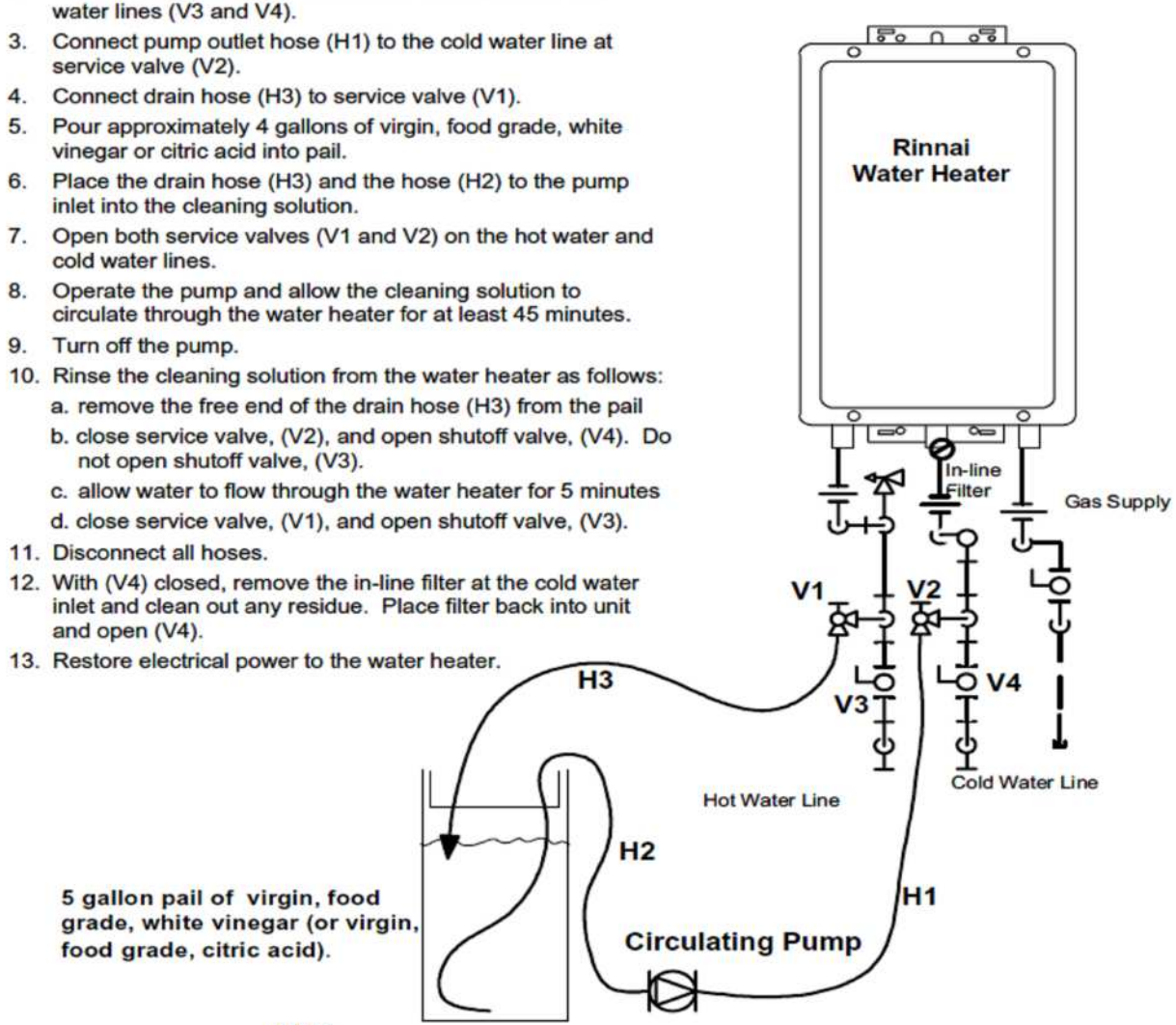
Tank Less Condensing Water Heater

• The design of the product may change without prior notice to improve the quality or performance.

Flushing the Heat Exchange (Error Code: LC or 00)

An "LC" or "00" error code indicates the unit is beginning to lime up and must be flushed. Failure to flush the appliance will cause damage to the heat exchanger. Damage caused by lime buildup is not covered by the unit's warranty. After flushing, reset the LC fault code by turning off the power to the unit and turning the power back on.

