

REVISED DRAFT WATER-EFFICIENT SINGLE-FAMILY NEW HOME SPECIFICATION

1.0 SCOPE AND OBJECTIVE

This specification establishes the criteria for water-efficient new homes under the U. S. Environmental Protection Agency's (EPA's) WaterSense® program. It is applicable to newly constructed single-family homes and townhomes, three stories or less in size. A new home must be built by a WaterSense builder partner and meet all of the identified criteria to become a WaterSense labeled new home.

The intent of this specification is to reduce indoor and outdoor water usage in new residential homes, thereby lowering consumer utility bills and encouraging water and wastewater infrastructure savings. EPA's goal is that WaterSense labeled new homes will use approximately 20 percent less water than a standard new home by using a combination of prescriptive and performance-based approaches identified in this specification.

All homes, landscapes, and irrigation systems shall meet all applicable national, state, and local regulations. This specification is not intended to contravene state or local codes and requirements. Unless indicated, criteria for the individual components or products specified in this specification do not constitute criteria to earn the WaterSense label for that component or product category. Individual component criteria are valid only in the context of this specification. EPA will review this specification every three years and revise it as necessary to reflect changes in technology and the marketplace.

2.0 SUMMARY OF CRITERIA

New homes must meet criteria in three areas:

- Indoor water use, including plumbing, plumbing fixtures and fittings, appliances, and other water-using equipment;
- Outdoor water use, including landscape design and irrigation systems, if installed; and
- Homeowner education.

3.0 INDOOR WATER-EFFICIENCY CRITERIA

- 3.1 Leaks – There shall be no visible leaks from any water-using fixtures, appliances, or equipment.
- 3.2 Service Pressure – The static service pressure shall be a maximum of 60 pounds per square inch (psi) (414 kilopascal [kPa]). Compliance for homes with publicly supplied water shall be achieved by the use of a pressure-regulating valve (PRV) downstream of the water meter. All fixture connections shall be downstream of the PRV. Compliance for homes supplied by groundwater wells shall be achieved by use of a pressure tank.

Installation of a PRV creates a closed water service system. Thermal expansion may increase pressure in the system and should be controlled in accordance with local code.

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

- 3.3 Hot Water Delivery System – To minimize water loss from delivering hot water, the hot water distribution system shall store no more than 0.6 gallons (2.3 liters) of water in any piping/manifold between the hot water source and any hot water fixture. Timer- and temperature-based recirculating systems shall not be used to meet the criteria.
- 3.4 Toilets – All toilets shall be [WaterSense labeled tank-type high-efficiency toilets](#). A listing of labeled toilets can be found at www.epa.gov/watersense/pp/find_het.htm.
- 3.5 Bathroom and Kitchen Faucets
- 3.5.1 Bathroom sink faucets – All [bathroom sink faucets](#) shall be WaterSense labeled high-efficiency bathroom sink faucets or faucet accessories (e.g., aerators). A list of faucets and accessories can be found at www.epa.gov/watersense/pp/lists/find_faucet.htm.
- 3.5.2 Kitchen faucets – Kitchen faucets shall comply with federal standards for maximum flow rate of 2.2 gallons per minute (gpm) @ 60 psi (8.3 liters per minute [lpm] @ 414 kPa).
- 3.6 Showerheads – WaterSense has not yet developed water-efficiency criteria for showerheads. Showerheads shall comply with the requirements of the Energy Policy Act of 1992, which sets a maximum flow rate of 2.5 gpm @ 80 psi (9.5 lpm @ 552 kPa), when certified in accordance with ASME A112.18.1/CSA B125.1. Showers shall also be equipped with automatic compensating valves that are certified to ASSE 1016 or ASME A112.18.1/CSA B125.1 and are designed to provide thermal shock and scald protection for the [rated flow rate](#) of the installed showerhead.

