



Arapahoe County Residential Water Heater Installation and Inspection Guide

The attached handout is designed to be a general permit submittal and inspection guide covering most installation instances, however it is not possible to anticipate all individual site variations and therefore additional plan review or inspection comments may apply beyond what is included herein

The main office number is 720-874-6600, where you can speak directly with inspection staff from 7:00 to 7:30 AM and 4:30 to 5:00 PM, or any of the office / plan review staff from 8:00 to 4:30.

Inspections requested by 4:30 PM are, except for rare occasions, normally always completed the next business day, and may be performed anywhere from 7:30 AM to 5:00 PM

For inspections to occur, the address must be posted, the permit card, approved plans and any previous correction notices must be available, access (including ladders if applicable) must be provided to the inspection area, someone at least 18 years of age must be present if access inside the structure is required, and permission must be provided prior to us entered a fenced yard.

Code references are based on the 2009 IRC

General Requirements:

- Water Heater replacement requires a permit and inspections. (IRC: R104)
- Installer information is required to be filled in on the back of the permit card: Company Name, Contact information, State License number(s), and CSST installer's certification number (if applicable). (CO Statute/County Policy)
- Manufacturer's Installation Instructions must be on-site for all inspections. (IRC: M1307)
- Walk-through and Velocity Hall permits are only permitted for "like-for-like" replacements. (i.e. replacement of a 40kbtu draft hood type with a new 40kbtu draft hood type)
- NOTE: Tankless Water Heaters require additional information BEFORE a permit can be issued (see below).
- When additional appliances are added to an existing system, or when the replacement appliance is larger then the original, gas pipe and vent system sizing documentation will be required. (IRC: G2413 / G2425.15)
- Gas appliances require Code compliant combustion air and venting. (IRC: G2407)
- Any new electrical work must be identified and inspected

Access Requirements:

- Accessible for service, maintenance, repair & replacement. (IRC P2801 & M1305)
- Garage Installation: sources of ignition must be elevated at least 18" above the floor. (IRC P2801.6)
- Attic Installations: (IRC 1305.1.3)
 - Access and passageway large enough for removal
 - Access opening large enough for largest piece of equipment. 30"x20" minimum
 - 30" x30" working platform in front (not required if appliance can be serviced and removed through access opening)
 - 24" wide (min) passageway of continuous solid flooring

- Passageway: 30" H x 22" W and maximum 20' long, or 6' h x 22" w and maximum 50' long
- Below Floors: (IRC 1305.1.4)
 - Access opening large enough for largest piece of equipment. 30" x20" minimum
 - 30" x30" working space in front (not required if appliance can be serviced and removed through access opening)
 - 24" wide (min) passageway of continuous solid flooring
 - Passageway: 30" h x 22" w and maximum 20' long, or 6' h x 22"w and unlimited in length
 - If the passageway or working space is more than 12" below grade then the walls must be masonry and 4" higher than the adjoining grade

Prohibited Locations (IRC G2406 & M2005)

- Fuel fired: not allowed in a space used as a storage closet (IRC M2005.2)
- Water heaters shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets or surgical rooms, or in a space that opens only into such rooms or spaces, except where the water heater is installed in a room or space that opens only into a bedroom or bathroom, and such room or space is used for no other purpose (not a storage closet) and is provided with a solid weather-stripped door equipped with an approved self-closing device. All combustion air shall be taken directly from the outdoors in accordance with Section G2407.6. (IRC G2406.2)

Water Heater Pan : (IRC P2801.5)

- Required if leakage will cause damage to construction: (IRC P2801.5)
- 24 gage galvanized, or listed to CSA LC3
- Minimum 1.5 In. deep, and large enough to receive all dripping or condensate.
- Minimum 3/4" drain of materials per table P2905.5 (no PVC)
- Pan drain must terminate over an indirect waste receptor or to the exterior (6"-24" above grade)

Water Shut-Off Valve (IRC P2903.9.2)

- Must be readily accessible, full-open type, and installed on the cold water supply to the heater

