

Irrigation Efficiency (General Principles)

Description

Properly design, install and maintain irrigation systems to ensure uniform and efficient distribution of water, thereby conserving water and protecting water resources.

Basic Practice Guidelines

The Irrigation Association has established five overall BMPs for irrigation systems:

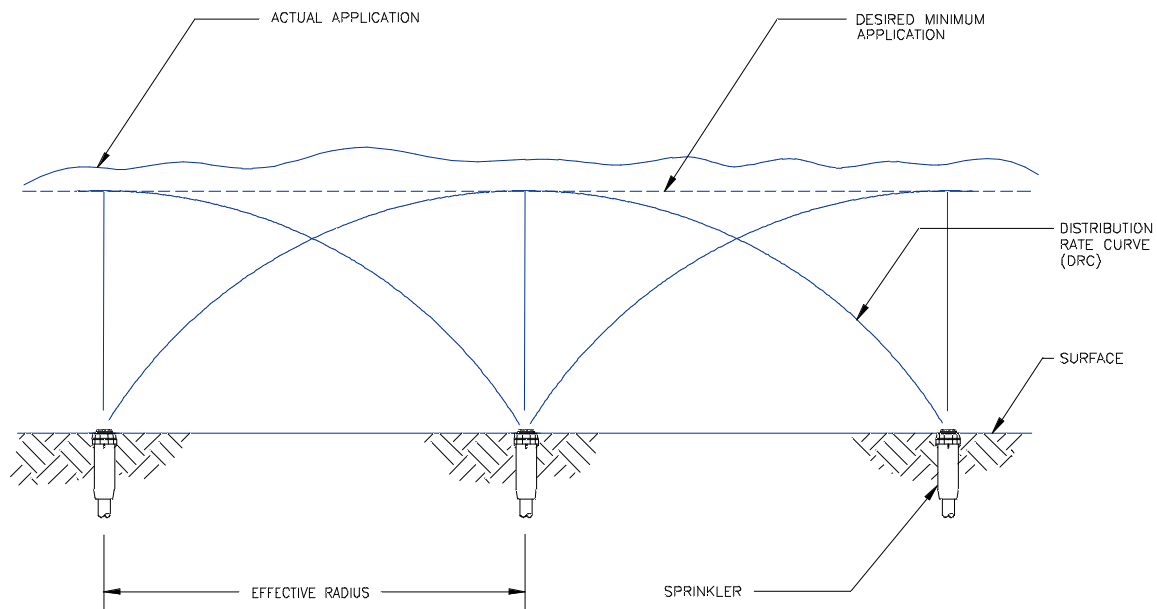
1. Assure the overall quality of the irrigation system.
2. Design the irrigation system for the efficient and uniform distribution of water.
3. Install the irrigation system to meet the design criteria.
4. Maintain the irrigation system for optimum performance.
5. Manage the irrigation system to respond to the changing need for water.

See the Irrigation Association’s (2001) publication titled “Turf and Landscape Irrigation Best Management Practices” (downloadable from www.irrigation.org) for detailed information on these practices.

In keeping with these overall BMPs, the following guidelines are relevant to the Green Industry:

1. Do not over water—most established vegetation does not require more than one inch per week depending on the season and rainfall. Plants will develop deeper roots and ultimately require less watering, when not over-watered.
2. Never water if the soil is still wet.
3. Irrigate according to the requirements of the plants, not on a fixed schedule. The duration of irrigation is typically what needs to be modified based on evapotranspiration (ET).
4. Apply only enough irrigation to replace water loss by ET. Match irrigation application to soil type and root depth. Avoid applying more water than can be contained in the root zone. Daily observation is optimal to determine the appropriate changes to make to the irrigation system. If impractical, weekly observation should be conducted at a minimum.
5. Water all plants deeply but infrequently to encourage deeper, healthier rooting. Prolonged intervals between watering (short of drought damage) provide maximum encouragement of plant growth.

BMP Type			
Design			X
Installation			X
Maintenance/Operation			X
Green Industry Relevance			
ASLA	X	GCC	X
ALCC	X	ISA	X
CALCP	X	RMSGGA	X
CGGA	X	WFC	
CNA	X		



Head-to-head sprinkler spacing for uniform water distribution.

Source: Stephen Smith, Aqua Engineering.

6. Until plants have developed deep roots, they may need more frequent watering than older established plants.
7. When determining the watering needs of planted areas, dig down about 4 to 6 inches to determine the moisture content of the soil. Do not worry about the dryness of the top inch of soil. If the soil is too dry to form a ball when squeezed in the hand, it needs water.
8. Water early in the morning or between the hours of 6 P.M. and 10 A.M. when temperatures and winds are at their lowest levels to reduce water loss. Sprinklers are also typically more efficient during these times due to better water pressure.
9. Excessive irrigation after fertilization may cause leaching or surface runoff that pollutes waterbodies, while lack of irrigation may result in inefficient utilization of the fertilizer.
10. Water lawns and shrubs/perennial beds separately. (These should be in different irrigation zones.)
11. Water trees and shrubs, which have deeper root systems, longer and less frequently than shallow-rooted plants.
12. When watering plants on slopes, compacted soils, and/or sandy soils, a series of several light applications instead of one continuous application is typically appropriate to account for the lower intake rates of these soils. Consider installing low-angle nozzles on tops of slopes to

improve efficiency. Irrigation systems should also apply more water at the top of the slope and less at the base to prevent excess runoff.

13. Watering too frequently may promote some diseases in the landscape.
14. Irrigation efficiency is equally dependent upon a good design, correct installation and proper maintenance. Use only qualified (e.g., licensed, certified as needed) irrigation professionals for all phases of irrigation management.

Regional or Industry Considerations/Adaptations

1. In greenhouses and retail garden centers, consider the following practices to improve irrigation efficiency:
 - Group plants together that have the same water requirements (i.e., use hydrozoning).
 - Space containers under fixed overhead irrigation to maximize plant irrigation and reduce waste between containers.
 - Use drip tubes or spray sticks for each individual container, when reasonably practical.
 - When using programmable irrigation booms, adjust travel rate and flow rates to crop needs.
 - Choose sub-irrigation systems where appropriate using ebb and flood or capillary mat irrigation technologies with a water capture and reuse system. Fertility rates for most sub-irrigation systems can be reduced 50 percent.
 - Minimize leaching from containers or pulse-irrigate containers. Many textbooks recommend leaching greenhouse and nursery crops to 10 percent excess. This rate can be reduced to close to zero by reducing fertilizer rates and closely monitoring the electrical conductivity or the root substrate.
 - Consider capturing leachate and pot-overspray water for recirculation. Fertility and pathogen levels in the collected water must be monitored. Water pasteurization systems including UV, ozone, chlorine and heat are all acceptable solutions. Storage of recycled water with fertilizers may be an issue. (*See the Pesticide, Fertilizer and Other Chemical Storage, Handling and Disposal BMP for more information.*)
 - Plug sprinkler heads that are not watering plants, keep sprinkler heads as low as possible to the plants and use larger water droplet size to reduce irrigation time.
2. Irrigation systems should be designed to account for local climate variation. ET controllers are one tool that can be used to take local conditions into consideration.

3. Winter watering can be critical to minimize stress to trees, shrubs, plants and turf on the Front Range and other areas receiving low winter precipitation. This is especially likely to be the case with newly planted evergreens.

Key References

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