The total allowable flow rate of potable water from all showerheads flowing at any given time, including rain systems, waterfalls, bodysprays, and jets, shall be limited to 2.5 gpm per shower compartment, where the floor area of the shower compartment is less than 2,600 inches² (in.²) (1.7 meters² [m²]). For each increment of 2,600 in.² (1.7 m²) of floor area thereafter or part thereof, additional showerheads are allowed, provided the total flow rate of potable water from all flowing devices is equal to or less than the 2.5 gpm per shower compartment.

Note: These showerhead criteria will be revised after the release of the final specification for WaterSense labeled high-efficiency showerheads. A copy of EPA's notice of intent to develop draft performance specifications for showerheads and related devices and information on the current status of the specification can be found at <http://www.epa.gov/watersense/pp/showerheads.htm>.

- 3.7 Appliances – If the following types of appliances are financed, installed, or sold as upgrades through the homebuilder, they shall meet these criteria:
- 3.7.1 Dishwashers – Dishwashers shall be ENERGY STAR® qualified. A listing of qualified dishwashers can be found at www.energystar.gov/index.cfm?fuseaction=dishwash.search_dishwashers.
- 3.7.2 Clothes washers – Clothes washers shall be ENERGY STAR qualified with a [water factor](#) of less than or equal to 6.0 gallons of water per cycle per cubic foot capacity. A listing of qualified clothes washers can be found at www.energystar.gov/index.cfm?fuseaction=clotheswash.search_clotheswashers.
- 3.8 Other Equipment – If the following pieces of equipment are financed, installed, or sold as upgrades through the homebuilder, they shall meet these criteria:
- 3.8.1 Evaporative cooling systems – [Evaporative cooling systems](#) shall use a maximum of 3.5 gallons (13.3 liters) of water per ton-hour of cooling when adjusted to maximum water use. Blowdown shall be based on time of operation, not to exceed three times in a 24-hour period of operating (every eight hours). Blowdown shall be mediated by conductivity or basin water temperature-based controllers. The reservoir discharge outlet should be easily visible so the user can see when the refill valve is leaking. Once-through or single-pass cooling systems, systems with continuous blowdown/bleedoff, and systems with timer-only mediated blowdown management shall not be used to meet these criteria.
- 3.8.2 Water softeners – All self-regenerating water softeners shall be certified to meet NSF/ANSI Standard 44, including the voluntary efficiency rating standards in Section 7 – *Mandatory testing for elective claims* for efficiency rated systems, which states that water softeners shall:
- Be a demand-initiated regeneration system (i.e., it must use a flow meter or water hardness sensor to initiate regeneration; devices that use time clock-initiated regeneration [fixed time schedule] do not qualify for the efficiency rating).
 - Have a rated salt efficiency of not less than 3,350 grains of total hardness exchange per pound of salt, based on sodium chloride (NaCl) equivalency (477 grams of total hardness exchange per kilogram of salt).
 - Not generate more than 5 gallons of water per 1,000 grains of hardness removed during the service cycle (18.9 liters per 64.8 grams of total hardness removed).
- 3.8.3 Drinking water treatment systems – Drinking water treatment systems must be certified to meet applicable NSF/ANSI standards. Such systems shall have an efficiency rating of not less than 85 percent.

4.0 OUTDOOR WATER-EFFICIENCY CRITERIA

- 4.1 Landscape – EPA has developed two options for designing the landscape of WaterSense labeled new homes; builders shall choose and implement one of these options. Option 1 provides a turfgrass allowance and Option 2 allows the builder/landscape professional to design a landscape that is sustainable with a specified amount of water (i.e., a [water budget](#)).

At a minimum, the [front yard](#) shall be landscaped to meet the criteria in either option. The entire yard shall be landscaped to meet the criteria in either option where landscaping of the entire yard is financed, installed, or sold as an upgrade through the homebuilder. The entire yard shall also be landscaped to meet the criteria in either option when irrigation systems, pools, spas, or [water features](#) have been financed, installed, or sold by the homebuilder.

