



City of
Santa Monica

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Guidelines for the Design & Construction of Water-Efficient Irrigation Systems in the City of Santa Monica Revised 08/08/07

These requirements are published by the City of Santa Monica Environmental Programs Division (SM/EPD). They are based on the Irrigation Association's *Turf & Landscape Irrigation Best Management Practices*, 2005 edition and tailored to the ordinances, policies and climate of the City of Santa Monica.

Quality Assurance

To assure that a high-quality irrigation system is designed and installed:

1. A qualified irrigation designer should design the system for the efficient distribution of water based on the requirements of the Design Requirements below. "Qualified" means certified, formally trained, licensed or other similar qualification.
2. A qualified contractor should be selected to install the irrigation system based on the Installation Guidelines below. The contractor should test the completed system to verify that the system operates according to the design criteria.
3. The irrigation designer or landscape architect or landscape designer should perform one or more site observations during system installation to check for adherence to the design. The observation should inspect the installation of the backflow prevention assembly, main line, laterals, valves, sprinkler heads, drip irrigation equipment, control wire, controllers, and sensors and should assure that the intent of the irrigation designer has been preserved.

Design Requirements

To ensure that the irrigation system is designed to conserve water resources by efficiently and uniformly distributing the water, the irrigation system designer should:

1. Obtain direct knowledge of site conditions and not rely solely on plot plans to generate a design.
2. Meet all applicable state and local codes including plumbing and electrical codes.
3. Specify manufacturer, model, type, and size of all components to eliminate ambiguity at construction and to facilitate management of the system. The selection of pipe, electrical wire and other materials should be based on design parameters, environmental conditions and code requirements.
4. Design the irrigation system to minimize installation and maintenance difficulties. The selection and placement of irrigation components should anticipate the growth of plants through a minimum three-year establishment period for shrubs and ten years for trees.

5. Provide a complete irrigation design package to the owner of the system.
6. Calculate the maximum safe flow rate using the following three formulas, then use the lowest resulting safe flow rate as the design flow rate:
 - a. The maximum allowable pressure loss through the meter should be less than 10% of the static pressure at the meter.
 - b. The maximum flow rate through the meter should not exceed 75% of the maximum safe flow rate through the meter.
 - c. The velocity of water through the service line supplying the meter should not exceed 7.5 feet per second (fps).
7. Plan a system with an operational watering window of no more than 10 hours per day. Match the system requirements to the site and consider site uses that may dictate different irrigation durations and frequencies, a school campus for example.
8. Specify Cross-Connection Control devices as required by Section 7.1.2.370 of the Santa Monica Municipal Code.
9. Specify metering devices that measure the total landscape water use separate from other use for all projects where it is practical and economically feasible to do so.
10. Allow for a reduction in static pressure of up to 10 pounds per square inch (psi) to accommodate possible expansion in the supply network.
11. Specify pressure regulation wherever necessary to insure that all irrigation devices operate within the manufacturer's recommended pressure range.
12. Specify main and lateral pipe sizes that will result in the velocity of water moving through these pipes at a rate not exceeding five fps.
13. For zones with drip irrigation conform to the current edition of *SM/EPD's Guide to Successful Drip Irrigation for Landscape Professionals*.
14. Design the system and select components to achieve a minimum operational lower quarter distribution uniformity (DU_{LQ}) or emission uniformity (EU) as follows:

Type of Zone	Type of Uniformity	Minimum Uniformity
Spray	DU_{LQ}	55%
Rotor	DU_{LQ}	70%
Drip	Emission Uniformity	80%

15. Choose irrigation devices and design the irrigation system to positively prevent runoff or overspray onto impermeable hardscape under all conditions regardless of wind or possible equipment misalignment.
16. Design sprinkler head spacing with a minimum of head-to-head coverage (minimum 50% of diameter). Wind derating, if used, should be based on wind criteria for the time period that the system is normally operated.

17. Assign separate station/zones (hydrozones) to areas with dissimilar water or scheduling requirements. For example; separate zones should be designed for trees, shrubs, flowers, shady areas, sunny areas, drip irrigation and sprinklers.
18. Specify watering devices with a manufacturer's published precipitation rate less than 0.75 inches / hour. This applies to all devices: bubbler, drip, spray, microspray and rotor.
19. Locate sprinkler heads based on a thorough evaluation of physical, environmental, and hydraulic site conditions, including wind. The design must not permit sprinklers to overspray onto impermeable hardscape under any condition.
20. Specify drip irrigation for all zones planted in one-gallon or larger size.
21. Specify weather-based irrigation controllers (WBIC) based upon Irrigation Association test results (<http://www.irrigation.org/SWAT/Industry/ia-tested.asp>) See <http://www.smpd.org/landscape> for more information on the use of WBICs in Santa Monica.
22. Specify check valves wherever necessary to prevent low-head drainage.
23. Specify flow measurement equipment where practical and economically feasible.
24. Specify systems to use graywater and/or captured rainwater for irrigation where practical and economically feasible.

Installation Requirements

To ensure that the irrigation system is installed to conserve water resources by efficiently and uniformly distributing the water, the irrigation system installer should:

1. Contact all appropriate utility companies prior to beginning installation, to locate underground utilities including gas lines, electrical, telephone, cable, and so forth. State laws require anyone who digs to notify utility companies before starting. The installation should not be started until all underground utilities are located and marked.
2. Prior to beginning installation, verify that the point of connection, flow rate, and static and dynamic pressures meet design criteria.
3. Install Cross-Connection Control devices as required by Section 7.12.370 of the Santa Monica Municipal Code.
4. Install the irrigation system according to the design specifications and manufacturer's published performance standards.
5. Review planting plans prior to installation to minimize conflicts between larger plants and irrigation equipment. Also review construction plans for conflicts between hardscape and sprinkler head placement.
6. Inform the property owner and irrigation system designer of unusual or abnormal soil conditions which may impact the design and management of the irrigation system.

7. Furnish to the owner of the system an *as-built* record set of drawings. Within the record set of drawings, describe the system layout and components including all changes from the original design.
8. Test the irrigation system to verify that it meets the design criteria.
9. After installation perform an irrigation audit using a procedure approved by the *Irrigation Association* or the *Irrigation Training and Research Center of California Polytechnic State University*. Provide the property owner with system specifications and a performance summary report by station/zone that includes the plant type, soil type, average root zone depth, precipitation rate, distribution or emission uniformity (DU_{LQ}/EU), area, square footage, target gallons per minute flow rate, recommended operating pressure range, and maximum recommended cycle run time without runoff. Retain a reference of each station/zone's DU_{LQ} /EU, precipitation rate, operating pressure, and flow rate at the controller.
10. Program the weather-based irrigation controller (WBIC) as required.
11. Explain to the property owner or his/her agent the location and operation of all components of the system.
12. Provide the property owner or his/her agent with recommendations for operation of the system for maximum water conservation and the importance of maintaining system components according to the original design.
13. Provide the property owner or his/her agent with keys, tools, warranties and operating instructions for all equipment.