Relief Valves (IRC: P2803)

- Rated capacity must be higher than the water heater's input and conform to ANSI Z21.22
- Relief valve(s) must address both Temperature and Pressure
- Temperature relief valve must be within the top 6" of the tank with a maximum temperature of 210° F
- Pressure Relief valves must be set at least 25 psi above the system pressure, but not over 150 psi, and shall not exceed the tanks rated working pressure

Relief Valve Discharge Pipe (P2803.6.1):

- Must discharge through an observable air gap located in the same room as the water heater, and:
 - to the floor, or
 - to an indirect waste receptor, or
 - to the outside.
- Must be equal or larger in size to relief valve outlet
- May not join with any other relief discharge pipe
- May not be trapped
- Must flow by gravity (be pitched)
- Terminate not more than 6" above floor or receptor

- May not have a threaded connection or valve or tee
- Be of approved material - per IRC table P2904.5 (Not PVC), or approved per ASME A112.4.1

Electric water heaters must be connected per NEC (IRC M2005.3)

- Electric Water Heaters must conform to UL 174 or UL 1453
- Requires a separate electrical inspection

Fuel-Fired (Gas) Water Heaters:

Combustion Air (IRC: G2407)

- Based on total demand of all appliances in space:
- Horizontal Ducts: 1 sq in / 2,000 btu each duct (High/Low), 1 sq in / 3,000 btu (high only)
- Vertical Ducts: 1 sq in / 4,000 btu each duct, 6" above insulation level (in an attics), or out the roof with approved cap
- Unusually Tight Construction may apply based on site specific conditions.

Gas Piping (IRC: G2413)

- If the water heater is new, or a replacement with a larger btu demand on the existing system, sizing must be provided to verify adequate supply to all appliances
- A sediment trap is required downstream of the shutoff valve, and as close to the appliance inlet as possible (IRC: G2419.4)

Gas Shutoff Valves (IRC: G2420)

- Must be approved for their intended use, accessible, and protected from damage.
 Note: If a gas piping test is warranted, valves may not be included in the tested pipe unless they are listed for the test pressure, and valves may not be used as a bulkhead between 'live' and tested pipe.

Gas flex connectors (IRC G2422)

- Maximum 72" in length
- Listed and labeled to ANSI Z21.24
- May not pass through walls, cabinets, or appliance housings.

Venting of Appliances:

- **Existing Vent** System must be verified for IRC compliance (G2425.15)
- **Common Vent and Connector sizing:**
 - **IF there are only two appliances, and both are draft hood type, then:**
 - The connector may be sized based on the draft hood outlet of the appliance and manufacturer requirements.(G2427.10.3.3)
 - The common vent size may be based on the area of the larger vent plus 1/2 of the area of the smaller vent. (G2427.6.8.1, #3)
 - **-or-**
 - **Combined System (other than two draft hood appliances):** Sizing is to be based on section G2428, and the allowances found in tables G2428.3(1) – G2428.3 (4).
 - All portions of the common vent , including Wye(s) or Tee(s) must be Double Wall (B-Vent) per G2428.3.9.1
 - Minimum height above the draft hood is 5' (IRC: G2427.6.4
 - Vents and vent connectors located in or passing through unconditioned spaces (crawl space, attic, etc) must be listed type B vent. (IRC: G2427.10.2.2)

- Vent connector materials must be 26 gauge (.018") galvanized steel, B-vent, or other approved materials per IRC G2427.10.2.3

Common Water Heater Replacement Venting Issues:

- Generally, the vent connector will need to be 4" diameter per the requirements of Table G2428.3(2).
- The common vent and Wye or Tee must be Double Wall (B-Vent) per G2428.3.9.1

Power Vent and Direct Vent models:

- Manufacturer's installation instructions must be present at time of inspection and installation must comply with all instruction requirements.
- Condensate drain may be required
- Pitch of vent(s)
- Support of vent(s)
- Termination of Vent(s), configuration, separation, caulking
- Insulation of vents
- Pipe Materials, fitting radius, joints, glue, primer - per instructions"

OTHER INSTALLATIONS:

- **Water Heater Used for Space Heating:** (IRC P2802)
 - Piping & components per IRC chapter 29- Water Supply and Distribution
 - No previously used components
 - No chemical additives
 - If space heating requires 140° or higher, domestic water must be tempered to 140° or lower.

