
WaterSense® Revised Draft Specification for Weather-Based Irrigation Controllers

1.0 Scope and Objective

This specification establishes the criteria for weather-based irrigation controllers labeled under the U.S. Environmental Protection Agency's (EPA's) WaterSense program. It applies to stand-alone controllers, add-on devices, and plug-in devices (collectively referred to in this specification as controllers) that use current climatological data as a basis for scheduling irrigation. This specification applies to controllers that create or modify irrigation schedules based on evapotranspiration (ET) principles by:

- Storing historical crop evapotranspiration (ET_c) data characteristics of the site and modifying these data with an onsite sensor;
- Using onsite sensors as a basis for calculating real time ET_c;
- Using a central weather station as a basis for ET_c calculations and transmitting the data to individual users from remote sites; or
- Using onsite weather or climate sensors.

For the purpose of this specification, the onsite sensor requirement includes weather sensors such as temperature or solar radiation. Because rain sensors do not modify ET_c but interrupt irrigation events based on rainfall, they do not meet this onsite sensor requirement when used alone.

The performance criteria contained in this specification are designed to test the capability of the controller to provide adequate and efficient irrigation while minimizing potential runoff when the controller is programmed and operated in compliance with manufacturer's instructions. Conformance with these requirements is an indication that the controller has the capacity to modify or generate appropriate irrigation schedules based on weather inputs.

This specification applies to controllers for use in residential or commercial settings.

2.0 Summary of Criteria

Controllers must meet criteria in the following areas, as applicable:

- Irrigation adequacy for each zone shall be greater than or equal to 80 percent as specified in Section 3.0.
- Irrigation excess for each zone shall be less than or equal to 5 percent, as specified in Section 3.0.
- The controller must conform to the supplemental capability requirements specified in Section 4.0.

3.0 Performance Criteria

The controller, as configured for testing in accordance with Appendix A, shall be tested in accordance with the most recent version of the Smart Water Application Technologies™ (SWAT) test protocol for climatologically based controllers, with the additional requirements listed in Section 3.1, and shall meet the performance criteria in Section 3.2.

In accordance with the SWAT protocol, the test period shall be 30 consecutive days. However, the test may run past the initial 30 days until a 30-day period occurs where all conditions in Section 3.1 are met.

3.1 Testing Modifications to the SWAT Protocol¹

- 3.1.1 Minimum Runtimes: All runtimes (irrigation cycles) that occur during the test period must be greater than three minutes in duration. Water applied during irrigation events totaling three minutes or less shall be excluded from the daily water balance calculation.
- 3.1.2 Missing Data From the Reference Weather Station
 - 3.1.2.1 For the test to be valid there shall be no more than two consecutive days, or no more than three days in total, of missing ET data generated by the reference weather station during the test period.
 - 3.1.2.1.1 If ET data generated by the reference weather station are missing during the test, then the previous day's ET data shall be used instead.
 - 3.1.2.2 There shall be no missing rainfall data during the test period, but data from a backup rain gauge located at the same site as the reference weather station may be substituted for missing rainfall data. If data from a backup rain gauge is available, this is not considered missing data.
- 3.1.3 Root Zone Working Water Storage Starting Point: The Root Zone Working Water Storage (RZWWS), as defined in the SWAT protocol, must be programmed as full at the beginning of the test.
- 3.1.4 Rainfall Requirement: In addition to the existing SWAT protocol requirement of a total of at least 0.40 inches of rainfall required during the test period, there shall be at least four days during the test period with 0.10 inches or greater of precipitation for the test to be considered valid.
- 3.1.5 Order of Operations: The order of operations implemented during the SWAT protocol daily water balance calculation shall be ETc, irrigation, then rainfall, rather than rainfall occurring first, as designated by the SWAT protocol.

¹ WaterSense has prepared and will make available software that performs SWAT protocol calculations with these modifications.

3.2 Performance Requirements

- 3.2.1 Irrigation adequacy, as calculated in accordance with the SWAT protocol and modified by Section 3.1 of this specification, shall be greater than or equal to 80 percent for each zone.
- 3.2.2 Irrigation excess, as calculated in accordance with the SWAT protocol and modified by Section 3.1 of this specification, shall be less than or equal to 5 percent for each zone.