Lots with [landscapable areas](#) equal to or less than 1,000 square feet are exempt from these landscape criteria.

4.1.1 Landscape design

4.1.1.1 Option 1 – Turfgrass shall not exceed 40 percent of the [landscapable area](#).

4.1.1.2 Option 2 – Landscape design shall be developed using the [water budget](#) tool based on a 70 percent [evapotranspiration adjustment factor](#).

4.1.2 Turfgrass – Turfgrass shall not be installed in strips less than 4 feet wide.

4.1.3 Slopes – Plantings other than turfgrass shall be installed on slopes in excess of 4 feet of horizontal run per 1 foot vertical rise (4:1).

4.1.4 Mulching – Non-vegetated, [softscape](#) parts of the [landscapable area](#) shall include a 2- to 3-inch layer of [mulching material](#).

4.1.5 Pools/spas – Pools and spas shall have an appropriate cover. The water surface area shall be deducted from the turfgrass allowance under Landscape Design Option 1 and included as [landscapable area](#) under Landscape Design Option 2.

4.1.6 Ornamental water features – [Ornamental water features](#) financed, installed, or sold as upgrades by the homebuilder must recirculate water and serve a beneficial use. The water surface area shall be deducted from the turfgrass allowance under Landscape Design Option 1 and included as [landscapable area](#) under Landscape Design Option 2.

- 4.2 Irrigation System – Irrigation systems, if installed, shall meet the following criteria:

- 4.2.1 Post-installation audit – All irrigation systems shall be audited by a WaterSense irrigation partner. A listing of irrigation partners by state can be found at www.epa.gov/watersense/pp/lists/irr_partners.htm.
- 4.2.2 Leaks – There shall be no visible leaks during the operation of the irrigation system. The system will be checked for leaks during the post-installation audit.
- 4.2.3 Runoff/overspray – Irrigation systems shall be designed to sustain the landscape without creating runoff or direct overspray during a minimum operating duration. This will be measured during the post-installation audit and the WaterSense irrigation partner will determine the minimum operating duration based on landscape conditions and irrigation system design.
- 4.2.4 Distribution uniformity – Irrigation systems shall achieve a lower quarter distribution uniformity (DU_{LQ}) of 70 percent or greater. Distribution uniformity will be measured during the post-installation audit.
- 4.2.5 Rainfall shutoff device – Irrigation systems shall be equipped with technology that inhibits or interrupts operation of the irrigation system during periods of rainfall (e.g., rain sensors).
- 4.2.6 Irrigation controllers – WaterSense has not yet developed water-efficiency criteria for irrigation controllers. Irrigation systems shall be equipped with irrigation controllers that contain the following features:
1. Multiple programming capabilities – shall be capable of storing a minimum of three different programs to allow for separate schedules.
 2. Multiple start times (cycling, cycle/soak, stackable start times) – shall be capable of a minimum of three different start times to allow for multiple irrigation cycles on the same zone for areas prone to runoff.
 3. Variable run times – shall be capable of varying run times, for example one minute to a minimum of one hour.
 4. Variable scheduling – shall be capable of interval scheduling (minimum of 14 days) to allow for watering on even day scheduling, odd day scheduling, calendar day scheduling, and interval scheduling.
 5. Percent adjust (water budget) feature – shall include a “Percent Up/Down Adjust” feature (or “Water Budget” feature) such as a button or dial that permits the user to increase or decrease the run-times or application rates for each zone by a prescribed percentage, by means of one adjustment without modifying the settings for that individual zone.
 6. Capability to accept external soil moisture and/or rain sensors.
 7. Non-volatile memory or self-charging battery circuit.
 8. Complete shutoff capability for total cessation of outdoor irrigation.

