Florida Water Star^{SM} Technical Manual

Updated April 2025

Introduction

The Florida Water Star Program Technical Manual contains detailed supporting technical information for the Residential, Commercial and Institutional, and Community certifications. This technical manual provides all stakeholders' clarification and direction on the program criteria, discussing in detail the foundation and requirements for all prerequisites and efficiency practices. Certification procedures and responsibilities are addressed in the Resources section of the Florida Water Star website.

Contents

INDOOR CRITERIA

General efficiency practices

The indoor efficiency practices address general design and leak prevention. These practices typically apply to multiple indoor water uses.

Appliance and fixture supply lines

Residential Silver and Gold - INC 1
CII – IN 1

Background

Certain pipe materials can fail if used as appliance and fixture water supply lines. In particular, rubber hoses supplying water to clothes washers have poor reputations for long-term durability. As the rubber dries and becomes brittle, the hose becomes vulnerable to failure, which can cause significant damage, especially if unrecognized for extended periods.

Requirements and certification

All fixture and appliance water supply connections shall use reinforced hoses.

Silver	Gold	Commercial/Institutional
Required	Required	Required

Qualified appliance water supply lines come as either metal-braided (left) or poly-braided construction.

This program criterion lists the materials that normally withstand long-term use as supply line connections. There is no single best material available, and any supply line may be subject to failure. Acceptable supply line materials are metal, metal braided, PEX, and poly braided. The only unacceptable materials are rubber or copper.

An inspector may waive this requirement for any appliance not installed by the time of inspection. To confirm this criterion, the inspector will visually inspect all appliance water connections. The inspector must have the applicant's approval to move heavier appliances when it is necessary to inspect supply line connections.

Hot water delivery

Residential Gold - INP 4

Background

The potential exists for increasing energy and water efficiency in water heating and delivery systems. Increases in water efficiency for water heating and delivery systems must be done on a case-by-case basis, considering the heater's location and plumbing design. Multiple strategies can be used for improving water efficiency for hot water delivery systems.

Requirements and certification

A centrally located water tank/manifold plumbing system shall be used.

Silver	Gold	Commercial/Institutional
NA	6 points	NA

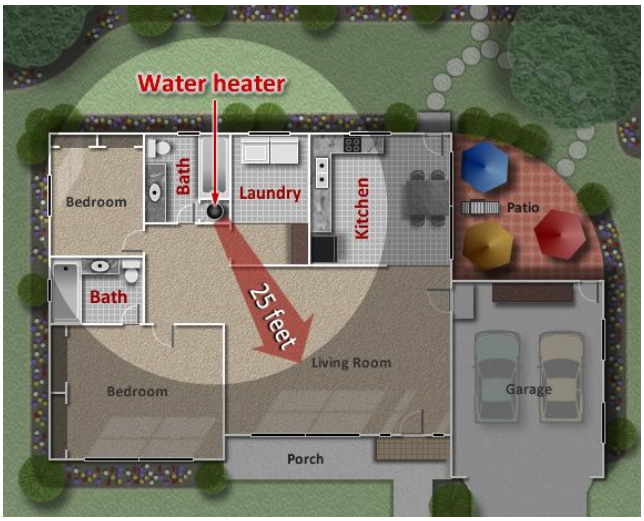
The length of pipe from the water heater to the fixture determines central location of a hot water tank. For a conventional system, no branch line from the water heater to any fixture may exceed 25 feet in one-story homes. Add 1x the ceiling height for two-story homes and add 2x the ceiling height for three- or four-story homes.

A point-of-use or on-demand water heater supplies the kitchen fixtures and appliances.

Silver	Gold	Commercial/Institutional
NA	6 points	NA

To receive credit, point-of-use or on-demand water heaters should be located within 10 feet of kitchen fixtures and appliances.

Provide design documentation that clearly represents heating equipment location and its distance to relevant water-using equipment (e.g., kitchen sink).



To receive points, hot water uses should be no more than 25 feet from a tank water heater.

Manifold plumbing system

Plumbing Fixtures

The plumbing section of the Florida Building Code establishes the maximum flow rate for indoor plumbing fixtures. Most of the maximum flow rates set for Florida code were established by the Energy Policy Act (EPAct) of 1992.

Maximum Flow Rates and Consumption for Plumbing Fixtures and Fixture Fittings	
Plumbing Fixture or Fixture Fitting	**Maximum Flow Rate or Quantity[b]**
Lavatory faucet, private	2.2 gpm at 60 psi
Lavatory faucet, public (metering)	0.25 gallon per metering cycle
Lavatory faucet, public (other than metering)	0.5 gpm at 60 psi
Showerhead[a]	2.5 gpm at 80 psi
Sink faucet	2.2 gpm at 60 psi
Urinal	1.0 gallon per flushing cycle
Toilet	1.6 gallons per flushing cycle
a. A hand-held shower spray is a showerhead.	
b. Consumption tolerances shall be determined from referenced standards.	
Source: 2007 Florida Building Code – Plumbing **gpm:** gallons per minute **psi:** pounds per square inch	

The U.S. Environmental Protection Agency (EPA) WaterSense® program https://www.epa.gov/watersense provides a majority of the fixture standards that are required for Florida Water Star. Launched in 2006, WaterSense® is an EPA-sponsored partnership program that seeks to protect the future of our nation's water supply by promoting water efficiency and enhancing the market for water-efficient products, programs and practices.

Toilets

Residential
Silver - INC 2, Gold - INP1
CII – IN 2

Background

Toilets are by far the main source of water use in the home, accounting for nearly 30 percent of an average home's indoor water consumption. Older, inefficient toilets that use as much as 6 gallons per flush also happen to be a major source of wasted water in many homes. The Energy Policy Act (EPAct) of 1992 and Florida Building Code requires that both residential and commercial toilets not exceed 1.6 gallons per flush (gpf). Many toilet models on the market today reduce flush volumes below this standard.

Requirements and certification

All toilets shall be high efficiency (1.28 gallons/flush with an UNAR MaP rating above 350 grams/flush). WaterSense®-labeled toilets comply.

Silver	Gold	Commercial/Institutional
Required	Required	Required

High-efficiency toilets (maximum 1.0 gpf) have an UNAR MaP rating above 350 grams per flush shall be installed. WaterSense®-labeled toilets comply.

Silver	Gold	Commercial/Institutional
NA	2 per toilet	NA

To earn additional points, the flush volume cannot exceed 1.0 gpf. Toilets with MaP rates above 600 grams per flush may offer better performance.

A stamp with the performance values located inside the toilet tank.

The inspector must verify the performance label for each toilet. A stamp with the performance values is located inside the toilet tank.

Program Tip

In recent years, utilities have expressed concern about using high-efficiency fixtures in commercial/institutional projects. The concern stems from a potential lack of drain-line carry, which occurs when the water volume is insufficient to carry waste through the drain line. This lack of drain-line carry most likely occurs when a building has only lavatories without showers or other higher-volume uses. Project developers should consult with their utilities when drain-line carry might be a concern.

For information about the MaP rating (flushing performance) of a toilet, visit the **MaP website**.

Urinals

CII – IN 3

Background

Urinals can account for a significant portion of indoor water usage in commercial and institutional settings. A typical office building could reduce its water use from old, inefficient urinals by 26,000 gallons per year or more. Federal and state codes establish that flush volume for flushing urinals is 1.0 gallon per flush (gpf). Reducing flush volumes below 1.0 gallon will result in significant water savings.

Requirements and certification

Urinals are high efficiency, 0.5 gallons/flush.

Silver	Gold	Commercial/Institutional
NA	NA	Required

This standard applies to all types of urinals, including those that rely on sensor-based activation. Specifications complying with this requirement must be detailed in the plumbing design, and installation is to be verified by the inspector.

Program Tip

Waterless urinals, which have gained in popularity in recent years, provide significant water savings. However, concerns have arisen that prevent them from being included as a prerequisite to receiving credit in the program. Odor, ventilation, drain-line carry, maintenance and other issues should be considered during the procurement of these fixtures.

A waterless urinal

Showerheads

Residential – Silver INC 3
CII – IN 6

Background

As established by the Energy Policy Act of 1992 (EPAct 1992) and as required by the Florida Building Code, showerheads may not exceed a flow rate of 2.5 gallons per minute (gpm). Showering is one of the leading ways we use water in the home, accounting for nearly 17 percent of residential indoor water use—for the average family, that adds up to nearly 40 gallons per day.

Low-flow showerhead

Many showerheads available today use less water than 2.5 gpm and offer a high-quality experience for the user.

Requirements and certification

Single showerhead with a flow rate of 2 gallons/minute or less shall be installed. WaterSense®-labeled showerheads comply.

Silver	Gold	Commercial/Institutional
Required	Required	Required

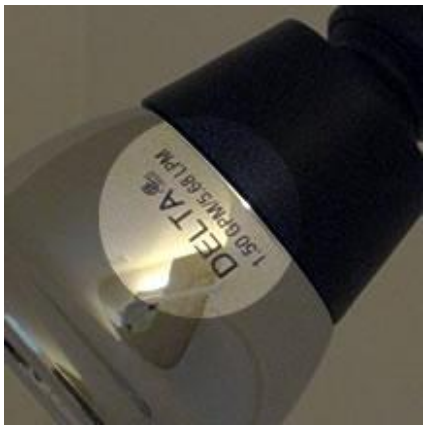
Large showers with multiple showerheads have become increasingly popular. A certified home can receive a variance for one additional hand-held showerhead. For the purposes of this program, one shower stall floor measures 2,160 square inches (1.4 square meters).

Multiple low-flow showerheads within a single stall supplied through a diverter valve are acceptable.

Each showerhead is to be verified by the inspector in one of the following ways:

- Flow rate stamp on showerhead
- WaterSense® label
- Flow bag test

Testing a showerhead using a flow bag



The flow rate stamp is clearly visible on this showerhead

Lavatory faucets

Residential – Silver INC 4, Gold INP 2
CII – IN 4 and IN 5

Background

Replacing old, inefficient faucets and aerators with WaterSense-labeled models can save the average family 700 gallons of water per year, equal to the amount of water needed to take 45 showers. As established by the Energy Policy Act of 1992 (EPAct 1992) and required by the Florida Building Code, 2.2 gallons per minute (gpm) is the maximum flow rate for private lavatory faucets.

Florida Building Code for plumbing limits the maximum non-metering faucet flow rate for public lavatories to 0.5 gpm and the metering faucet flow rate to 0.25 gallons per metering cycle.

Requirements and certification

All lavatory sink faucets shall have flow rates of 1.5 gallons/minute or less. WaterSense®-labeled comply.

Silver	Gold	Commercial/Institutional
Required	Required	NA

Gold extra credit
Lavatory sink faucets shall have flow rates of 1 gallon/minute or less.

Silver	Gold	Commercial/Institutional
NA	2 per faucet	NA

Lavatory non-metering sink faucets have flow rates of 0.5 gallons/minute or less. Metering lavatory sink faucets have flow rates of 0.25 gallons per metering cycle or less.

Silver	Gold	Commercial/Institutional
NA	NA	Required

The faucet installation is to be verified by the inspector in one of three ways:

- Flow rate stamp on faucet
- WaterSense® label
- Flow bag test

Kitchen faucets

Residential – Gold INP 3

Background

As established by the Energy Policy Act of 1992 (EPAct 1992) and required by the Florida Building Code, 2.2 gallons per minute (gpm) is the maximum flow rate for kitchen faucets.

Requirements and certification

All kitchen sink faucets have a flow rate of 1.5 gpm or less or are WaterSense®-labeled faucets.

The faucet installation is to be field verified by the inspector in one of two ways:

- Flow rate stamp on faucet
- Flow bag test

Kitchen faucet

Pre-rinse spray valves

CII –- IN 7

Background

About one million food service establishments in the United States use nearly 53 billion gallons of water each year to rinse dishes with pre-rinse spray valves (PRSV). In fact, PRSVs can account for nearly one-third of the water used in a typical commercial kitchen. By switching to a high-efficiency PRSV, a commercial or institutional kitchen can save more than $110 annually in energy and water costs. A PRSV is used to rinse dishware prior to insertion into a mechanical dishwasher, usually in a commercial setting. PRSV water use is similar to a showerhead or faucet, and significant conservation potential exists through increased efficiency above 1.6 gallons per minute (gpm) for federal performance requirements.

The U.S. Environmental Protection Agency (EPA), on July 10, 2009, released a WaterSense® notice of intent to develop draft "Performance Specifications for High-Efficiency Pre-rinse Spray Valves,"

which cites 1.25 gpm as a potential target for a maximum PRSV flow rate. Florida Water Star Commercial and Institutional standards require the use of 1.25 gpm PRSVs.

Requirements and certification

Pre-rinse spray valves use 1.25 gallons per minute or less.

Silver	Gold	Commercial/Institutional
NA	NA	Required

Installation of the spray valve is to be field verified by the inspector.

Pre-rinse spray valve

Appliances

The ENERGY STAR® program of the U.S. Environmental Protection Agency (EPA) provides a majority of the standards that are used for Florida Water Star. ENERGY STAR® is a joint program of EPA and the U.S. Department of Energy to protect the environment through energy-efficient products and practices.

Program certification only applies to appliances that are installed at the time of inspection. To receive credit for any appliance, it must be installed by the time of inspection.

Appliances are divided into the following areas:

- Residential dishwashers
- Commercial dishwashers
- Residential clothes washers
- Commercial clothes washers
- Commercial ice machines
- Commercial food steamers
- Commercial woks
- Commercial HVAC

Residential dishwashers

Residential, Silver and Gold - INC 6

Background

A standard-sized ENERGY STAR certified dishwasher costs about $50 per year to run and can save about 5,800 gallons of water over its lifetime. Dishwasher technology has improved dramatically over the last decade and new ENERGY STAR certified models include several innovations like soil sensors, improved water filtration, more efficient jets, and dish rack designs that reduce energy and water consumption and improve performance. Federal standards (2009) for residential automatic dishwasher water use specify less than 3.2 gallons/cycle for a standard washer and less than 2 gallons/cycle for compact models. The current ENERGY STAR criteria for dishwashers became effective July 19, 2023.

Requirements and certification

If the applicant chooses to install a dishwasher, it shall be currently ENERGY STAR® listed.

Silver	Gold	Commercial/Institutional
Required*	Required	Required

Residential automatic dishwasher water use efficiency is currently addressed by the federal ENERGY STAR® label and is limited to 3.2 gallons per cycle when the machine is set on the "normal" setting.

ENERGY STAR® Dishwasher Water Use Standards (July 19, 2023)		
Dishwasher Size	**Water Use (gallons per cycle)**	**Label**
Standard	3.2	
Compact	2.0	

Installation is to be field verified by the inspector. To receive points, a dishwasher must be installed by the time of inspection.

A water-efficient dishwasher

Commercial dishwashers

CII – IN 9

Background

Commercial dishwashers can consume the largest amount of water in a commercial kitchen. A variety of types and sizes of commercial dishwashers are available. Average commercial dishwasher water use is approximately 4 gallons per rack (Alliance for Water Efficiency 2010).

Requirements and certification

Commercial dishwashers shall be ENERGY STAR®-labeled.

