



# Inspection and Verification Guidance for HERS<sub>H2O</sub>

Version 2.0

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## Inspection and Verification Guidance for HERS<sub>H2O</sub>

### I. Background

The Residential Energy Services Network (RESNET) began developing guidelines for a home water efficiency rating standard in 2015. After four years of development, multiple public comment periods and input from the country's leading water efficiency experts, RESNET finalized BSR/RESNET/ICC 850, which serves as the basis for the HERS<sub>H2O</sub> Index. HERS<sub>H2O</sub> is a first-of-its-kind whole house system to rate the water efficiency of a home.

HERS<sub>H2O</sub> has two topic areas:

1. Indoor water use, including plumbing, plumbing fixtures and fittings, appliances, and other water-using equipment.
2. Outdoor water use, including landscape design and irrigation systems.

### II. General Site and Inspection Information

The Rater should begin each inspection by confirming the address of the home and recording it on the *HERS<sub>H2O</sub> Inspection Checklist*. Fill in the inspection date on the inspection checklist. The Rater should provide the builder with a copy of the inspection checklist.

Homes eligible to earn the HERS<sub>H2O</sub> label include:

- Single-family homes, duplexes, and
- Townhomes

The builder is expected to make the documentation listed in this guidance document available to the Rater. This is typically done onsite during the inspection, but it can also be arranged for at any mutually agreeable time. The Rater is required to keep a copy of the inspection checklist, any digital photos, and any other supporting information that was obtained during the inspection.

### III. Required Equipment

To conduct the inspection, Raters will need the following pieces of equipment:

- Stop watch
- Digital thermometer such as a digital food thermometer
- Pressure gauge
- Bucket or flow bag with volume measures marked
- Dye tablets for toilets
- Flashlight
- Digital camera
- Tape measure

### IV. Indoor Water Efficiency Inspection

Fill out the *HERS<sub>H2O</sub> Inspection Checklist* (or other, similar method of documentation) and

gather supporting documentation, as appropriate.

## Leaks

There shall be no detected leaks from any water-using fixtures, appliances, or equipment. Compliance shall be verified through pressure-loss testing and visual inspection on existing homes. For new construction, a visual inspection is required, but pressure-loss testing is optional.

### Rater Instructions

- Make sure that the water is turned on to the home. Attach a pressure gauge to the cold water faucet for the washing machine hookup or other cold water faucet and take a pressure reading. Turn the water to the home or unit off and wait approximately 10 minutes, then take another pressure gauge reading. A loss of pressure indicates a leak. Notify the builder if a leak is detected.
- For homes with a separate water supply for irrigation (e.g., reclaimed water), check both the outdoor and indoor water supplies for leaks. To check the outdoor water supply, attach a pressure gauge to the outside faucet and take a pressure reading. Wait approximately 10 minutes and take another pressure gauge reading.

To check the indoor water supply, make sure that the water is turned on to the house. Attach a pressure gauge to the cold water faucet for a washing machine hookup and take a pressure reading. Turn the water to the house off. Wait approximately 10 minutes and take another pressure gauge reading. A loss of pressure in either water supply indicates a leak. Notify the builder or homeowner if a leak is detected.

- During the inspection, check for leaks at all visible water supply connections and valves for water-using fixtures, appliances, and equipment. Notify the builder if leaks are detected. Some of the specific inspection requirements included below will provide additional instructions for checking for leaks.

## Service Pressure

### Requirements

Where the static service pressure of a home exceeds 90 pounds per square inch (psi) (414 kilopascal [kPa]) this shall be noted on the inspection checklist. Service pressure shall be verified through one of the following methods:

- Use of a pressure-reducing valve (PRV) downstream of the point of connection. All fixture connections shall be downstream of the PRV; **or**
- For homes with a private well, verification that the pressure tank is not set in excess of 90 psi; **or**
- Determination that the service pressure at the home is 90 psi or less at the time of inspection, *and* documentation from the public water supplier that service pressure is unlikely to regularly exceed 90 psi at the home or unit on a daily or seasonal basis.

Piping for home fire sprinkler systems is excluded from this requirement and should comply with state and local codes and regulations.