Note: These irrigation controller criteria will be revised after the release of the final specification for WaterSense labeled weather-based or sensor-based irrigation control technology. A copy of EPA's notice of intent to develop draft performance specifications for these technologies and information on the current status of the specification can be found at www.epa.gov/watersense/specs/controltech.htm.

- 4.2.7 Sprinkler irrigation – [Sprinkler irrigation](#), other than as components of a [microirrigation system](#), shall not be used to water plantings other than maintained turfgrass. Sprinkler heads shall have a 4-inch or greater pop-up height and matched precipitation nozzles.
- 4.2.8 Microirrigation systems – At a minimum, [microirrigation systems](#) shall be equipped with pressure regulators, filters, and flush end assemblies.
- 4.2.9 Schedule – Two water schedules, developed by the [WaterSense irrigation partner](#) as part of the [post-installation audit](#), shall be posted at the controller. One schedule shall be designed to address the initial grow-in phase of the landscape and the second schedule shall be designed to address an established landscape. Both schedules shall be seasonal in nature.

5.0 HOMEOWNER EDUCATION

- 5.1 Operating Manual – The builder shall develop and provide to the homebuyer a written operating and maintenance manual for all water-using equipment or controls installed in the house and yard, including all relevant WaterSense materials on indoor and outdoor water use. This may be a chapter or folder in an existing manual. If clothes washers or dishwashers are not provided, general information about water-efficient appliances shall be included.
- 5.2 Irrigation System – If an irrigation system is installed, the builder shall provide the homebuyer with a record drawing (schematic) of the system and copies of the irrigation schedules.

6.0 FUTURE SPECIFICATION REVISIONS

EPA reserves the right to revise this specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. Industry partners and other interested parties will be notified in advance of anticipated changes. Revisions to the specification would be made following discussions with industry partners and other interested parties.

7.0 DEFINITIONS

Builder partner – A homebuilder who has committed to building new homes in accordance with the Water-Efficient Single-Family New Home Specification. The builder must signify such commitment by signing a WaterSense partnership agreement with EPA.

EPA-licensed provider – An organization licensed by EPA to hire or contract with inspectors, oversee new home inspections, and provide builder partners of certified new homes with the WaterSense label. More information concerning the provider's roles and responsibilities can be found in the [WaterSense new homes certification system](#).

Evaporative cooling system – System that cools the air using water evaporation. There are two types of evaporative cooling systems: direct and indirect (all called "two-stage"). In a direct evaporative cooling system, a blower forces air through a permeable, water-soaked pad. As the air passes through the pad, it is filtered, cooled, and humidified. An indirect evaporative cooling system has a secondary heat exchanger that prevents humidity from being added to the airstream that enters the home. Cooling systems are defined by the temperatures they can "hold" either in the space and/or the process or equipment, and the amount of heat they can remove at full capacity. This heat removal is normally expressed in tons of cooling (or refrigeration) capacity. One ton of cooling equals precisely 12,000 British thermal units of heat removal per hour (Btu/h).

Evapotranspiration adjustment factor – An adjustment factor used in the water budget tool to limit the allotment of water a landscape can be designed to use. For the purposes of this specification, EPA has set this level at 70 percent of reference evapotranspiration (ET_0). This means that the landscape must be designed to require a maximum of 70 percent of the amount of water required by an equally sized landscape composed entirely of turfgrass.

Front yard – The area from the front of the house to the street, curb, and/or property lines.

Irrigation system audit – Procedure to collect and present information concerning the uniformity of application, precipitation rate, and general condition of an irrigation system and its components.¹

Landscapable area – Buildable lot area excluding area under roof. Buildable lot area is the portion of a site where construction can occur. Buildable land excludes public streets and other public rights-of-way, land occupied by nonresidential structures, public parks, and land excluded from residential development by law. Septic field drainage areas are also excluded from the definition of landscapable area.