Maximum Water Use			
Dishwasher Type	**Water Use (gallons per rack)**		**Label**
	High Temperature Requirements	**Low Temperature Requirements**	
Under-counter	≤ 1.00	≤ 1.70	
Stationary single-tank door	≤ 0.950	≤ 1.18	
Single-tank conveyor	≤ 0.700	≤ 0.790	
Multiple-tank conveyor	≤ 0.540	≤ 0.540	

Source: ENERGY STAR®

Silver	Gold	Commercial/Institutional
NA	NA	Required

Installation is to be field verified by the inspector. To receive credit, a dishwasher must be installed by the time of inspection.

Residential clothes washers

Residential Silver and Gold – INC 5

Background

For residential clothes washers, water use efficiency is evaluated based on the water factor. This standard industry calculation for water use intensity is defined as the number of gallons used per cubic feet of clothes washer volume.

Residential Clothes Washer Federal Standards (water factor) 2021			
Year	**March 2015**	**February 2018**	**April 22, 2021**
Top-loading	8 WF	4.3 WF	4.3 WF
Front-loading	4.5 WF	3.2 WF	3.2 WF
WF: water factor			

Requirements and certification

If the applicant chooses to install a clothes washer, it shall be currently ENERGY STAR® listed.

Silver	Gold	Commercial/Institutional
Required*	Required	Required
*If the applicant installs a clothes washer, it must meet current ENERGY STAR® criteria.		

Water-efficient clothes washer

As with other appliance performance requirements, Florida Water Star requires an ENERGY STAR® label for clothes washers. ENERGY STAR® labels are awarded only to front-loading and top-loading clothes washers that have capacities of greater than 1.6 cubic feet (ft^3).

Installation is to be field verified by the inspector. To receive credit, a clothes washer must be installed by the time of inspection.

Commercial clothes washers

CII – IN 11

Background

For commercial clothes washers, water use efficiency is evaluated based on the water factor. This standard industry calculation for water use intensity is defined as the number of gallons used per cubic feet of clothes washer volume. Typically, commercial laundries cleanse fabrics that are significantly more soiled than fabrics washed in residential settings.

Requirements and certification

Commercial clothes washers shall be ENERGY STAR®-labelled.

Silver	Gold	Commercial/Institutional
NA	NA	Required

ENERGY STAR® labels are awarded only to front-loading and top-loading clothes washers that have capacities of greater than 1.6 cubic feet (ft^3).

Installation of the appliance is to be field verified by the Inspector. To receive credit, a clothes washer must be installed by the time of inspection.

Commercial clothes washer

Commercial ice machines

CII – IN 12

Background

Commercial ice machines can use many types of cooling and production processes. Florida Water Star commercial ice machine requirements are based on ENERGY STAR® standards. These performance specifications are, on average, 10% more water-efficient than standard commercial ice machines.

A cooling system is an essential icemaker component that is generally either air-cooled or water-cooled. Water-cooled ice machines are not eligible for ENERGY STAR® labeling. In addition, flake and nugget ice machines are not eligible for ENERGY STAR® until a sound testing protocol and performance database are established. Any ice machines that do not fit within these categories will be evaluated on a case-by-case basis.

Requirements and certification

Commercial ice machines shall be ENERGY STAR®-labeled.

Commercial Ice Machine			
Equipment Type	**Harvest Rate (pounds of ice per day)**	**Potable Water Use Limit (gallons per 100 pounds ice)**	**Label**
IMH	< 450	≤ 25	
	≥ 450	≤ 25	
RCU (without remote compressor)	< 1000	≤ 25	
	≥ 1000	≤ 25	
RCU (with remote compressor)	< 934	≤ 25	
	≥ 934	≤ 25	
SCU	< 175	≤ 35	
	≥ 175	≤ 35	
IMH: ice making head **RCU:** remote condensing unit or split system **SCU:** self-contained unit			

Silver	**Gold**	**Commercial/Institutional**
NA	NA	Required

Installation is to be field verified by the inspector. To receive credit, an ice machine must be installed by the time of inspection.

Commercial ice machine

Commercial food steamers

CII – IN 13

Background

Some cooking devices use water as a cooking medium (i.e., steam) or as a coolant. While these uses do not have a specific water use rate, best management practices exist. ENERGY STAR®-qualified steam cookers are 90% more water-efficient than standard steam cookers. Standard steam cookers average 40 gallons of water per hour, whereas ENERGY STAR®-labeled steam cookers average three gallons of water per hour.

No explicit maximum water use requirement exists for ENERGY STAR® qualification, and increased water efficiency is a result of increased energy efficiency.

Requirements and certification

All commercial steam cookers shall be ENERGY STAR®-labeled.

Silver	Gold	Commercial/Institutional
NA	NA	Required

Installation is to be field verified by the inspector. The commercial food steamer must be installed by the time of inspection.

Commercial food steamer

Commercial woks

CII – IN 14

Background

Conventional commercial woks use a constant supply of water as a coolant that typically flows at a gallon per minute during operation. Waterless woks contain an insulating air gap that circumvents the need for coolant water.

Requirements and certification

Commercial woks are waterless.

Silver	Gold	Commercial/Institutional
NA	NA	Required

Installation is to be field verified by the inspector. The waterless wok must be installed by the time of inspection.

Indoor innovation

Residential Gold – INP 6

Background

Innovative water-saving technologies cannot be adequately addressed within the general criteria of Florida Water Star. These technologies may be evaluated on a case-by-case basis for their water-saving potential on an individual project.

An example of an innovation is a gray water system for toilet flushing.

Requirements and certification

To receive points, an innovative indoor water-conserving product is used.

Silver	Gold	Commercial/Institutional
NA	Up to 10 Points	NA

This whole-house leak detection system is an example of indoor innovation

For evaluation, complete specifications must be submitted for each innovation. In some cases, a manufacturer's specification sheet will meet this requirement. In those cases where specifications

or designs are customized to a project, detailed designs will be required to verify potential conservation.

The St. Johns River Water Management District will award points after receiving recommendations from the Florida Water Star Technical Advisory Committee (TAC). In the absence of a TAC recommendation or when timeliness is essential, program staff may render a decision based on input from plumbing experts.

Program Tip

As the water-saving of a particular innovation becomes clear and its use is consistent in numerous projects, there is potential that it will be included as a program efficiency practice.

BUILDING SITE CRITERIA

General information

Water-efficiency practices can be closely linked to water quality in the built environment. Certain practices included during construction can have the double benefit of water quality improvement and water conservation.

Preservation

Residential Gold – S1

Background

Preservation of existing on-site vegetation retains values such as wildlife habitat, soil integrity and shading. Vegetation that is preserved is already established in the absence of supplementary irrigation. Also, these preserved areas reduce overall irrigation demand and stormwater runoff.

Requirements and certification

A percentage of the lot shall be undisturbed and in a natural vegetative state.

Percent of Lot Preserved	Silver	Gold	Commercial/ Institutional
30 or more	NA	15 points	NA
20 or more	NA	10 points	NA
10 or more	NA	5 points	NA

Natural vegetation should be preserved where possible

Preserved Vegetation Point Calculation
(Total preserved vegetation area ÷ total lot area) × 100 = percent of lot preserved

The inspector must confirm the amount of preserved area during the site inspection and measure the preserved area to determine the percentage if in doubt.

Soil amendments

Residential Gold S2

Background

Soil health can influence the ability of rainwater to penetrate the soil, thereby preventing excess runoff, sedimentation, erosion, and flooding. Soil also helps to clean, store, and recharge groundwater. By storing water, slowing the delivery of water to plants, and supplying nutrients, soils play a significant role in vegetation health.

Soil amendments are any elements added to the soil, such as compost, peat moss or fertilizer, that improve the capacity of soil to support plant life. While fertilizer improves soil by adding nutrients only, amendments such as compost also improve soil by making its texture or drainage more conducive to plant health.

Requirements and certification

Organic soil amendments, when used, shall be incorporated into the top 6 inches of existing soil per the manufacturer's installation recommendations.

Silver	Gold	Commercial/Institutional
NA	Up to 20 points	NA

Soil Amended Turf Grass Point Formula
(Soil amended turf grass area ÷ total turf grass area) × available points

Program Tip

The area to receive credit is calculated based on a percentage of the turf grass area only. Soil amendments are most effective in the turf areas of the landscape.

The inspector will confirm this practice with documentation from the applicant of the purchase of the soil amendment and, if possible, photo documentation of the installation.

Application of soil amendments (Photo courtesy of UF IFAS)

Green stormwater infrastructure

Residential Gold S3

Background

Green stormwater infrastructure (GSI) can help supplement and enhance traditional stormwater systems while protecting or helping further improve water quality and limiting flooding. Examples of GSI include rain gardens, bioswales and permeable pavement.

Requirements and certification

Green stormwater infrastructure, if present, shall be installed and landscaped appropriately.

Silver	Gold	Commercial/Institutional
NA	Up to 20 points	NA

(GSI area ÷ total landscaped area) × available points

A rain garden (Photo courtesy of UF IFAS)

Permeable surfaces

Residential Gold S4

Background

Permeable pavements infiltrate, treat, and/or store rainwater where it falls. They can be made of pervious concrete, porous asphalt, or permeable interlocking pavers. Permeable pavements can also reduce construction costs for residential and commercial development by reducing the need for some conventional drainage features.

Requirements and certification

Pervious surfaces shall be awarded points when installed in place of impervious materials or irrigated areas.

Silver	Gold	Commercial/Institutional
NA	Up to 20 points	NA

(Pervious surface area ÷ total landscaped area) × available points

The inspector will confirm this practice with documentation from the applicant of the nature of the GSI infrastructure. The inspector shall seek points from the program administrator. Points will be awarded based on the percentage of traditional impervious surfaces that are replaced with permeable surfaces.

Permeable surface driveways (Photos courtesy of UF IFAS)

Downspouts

Residential Gold S5

Background

Typically, rain falls on a roof, flows through downspouts and over impervious surfaces, and then travels into off-site stormwater treatment systems. The diversion of downspouts to pervious areas creates the following improvements:

1. Water that would be wasted as runoff is used to meet plant water needs.
2. Water that would typically run off and burden the stormwater system infiltrates the soil and is treated on-site.

Requirements and certification

Downspouts shall be directed to pervious areas onsite two feet or more from the foundation.

Silver	Gold	Commercial/Institutional
NA	15	NA

Program Tip

The inspector must visually confirm presence of gutters, partial or complete. Downspout extenders may be used to achieve credit.

A swale helps drainage

Downspout extender (Photos courtesy of UF IFAS)

Water Runoff

Residential Gold S6

Background

Some stormwater runoff efficiency practices are not addressed within the Florida-Friendly Water Star criteria. A specific review will be conducted for any practices having significant, long-term, water quality improvement.

Requirements and certification

Innovative water runoff or conservation strategies are used.

Silver	Gold	Commercial/Institutional
NA	Up to 10	NA

The Florida Water Star inspector must submit the proposed innovation strategy to the program administrator for review and consideration for these points.

Construction Waste

Background

Excessive construction debris can result in many negative impacts such as degrading the soil quality, impacting root growth, and in some cases, the pH of the soil may be altered. Common site debris includes drywall shavings, concrete and paint slurry, nails, irrigation wiring and components, and general waste. To prevent commingling, damage, and other waste-creation activities, waste management and materials handling techniques should be used.

Requirements and certification

No construction waste shall remain on the landscaped areas at the time of inspection.

Silver	Gold	Commercial/Institutional
Required	Subtract 5 pts if debris is visible.	NA

Program Tip

The Florida Water Star inspector must visually confirm the absence of construction debris throughout the landscape. Presence of construction debris will subtract points from the total score.

Construction debris should be removed immediately

Terrace, swale or berm adjacent to water bodies

Background

On-site treatment of stormwater reduces nutrient loading to water bodies. The creation of vegetated depressed areas for catching, holding and treating stormwater in areas adjacent to a water body can prevent nutrients from entering the water body.

Requirements and certification

Non-irrigated vegetated terraces, swales or berms are used to prevent stormwater from entering the water body. (A letter of modification to an environmental resource permit may be required by the applicant to achieve these points.)

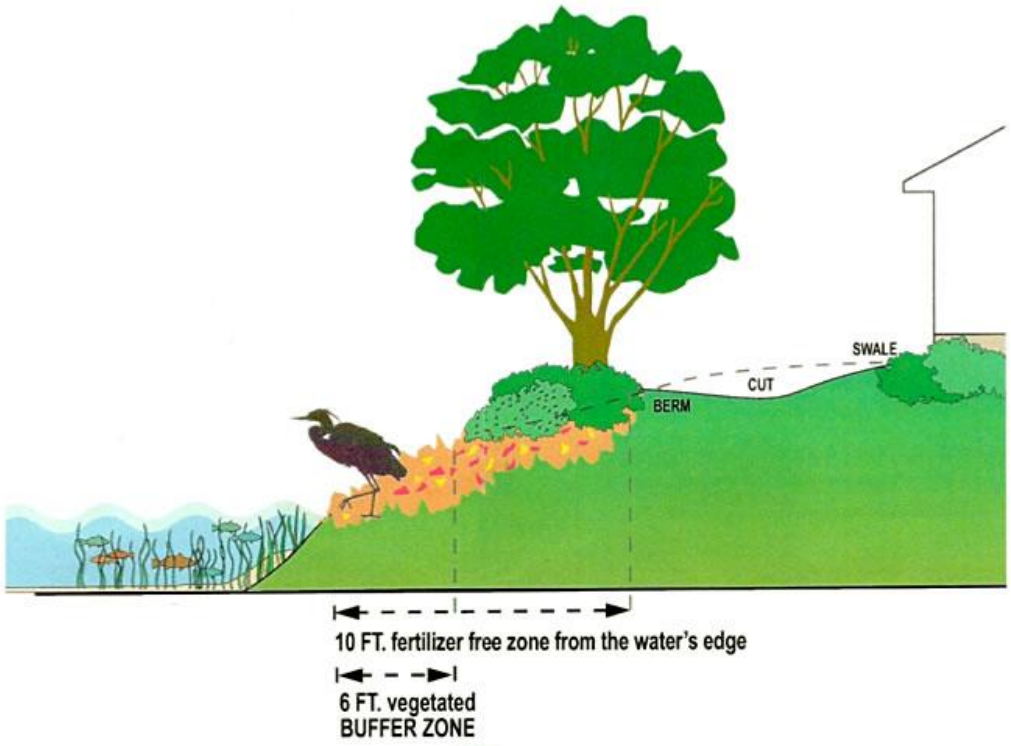
Silver	Gold	Commercial/Institutional
NA	Up to 20 points	NA