- **Tankless Water Heaters**

Tankless, instantaneous or hybrid type service water heaters that are not a direct replacement of the same type of appliance may not be permitted on line using the Velocity Hall application, or as a "Walk-Through"

Permit applications for tankless or instantaneous service water heaters must include:

- Brand of water heater being installed
- Manufacturer's equipment sizing information
- For gas fired heaters, complete gas pipe system sizing documentation
- If CSST gas pipe is used identify the brand to be used
- All CSST gas pipe must be bonded per the installation instructions
- Provide the CSST installers training certificate number
- Plumbing contractor's and Electrical contractor's State license number and contact information will be required on the back of the permit card
- Gas appliances require Code compliant combustion air and venting
- All new electrical work must be identified and inspected.

NOTICE

Due to recent changes in State law, permits that are issued as of July 1, 2009 and that meet the qualifiers as prescribed below, and includes permits for water heater and furnace replacements, must have carbon monoxide detectors installed as described herein.

38-45-102. Carbon Monoxide Alarms in Single-Family Dwellings. Notwithstanding any other provision of law, every single-family dwelling that includes either fuel-fired appliances or an attached garage where, on or after July 1, 2009, interior alterations, repairs, fuel-fired appliance replacements, or additions, any of which require a building permit, occurs or where one or more rooms lawfully used for sleeping purposes are added shall have an operational carbon monoxide alarm installed within fifteen feet of the entrance to each room lawfully used for sleeping purposes or in a location as specified in any building code adopted by the state or any local government entity. The carbon monoxide alarm must produce a distinct, audible alarm, and