Lower quarter distribution uniformity (DU_{LQ}) – Distribution uniformity is the measure of uniformity of applied irrigation water over an area. DU_{LQ} is the ratio of the average of the lowest 25 percent of measurements to the overall average measurement, often determined through the use of catch cans or soil moisture probes that evaluate the coverage of one or more sprinklers or drip systems.²

¹ Irrigation Association. 2005. *Landscape Irrigation Scheduling and Water Management*.

² Irrigation Association. 2005. *Landscape Irrigation Scheduling and Water Management*.

Microirrigation system – Method where water is applied at or below the soil surface at low pressure and low volume.³

Mulching material – Organic and/or inorganic permeable materials that will retain soil moisture, suppress weeds, and allow free movement of oxygen into and out of the soil.

Ornamental water feature – Includes fountains, ponds, waterfalls, man-made streams, and other decorative water-related constructions. To meet the criteria, these features shall recirculate water and serve a beneficial use (e.g., habitat for wildlife, stormwater management, cooling properties).

Rated flow rate – The flow rate of the showerhead when tested in accordance with ASME A112.18.1/CSA B125.1.

Softscape – The natural elements of a landscape, such as plant materials and soil. Softscapes can include hard elements such as rocks.⁴

Sprinkler irrigation – Type of irrigation using mechanical devices with nozzles (sprinklers) to distribute the water by converting water pressure to a high velocity discharge stream or streams.⁵

Static service pressure – The pipeline or municipal water supply pressure when water is not flowing.

Water budget – A water budget is used to calculate the amount of water a landscape needs, taking into account the inputs and outputs of water to and from the root zone. Inputs, such as precipitation, are subtracted from outputs, such as evapotranspiration, to calculate the water needs of the landscape. Many factors are taken into consideration when calculating a water budget, such as plant type and irrigation system efficiencies.

Water factor – The quotient of the total weighted per-cycle water consumption divided by the capacity of the clothes washer.

WaterSense labeled bathroom sink faucet – These faucets have a flow rate that does not exceed 1.5 gallons per minute (gpm) (5.7 lpm) at a pressure of 60 psi (414 kPa) at the inlet when water is flowing, and is not less than 0.8 gpm (3.0 lpm) at a pressure of 20 psi (1.38 kPa) at the inlet when water is flowing. The WaterSense high-efficiency bathroom sink faucet specification can be found at www.epa.gov/watersense/specs/faucet_final.htm and a list of labeled faucets and faucet accessories can be found at http://www.epa.gov/watersense/pp/lists/find_faucet.htm.

WaterSense labeled tank-type high-efficiency toilet – These toilets have a flush volume that does not exceed 1.28 gallons (4.8 liters), have a solid waste removal of 350 grams or greater, and conform to the adjustability and other supplementary requirements included in the

³ Irrigation Association. 2005. *Landscape Irrigation Scheduling and Water Management*.

⁴ U.S. Green Building Council. *LEED for Homes Reference Guide*, First Edition, Washington, D.C. 2008.

⁵ Irrigation Association. 2005. *Landscape Irrigation Scheduling and Water Management*.

WaterSense high-efficiency tank-type toilet specification. This specification can be found at www.epa.gov/watersense/specs/het.htm and a list of labeled toilet models can be found at www.epa.gov/watersense/pp/find_het.htm.

WaterSense irrigation partner – These professionals are certified through WaterSense labeled programs for their expertise in water-efficient irrigation technology and techniques. The specifications for professional certification programs can be found at http://www.epa.gov/watersense/pp/cert_programs.htm and a listing of irrigation partners by state can be found at www.epa.gov/watersense/pp/irrprof.htm.

APPENDIX A

Informative Annex for WaterSense Labeling

The following requirements must be met before a new home may earn the WaterSense label.

1.0 WATERSENSE PARTNERSHIP

The homebuilder must have a signed partnership agreement in place with EPA.

2.0 CONFORMITY ASSESSMENT

Conformance to this specification must be certified by an [EPA-licensed provider](#) in accordance with the [WaterSense New Home Certification System](#).