This waterfront home has a swale, a berm and a seawall

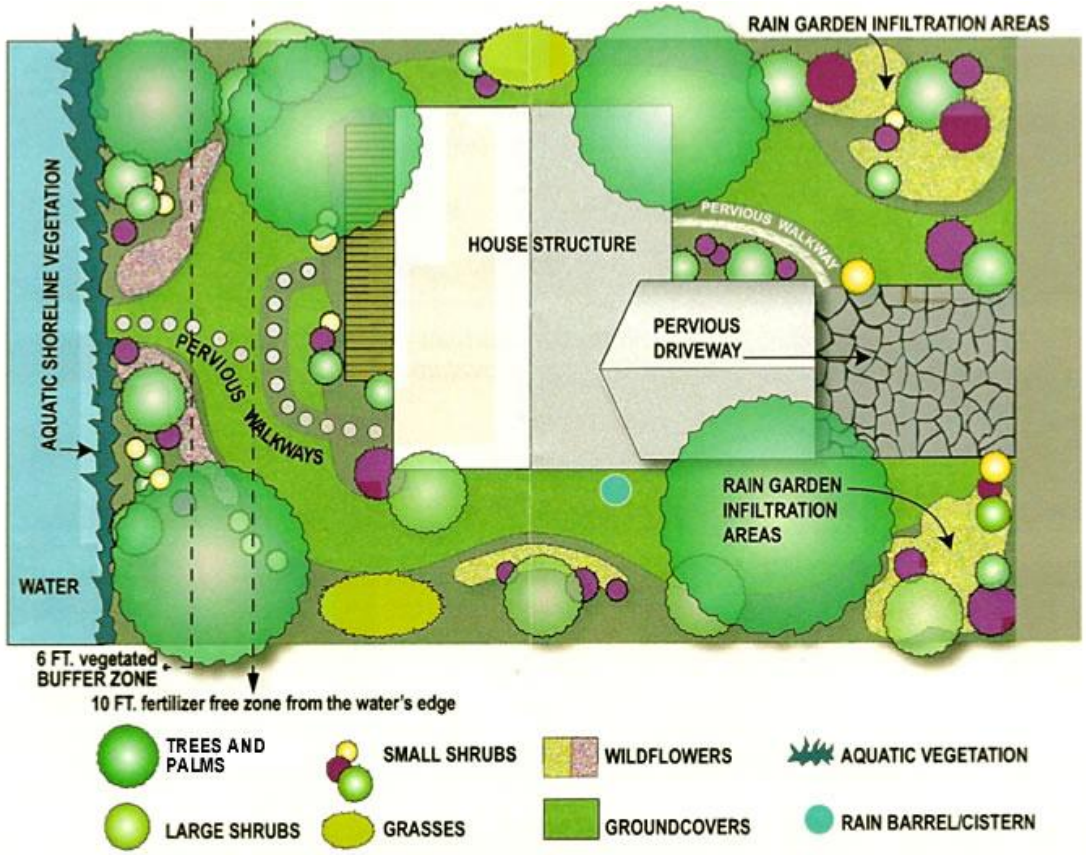
All vegetated catchment areas must be unirrigated after plant establishment. Temporary irrigation for establishment is acceptable.

The inspector must confirm that the stormwater treatment system has been installed. The inspector awards points based on the percentage of the waterfront portion of the property that has a terrace, swale, or berm. Program staff will assist in assigning these points.

To prevent unforeseen effects like flooding to adjacent properties, caution should be taken when designing any on-site stormwater treatment structure. The relevant agency (Florida Department of Environmental Protection or water management district) compliance letter should be submitted with other documents via e-Certification.



This illustration (courtesy of SWFWMD) and the one that follows depict designs for waterfront buffer zones



Border adjacent to water bodies

Background

Transport of fertilizers, grass clippings and lawn chemicals to water bodies during rain or irrigation can cause pollution from nutrients and suspended solids. The creation of a landscape buffer reduces the likelihood that pollutants will enter a water body.

Requirements and certification

A minimum 10-foot-wide border of unirrigated, site-appropriate plants is created parallel to the shoreline/seawall.

Silver	Gold	Commercial/Institutional
NA	Up to 10 points	NA

The inspector will visually inspect this area and use the Waterwise Plant Database to confirm plant suitability. Pictures must be submitted as documentation. The Inspector awards points based on the percentage of the waterfront portion of the property that has the 10-foot buffer.

Program Tip

More information specific to this practice is available on the website of the Florida Department of Environmental Protection and the University of Florida:

- *The Florida Yards and Neighborhoods Handbook*
- *Florida-Friendly Best Management Practices for Protection of Water Resources by the Green Industries*

LANDSCAPE CRITERIA

Florida Water Star landscape efficiency practices focus on the design and installation of landscapes that contain site-appropriate plants that are selected and grouped according to similar environmental needs. Specifically, plants are grouped into hydrozones based on their watering needs and climate requirements.

The practices specified in this Florida Water Star manual provide detailed information for designing hydrozones and implementing other water-efficient landscaping practices, resulting in sustainable landscapes that effectively thrive over the long term. These practices are consistent with the principles of the Florida-Friendly Landscaping™ program.

Although many landscape design practices today encourage landscaping that appears mature at the time of installation, this "instant landscape" approach leads to increased competition among plants, stress and higher watering and maintenance requirements. Florida Water Star landscaping criteria result in sustainable landscapes that provide many benefits while conserving the greatest possible amount of water.

Sustainable landscapes promote ecosystem services, such as natural stormwater treatment, while also supporting aesthetic appeal and ecological diversity. Although landscape designs vary widely across the state, they are most effective when tailored to specific site conditions and incorporate plant species suited to the environment. Designed with water efficiency in mind, sustainable landscapes require less supplemental irrigation, maintenance and nutrient applications and, in turn, have less stormwater runoff. This approach is crucial for safeguarding both the quantity and quality of Florida's water resources.

Florida Water Star encourages using site-appropriate, drought-tolerant plants that survive without rainfall or irrigation for short periods. Most plants are drought-tolerant after establishment if planted in the right conditions, i.e., succulents survive droughts in xeric soils, while wetland plants survive droughts in hydric soils. The practices described in this manual are designed to assist the applicant in planning a water-efficient Florida Water Star landscape.

General practices

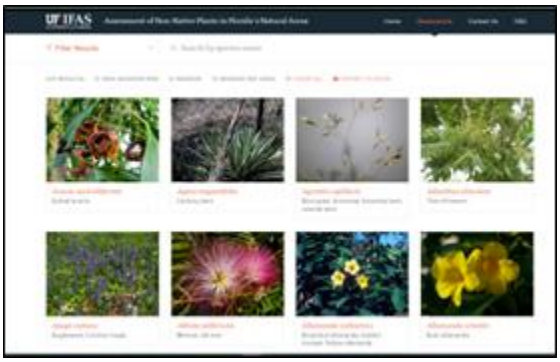
Florida Water Star requires sustainable general landscape design practices that directly encourage behavioral change during the landscape design process and increase the potential for irrigation water conservation. Further, these general design practices can reduce long-term maintenance by encouraging the installation of site-appropriate plants in appropriate locations. To encourage efficiency in landscape design, Florida Water Star requires a number of general design practices.

Exotic invasive plants

Residential – Silver and Gold LC 1
CII – LS 1

Background

Exotic, invasive plant species can outcompete neighboring landscape plants and spread from urban areas into natural environments. The spread of these invasive species has significantly harmed ecosystems across Florida. As a result, it is crucial to restrict scientifically documented invasive exotics in landscape design to help prevent further damage to Florida's natural ecosystems.



Florida Water Star requires that applicants consult the following references when evaluating whether a plant is listed as an invasive exotic species for Florida.
The following resources can be used to identify exotic invasive plants:

- The Florida Department of Agriculture and Consumer Services (FDACS)
- Florida Invasive Species Council (FISC)
- UF IFAS Assessment of Non-Native Plants

Requirements and certification

No invasive exotic plant species shall be in the landscaped area.

Silver	Gold	Commercial/Institutional
Required	Required	Required

Depending on the location, some exotic, invasive plant species are more aggressive and prolific than others. Differentiation by relative aggressiveness is reflected in the plants listed by the Florida Department of Agriculture (FDAC) and Florida Invasive Species Council (FISC), and the UF IFAS Assessment. Florida Water Star prohibits the installation of any category 1 invasive plant on the FISC list or on the UF IFAS Assessment, High Invasive, Invasive and Invasive No Uses conclusion types. (Such plants have red font in description to indicate level of invasiveness.)

An example of a plant that is invasive in one region but not in another is cane grass (*Neyraudia reynaudiana*), which is invasive in south Florida, but not central or northern Florida.

Program Tip

Inspectors must be knowledgeable of the invasive exotic species within their regions. Sterile species of listed invasive species must receive a variance from the Florida Water Star program administrator before use. In this case, applicants must provide documentation that validates the sterility of the species in question.

Turf grass and landscape bed separation

CII – LS 2

Background

Turf grass and landscape beds do not have the same watering and maintenance requirements. When turf grass and landscape beds are planted in the same irrigation zone or intermixed within a zone, it can be difficult to apply irrigation efficiently.

Requirements and certification

For in-ground irrigation systems, turf grass and landscape bed areas are distinctly separate.

Silver	Gold	Commercial/Institutional
NA	NA	Required

This efficiency practice supports a similar irrigation prerequisite and is part of the overall effort to integrate water-efficient landscape and irrigation design.

To meet this requirement, separate valves must be used to irrigate turf grass and landscape beds, and the irrigation zones must clearly match landscape hydrozones within the irrigation design.

Program Tip

In some cases, seemingly dissimilar plants might do better if grouped together. For instance, if it is not feasible to establish trees in a separate irrigation zone, their moisture requirements might be more like turf grass than shrubs and can be included in irrigation zones for turf. Refer to the Waterwise Plant Database to confirm that plants within an irrigation zone have similar moisture and maintenance requirements. The design drawings should clearly demonstrate zone separation.

Plant proximity to buildings

Residential – Silver and Gold LC 2
CII – LS 3

Background

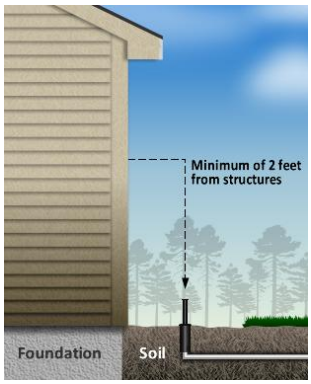
Florida Water Star recognizes that plants installed adjacent to buildings can create the following problems:

1. Plants installed directly under roof overhangs do not receive natural rainfall and may require additional irrigation.
2. Root balls, plant materials, and additional irrigation that reach a building's foundation can increase the likelihood of mold and mildew.
3. Frequent irrigation adjacent to building foundations can dilute termiticide and increase the chance of termite infestation.
4. Plants can grow to the point of reaching the building, thereby creating the need for frequent landscape maintenance and increasing the difficulty of building maintenance.

Requirements and certification

Root balls are at least 2.5 feet on center from the foundation of the structure.

Silver	Gold	Commercial/Institutional
Required	Required	Required



Root ball spacing applies to conditioned/enclosed structures; porches, patios, and similar structures are exempt. This landscape practice is complementary with the Florida Water Star irrigation practice requirement: Sprinklers and/or emitters are located a minimum of 2 feet from structures.

Landscape designs should clearly specify a 2.5-foot buffer around structures throughout the landscape. This specification can be done through either design notes or specific design details. A plant's mature size should be considered when plants are installed adjacent to structures. In most cases, plants with mature widths greater than 2.5 feet should not be installed adjacent to structures.

The inspector will visually inspect for compliance with this practice and should measure the spacing if in doubt.

Program Tip
Unirrigated turf can be installed within 2.5 feet of foundations. An example of an approved variance is for unirrigated Bahia grass adjacent to a structure.

Plant spacing

CII – LS 4

Background
Densely spaced plants, or instant landscapes, can appreciably increase a landscape's watering and maintenance requirements, which is contrary to water-efficiency practices of Florida Water Star. Often plantings are in proximity to each other to give the appearance of a mature landscape at the time of building occupancy. However, as plants mature, there is insufficient space for plants to establish and thrive, which can increase the need for irrigation, nutrition, and pesticide applications due to stressed conditions. For the purposes of Residential Florida Water Star, plant beds should be designed so that, at maturity, they have a 60 percent cover.

Requirements and certification
Plants are spaced for growth to maturity.

Silver	Gold	Commercial/Institutional
NA	NA	Required

Evaluating the density of plant species and growth rates can be subjective. During the landscape design process, landscape designers should use mature widths from the Waterwise plant database, or other accepted references, to determine the number of plants and spacing. For Residential Florida Water Star, the designer must plan for the installation of sufficient plants so that, at maturity, plants will cover 60 percent of the bed.

Design Requirements for Establishing Plant Spacing	
Information	**Document**
Documentation of growth rate and mature size	Plant list
Clear specification of plant location on the landscape design	Landscape design

Inspectors should review the landscape design prior to installation to ensure that the landscape installer uses the design-specified species and recommended plant spacing.

The following graphic from the Waterwise plant database provides information for the Mary Nell holly. The mature width range is from 10 feet to 15 feet, meaning that this tree should be planted at least 5 feet to 7.5 feet from adjacent plants or structures.

Details	
Common name :	Holly, Mary Nell
Scientific name:	*Ilex x 'Mary Nell'*
Plant category:	Trees < 25 ft.
Hardiness range:	7 – 9b
Mature height (ft.):	15 – 20
Mature width (ft.):	10 – 15
Flower color:	White
Soil moisture range:	Dry – moist
pH:	Acidic – neutral
Light range:	Full sun – partial sun
Salt tolerance:	Low
Growth rate:	Slow
Native:	Yes
Comments:	Evergreen. Warm season flowers. Female clone. Red berries. Attracts birds and pollinators.

Screenshot from the Waterwise plant database

Program Tip

If the landscape professional has a valid reason to exceed the recommended spacing of a species, an explanation may be submitted for inspector consideration.

Florida Water Star residential certifications address plant spacing by ensuring sufficient plants are installed to allow for 60 percent cover at maturity, are site-appropriate and that plants are grouped with similar moisture and maintenance requirements.

Drought-tolerant turf grass

Residential Gold – LP 2

Background

Florida Water Star encourages the use of site-appropriate species as a practice. Several turf species, if correctly established, may be used on Florida Water Star projects and will receive points. In parts of Florida, it will be necessary to amend the soil before laying the sod. This will maximize the opportunity for a successful establishment. Builders and landscapers should check with their local IFAS extension office to determine the best species of turf in unirrigated areas. To learn more about appropriate ground cover species, use the Waterwise plant database. The Florida Water Star program has a recommended protocol for temporary establishment methods. Reach out to an administrator for this document.

Requirements and certification

Unirrigated drought-tolerant turf grass or ground cover is used.

Silver	Gold	Commercial/Institutional
NA	Up to 25 points	NA

Points are awarded based on the percentage of the turf area that is planted with the drought-tolerant species.

Drought-Tolerant Turf Grass Point Formula
(drought-tolerant turf grass area ÷ total turf grass area) × available points

Unirrigated Bahia grass

The builder or inspector must request a written variance from the program administrator to receive credit for additional drought-tolerant turf species. This request must include documented, scientific research that validates the drought tolerance of the proposed turf grass species.

Program Tip

The Florida Water Star Technical Advisory Committee (TAC) and program staff may approve additional species. Points will be awarded after review of water-saving or water-efficiency documentation by the program staff, after receiving recommendations from the program TAC. In the absence of a recommendation by this committee or a demonstrated need for timeliness, the water management district may render a decision with the input of irrigation and landscape design experts.

Increasing shade from trees

Residential – Silver LC 5, Gold LP 1

Background

Florida Water Star gives credit for landscapes that have a tree canopy that provides shade to a significant portion of the landscape, which can substantially reduce on-site evapotranspiration (ET).