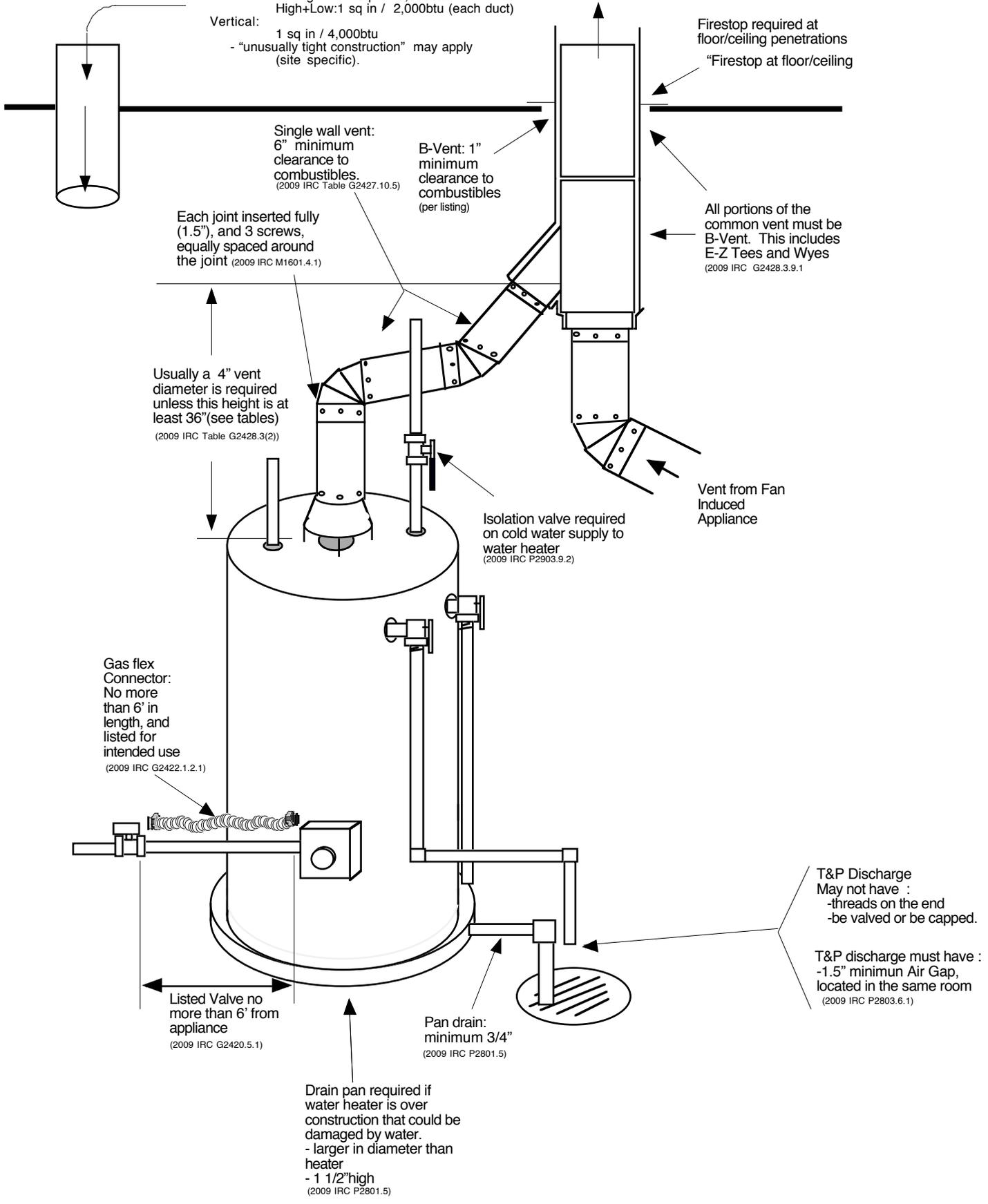
- Must be listed by a nationally recognized, independent product-safety testing and certification laboratory; and
- May be battery powered, or
- May plug into a dwelling's electrical outlet and have a battery backup, or
- May be wired into a dwelling's electrical system and have a battery back-up, or is connected to an electrical system via an electrical panel.
- May be combined with a smoke detecting device if the combined device complies with applicable law regarding both smoke detecting devices and carbon monoxide alarms and that the combined unit produces an alarm, or an alarm and voice signal, in a manner that clearly differentiates between the two hazards.

Residential Water Heater Installations

Adequate supply of combustion air is required for all gas appliances present: (2009 IRC G2407)

Horizontal:
 All High : 1 sq in/ 3,000btu
 High+Low: 1 sq in / 2,000btu (each duct)

Vertical:
 1 sq in / 4,000btu
 - "unusually tight construction" may apply (site specific).



Single wall vent:
 6" minimum clearance to combustibles.
 (2009 IRC Table G2427.10.5)

B-Vent: 1" minimum clearance to combustibles (per listing)

Each joint inserted fully (1.5"), and 3 screws, equally spaced around the joint (2009 IRC M1601.4.1)

Usually a 4" vent diameter is required unless this height is at least 36" (see tables)
 (2009 IRC Table G2428.3(2))

Isolation valve required on cold water supply to water heater
 (2009 IRC P2903.9.2)

Gas flex Connector: No more than 6' in length, and listed for intended use
 (2009 IRC G2422.1.2.1)

Listed Valve no more than 6' from appliance
 (2009 IRC G2420.5.1)

Pan drain: minimum 3/4"
 (2009 IRC P2801.5)

Drain pan required if water heater is over construction that could be damaged by water.
 - larger in diameter than heater
 - 1 1/2" high
 (2009 IRC P2801.5)

Firestop required at floor/ceiling penetrations
 "Firestop at floor/ceiling"

All portions of the common vent must be B-Vent. This includes E-Z Tees and Wyes
 (2009 IRC G2428.3.9.1)

Vent from Fan Induced Appliance

T&P Discharge May not have :
 -threads on the end
 -be valved or be capped.

T&P discharge must have :
 -1.5" minimum Air Gap, located in the same room
 (2009 IRC P2803.6.1)