### Rater Instructions

- Determine if the home receives publicly supplied water or receives water from a groundwater well.
- If the home's water is supplied by a groundwater well, verify that a pressure tank is installed and that the pressure is set to 90 psi or below.
- If the home's water is publicly supplied either:
  - Verify that a PRV is installed downstream of the point of connection; **or**
  - Verify that the water pressure to the home or unit is 90 psi or less (this could be done during the pressure-loss testing discussed in Section 3.1).
- Note that separate PRVs may have been installed for indoor and outdoor water usage.

## Hot Water Delivery System

### Requirements

The pipe length for the hot water delivery system shall be determined, along with the length of any recirculation loop and recirculation branch. The watts for the recirculation pump shall also be noted as well as the presence or absence of a drain water heat recovery system and pipe insulation.

### Rater Instructions

- Verify that the water heater is on. It is common for builders to turn off the gas and reduce the temperature setting to “vacation” on a gas water heater or to trip the breaker.
- Check to see that connection points in the hot water delivery system do not leak.
- Check the type of hot water delivery system installed to verify the type of recirculation system, if one is installed.
- If a recirculation system is installed, verify the watts of the pump.
- Determine the length of hot water piping from the hot water heater to the farthest hot water fixture, measured longitudinally from plans, assuming the hot water piping does not run diagonally, plus 10 feet of piping for each floor level, plus 5 feet of piping for unconditioned basements (if any). Can be determined from plans.
- Determine hot water recirculation loop piping length including both supply and return sides of the loop, measured longitudinally from plans, assuming the hot water piping does not run diagonally, plus 20 feet of piping for each floor level greater than one plus 10 feet of piping for unconditioned basements. Can be determined from plans.
- Determine the length of the branch hot water piping from the recirculation loop to the farthest hot water fixture from the recirculation loop, measured longitudinally from plans, assuming the branch hot water piping does not run diagonally. Can be determined from plans.
- Indicate the presence or absence of hot water pipe insulation and indicate the R-value, if present.
- Indicate whether or not a drain water heat recovery system is installed. If installed, note whether or not one shower, or more than one shower are connected to the system.

## Toilets

**Rater Instructions**

- Obtain the make and model name and number of all toilets installed in the house from the builder.
- Verify that the toilets installed match the builder's list.
- Check the angle valve and connections for visible leaks.
- Conduct a dye tablet test in each toilet to ensure the flapper is not leaking:
  - Drop dye tablets into the toilet tank and wait five minutes (while waiting you may want to test the faucets and/or showerheads).
  - Check the toilet bowl for tablet color. If color flows into the toilet, the flapper valve is leaking and needs to be replaced.
  - Flush upon completion to avoid staining from the dye.
- Check the water level setting:
  - Remove the tank lid.
  - Flush toilet.
  - Ensure water level is properly set so that water does not overflow from the overflow tube.

**Bathroom Sink Faucets****Rater Instructions**

- Obtain the make and model number of all bathroom faucets or faucet accessories installed in the house from the builder.
- Note the flow rate stamped on the aerator or from manufacturer specifications

OR

- Check the maximum flow rate from all faucets to ensure that the aerators have not been removed or tampered with:
  - Use a small bucket underneath or attach a flow-measuring bag to the faucet spout.
  - Turn on the water completely while starting a stopwatch. If the faucet has two handles, turn both handles on completely.
  - After 10 seconds on the stopwatch, turn off the water.
  - Multiply the amount of water collected by 6 to obtain the gallons per minute flow rate
- Check the faucets for leaks after the water flow is turned off.
- Check the faucets' hot/cold water connection hoses and valves for leaks.

**Kitchen Sink Faucets****Rater Instructions**

- Obtain the make and model number of all kitchen sink faucets installed in the house from the builder.
- Note the flow rate stamped on the aerator or from manufacturer specifications

OR

- Check the maximum flow rate from all kitchen sink faucets:
  - Use a small bucket underneath or attach a flow-measuring bag to the faucet spout.
  - Turn on the water completely while starting a stopwatch. If the faucet has two handles, turn both handles on completely.
  - After 10 seconds on the stopwatch, turn off the water.
  - Multiply the amount of water collected by 6 to obtain the gallons per minute flow rate
- Check the faucet for leaks after the water flow is turned off.
- Check the faucet valves and/or connection hoses for leaks.

## **Showerheads and Shower Compartments**

### Shower Compartment Requirements

The total flow rate of water from all showerheads flowing at any given time, including rain systems, waterfalls, body sprays, and jets, shall be verified for each shower compartment.