Requirements and certification

Trees will provide shade to 30% of the total landscaped area at maturity. For properties where no more than 50% of the turf has permanent irrigation, trees at maturity shall provide shade to a minimum of 15% of the total landscaped area.

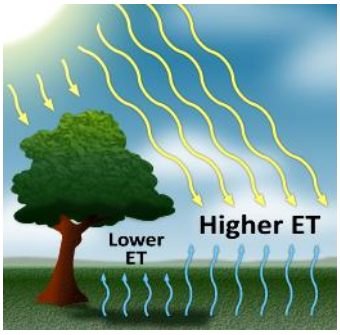
Percentage	Silver	Gold	Commercial/Institutional
50	NA	20	NA
40	NA	15	NA
30	Required	Required	NA

For properties where 51% to 100% of the turf has permanent irrigation, trees at maturity shall provide shade covering a minimum of 30% of the total landscaped area.

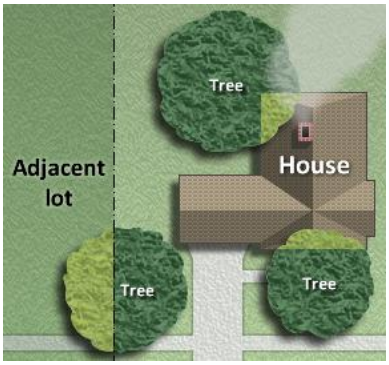
For properties where 50% or less of the turf has permanent irrigation, trees at maturity shall provide shade covering a minimum of 15% of the total landscaped area.

This practice pertains to all trees on the lot, recently planted or existing. Landscape designers and inspectors should use the Waterwise plant database, or comparable reference, to assess the mature shade area of the trees.

This practice does not give credit to overlapping portions of tree canopies or to the portions of canopies that provide shade beyond lot boundaries to adjacent lots.



Less evapotranspiration occurs in shaded areas



Shade tree example — The darker green areas count towards points; the overhanging faded green areas do not. It might be better to focus on a small area, include a specific radius, and have an actual calculation.

No permanent irrigation in landscape beds

Gold – LP 3

Background

Many plants used in landscape beds in Florida do not require supplemental irrigation beyond establishment and outside of drought conditions. As a result, Florida Water Star recognizes that great conservation potential exists for the following: (1) not installing irrigation in landscape beds, or (2) disconnecting landscape bed irrigation after plant establishment.

Requirements and certification

Landscape beds are designed to have no permanent irrigation system. (All extensions/lateral lines to these areas from an existing irrigation system are permanently disabled.)

Silver	Gold	Commercial/Institutional
NA	Up to 20 points	NA

No Permanent Landscape Bed Irrigation Calculation

(unirrigated landscape bed area ÷ total landscape bed area) × available points

If 100% of the landscape beds are unirrigated, the full point value is awarded. Partial points are awarded for having less than 100% unirrigated beds. For example, if 1,500 square feet (ft^2) of landscape beds are unirrigated and 1,000 ft^2 of landscape beds are irrigated, 13 points will be awarded. Points are awarded if the irrigation equipment is still in place, but permanently disabled. The Inspector must receive a written guarantee from the irrigation installer or applicant that any temporary irrigation system is removed after plants are established, no longer than 60 days after planting.

Organic mulch

Residential Silver LC 6 and Gold LC 8

Background

When correctly applied, mulch can provide many benefits to increase the overall sustainability of landscapes. Four of the primary benefits from mulch are: (1) the prevention of water loss from the soil through evaporation, (2) the suppression of weed growth, (3) the moderation of soil temperatures, and (4) the addition of organic nutrients to the soil.

A variety of mulch materials are used in Florida landscapes. The following are some types of organic mulch materials that meet Florida Water Star criteria:

- Tree bark
- Wood chips
- Leaves
- Pine needles

Requirements and certification

Organic mulch shall be used and applied to a depth of 2 to 4 inches.

Silver	Gold	Commercial/Institutional
Required	Required	NA

The Florida Water Star inspector must visually confirm mulch depth in several locations throughout the landscape.

Pine bark mulch will help keep these newly planted shrubs moist in the dry season

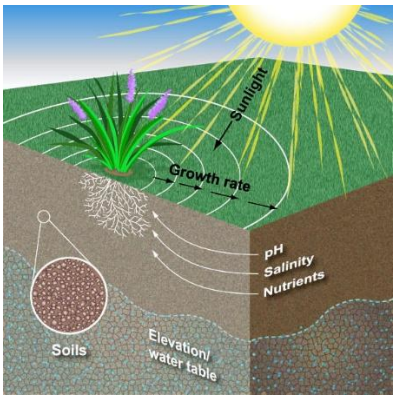
Program Tip

In many cases, mulch depth is compliant with this practice. However, it is common for mulch to be piled against plant bases. In such a case, inspectors can recommend that the builder/builder's representative remediate this problem during the inspection.

Plant site compatibility

Background

Efficiency practices relating to plant compatibility are intended to ensure that landscape plants are compatible with the site conditions. Florida Water Star encourages that the right plant be installed in the right place. This ensures a sustainable landscape that is able to survive on minimal irrigation. Plant site compatibility and plant grouping are efficiency practices that serve the implementation of the "right plant, right place" philosophy. The Waterwise plant database is a tool that can be used to demonstrate compliance with these practices.



These are some of the factors that influence a plant's suitability to a site

Waterwise plant database

The online Waterwise plant database contains many of Florida's landscape plants and is organized based on each plant's natural environmental requirements. This database can be sorted by plant characteristics.

In addition, it is possible to organize plants into groups by hydrozone. This will create a plant palette that is appropriate to the specific site. Applicants are encouraged to use this tool as a basis for documenting Florida Water Star landscape compliance. Refer to the frequently asked questions section of the Waterwise web pages to learn how to best use this database. Additional plant resources may be incorporated in the development of the plant palate and should be documented in the case of their use.

DETAILS	
Common name:	Red maple, swamp maple
Scientific name:	*Acer rubrum*
Plant category:	Trees > 25 ft.
Hardiness range:	4 – 9b
Mature height (ft.):	60 – 75
Mature width (ft.):	25 – 35
Flower color:	Red
Soil moisture range:	Moist – wet
pH:	Acidic
Light range:	Full sun – shade
Salt tolerance:	Low
Growth rate:	Fast
Native:	Yes
Comments:	Warm season red flowers. Provides food for wildlife. Red, purple, yellow fall foliage.

This screenshot from the Waterwise plant database shows details of natural conditions needed by this plant to thrive

Plant site compatibility

Residential Silver – LC 3 Gold – LC 4
CII – LS 5

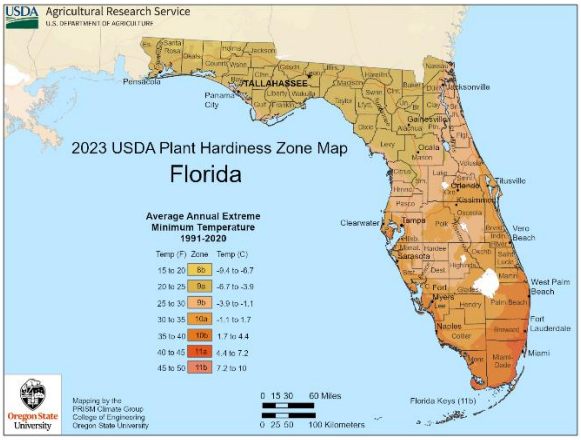
Background

Plants require more irrigation and maintenance if planted in unsuitable conditions. If established plants have been sited appropriately, they will survive with minimal irrigation during dry periods. Florida Water Star identifies the following primary site characteristics influencing plant health and survival:

- Hardiness zone
- Soil pH
- Soil moisture
- Sunlight
- Salt tolerance

Hardiness zone is a geographic region in which a plant is capable of growing, as defined by climatic conditions, including its ability to withstand the minimum temperatures of the zone. The U.S. Department of Agriculture determines hardiness zones.

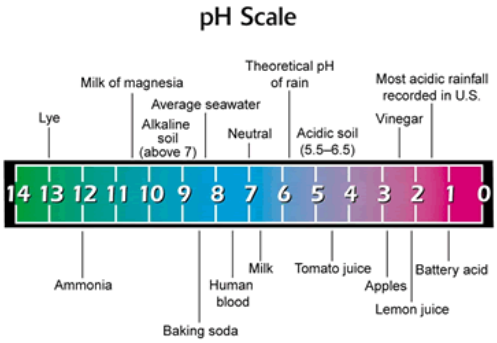
Hardiness zones vary across the United States. The map shows hardiness zones for each county in Florida (zones 8b-11b). For best results in your landscape, choose plants best suited for the zone in which you live.



All landscape plants should be adapted to survive within the property's climate (hardiness) zone. Microclimates, caused by proximity to a large water body, for example, can exist on a site and can create modified site conditions for growth. Such microclimates should be detailed by the inspector.

Soil pH is the measure of the soil's acidity or alkalinity. The pH can range in value from 1 to 14; the value of 7 represents neutrality. Locating a plant in a soil with a different pH than recommended for that species can affect absorption of nutrients and create stressful conditions that can contribute to pest problems.

Acidic soil has a pH level below 7, while alkaline soil has a pH level above 7. Florida Water Star does not require that inspectors measure a site's pH.



Soil moisture is the water held in the spaces between soil particles. Dry soil is also called xeric, while moist or wet soil is called hydric. Sites can have uniform soil moisture, and others have a wide soil moisture range that significantly affects landscape health.

Sunlight:

- Full sun indicates locations that receive more than 6 to 8 hours of sunlight a day (e.g., southeast areas, treeless lots, new subdivisions with new landscapes, large open expanses of turf).
- Partial sun areas receive 5 to 6 hours of sunlight in either the morning with afternoon shade or in the afternoon with morning shade.
- Areas with full shade receive less than 5 hours of sunlight a day (e.g., northwest areas, deep shade under canopy trees, areas between homes on zero-lot lines, bedding areas under roof eaves).

Salt tolerance
A plant that tolerates a large amount of salt in the soil or in the wind (salt spray) has salt tolerance. Some plants may be tolerant of salt spray, but not salt water, especially in coastal communities using reclaimed water. For Florida Water Star purposes, salinity should only be an issue for coastal locations and, in some cases, where municipal reuse water is the primary source for irrigation.

Requirements and certification

A minimum of 90% of plant selections are compatible with site-specific conditions such as sunlight, soil type and salinity.

Silver	Gold	Commercial/Institutional
Required	Required	Required

This practice interprets the suitability of a plant for the overall site conditions. Credit is awarded based on the percentage of plants in the landscape beds that meet the site-specific growing conditions. Plant beds should be designed such that at maturity they cover 60% of the bed.

Typically, the program inspector should use information in the design drawings and the Waterwise plant database to assess the compatibility of each landscape bed. Confirmation of planted species and site conditions must occur on-site.

1. Credit is allocated by calculating the percentage of compatible species as a percentage of the entire number of species. For example, if 90 of 100 species are compatible with site conditions, then 90% is credited.
2. Alternatively, the inspector may award credit based on the total number of plants.

For existing landscapes, inspectors must use their judgment and potentially approve compliance with this practice, if existing plants are surviving well in the absence of regular irrigation.

Program Tip

In some cases, microclimates create conditions that do not conform to the information contained in the Waterwise plant database, or in other plant references. Microclimates can expand the range

of a plant to survive during extreme temperature fluctuations, usually winter freezes. In this situation, the inspector should request a variance and provide plant references that document the plant species' ability to thrive in the microclimate.

Plant grouping

Residential Silver – LC 4, Gold LC 5
CII – LS 6

Background

When plants with dissimilar needs are installed within the same irrigation zone (hydrozone), overwatering and unsustainable maintenance practices can occur. Florida Water Star water-efficient practices are intended to result in landscapes with plants that are most appropriate for the site. These landscapes should only require minimal irrigation to survive.

Plants within the same irrigation zone, or hydrozone, should have similar moisture and maintenance needs.

Height/width: It is recommended that spacing compatibility be evaluated by using the waterwise plant database. In most cases, plant spacing is compatible if a plant has enough space to grow to maturity, or plants should be spaced at least half their mature width from each other. Plant width should be considered in choosing plants adjacent to buildings to minimize long-term maintenance. The landscape design may demand denser spacing for hedges or ground cover. Plant height is a particular consideration when choosing plants that will be installed adjacent to buildings.

Growth rate: The rate at which a plant grows under normal conditions, (i.e., slow, moderate, fast) is called the growth rate.

Soil moisture: All plants within a hydrozone must have similar soil moisture tolerances.

Annual Growth Rate of Plants (in feet [ft])			
Plant Type	**Slow**	**Medium**	**Fast**
Trees	Less than 2 ft	2 to 3 ft	More than 3 ft
Shrubs	Less than 2 ft	2 to 3 ft	More than 3 ft
Perennials	Less than 1 foot	1 foot	More than 1 foot
Fruit trees	Less than 2 ft	2 to 3 ft	More than 3 ft
Fern	Less than 3 inches	2 to 3 ft	More than 3 ft
Ground covers	Less than 1 foot	1 to 2 ft	More than 2 ft
Vines	Less than 2 ft	2 to 3 ft	More than 3 ft

Requirements and certification

A minimum of 90% of plants are grouped by similar moisture and maintenance requirements.

Silver	Gold	Commercial/Institutional
Required	Required	NA

Plants are grouped by similar moisture and maintenance requirements.

Silver	Gold	Commercial/Institutional
NA	NA	Required

The Florida Water Star inspector should use information in the design drawings and the waterwise plant database to assess the compatibility of each landscape bed.

Confirmation of planted species and site conditions must occur on-site.

1. Credit is awarded by calculating the percentage of compatible species as a percentage of the entire number of species. For example, if 90 of 100 species are compatible then 90% is achieved.
2. Alternatively, the inspector may award credit based on the total number of plants.

IRRIGATION SYSTEM CRITERIA

General Design

Irrigation systems function to supplement rainfall to meet plant watering requirements. System designs and installations can be basic or complicated, depending on plant needs, site conditions and aesthetic requirements.

Florida Water Star landscapes are designed for sustainability, meaning they survive with minimal irrigation. This does not mean that a less superior irrigation system should be installed, but that the irrigation system is more efficient, waters only those areas that need it, and is operated to apply water based on the plant's needs. A Florida Water Star residential project may not irrigate more than one-half acre of landscaped area.

Ongoing operation and maintenance are essential to preserving irrigation system efficiency. Designers, installers and operators should plan to perform periodic analysis of the irrigation system, checking to optimize its efficiency. Routine maintenance of the system hardware, including replacement of broken sprinklers/emitters, leveling and raising of sprinkler heads, micro-irrigation

monitoring and other periodically executed practices, is essential to maintaining the system's efficiency. Appendix F of the Florida Plumbing Code provides additional information on irrigation system design and installation.