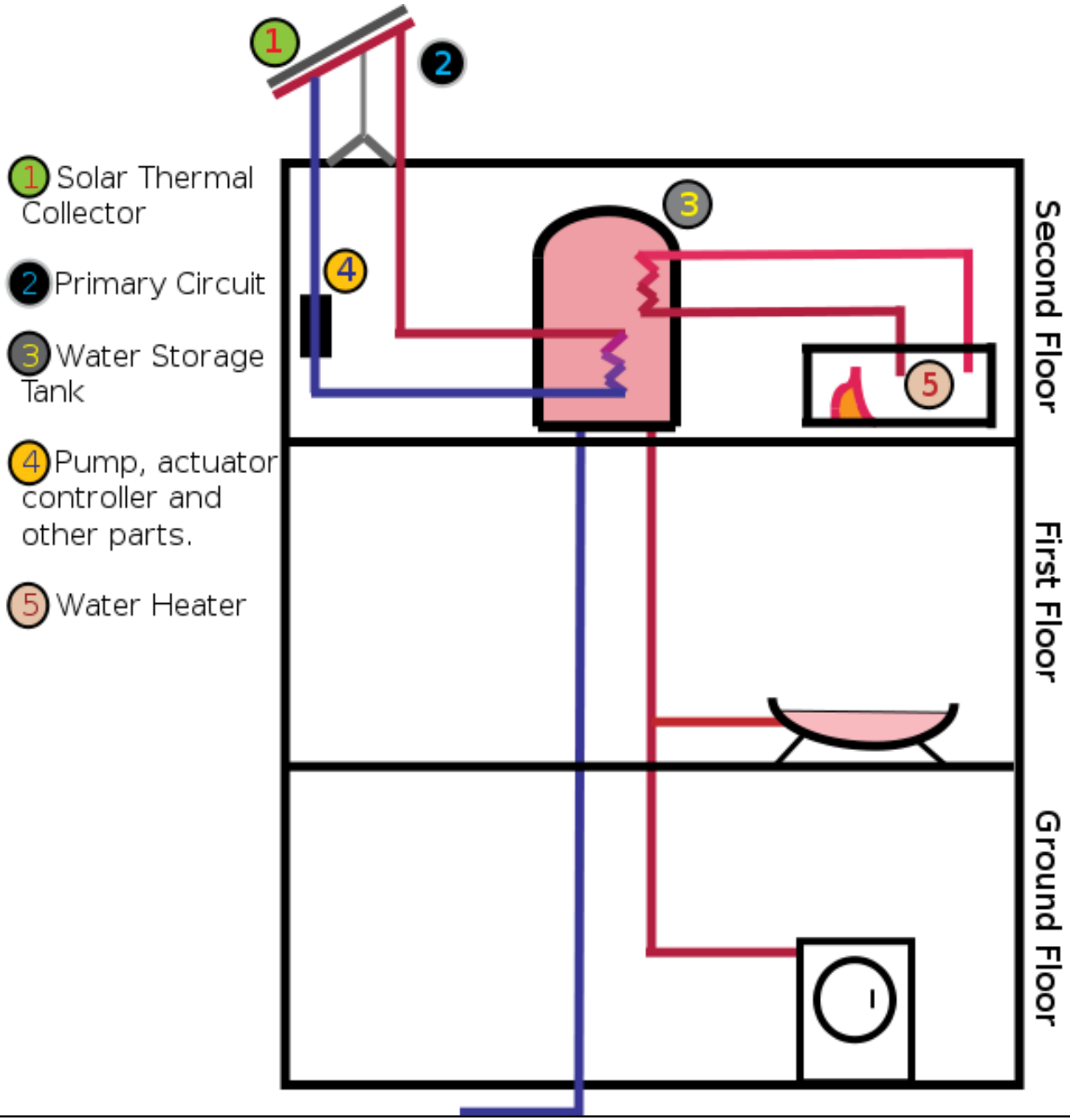
1. Disconnect electrical power to the water heater.
2. Close the shutoff valves on both the hot water and cold water lines (V3 and V4).
3. Connect pump outlet hose (H1) to the cold water line at service valve (V2).
4. Connect drain hose (H3) to service valve (V1).
5. Pour approximately 4 gallons of virgin, food grade, white vinegar or citric acid into pail.
6. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution.
7. Open both service valves (V1 and V2) on the hot water and cold water lines.
8. Operate the pump and allow the cleaning solution to circulate through the water heater for at least 45 minutes.
9. Turn off the pump.
10. Rinse the cleaning solution from the water heater as follows:
    a. remove the free end of the drain hose (H3) from the pail
    b. close service valve, (V2), and open shutoff valve, (V4). Do not open shutoff valve, (V3).
    c. allow water to flow through the water heater for 5 minutes
    d. close service valve, (V1), and open shutoff valve, (V3).
11. Disconnect all hoses.
12. With (V4) closed, remove the in-line filter at the cold water inlet and clean out any residue. Place filter back into unit and open (V4).
13. Restore electrical power to the water heater.



KEY

3/4" Ball Valve	Pressure Regulator
3/4" Union	Circulating Pump
Check Valve	Boiler Drain Valve
Pressure Relief Valve	Solenoid Valve

Solar Water Heating



Codes and the Manufacturers' Instructions

All Codes refer to Manufacturer's Instructions

Codes and the Manufacturers' Instructions

When performing an inspection on an installed appliance what does the code require to be on the job site?

a.Testing Equipment

b.Manufacturer's instructions

c.The Installer.

d.A Code Book

e.Answer b. Manufacturer's Instructions

Water Heaters
Installation

IPC 502.1 General. **Water heaters shall be installed in accordance with the manufacturer's installation instructions**. Oil-fired water heaters shall conform to the requirements of this code and the International Mechanical Code. Electric water heaters shall conform to the requirements of this code and provisions of the ICC Electrical Code listed in Chapter L13. Gas-fired water heaters shall conform to the requirements of the International Fuel Gas Code.