4.0 Supplemental Capability Requirements

The manufacturer must attest that the controller, as configured for testing in accordance with Appendix A, has the following supplemental capabilities either in smart mode or standard mode, as indicated in the table below.

Capability	Required in Smart Mode	Required in Standard Mode
4.1 The controller shall be capable of preserving the contents of the irrigation program settings and the correct calendar date and time when the power source is lost and without relying on an external battery backup.	X	X
4.2 The controller shall be capable of independent, zone-specific programming or storing a minimum of three different programs to allow for separate schedules for zones with differing water needs.		X
4.3 The controller shall be capable of indicating to the user when it is not receiving a signal or local sensor input and is not adjusting irrigation based on current weather conditions.		X
4.4 The controller shall either include a rain sensor or be capable of interfacing with a rain sensor and shall have a means for indicating to the user when the rain sensor has suspended irrigation.	X	X
4.5 Controllers for use in large commercial settings (defined as those with more than 48 stations) shall either include a flow sensor or be capable of interfacing with a flow sensor.	X	X

<p>4.6 The controller shall be capable of accommodating watering restrictions as follows:</p> <p>4.6.1 Operating on a prescribed day(s)-of-week schedule (e.g., Monday-Wednesday-Friday, Tuesday-Thursday-Saturday, any two days, any single day, etc.).</p> <p>4.6.2 Even day or odd day scheduling or any day interval between 2 and 7, such as 3rd day, or every 4th, 5th, 6th, or 7th day interval.</p> <p>4.6.3 The ability to set irrigation runtimes to avoid watering during a prohibited time of day (e.g., irrigation will not occur between 9 a.m. and 9 p.m.)</p> <p>4.6.4 Complete shutoff (e.g., on/off switch) to accommodate outdoor irrigation prohibition restrictions.</p>	X	X
<p>4.7 If the primary source of weather information is lost, the controller shall be capable of reverting to either a proxy of historical weather data or a percent adjust (water budget) feature.²</p>		X
<p>4.8 The controller shall be capable of allowing for a manual operation troubleshooting test cycle. The window for manual operation shall be limited to two hours, and the controller shall automatically return to default mode, even if the switch is still positioned for manual operation.</p>	X	X

5.0 Packaging and Product Documentation Requirements

Controllers shall be packaged and provided with documentation as indicated in this section.

5.1 General: Applies to Stand-Alone, Add-On Devices, and Plug-In Devices

The product, as packaged, shall include the same components or attributes that it was tested with to meet the requirements of this specification. For controllers with weather stations or sensors, all components tested with the controller must be packaged with the controller. For signal-based controllers, instructions on acquiring the proper weather signal shall be packaged with the controller.

The product packaging shall include an instruction manual that lists the settings and specific parts used during the performance test as described in Section 3.0.

The product shall not be packaged or marked to encourage operation of the controller in standard mode. Any instruction related to the maintenance of the product shall direct the user on how to return the controller to smart mode.

² The percent adjust (water budget) feature is defined as having the means to increase or decrease the runtimes or application rates for all zones by means of one adjustment without modifying the settings for each individual zone.

5.2 Add-On Devices

The add-on device is not required to be packaged with the base controller(s) that it was tested with to meet the requirements of this specification. However, the product documentation for the add-on device must list each base controller model that the device was tested with to meet the requirements of this specification and with which the manufacturer intends it to be connected. The documentation must also contain a statement to the effect that the device is only WaterSense labeled when used in combination with a base controller on the provided list.

5.3 Plug-In Devices

The plug-in device is not required to be packaged with the base controller(s) that it was tested with to meet the requirements of this specification. However, the product documentation for the plug-in device must list each base controller model that the device was tested with to meet the requirements of this specification and with which the manufacturer intends it to be connected. The documentation must also contain a statement to the effect that the device is only WaterSense labeled when used in combination with a base controller on the provided list.

6.0 Effective Date

This specification is effective on TBD.