Installing a new spray nozzle

High-volume/sprinkler irrigation

Residential - Silver IRC 1, Gold IRC 1, IRP 2

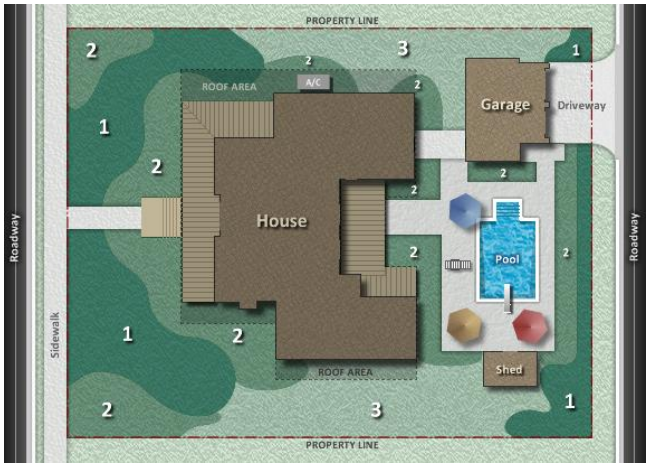
Background

Sprinkler irrigation is any sprinkler or emitter with a flow rate of 30 gallons per hour (gph) or 0.5 gallons per minute (gpm) or greater. In most cases, high-volume irrigation devices are spray and rotor sprinklers. Low-volume irrigation is typically referred to as micro-irrigation. Bubblers usually have flow rates at or above 0.5 gpm and, for the purposes of this program, they are considered high-volume irrigation. Sprinklers are used to irrigate turf grass and other plant materials having a greater watering requirement.

Florida Water Star requires reduced high-volume irrigation for the following reasons:

High precipitation rate irrigation: The volume of water applied is derived from a combination of the precipitation rate and run time of the sprinkler/emitter. As volume is also dependent on run time, the term high-volume denotes high precipitation rate devices. High precipitation rates create the potential for high water use when poor scheduling practices are used, which is common in Florida. Additionally, excess irrigation water can result in stormwater runoff.

Application efficiency: High-volume (high precipitation rate) irrigation devices have lower application efficiencies in comparison with micro-irrigation. In other words, micro-irrigation emitters use less water to effectively deliver the amount of water necessary to meet a plant's water requirement.



Hydrozones By reducing the area of the landscape that requires high-volume irrigation and using micro-irrigation or no irrigation after establishment, the demand for irrigation water can be reduced significantly. In Florida, high-volume irrigation is frequently run for longer periods than necessary, resulting in overwatering. Reducing the amount of high-volume irrigation area can reduce total irrigation application. Opting for micro-irrigation or no irrigation is driven by the landscape design. In most situations, decreasing high-volume irrigation is accomplished by reducing the area covered by turf grass when planning the landscape design.

Requirements and certification

Sprinkler areas are limited to the following percentages of the total landscape area for each level of Florida Water Star Residential certification:

- **Silver: 60%**
- **Gold: 50%**

The total irrigated area on a Florida Water Star Residential project cannot exceed one-half acre. No high-volume percentage restriction exists for the Florida Water Star Commercial/Institutional certification or the common areas of Community certification. The water budget for Commercial/Institutional certification addresses high-volume irrigation.

Percentage of Landscape with HV Sprinklers	**Silver**	**Gold**	**Commercial/ Institutional**
60	Required	NA	NA
50	NA	Required	

Points are awarded in Gold based what percentage of the irrigated area includes high-volume sprinklers as opposed to the landscape area.

Percentage of Irrigated Area with HV Sprinklers	Silver	Gold	Commercial/ Institutional
30	NA	15 Points	NA
31-40	NA	10 Points	
41-50	NA	5 Points	

The irrigation drawing should clearly indicate the area (in square feet) of high-volume irrigation. The inspector should field-verify the percentage of high-volume irrigation. The percentage of high-volume irrigation area is calculated as a percentage of the entire landscaped area.

High-Volume Irrigation Percentage Calculation
Total high-volume irrigation area ÷ total landscaped area

Program Tip

To meet this requirement, there must be communication among the landscape and irrigation contractors to ensure the high-volume irrigation area does not exceed the percent requirement. The percentage threshold is precisely interpreted, and variances are prohibited.
Precipitation rates for sprinklers are listed in the manufacturer's product manual and can often be found on the company's or distributor's website.

Micro-irrigation in landscape beds

Residential Silver – IRC 2 and Gold IRC 2

Background

Micro-irrigation is defined as the frequent application of small quantities of water directly on or below the soil surface or plant root zone, usually as discrete drops, tiny streams or miniature sprays through emitters placed along the water delivery pipes (laterals). Micro-irrigation encompasses several methods or concepts, including drip (previously known as trickle irrigation), subsurface, bubbler and microspray irrigation. Micro-irrigation emitters apply less than 30 gallons per hour (gph) or 0.5 gallons per minute (gpm). (Landscape Irrigation and Florida-Friendly Design Standards) Most types of micro-irrigation deliver water below the plant canopy and directly to the root ball, resulting in higher application efficiencies than sprinklers. Florida Water Star encourages the use of micro-irrigation for landscape beds. Higher application efficiencies allow for effective irrigation while using less water than sprinklers. Lower application rates allow more time for water to infiltrate the soil, thus reducing the likelihood of runoff.

Micro-irrigation Emitter Types	
 In-line drip	• In-line drip tubing consists of evenly spaced micro-irrigation emitters embedded in a hose. • Depending on plant materials, soils and other factors, the tubing should either be installed alongside the plant root ball or laid out in an even grid pattern. • A grid is good for irrigating ground cover and turf grass, while installing tubing adjacent to root balls is better for shrubs.
 Point source emitter	• Wide ranges of application rates are available for point-source emitters. • Emitters should be installed on each side of the plant, for even watering and balanced root growth.
 Microspray sprinkler	• Micro sprays are smaller versions of high-volume spray heads that should be installed following spacing requirements that apply to regular spray heads. • Micro sprays should be installed head-to-head.

 Bubbler	• Bubblers are capable of applying more than 30 gph and are considered as high-volume in some situations. They should ONLY be used to irrigate trees in the landscape. • A minimum of two bubblers is recommended to be installed on opposite sides of a tree

Micro-irrigation systems require increased maintenance compared to high-volume irrigation systems. Components can be damaged or caused to malfunction if water pressure is too high, and the correct installation of pressure regulation is necessary. Clogging can occur because micro-irrigation emitters have smaller orifices than high-volume sprinklers. It is usually necessary to install filters and flush valves to prevent clogging, especially when reclaimed water is used. Micro-irrigation components are often installed aboveground, and they can be more vulnerable to inadvertent damage from wildlife and sunlight, or exposure to weather.

Micro-irrigation Recommendations

Adapted from *A Guide to Micro-Irrigation for West-Central Florida Landscapes* (Source: Tampa Bay Water)

- Do not run ½-inch poly tubing more than 250 feet.
- Do not run ¼-inch spaghetti tubing more than 5 feet.
- Use buried PVC pipe or poly tubing to deliver water closer to the irrigated area.
- Place emitters so they are evenly spaced around plants; for example, emitter should be placed halfway between a tree's trunk and the canopy edge.
- Install micro sprays to provide head-to-head coverage.
- For large trees, potted plants and hanging baskets, additional rows and/or emitters may be necessary to meet the plant's water needs.
- Maintain plant health by moving emitters away from plants as they mature to encourage proper root development.

Due to smaller emitters, tubing and other components, micro-irrigation might require pressure regulation, filtration and flush valves to prevent clogging and damage from high water pressure.

The following factors must be considered when designing emitter spacing:

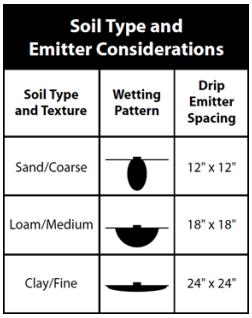
- Micro-irrigation should be tailored to the plant material that it will irrigate. Inline drip in a grid pattern might be appropriate for ground cover, while point-source emitters are better suited to a zone with different-sized shrubs.
- Soil plays a significant role in micro-irrigation system design. Particularly, emitter and drip line spacing must be determined based on soil texture. Spacing should be narrower for sandy soils and wider for clay soils.
- Building use (high/low foot traffic): Micro-irrigation devices such as micro sprays might not be suitable for high-traffic areas.

Requirements and certification

If irrigation is used for landscape beds, micro-irrigation is installed.

Silver	Gold	Commercial/Institutional
Required	Required	NA

In addition, designers and installers should refer to the manufacturer's recommendations for correct installation guidelines.



Program Tip

If micro-irrigation components are not directly visible, the inspector must manually remove mulch in multiple areas to confirm its presence and correct the installation. Inspectors should replace any mulch that was displaced during micro-irrigation inspection.

While it is not a requirement of Florida Water Star certification, reducing ultraviolet (UV) exposure to micro-irrigation tubing can greatly increase its longevity. Covering tubing with mulch/soil and staking it to the ground can reduce the tendency for drip tubing to rise from the soil. This may prevent UV exposure.

In certain conditions, as plants mature, emitters might need to be moved away from the plant base to promote root development.

Turf grass and landscape bed separation

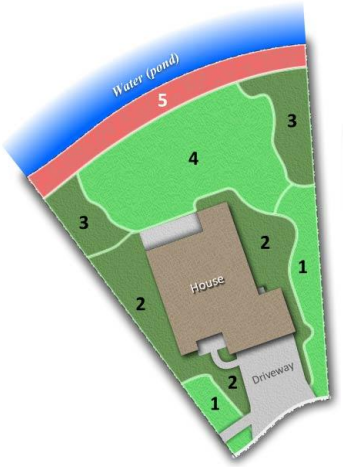
Residential Silver IRC 3 and Gold IRC 3
CII – IR 1

Background

Turf grass and landscape beds do not have the same watering and maintenance requirements. When turf grass and landscape beds are planted in the same irrigation zone or intermixed within a zone, it can be difficult to apply irrigation efficiently.

Florida Water Star encourages irrigation separated by hydrozone, which is a distinct group of plants with similar water needs and climatic requirements. Additionally, the program encourages the design and installation of sustainable landscapes that can survive with minimal irrigation.

The following figure shows an example of multiple hydrozones within a landscape. These hydrozones contain plants with similar moisture and maintenance requirements. In this example, a separate zone valve should irrigate each zone.



Hydrozones	
1	Turf grass
2	Landscape bed
3	Landscape bed
4	Turf grass
5	Unirrigated buffer zone

Requirements and certification

Irrigation zones for turf grass and landscape beds are separate.

Silver	Gold	Commercial/Institutional
Required	Required	Required

For new construction (Florida Water Star Silver, Gold, Commercial/Institutional and Community), this efficiency practice disallows irrigation of turf grass and landscape beds in the same irrigation zone.

Separation of zone irrigation types must be clearly reflected in designs, and inspectors should field-verify the zone separation by testing the operation of all zones.

Program Tip

Grouping seemingly dissimilar plants is sometimes preferable to the alternative. For instance, turf grass watering requirements might be more like a vegetable garden than a landscaped bed with shrubs. In addition, it might be preferable to install bubblers that irrigate large-caliper trees in turf grass zones.

Inspectors are responsible for evaluating these types of situations to determine the most water-conserving strategy and should contact the administrator for final determination.

Micro-irrigation in narrow areas

Residential Silver and Gold – IRC 4

Background

Generally, landscape areas that are less than 4 feet wide are difficult to irrigate without creating overspray to adjacent areas.

Requirements and certification

Irrigated areas less than 4 feet wide shall be irrigated with micro-irrigation or zone-appropriate spray heads (center or side strip sprays are in their own zone).

Silver	Gold	Commercial/Institutional
Required	Required	NA

The Florida Water Star inspector will visually confirm this prerequisite. In some cases, as in between two houses, it is common to have turf strips less than 4 feet. A variance may be requested if this situation occurs, and the variance will depend on the actual width of the turf and specific site conditions.

Program Tip

Side yards often have small turf grass strips required by local codes. There is the potential for a variance if a side yard is required to have a turf strip of less than 4 feet wide for irrigation. This can happen on a small lot that must have turf grass for stormwater conveyance. Inspectors should contact the Florida Water Star administrator to determine if a variance is applicable.

Sprinkler/emitter proximity to buildings

Residential Silver and Gold - IRC 5
CII – IR 2

Background

Requiring irrigation sprinklers and emitters to be installed away from buildings is intended to address potential problems. For example:

- Florida's climate is abundantly moist and adding moisture can create many problems in a built environment. These problems range from mold to termites and can be very costly relative to the benefit of having plants near a building.

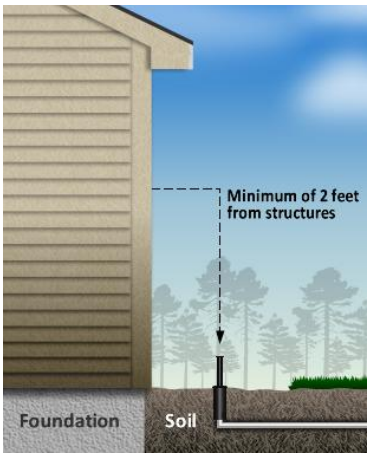
- Plants can grow to the point of reaching the building, creating the need for frequent landscape maintenance and increasing the difficulty of building maintenance. Locating plants away from buildings necessitates irrigation sprinklers and emitters to be located further from buildings.

Requirements and certification

Sprinklers and/or emitters are located a minimum of 2 feet from structures.

Silver	Gold	Commercial/Institutional
Required	Required	Required

Any type of sprinkler or emitter must be a minimum of 2 feet away from an enclosed/conditioned structure. Structures that apply to this requirement are any conditioned space and enclosed structures such as garages. In most cases, impervious structures such as porches and patios are exempt.



Location of sprinkler adjacent to home.

This criterion requires designs to specify, stating clearly, that all sprinklers/emitters are 2 feet from enclosed structures, which Florida Water Star Inspectors are to field-verify.

Where irrigated turf is installed adjacent to the property, sprinklers may be placed 18” from the enclosed structure.

Program Tip

The Florida Water Star landscape efficiency practice that acts in tandem with this irrigation requirement states:

> *Root balls are at least 2.5 feet on center from the foundation of a structure.*
> *In combination, these efficiency practices allow for sprinklers/emitters to safely apply water away from structures and to adjacent plants.*

Leaks

Residential Silver and Gold – IRC 6
CII – IR 3

Background

Irrigation system leaks can be common and sometimes result in significant water loss, which is frequently overlooked. The following are some commonly observed irrigation system leaks:

- Broken irrigation heads
- Cracked pipe at the point of connection with the sprinkler casing
- Cut or cracked inline drip tubing
- Disengaged emitters
- Wear at emitter insertion points

Florida Water Star attempts to identify any above ground leaks at the time of certification. Inspectors must run every zone to inspect for leaks and observe other criteria.

A leak from a cracked sprinkler head

Requirements and certification

The irrigation system shall be free from observable leaks.

Silver	Gold	Commercial/Institutional
Required	Required	Required

Inspectors will ensure no leaks exist during system operation. The program inspector is to visually inspect the entire irrigation system and require that any leaks be stopped prior to certification. It is not within the scope of this program to check for underground leaks.

Program Tip

Often landscape and irrigation system installations overlap, creating the potential for inadvertent damage to irrigation system components. If landscape plants are installed after the irrigation

system, which often occurs, the irrigation system should be inspected to ensure no leaks or other malfunctions were created during the landscape installation.

Leak detectors or flow sensors

Residential Gold – IRP 3

Background

Leak-detection and/or flow-sensing are becoming more common, especially in planned communities and utilities' service areas. These devices detect flows that are significantly greater than those for standard water use, and they are useful in notifying the utility or community manager of excessive flow.