Joints and connections PVC.

IPC 605.22 Joints between different materials. Joints between different piping materials shall be made with a mechanical joint of the compression or mechanical-sealing type, or as permitted in 605.22.1 and 605.22.2. Connectors or adapters shall have an elastomeric seal conforming to ASTM D 1869 or ASTM F 477. **Joints shall be installed in accordance with the manufacturer's instructions.**

.

Manufacturers Installation Instructions
Residential Code

R502.8.2 Engineered wood products.

Cuts, notches and holes bored in trusses, structural composite lumber, structural glue-laminated members or I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional. **Products must be installed according to manufacturer's Instructions.**

Manufacturers Installation Instructions
Mechanical Code

SECTION 304 INSTALLATION

304.1 General. **Equipment and appliances shall be installed as required by the terms of their approval, in accordance with the conditions of the listing, the manufacturer's installation instructions and this code.** Manufacturer's installation instructions shall be available on the job site at the time of inspection.

Conflicts between Manufacturers Installation Instructions and the Codes

Is some cases the manufacturer's instruction differ from the requirements set forth by codes. When this happens what document would an installer be required to follow? As you will see the code says you follow the most restrictive. If the code is more restrictive then the code dictates the requirements. If the manufacturer is more restrictive the you follow their requirements.

One case in the code where this occurred was in dealing with water hammer arrestors. The code states that a water hammer arrestor shall be installed wherever a quick closing valve is installed and pipe shock can occur. A number of manufacturers of plastic piping such as CPVC and PEX stated these were not required on their systems because of the shock absorbing ability of their pipes. As the code requirements did not allow exemptions for these products then water hammer arrestors were required on the systems. This issue was later resolved when the manufacturers deferred to the code requirements.

2012 IPC Chapter 6

WATER DISTRIBUTION SYSTEM

604.9 Water hammer. The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. **A water-hammer arrestor shall be installed where quick-closing valves are utilized unless other wise approved.** Water-hammer arrestors shall be installed in accordance with the manufacturer's specifications. Water- hammer arrestors shall conform to ASSE 1010.

IPC 301.7

- **Conflicts.** Where conflicts between this code and **the conditions of the listing or the manufacturer's installation instructions occur, the provisions of this code apply.**

- **Exception:** Where a code provision is less restrictive than the conditions of the listing of the equipment or appliance or the manufacturer's installation instructions, **the conditions of the listing and manufacturer's installation instructions shall apply.**

DESIGN OF BUILDING WATER DISTRIBUTION SYSTEM

604.9 Water hammer. The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. **A water-hammer arrestor shall be installed where quick-closing valves are utilized.** Water-hammer arrestors shall be installed in accordance with the manufacturer's specifications. Water- hammer arrestors shall conform to ASSE 1010.

More restrictive than the Manufacturers' Instructions so the code requirement must be followed

Manufacturer’s Instructions and the Codes

When there is a conflict between the Code and the Manufacturer’s Instructions which are you required to follow?

A.The Code

B.Manufacturer’s Instructions

C.Inspector’s Decision

D.Most Restrictive of the two documents

Answer d. Most Restrictive of the two documents

Manufacturer’s installation instructions.

Manufacturer’s Instruction give specific information about the product.

Manufacturer’s installation instructions.

P605.18.2 Mechanical joints. Joints shall be made with an approved elastomeric seal. Mechanical joints shall be installed in accordance with the manufacturer's instructions

Manufacturer’s installation instructions.

Fernco Couplings

For special applications, our custom design service can supply couplings to individual customer requirements. Tested designs backed by over five decades of proven performance. The following information applies to all standard Fernco couplings

Applications
Positive seal against infiltration and exfiltration
Leak-proof, root-proof and are resistant to chemicals, ultraviolet rays, fungus growth, and normal sewer gases
Conforms to **ASTM D 5926, C 1173** and **CSA B602**
Connects same or different pipe sizes and materials quickly and easily
Stainless steel clamps are corrosion-resistant and rustproof

Tech Specs:
Installation torque: 60 inch lbs.
Maximum test pressure: 4.3 PSI (29.6KPA)
Maximum operating temperature: 140º F non-consistent
Minimum operating temperature: – 30° F

Manufacturer’s installation instructions.

Manufacturer’s Instructions can be found on Internet by going to the manufacturer’s website. Site also give technical specs and list all of the products referenced standards and approvals.

Water Heaters

www.rheem.com
www.aosmith.com
us,navien.com
www.rennai.us

Fittings

Fernco.com

Manufacturer’s installation instructions.

What are the three documents that govern the installation of Appliances, materials and new products?

a.The International code Council’s Construction Codes

b.The manufacturer’s Instructions

c.The 3rd Party Approval Standards

d.All of the above

e.Answer d. All of the above

Manufacturer’s installation instructions.

You have completed this class!

Complete