7.0 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. Revisions to the specification shall be made following discussions with industry partners and other interested stakeholders.

8.0 Definitions

Definitions within the SWAT test protocol for climatologically based controllers (Draft 8, September 2008) are included by reference.

Add-on device: A product that modifies an existing system equipped with a standard clock timer controller to use current climatological data as a basis for controlling the irrigation schedule. For purposes of this specification, add-on devices are defined as those that communicate with the standard controller through a common wire connection.

Base controller: The standard clock timer controller the add-on or plug-in device is attached to for full operation.

Flow sensor: A device that measures the rate of liquid flow or the total accumulated flow.³

Plug-in device: A product that modifies an existing system equipped with a standard clock timer controller to use current climatological data as a basis for controlling the irrigation schedule. For

³ Irrigation Association. 2001. Turf and Landscape Irrigation Best Management Practices. Water Management Committee.

purposes of this specification, plug-in devices are defined as those that are made specifically for one brand of controller and may connect with the standard controller through a variety of ways.

Reference weather station: The weather station maintained by the licensed certification body that produces the reference weather data used during the performance test.

Smart mode: The operating mode in which the controller is using weather data to schedule irrigation or modify the irrigation schedule.

Stand-alone controller: A product for which weather-based control is an integrated capability. This includes a single controlling device (i.e., the irrigation controller) and all of the sensors and/or weather service that provide the climatological data.

Standard mode: The operating mode in which the controller is not using weather data to schedule irrigation or modify the irrigation schedule (i.e., when a weather-based controller is not in smart mode).

APPENDIX A: Testing Configuration and Programming

Controllers shall be configured for testing in accordance with the relevant sections below.

1.0 General

The controller shall be tested with all weather stations, sensors, or service(s) required to meet this specification.

The controller shall be programmed according to the list of settings provided by the manufacturer in the product's instruction manual, as described in Section 5.1 of this specification.

2.0 Add-On Devices

Add-on devices must be tested with each base controller model with which the manufacturer intends it to be connected. As a unit, the add-on device and the base controller must meet all of the requirements contained in this specification.

3.0 Plug-In Devices

Plug-in devices must be tested with each base controller model with which the manufacturer intends it to be connected. As a unit, the plug-in device and the base controller must meet all of the requirements contained in this specification.

APPENDIX B: Informative Annex for WaterSense Labeling

The following requirements must be met for products to earn the WaterSense label.

1.0 WaterSense Partnership

The manufacturer⁴ of a controller must have a signed partnership agreement in place with EPA. Manufacturers of components, such as weather stations or additional sensors, or weather services, are not eligible for partnership on that basis alone.

2.0 Conformity Assessment

Conformance to this specification must be certified by a licensed certifying body accredited in accordance with the WaterSense product certification system.

3.0 WaterSense Labeling

- 3.1 Product packaging that includes the certified controller and all components or attributes that the controller was tested with to meet the requirements of this specification may bear the WaterSense label.
- 3.2 Only add-on devices certified to meet the requirements of this specification may bear the WaterSense label. Base controllers that the add-on devices are tested with and that are sold separately from the add-on devices shall not bear the WaterSense label. Product documentation shall indicate that the add-on device is only WaterSense labeled when used in combination with the base controller(s) listed in product documentation as described in Section 5.0 of this specification.
- 3.3 Only plug-in devices certified to meet the requirements of this specification may bear the WaterSense label. Base controllers that the plug-in devices are tested with and that are sold separately from the plug-in devices shall not bear the WaterSense label. Product documentation shall indicate that the plug-in device is only WaterSense labeled when used in combination with the base controller(s) listed in product documentation as described in Section 5.0 of this specification.

4.0 Product Sampling for Certification

Product sampling for certification shall be conducted in accordance with the current version of the SWAT test protocol for climatologically based controllers.

⁴ Manufacturer is defined by the Department of Energy as “any person who manufactures, produces, assembles, or imports a consumer product.” In the case of private labeling, the private labeling organization that ultimately brands the product for sale must have a signed WaterSense partnership agreement in place with EPA.