Requirements and certification

Leak detection/flow-sensing system is installed and operational.

Silver	Gold	Commercial/Institutional
NA	10 points	NA

Flow sensors detect excessive watering

If a utility has installed a flow-sensing device to determine if excessive water use is occurring, it is the responsibility of the applicant to determine if the device is in use and provide the inspector with written confirmation from the utility. The Florida Water Star inspector shall submit the written confirmation of flow-sensing technology to the certification entity.

Check valves

Residential Silver and Gold – IRC 7
CII – IR 4

Background

Water pressure in an irrigation system will affect the performance of sprinklers and emitters. The accumulated weight of water increases pressure as gravity pulls on water. Sprinkler height differential creates varying pressures. Thus, pressures can build at lower heads.

Decline creates greater water pressure at lower head

This additional pressure can cause a standard irrigation head to remain partially open and "weep" or "bleed" after the solenoid valve closes, which causes any remaining water in the pipe to drain out and go to waste. Up to 1 gallon of water can leak from low-lying heads every time the system shuts off. Significant water loss can occur over time in systems with numerous low-lying heads.

Check valve installed in a pop-up sprinkler head

A check valve is a component that increases the resistance of the sprinkler pop-up mechanism and prevents water from weeping out.

Requirements and certification

Sprinklers in low-lying areas shall have check valves.

Silver	Gold	Commercial/Institutional
Required	Required	Required

Locations that typically require check valves are the site perimeters that are at a low point in a slope away from the building. Heads requiring check valves must be clearly identified on the irrigation system design and are to be field verified by Florida Water Star inspectors.

No permanent (inground) irrigation

Residential Gold – IRP 1

Background

Unirrigated landscape areas continue to gain traction as a significant water-efficiency practice for water conservation. This practice relies on careful design of landscape beds and turf grass/ground cover areas, and correct installation and establishment of site-appropriate plants. These types of well-designed landscapes should survive with minimal irrigation beyond establishment and can often be limited to hand watering during dry periods. The program has specific recommendations for establishing this turf area.

Most new landscapes require some establishment irrigation. Strategies for applying establishment irrigation vary widely and should be both effective and removed in a timely manner.

Requirements and certification

Landscape has reduced or no permanent irrigation system.

Example of a temporary irrigation system

Percent of Landscape with no permanent irrigation	Silver	Gold	Commercial/Institutional
100	NA	40 points	NA
75	NA	30 points	NA
50	NA	20 points	NA

25	NA	10 points	NA

Temporary irrigation systems are permitted for landscape plant establishment. After establishment, plants should be able to survive on rainfall alone during normal conditions. Therefore, an irrigation system must be verified as temporary in an area that receives credit for having no permanent irrigation.

Definitions and Inspection Process for Temporary Irrigation Systems:

Definitions

1. **Permanent Irrigation**:
    - **Definition**: Permanent irrigation refers to any irrigation system designed and installed for long-term use, intended to provide supplemental water to plants beyond the establishment period.
    - **Characteristics**:
        - Designed for continuous use.
        - Typically buried or integrated into the landscape.
        - Requires regular maintenance and operation.
        - May include controllers, timers, sensors, or other features for efficient operation.
2. **Temporary Irrigation**:
    - **Definition**: Temporary irrigation refers to any irrigation system used solely for the purpose of establishing new plant growth during a short-term establishment period. These systems must be removed or permanently disabled after the establishment period to comply with FWS criteria.
    - **Characteristics**:
        - Used exclusively for plant establishment.
        - Designed for short-term use (typically 30 days).
        - Must be removed or permanently disabled after the establishment period.
        - May include above ground or buried components, but buried components require specific handling before FWS certification can be issued.

Inspection Process

For In-Ground Temporary Irrigation Systems:

1. **Initial Inspection**:
    - Verify that all FWS criteria are met except for IRC 1 (sprinkler coverage limitation) and removal of temporary components.
    - Confirm that the irrigation design plan accurately reflects separation between temporary and permanent zones.
2. **Second Inspection**:
    - Conduct a follow-up inspection to ensure compliance by verifying that:
        - All in-ground irrigation components (but not piping) have been removed.

        - Pipes are cut and capped.
        - Wires are disconnected from controllers.
3. **Documentation**:
    - Ensure that installer's removal instructions or policies are documented.
    - Verify that the irrigation design plan notes removal of temporary zones.

For Above-Ground Temporary Irrigation Systems:

1. **Single Inspection**:
    - Conduct a comprehensive inspection to verify that:
        - The irrigation design plan matches inspected zones.
        - All above-ground components are easily removable and not integrated with permanent systems.
2. **Documentation**:
    - Ensure that installer's removal instructions or policies are documented.

General Recommendations:

- Inspectors must verify that all temporary components (above-ground or buried) are designed for complete removal (not including piping for buried systems) or disabling.

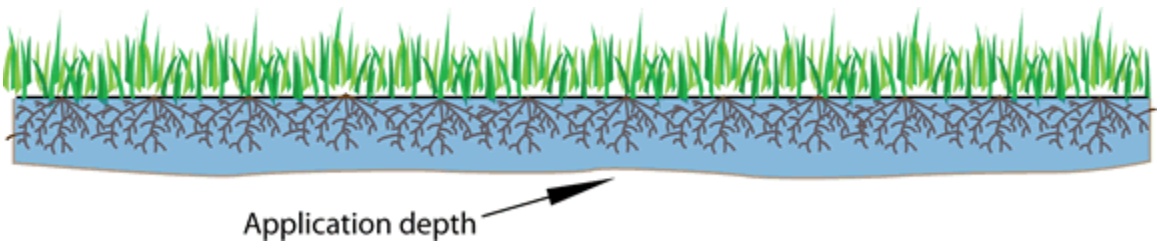
Applicants shall notify the Florida Water Star inspector of the temporary irrigation disconnection. An email will suffice to meet this requirement.

Distribution (application) uniformity

CII – IR 7

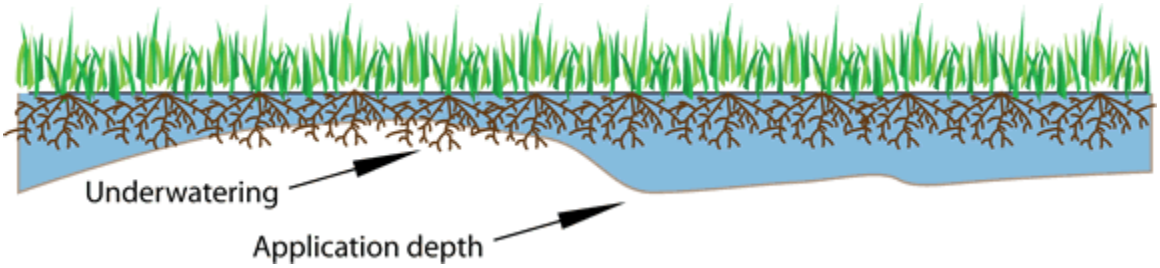
Distribution uniformity (DU): This describes the evenness of an irrigation application across a landscaped area that is typically made up of turf grass. Poor (low) DU in turf zones is common, resulting in significantly reduced overall system efficiency and causing large quantities of wasted water. DU can be expressed as a percentage or decimal value.

Good DU: This figure shows an irrigated area containing turf grass with good DU. The depth of irrigation is relatively even, and no plant is receiving significantly more or less water than another. There is always some variation in an irrigation zone, and therefore it is impossible to have perfect uniformity.



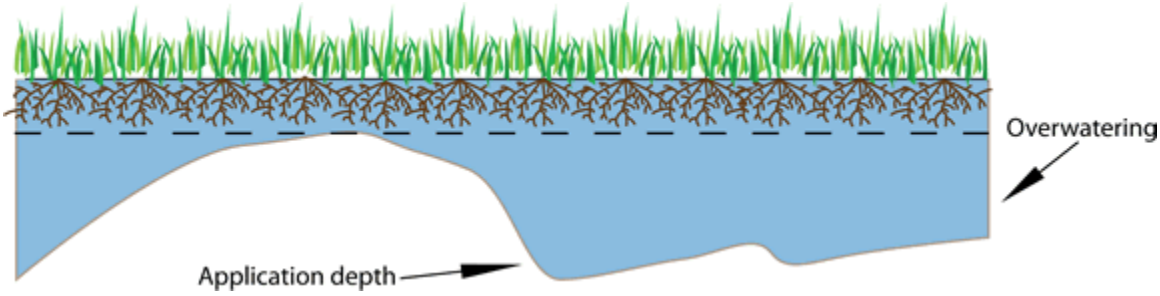
Good DU of system irrigation (although never perfect)

Poor DU: This figure shows an irrigated area containing turf grass with poor DU. During the irrigation cycle, the area on the right receives sufficient amounts of water, while the area on the left does not.



Poor DU of system irrigation

Consequences of poor DU: The figure showing poor DU depicts the increased potential for stress to the turf area on the left. When this results in apparent plant stress, irrigation system operators are likely to increase watering times, which results in overwatering of the turf on the right. The overwatering figure depicts what occurs when system run times are increased to compensate for poor DU. In this example, nearly twice the irrigation is necessary to meet the second plant's watering requirements. If these plants require ¾ inch of irrigation water, then approximately 1.5 inches would be required.

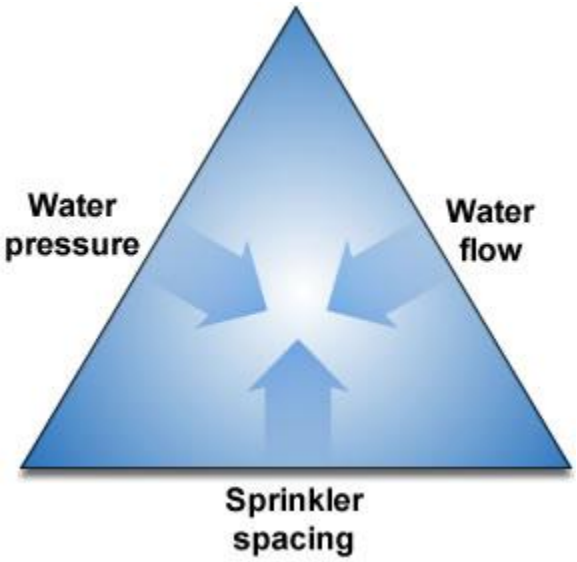


Overwatering, as when irrigation system run time increase

Balancing pressure, flow and spacing: Change in any one of these variables will affect the others and shift overall DU. Consequently, the prerequisites described in this section typically address pressure, flow or spacing, and focus on those efficiency practices that lead to a better DU.

General uniformity practices should be implemented on any irrigation system designed for water efficiency, and these practices may include the following:

- Matched precipitation
- Sprinkler spacing
- Sprinkler clearance
- Overspray limitation
- Nozzle restrictions



Important components of efficient irrigation

Matched precipitation

Residential Silver and Gold – IRC 10
CII – IR 8

Background

The precipitation rate, also known as the application rate, is the average rate (in inches per hour) of rainfall or irrigation system water application.

The term matched precipitation means that all the sprinklers in a particular zone apply about the same amount of water on a given area. Precipitation rates are found in manufacturers' catalogs and vary between sprinkler/emitter types and their range of throw.

Requirements and certification

Precipitation rates for all sprinklers within a zone shall be matched.

Silver	Gold	Commercial/Institutional
Required	Required	Required

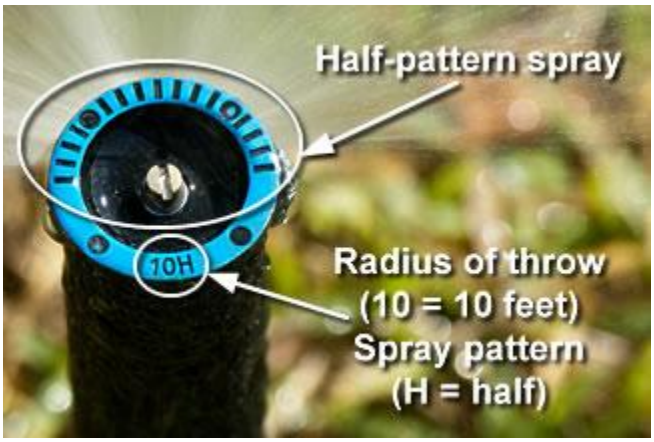
Mismatched precipitation rates typically do not occur in spray head zones because spray heads are manufactured to have matched precipitation.

Rotor heads do not already have matched precipitation, requiring further effort by the designer/installer. Additionally, rotor heads have lower precipitation rates than spray heads. Therefore, this criterion requires that:

1. All rotor zones must have matched precipitation.
2. Rotors shall not be installed in the same zone as spray heads.

Two different strategies can be used to achieve matched precipitation within a rotor zone.

Zoning similar throw patterns together: Matched precipitation is best when sprinklers with similar throw patterns are installed in the same zone (e.g., quarter-spray heads with only quarter-spray heads).

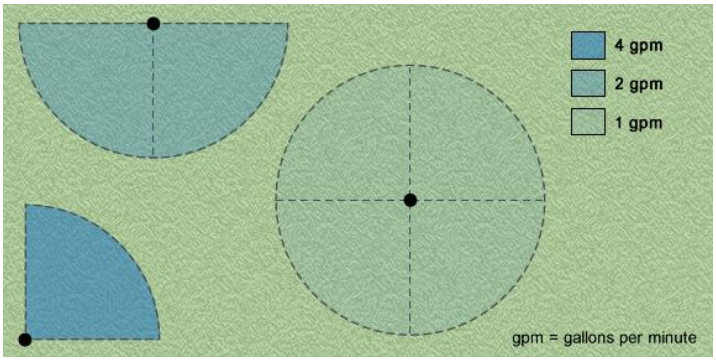


Pop-up sprinkler head indicating spray pattern and distance of throw

Rotor tool

Even spacing and correct nozzle size: While not as exact as installing heads with similar throw patterns together, matched precipitation can be achieved by spacing sprinklers evenly and installing appropriate nozzles. This approach is dependent on a sprinkler's flow and area of coverage. The designer/installer must:

- Choose nozzles according to flow rate (gallons per minute).
- Install all the heads within a zone the same distance apart.
    - For sprinkler heads with the same throw radius (e.g., 20 ft), an increase in the throw pattern (e.g., 90 degrees to 180 degrees) should result in a proportional increase the nozzle flow rate (e.g., 1 gpm to 2 gpm).
    - If a 1-gpm nozzle is used to irrigate a quarter circle, a 2-gpm nozzle must be used to irrigate a half circle and a 4-gpm nozzle must be used to irrigate a full circle.



Rotor head precipitation rate comparison, in gallons per minute (gpm)

Program Tip
Mismatched precipitation rates often occur when the same sized rotor nozzle is used in all sprinklers throughout the entire zone. To avoid this, a contractor should change nozzles in order to achieve matched precipitation.

Micro-irrigation emitters are available in a wide variety of precipitation rates that are designed to meet specific plant watering requirements. These precipitation rates are significantly lower than spray and rotor nozzles, but a single micro-irrigation zone can have many more emitters. Precipitation rate variation in a micro-irrigation zone is acceptable if the zone is designed to meet each plant's watering requirement within a similar amount of time.