### Rater Instructions

- Obtain the make and model number of all showerheads installed in the house from the builder.
- Check the showerhead for leaks at the shower arm and showerhead threaded connection. Also, if it is a bath/shower combination, check the shower diverter for minimum water seepage.
- Note the flow rate stamped on each showerhead or as noted in manufacturer specifications

OR

Check the maximum flow from the showerhead.

- For a single showerhead in a shower compartment:
  - Use a bucket or attach a flow measuring bag to the showerhead.
  - Turn on the water completely while starting a stopwatch. If the shower has two handles, turn on both handles completely.
  - After 10 seconds on the stopwatch, turn off the water.
  - Multiply the amount of water collected by 6 to obtain the gallons per minute flow rate
- For multiple showerheads in a single shower compartment:
  - Use a bucket, attach a flow measuring bag, or use another method to capture all of the water flowing from each showerhead, either together or individually.
  - Turn on the water completely while starting a stopwatch. If the shower has two handles, turn on both handles completely.
  - After 10 seconds on the stopwatch, turn off the water.
  - Add the maximum flow rates from each showerhead to determine the total flow

rate.

- If a single device contains multiple showerheads, hand-held showers, etc., verify the maximum flow rate from each of the possible operating modes. The greatest flow rate should be used for the rating.
- If more than one showerhead is installed in a shower, verify that the showerhead serving the additional area is operated by separate controls. If there are not separate controls, use the flow rate from all showerheads operated by a single control for the rating. Where there are separate controls, use the showerhead with the highest flow rate for the rating.

## Dishwashers

### Rater Instructions

- Review the documentation to verify the capacity of the dishwasher (in place settings) as identified in manufacturer's data.
- Verify the gallons per cycle of the dishwasher:
  - gal/cycle can be entered either directly or as listed on:
    - a) The ENERGY STAR product finder database
    - b) The California Energy Commission (CEC) Modernized Appliance Efficiency Database
    - c) The Department of Energy (DOE) Compliance Certification Management System (CCMS), OR
    - d) gal/cycle can be calculated from the Energy Guide label, following the calculation procedures as found in BSR/RESNET/ICC 850.
- Check for leaks at all visible connection valves.

## Clothes Washers

### Rater Instructions

- Review the documentation to verify the capacity of the clothes washer in cubic feet from manufacturer's data, OR the California Energy Commission Database, OR the EPA Energy Star website, OR use the default value of 2.874ft<sup>3</sup>.
- Review manufacturer's data to determine the clothes washer's Integrated Water Factor (IWF) [gal/cyc)/ft<sup>3</sup>]
- Check for leaks at all visible connection valves.

## Water Softeners

### Requirements

Where a water softener system is installed, the Rater shall verify the water hardness of the area and the water uses being softened.

### Rater Instructions

- Data for the hardness of water shall be determined by the location of the Rated Home and one of the following:



- a) U.S. Geological Survey *Concentrations of Hardness as Calcium Carbonate* Map
- b) Data provided by the local water supplier
- c) A hardness test of water collected in the home using an EPA approved method for determination of hardness
- Verify and document whether or not all the water uses for the home are being softened, or only specific uses (i.e., only hot water, only indoor water, etc)
- Check for leaks from all visible connections and valves.

## V. Outdoor Water Efficiency Criteria

### Landscape

At a minimum, the front yard landscape must be completed in order to complete a rating. Determine the size of the lot and the portion of the lot area that is or will be landscaped. Verify the type of irrigation system, type of irrigation system controller and whether or not a professional commissioned the irrigation system. Verify whether or not the builder or homeowner will want to use the Residential Irrigation Capacity Index (RICI) to potentially get additional credit.

The following definitions apply to this section:

**Automatic Irrigation System**— An irrigation system that is initiated by a clock timer, irrigation controller, or other method that does not require human intervention to initiate an irrigation event.

**Irrigated Area**—the portion of a lot that receives supplemental water for irrigation.

**Lot Size**—the area of a single parcel of land upon which the Rated Home is located.

**Outdoor Water Use**— Water use that occurs outside of the exterior walls of a dwelling unit.

**Residential Irrigation Capacity Index (RICI)**— The intensity with which an automatic irrigation system applies water calculated in accordance with section 4.6.4 (of BSR/RESNET/ICC 850.)