Sprinkler spacing

Residential Silver and Gold – IRC 12
CII – IR 9

Background
Distribution uniformity is increased by head-to-head spacing. This occurs when sprinkler heads are located a distance of 50% of the nozzle throw diameter from the adjacent head. In other words, a sprinkler head with a 10-foot throw should be spaced 10 feet from the adjacent head. This spacing must occur in all directions that the nozzle is throwing.

Requirements and certification
Head spacing shall not exceed 50% of the nozzle throw diameter (head-to-head spacing).

Silver	Gold	Commercial/Institutional
Required	Required	Required

Sprinkler head zones must have head-to-head spacing with no more than 1-foot variance. The following should also be considered:

- Narrow side yards graded for drainage and adjacent to similarly landscaped zones may have single row spacing.
- Every corner area should have an irrigation head.
- An irrigated rectangular landscape area should have head spacing that is equal to its width.
- Triangular spacing, while potentially more uniform in some situations, can create significant overspray when used in small areas and adjacent to impervious surfaces.

Irrigation drawings must depict head-to-head spacing, and any notes associated with design drawings should confirm this requirement. The Florida Water Star inspector will visually inspect for this prerequisite while each zone is running.

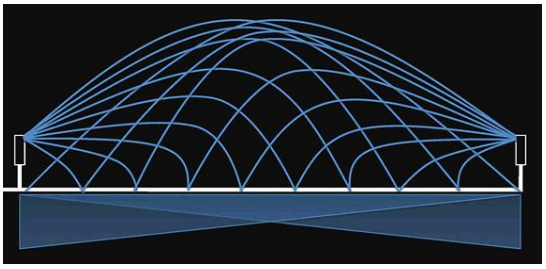
When irrigating turf in side yards or right-of-way areas 4 feet wide or greater, it can be possible to use a single row of sprinklers if ALL of the following conditions are met:

1. There is an adequate slope away from the single row of sprinklers to provide surface water movement.
2. The sprinkler spacing is reduced to a maximum of 40% of radius (closer than head-to-head) to compensate for the lack of a second row of sprinklers and increasing the precipitation rate slightly to assist in the surface water movement.
3. The sprinklers are on a separate zone in order to time this specialty application separately from all other zones AND the runtime and cycles for that zone are correct to minimize wasted water.
4. The sprinklers are adjusted to minimize overspray beyond the zone.

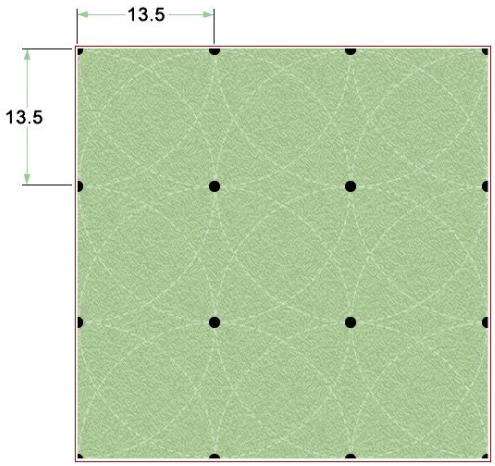
Notes: FWS allows a one-foot variance on location in this criterion. All areas less than 4 feet wide must be irrigated with micro spray or drip. If turf is not required to be in these areas, consider a groundcover species and micro-irrigation.

Program Tip

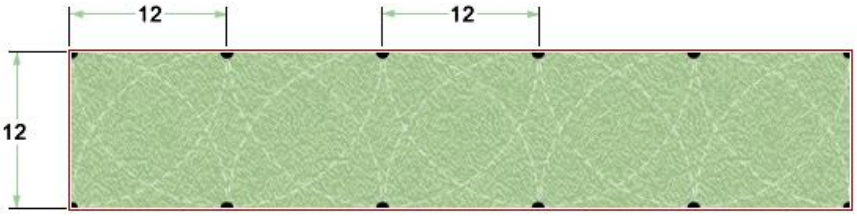
Locations that consistently receive greater wind speeds might require even closer spacing. Designers and installers should be aware of any such locations and make changes accordingly.



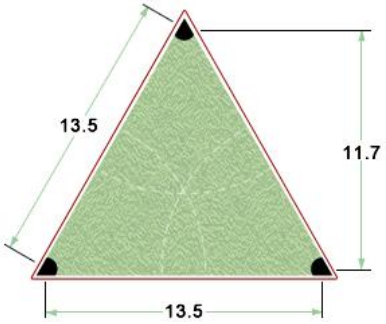
Head-to-head spacing of sprinklers



Example of head-to-head spacing



Rectangular spacing of sprinkler heads



Triangular spacing of sprinkler heads

Sprinkler clearance

Residential Silver and Gold – IRC 8
CII – IR 5

Background

Sprinkler water application can be altered when sprinkler heads are unable to rise above the turf grass. When application is obstructed, distribution of water is increased in areas adjacent to the sprinkler head and areas further away receive less water. Sprinklers that do not clear turf grass are another cause of reduced distribution uniformity, which can significantly diminish plant vitality.

Requirements and certification

Sprinklers rise above turf grass height:

- A minimum of 6-inch pop-up sprinkler heads and 4-inch pop-up rotor heads for St. Augustine, Zoysia and Bahia grasses
- A minimum of 4-inch pop-up sprinkler heads and 4-inch pop-up rotor heads for centipede, Bermuda and seashore paspalum

Silver	Gold	Commercial/Institutional
Required	Required	Required

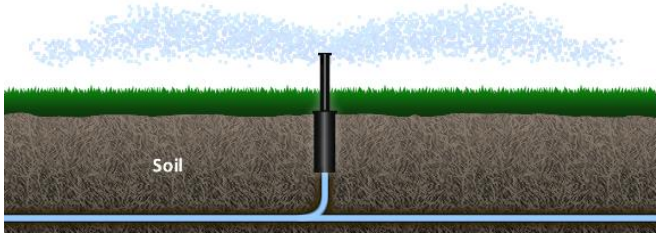
The criteria listed above are required as a minimum standard. When circumstances require longer sprinkler heads, the designer or installer should make necessary changes. In some cases, actual sprinkler head height might not be the primary problem if soils have settled or if turf grass has been installed incorrectly.

The inspector must visually inspect for this prerequisite while each zone is running.

Program Tip

The correct installation of any sprinkler head requires that the head be perpendicular to the ground surface as well as the head being level. These additional steps will further increase efficiency.

Sprinkler clearance above turf



Sprinkler rising above turf grass during system operation

Overspray limitation

Residential Silver and Gold – IRC 9
CII – IR 6

Background

Overspray occurs to some extent in most aboveground irrigation systems. Overspray on impervious surfaces, such as sidewalks, fences, or nearby buildings, wastes water through evaporation or runoff from these surfaces.

Requirements and certification

Application occurs in correct spray patterns, minimizing overspray on impervious surfaces.

Silver	Gold	Commercial/Institutional
Required	Required	Required

Unacceptable overspray is to be minimized

Overspray prevention requires that all sprinklers/emitters are correctly spaced by design and that they are installed according to the correct design.

Variable-arc nozzles (VANs) or adjustable nozzles should be used only for irrigating unevenly shaped turf grass areas that cannot be irrigated with fixed-spray nozzles. The consistent use of a VAN in an irrigation system will likely result in significantly more overspray than what is typical for a fixed-spray nozzle.

Florida Water Star inspectors are to conduct a visual inspection while the irrigation system is running.

Program Tip
Some amount of drift is unavoidable in most irrigation systems. Windy conditions can affect irrigation applications, and inspectors should consider this during the inspection.

Pipe Sizing

CII – IR 7

Background
A maximum 5 feet per second (ft/s) water flow velocity is the industry standard for maintaining irrigation system integrity. Velocities above this rate can damage components, essential to the irrigation system's operation.

Potentially damaging velocities correlate with smaller pipe diameters and, to a lesser extent, specific pipe material properties. The likely result of an incorrect pipe size is water hammer, which occurs when a wave of energy travels back and forth through the water in the pipe causing stress to the pipe, joint and adhesive holding the system together.

Requirements and certification
Pipes are sized to prevent velocities greater than 5 feet per second (ft/s).

Silver	Gold	Commercial/Institutional
NA	NA	Required

A friction loss chart is shown for Class 160 polyvinyl chloride (PVC) pipe. The shaded areas represent velocities over 5 ft/s, requiring a larger pipe to be used. Sizing tables are available in most irrigation system manufacturers' catalogs.

Designers must size pipes according to a recognized pipe sizing/friction loss chart and clearly specify these pipe sizes on the irrigation system design. Installers must install pipes exactly as specified by design.

Irrigation Association Friction Loss Chart 2008

Class 160 PVC IPS Plastic Pipe

ANSI/ASAE S376.2 ASTM D2241 SDR 26 C=150

psi loss per 100 feet of pipe

Nominal Size	Shown for convenience Class 315 1/2"		Class 200 3/4"		1"		1-1/4"		1-1/2"		2"		2-1/2"		3"		4"		6"	
Avg. ID	0.696		0.910		1.175		1.512		1.734		2.173		2.635		3.21		4.134		6.084	
Pipe OD	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
Avg. Wall	0.072		0.070		0.070		0.074		0.083		0.101		0.120		0.145		0.183		0.271	
Min. Wall	0.062		0.060		0.060		0.064		0.073		0.091		0.110		0.135		0.173		0.255	
Flow gpm	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss
1	0.84	0.25	0.49	0.07	0.30	0.02	0.18	0.01	0.14	0.00										
2	1.68	0.90	0.99	0.24	0.59	0.07	0.36	0.02	0.27	0.01	0.17	0.00								
3	2.53	1.90	1.48	0.52	0.89	0.15	0.54	0.04	0.41	0.02	0.26	0.01								
4	3.37	3.24	1.97	0.88	1.18	0.25	0.71	0.07	0.54	0.04	0.35	0.01	0.24	0.00						
5	4.21	4.89	2.46	1.33	1.48	0.38	0.89	0.11	0.68	0.06	0.43	0.02	0.29	0.01						
6	5.05	6.86	2.96	1.86	1.77	0.54	1.07	0.16	0.81	0.08	0.52	0.03	0.35	0.01	0.24	0.00				
7	5.90	9.12	3.45	2.47	2.07	0.71	1.25	0.21	0.95	0.11	0.60	0.04	0.41	0.01	0.28	0.01				
8	6.74	11.68	3.94	3.17	2.36	0.91	1.43	0.27	1.09	0.14	0.69	0.05	0.47	0.02	0.32	0.01				
9	7.58	14.53	4.43	3.94	2.66	1.14	1.61	0.33	1.22	0.17	0.78	0.06	0.53	0.02	0.36	0.01				
10	8.42	17.66	4.93	4.79	2.96	1.38	1.78	0.40	1.36	0.21	0.86	0.07	0.59	0.03	0.40	0.01				
12	10.11	24.75	5.91	6.71	3.55	1.94	2.14	0.57	1.63	0.29	1.04	0.10	0.71	0.04	0.48	0.01				
14	11.79	32.93	6.90	8.93	4.14	2.58	2.50	0.76	1.90	0.39	1.21	0.13	0.82	0.05	0.55	0.02				
16	13.48	42.16	7.88	11.44	4.73	3.30	2.86	0.97	2.17	0.50	1.38	0.17	0.94	0.06	0.63	0.02	0.38	0.01		
18	15.16	52.44	8.87	14.23	5.32	4.10	3.21	1.20	2.44	0.62	1.56	0.21	1.06	0.08	0.71	0.03	0.43	0.01		
20			9.85	17.29	5.91	4.99	3.57	1.46	2.71	0.75	1.73	0.25	1.18	0.10	0.79	0.04	0.48	0.01		
22			10.84	20.63	6.50	5.95	3.93	1.74	2.99	0.90	1.90	0.30	1.29	0.12	0.87	0.04	0.53	0.01		
24			11.82	24.24	7.09	6.99	4.28	2.05	3.26	1.05	2.07	0.35	1.41	0.14	0.95	0.05	0.57	0.02		
26			12.81	28.11	7.68	8.11	4.64	2.38	3.53	1.22	2.25	0.41	1.53	0.16	1.03	0.06	0.62	0.02		
28			13.80	32.25	8.27	9.30	5.00	2.73	3.80	1.40	2.42	0.47	1.65	0.18	1.11	0.07	0.67	0.02		
30			14.78	36.64	8.87	10.57	5.35	3.10	4.07	1.59	2.59	0.53	1.76	0.21	1.19	0.08	0.72	0.02		
32					9.46	11.91	5.71	3.49	4.34	1.79	2.76	0.60	1.88	0.23	1.27	0.09	0.76	0.03	0.35	0.00
34					10.05	13.32	6.07	3.91	4.61	2.01	2.94	0.67	2.00	0.26	1.35	0.10	0.81	0.03	0.37	0.00
36					10.64	14.81	6.42	4.34	4.88	2.23	3.11	0.74	2.12	0.29	1.43	0.11	0.86	0.03	0.40	0.00
38					11.23	16.37	6.78	4.80	5.16	2.46	3.28	0.82	2.23	0.32	1.50	0.12	0.91	0.04	0.42	0.01
40					11.82	18.00	7.14	5.28	5.43	2.71	3.46	0.90	2.35	0.35	1.58	0.14	0.95	0.04	0.44	0.01
42					12.41	19.70	7.50	5.78	5.70	2.97	3.63	0.99	2.47	0.39	1.66	0.15	1.00	0.04	0.46	0.01
44					13.00	21.47	7.85	6.30	5.97	3.23	3.80	1.08	2.59	0.42	1.74	0.16	1.05	0.05	0.48	0.01
46					13.59	23.32	8.21	6.84	6.24	3.51	3.97	1.17	2.70	0.46	1.82	0.18	1.10	0.05	0.51	0.01
48					14.18	25.23	8.57	7.40	6.51	3.80	4.15	1.27	2.82	0.50	1.90	0.19	1.15	0.06	0.53	0.01
50					14.78	27.21	8.92	7.98	6.78	4.10	4.32	1.37	2.94	0.53	1.98	0.20	1.19	0.06	0.55	0.01
55							9.82	9.52	7.46	4.89	4.75	1.63	3.23	0.64	2.18	0.24	1.31	0.07	0.61	0.01
60							10.71	11.18	8.14	5.74	5.18	1.91	3.53	0.75	2.38	0.29	1.43	0.08	0.66	0.01
65							11.60	12.97	8.82	6.66	5.62	2.22	3.82	0.87	2.57	0.33	1.55	0.10	0.72	0.01
70							12.49	14.88	9.50	7.64	6.05	2.55	4.11	1.00	2.77	0.38	1.67	0.11	0.77	0.02
75							13.38	16.90	10.18	8.68	6.48	2.89	4.41	1.13	2.97	0.43	1.79	0.13	0.83	0.02
80							14.28	19.05	10.86	9.78	6.91	3.26	4.70	1.28	3.17	0.49	1.91	0.14	0.88	0.02
85									11.53	10.94	7.34	3.65	4.99	1.43	3.37	0.55	2.03	0.16	0.94	0.02
90									12.21	12.16	7.78	4.06	5.29	1.59	3.56	0.61	2.15	0.18	0.99	0.03
95									12.89	13.45	8.21	4.48	5.58	1.76	3.76	0.67	2.27	0.20	1.05	0.03
100									13.57	14.79	8.64	4.93	5.88	1.93	3.96	0.74	2.39	0.22	1.10	0.03
110									14.93	17.64	9.50	5.88	6.46	2.30	4.36	0.88	2.63	0.26	1.21	0.04
120											10.37	6.91	7.05	2.71	4.75	1.04	2.86	0.30	1.32	0.05
130											11.23	8.02	7.64	3.14	5.15	1.20	3.10	0.35	1.43	0.05
140											12.10	9.20	8.23	3.60	5.54	1.38	3.34	0.40	1.54	0.06
150											12.96	10.45	8.81	4.09	5.94	1.57	3.58	0.46	1.65	0.07
160											13.82	11.77	9.40	4.61	6.34	1.76	3.82	0.52	1.76	0.08
170											14.69	13.17	9.99	5.16	6.73	1.97	4.06	0.58	1.87	0.09
180													10.58	5.73	7.13	2.19	4.30	0.64	1.98	0.10
190													11.16	6.34	7.52	2.42	4.54	0.71	2.09	0.11
200													11.75	6.97	7.92	2.67	4.77	0.78	2.20	0.12
220													12.93	8.31	8.71	3.18	5.25	0.93	2.42	0.14
240													14.10	9.77	9.50	3.74	5.73	1.09	2.65	0.17
260															10.29	4.33	6.21	1.27	2.87	0.19
280															11.09	4.97	6.68	1.45	3.09	0.22
300															11.88	5.65	7.16	1.65	3.31	0.25
320															12.67	6.37	7.64	1.86	3.53	0.28
340															13.46	7.12	8.12	2.08	3.75	0.32
360															14.25	7.92	8.59	2.31	3.97	0.35
380																	9.07	2.56	4.19	0.39
400																	9.55	2.81	4.41	0.43
420																	10.03	3.08	4.63	0.47
440																	10.50	3.35	4.85	0.51
460																	10.98	3.64	5.07	0.56
480																	11.46	3.94	5.29	0.60
500																	11.94	4.25	5.51	0.65

Shaded area represents velocities over 5 fps. Use with caution.

Friction loss chart for class 160 IPS plastic pipe (Courtesy of the Irrigation Association)

Variable-arc nozzle (VANs) or adjustable nozzle restrictions

CII – IR 11

Background

Variable-arc nozzles (VANs) are adjustable spray nozzles that allow application in a range of arc. While this enables in-field adaptability, VANs do not typically apply water as uniformly as standard fixed-spray nozzles, especially over time.

Requirements and certification

VANs are only used to irrigate unevenly shaped turf grass areas that cannot be effectively irrigated with fixed-spray nozzles.

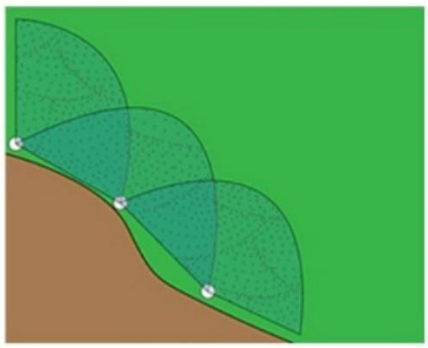
Silver	Gold	Commercial/Institutional
NA	NA	Required

Limit VANs use to those landscaped areas that cannot be effectively irrigated by fixed-spray nozzles. The following illustration shows an example of how VANs might be the best solution to effectively apply water to a turf grass area. Ideally, the landscape design should limit such situations.

Program Tip

Early coordination of landscape and irrigation designs can reduce the need for VANs, by limiting the number of oddly shaped areas that cannot be effectively irrigated by fixed-spray nozzles. This Florida Water Star requirement can be met through thoughtful landscape design.

Variable-arc nozzle



Appropriate VANS installation

Pressure regulation

Residential Silver and Gold – IRC 11
CII – IR 10

Background

Sprinklers and emitters function best within certain pressure ranges according to application type, such as the following:

- Spray nozzles apply water through multiple small orifices in a sheet, requiring typical pressure ranges from 25 to 35 pounds per square inch (psi).
- Rotor nozzles apply water through a single large orifice and function best at a range of between 40 psi and 55 psi.
- Micro-irrigation requires a much lower pressure range due to lower application rates per emitter and smaller, more vulnerable components.

When pressures supplied through the valve are not within the manufacturer's recommended range, sprinklers and emitters will not perform efficiently. The following four practices address irrigation system pressure regulation.

Zone pressure-regulation

Pressure-regulating spray heads restrict water pressure to the range recommended by the manufacturer. Use of these heads increases application efficiency.

Requirements and certification

All zones with spray nozzles are pressure-regulated at the head or at the zone valve.

Silver	Gold	Commercial/Institutional
Required	Required	Required

All spray heads or zone valves within a Florida Water Star-certified irrigation system must be pressure-regulated to receive credit for this practice. During inspection, the inspector is to confirm that all spray heads or spray zones are pressure-regulated.

Program Tip

Florida Water Star inspectors can easily inspect for pressure-regulated spray heads during their inspection for emitter spacing, matched precipitation, and other requirements that require establishment of spray head specifications.

Irrigation valve with pressure regulation

A pressure-regulating spray head

Another brand of pressure-regulating spray head

Water supply

Many water sources are used for landscape irrigation, ranging from potable municipal supply to on-site gray water. The availability of different types of water sources varies by location and budget constraints. In all cases, Florida Water Star encourages using the lowest-quality water source whenever feasible.

Water supply should be a significant consideration of any irrigation system designed for water efficiency. Water-supply efficiency practices that are evaluated by Florida Water Star include:

Rainwater, stormwater and surface waters

Residential Gold – IRP 4

Background

Florida's abundant rainfall provides an excellent opportunity for non-potable irrigation water supply. With the implementation of the revised Florida Department of Environmental Protection (FDEP) Stormwater Quality rule (Chapter 62-347, *Florida Administrative Code*), using storm water for irrigation will become a viable option for both residential and commercial development.

Requirements and certification

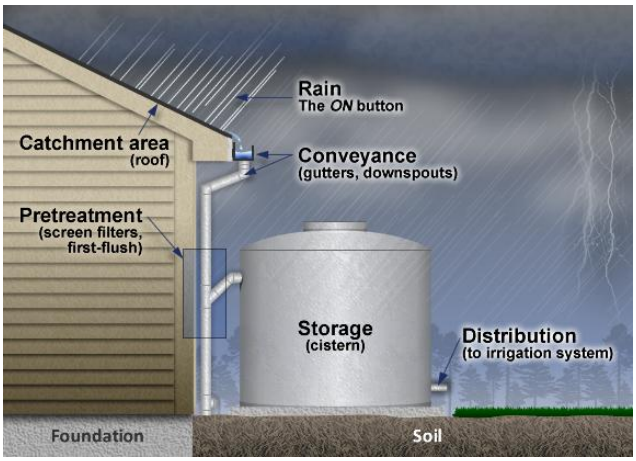
Permanent irrigation is supplied by rainwater, storm water or surface water that meets the program criteria. The backup supply cannot be from a potable source. Irrigation is supplied by a rainfall harvesting system (designed in accordance with Tampa Bay Water BMP manual).

Silver	Gold	Commercial/Institutional
NA	Up to 40	NA

When any alternate source is used for irrigation, it is the responsibility of the applicant to confirm that the maintenance schedule requirement of the irrigation system can be met with the alternate source.

For additional recommendations on cistern design and installation, the applicant can refer to the following documents on the Tampa Bay Water website:

- ***Rainwater Harvesting with Cisterns for Landscape Irrigation*** from Tampa Bay Water
- **International Green Construction Code**
- **National Sanitation Foundation**



For the Florida Water Star inspector to evaluate the cistern's capacity in relation to the irrigation system's requirements, applicants must submit the following information:

- A typical system set up for harvesting rainwater for landscape use
- Formulas used for the sizing calculation in accordance with **Tampa Bay Water BMP manual**
- A detailed design drawing
- Irrigation system precipitation rates (each zone)
- Irrigation controller scheduling information

The Inspector will review details of the design and sizing of the cistern. Utility-supplied potable water cannot be used as backup for rainfall on any cistern. The inspector may seek input from Florida Water Star administrators in determining the point allocation for this practice.
When using storm water for irrigation, the inspector must confirm that the applicant has determined that the stormwater pond can be used for irrigation purposes and treatment will not be diminished.

Operation and scheduling

The majority of the Florida Water Star efficiency practices in the General Design and Distribution Uniformity sections focus on optimizing an irrigation system's physical delivery of water.

This section of efficiency practices focuses on maximizing the accuracy of an irrigation schedule's delivery of water based upon the actual plant water requirement in the soil. Three main factors affect the amount of water that is available to a plant:

1. The amount of plant-available water that is lost, or the evapotranspiration rate. More specifically, evapotranspiration is the "combination of water transpired from vegetation and evaporated from the soil and plant surfaces" (American Society of Agricultural and Biological Engineers [ASAE], 1998).
2. The amount of water that is gained, or effective rainfall, which is the "portion of total rainfall which becomes available for plant growth" (ASAE, 1998).

3. The soil's water holding capacity, which is the "total amount of water held in the soil per increment of depth" (National Resources Conservation Service). Water holding capacity is lowest in sandy soils, which are common in Florida, and highest in clay soils.

Mandatory lawn-watering restrictions have been in effect in most areas of the state for more than 20 years. These requirements must be adhered to in any Florida Water Star irrigation schedule. For specific information about restrictions for your region, refer to water management district websites.

Plant water requirements vary from month to month. As a result, in some locations, it might be necessary to have two schedules, one for one-day-per-week irrigation and one for two-day-per-week irrigation.

Operation and scheduling practices should be a major consideration of any irrigation system that is designed for water efficiency. This efficiency practice category includes the following:

- Rain shut-off device
- Water budget
- System information education
- Innovation

Project: 1/8-acre Lot Base Irrigation Schedule											
90% drip efficiency											
75% rotary efficiency											
Point of Connection	Station	Gallons per Minute	Square Feet	Application Type	Plant Material	Average Net Precipitation with Efficiency (inches/hour)	Summer Run Time per Cycle (minutes)	Summer Usage, Two Cycles per Week (gallons)	Winter Run Time per Cycle (minutes)	Winter Usage, Two Cycles per Week (gallons)	Annual Usage per Station (gallons)
5/8" meter	1	7.9	1338	Rotary	Turf	0.55	35	17,696	39	6,162	23,858
	2	12	775	Drip	Shrub	1.4	9	6,912	9	2,160	9,072
	3	3	346	Rotary	Turf	0.55	35	6,720	39	2,340	9,060
	4	5	312	Drip	Shrub	1.4	9	2,880	9	900	3,780
	5	7	413	Drip	Shrub	1.4	9	4,032	9	1,260	5,292
Total Annual Irrigation Water Usage (gallons)											51,062
Annual Gallons of Irrigation per Square Foot											16.0
Annual Inches of Irrigation per Square Foot											25.7
Rainfall is not considered in this schedule, but should be incorporated through an on-site rain sensor and/or soil moisture sensor or evapotranspiration (ET) controller, which will reduce the usage shown.											

An example of a residential irrigation schedule

Rain shut-off device

Residential Silver and Gold – IRC 13
CII – IR 12

Background

Various devices have been developed to automatically bypass an irrigation cycle after a certain amount of rainfall. Rain sensors or rain shut-off switches have been most commonly used in residential and commercial systems. However, soil moisture sensor (SMS) controllers and evapotranspiration (ET) controllers, which are known as Smart Water Application Technology

(SWAT) devices, also function as rain shut-off devices and are becoming increasingly useful in residential and commercial settings.

Chapter 373.62, *Florida Statutes,* states:

> Any person who operates an automatic landscape irrigation system shall properly install, maintain, and operate technology that inhibits or interrupts operation of the system during periods of sufficient moisture.

Requirements and certification

A device with rain shut-off capabilities shall be installed in an operable location and is functioning.

Silver	Gold	Commercial/Institutional
Required	Required	Required

All automatic irrigation systems shall be controlled with a smart controller (weather-based or soil-moisture). WaterSense®-labelled controllers comply.

Silver	Gold	Commercial/Institutional
N/A	Required	Required

Florida Water Star inspectors are responsible for ensuring that the sensor meets the following criteria:

1. **The sensor is placed in a location representative of the overall landscape conditions.** The automatic irrigation override rain sensor shall be located where it can receive rainfall unobstructed and cannot be wetted by irrigation water or roof runoff.
2. **The sensor is connected to the irrigation controller.** The sensor must be wired or set to bypass the irrigation controller when the controller's rain sensor switch is in the "on" position.

To function correctly, a rain sensor should never be placed in any of the following locations:

- Underneath existing trees or a tree canopy
- Near plants that will grow in size to obstruct the path of rainfall to the rain sensor
- Under overhangs or eaves
- In high-traffic areas, susceptible to damage

Soil moisture sensor controllers and evapotranspiration controllers that effectively bypass the irrigation schedule following a significant rainfall event comply with this practice.

Rain shutoff device

An ET controller

Another on-site ET sensor

Program Tip

Smart devices are capable of increasing scheduling efficiency, resulting in significant water savings. However, correct installation of these devices requires diligent planning and implementation of a number of best practices. Designers and installers must ensure that any type of Smart device is able to provide the greatest water savings possible.

Residential water budget

Residential Gold – IRP 5
CII – IR 13

Background

Industry experience and research indicate that a site-appropriate landscape can thrive on a 25 annual inch water budget. This 25-inch water budget provides a clear goal for water conservation. The water budget requirement allows designers more flexibility in creating the landscape, instead of selecting specific practices from a points list.

Requirements and certification

Gold – A water budget demonstrating the irrigation system shall not exceed 35 inches per square foot annually shall be included in homeowner documents.

Commercial – The irrigation schedule for maintenance does not exceed 25 inches per square foot (15.5 gallons) annually, and the controller shall be set in compliance with water management district landscape watering restrictions.

Silver	Gold	Commercial/Institutional
NA	15	Required

The limit of 25/35 inches is not fixed to a single location, but it can be averaged across the entire landscaped area. In other words, any water below 25/35 annual inches not used in an area could be used elsewhere in the landscape and is, therefore, considered an average application over the entire landscaped area. For instance, excess budgeted water for a landscape bed with shrubs that requires little additional irrigation beyond establishment could be used for an annual bed that might require more than 25 inches annually.

This water budget is the annual depth of application per square foot allowed for maintenance irrigation. Therefore, establishment irrigation is exempt but must occur in compliance with Florida Water Star requirements.

Thorough calculations are required to verify this prerequisite. A water budget calculator may be used to demonstrate compliance. https://floridawaterstar.com/resources/budget-calculator/

System information education

Residential Silver-IRC 14

Background

Some basic irrigation system information is necessary to ensure ongoing implementation of correct scheduling and maintenance. Homeowners and maintenance professionals can be left at square one when information such as the correct maintenance irrigation schedule and soil moisture sensor probe location are unknown. Hands-on instruction with a professional can give a homeowner the knowledge and experience they need to correctly manage the controller.

Requirements and certification

Controller handbook/operating instructions shall be provided for the homeowner.

Silver	Gold	Commercial/Institutional
Required	Required	NA

The inspector must confirm that written operating instructions are provided to the homebuyer and permanently affixed to or adjacent to the controller.

THE END