### Landscape Design

Landscaped and irrigated area is defined as the designed area of landscape excluding the footprint of the home and permanent hardscape areas, such as driveways, sidewalks, and patios. Septic drainage fields and public right-of-ways should also be excluded from this calculation.

#### Rater Instructions

- Measure or obtain documentation of the total lot area for the rated home, in square feet. This can typically be determined from a site plan.
- Measure or obtain documentation to determine the total irrigated area.
  - To determine the total irrigated area, start with the area of the entire lot and subtract the area of the home's footprint as well as any accessory structures like garages and sheds, then subtract the area of any hardscaping (driveway, sidewalk, patio), artificial turf, and landscaping not receiving supplemental water for irrigation (i.e., drought tolerant plantings)
- There are only four data points necessary to complete the estimate of outdoor water use

and get a HERS<sub>H2O</sub> Index score: “Lot Area”, “Irrigated Area”, by selecting “yes” or “no” to whether or not the home has an automatic irrigation system and by selecting “yes” or “no” to whether or not the home has a pool or spa.

- All other data points in the HERS<sub>H2O</sub> calculation spreadsheet for outdoor water use are optional and can be used to improve the home’s score. These fields include: “Smart/weather-based controller?”, “Use RICl?”, “Zone flow rates (gpm)”, “Prof Audit?”.

## Pools/Spas

### Rater Instructions

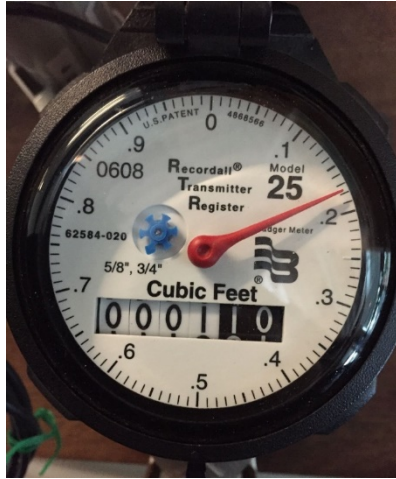
- Verify the number of pools and/or spas installed.

## Irrigation System Design and Installation

Verify the type of irrigation system installed, whether or not a professional audit of the system was conducted and whether or not the builder or homeowner want to take credit for a low flow irrigation system using the Residential Irrigation Capacity Index (RICl).

### Rater Instructions

- Determine whether or not an automatic irrigation system is installed (look for the irrigation controller).
- Verify whether or not the automatic irrigation system is run by a smart controller (i.e., weather-based or rain/soil moisture-based controller).
- If the builder or homeowner would like to obtain additional credit by using the Residential Irrigation Capacity Index (RICl) ask for documentation of the gallons per minute flow rate for each zone in the system or conduct a test to determine the flow rate.
  - To determine irrigation system flow rates:
  - Turn off all fixtures and appliances (ensure there is no water being used in the house)
  - Set irrigation controller to run each zone for about 5 minutes (equalize system)
  - Verify whether the water meter measures water flow in cubic feet or gallons
  - Measure flow rates by noting start reading of the meter (If the meter is in cubic feet, then one complete rotation of the red sweep hand is equivalent to 1 cubic foot of water (or 7.48 gallons). If the meter is in gallons, one complete rotation of the red sweep hand is equivalent to 10 gallons) (See example images of both types of water meters, below)
  - Watch for 30 seconds and note the amount of water used in gallons or cubic feet, depending on your meter type, then multiply that number by 2. (to convert cubic feet into gallons: 1 cf = 7.48 gallons)
  - If all zones are not run at once, repeat the above steps for each individual zone in the irrigation system
  - Sum together flow rates of all zones in gpm.
  - On the HERS<sub>H2O</sub> calculation spreadsheet, enter this number in the “Zone flow rates” cell and select “Yes” for “Use RICl?”



- Ask the builder whether or not a certified irrigation professional audited the system. If so, request the audit results and any other documentation. On the calculation spreadsheet, select “Yes” in the field “Prof. Audit?”.
- If the builder already had the flow rates of the irrigation system tested, obtain documentation indicating the number of irrigation zones and the flow rates for each zone in gallons per minute. Enter the sum of all zone flow rates in the field “Zone flow rates (gpm)”.