

B.C. SPRINKLER IRRIGATION MANUAL

Appendix F

Editor

Ted W. van der Gulik, P.Eng.
Senior Engineer

Authors

Stephanie Tam, P.Eng.
Water Management Engineer

Andrew Petersen, P.Ag.
Regional Resource Specialist

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The primary purpose of this manual is to provide irrigation professionals and consultants with a methodology to properly design an agricultural irrigation system. This manual is also used as the reference material for the Irrigation Industry Association's agriculture sprinkler irrigation certification program.

While every effort has been made to ensure the accuracy and completeness of these materials, additional materials may be required to complete more advanced design for some systems. Advice of appropriate professionals and experts may assist in completing designs that are not adequately covered in this manual.

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F.

GLOSSARY

A

acre-foot: the amount of water that will cover one acre to a depth of one foot; equal to 1,233.84 m³, [1,233,840 L], or 43,560 ft³ [325,829 US gal]

allowable depletion: the percentage of moisture the plant can extract from the soil before the next irrigation. The maximum allowable depletion is equal to the availability coefficient.

annual: a plant that lives for one year or season

annual irrigation requirement: the water required annually for maximum demand crops

annual water use: the water used for irrigation during one season; given as inches of water over the crop area, or, as on a water licence, as acre-feet of water (also see acre-foot)

application efficiency: the ratio of net depth of desired application to the gross depth of water delivered by the irrigation system

application rate: the rate at which irrigation water is applied to the soil in inches per hour

availability coefficient: the maximum fraction of available water storage capacity in the soil to be removed before irrigation is required.

available water storage capacity (AWSC): the amount of soil water retained in the soil between the field capacity and the permanent wilting point.

B

bacteria: a large group of single-celled microscopic organisms lacking an organized

nucleus; some can cause disease, such as Salmonella or Cholera

coliform bacteria: bacteria found in faeces, soil, and vegetation, which is used to indicate the bacteriological quality of water; given as “*total coliforms*” in a water test

E.coli: bacteria sometimes found in under-cooked meat, such as ground beef; causes “hamburger disease”

fecal coliform: bacteria present in virtually all warm-blooded animals; commonly used as an indicator organism in water contamination testing due to low testing cost; given as “*fecal coliforms*” in a water test (also see fecal)

C

centre pivot: a trussed piping network supported by towers on wheels that travel in a circle or part circle around a pivot point

climate moisture deficit: the difference between annual crop water requirement and precipitation for a specific location.

coefficient of uniformity: the percentage of deviation from the average application of water from sprinklers

coliform: see bacteria

crop coefficient factor (K): used in calculating the plant water requirement for design purposes. This is an adjustment for canopy, root area, plant shape and spacing.

D

diversion: a channel or dam constructed across a slope to intercept surface water flow and transfer it to a safe or convenient discharge point, such as placed for a water system intake, or used above a area to be protected from surface water flow

point of diversion: [from the *Water Regulation*] the place on the natural channel of a stream where an applicant proposes, or a licensee is authorized, to divert water from the stream

distribution uniformity: a measurement of the evenness of water application across a field, and is expressed as a percentage.

E

effective precipitation: the amount of precipitation that is actually added and stored in the soil.

effective rooting depth: the depth in the soil above which the roots obtain 90% or more of their water between irrigations.

electrical conductivity (EC): a measure of the ability of water to conduct electricity; used to estimate the amount of soluble salts in water

emitter: a device used in trickle irrigation for pressure dissipation to obtain a desired low flow rate

evaporation: the process of liquid water becoming water vapour from water surfaces, land surfaces and snow

evapotranspiration (ET): the combined loss of water to the atmosphere from a given area by evaporation from the land and transpiration from plants; used in determining crop irrigation needs (also see evaporation and transpiration).

F

fecal: waste matter, feces, from the gut or gastrointestinal tract of animals

fecal coliform: see bacteria

fertigation: a term used to describe the application of fertilizers through an irrigation system

field capacity: the water content of the soil where all free water has been drained from the soil through gravity.

filtration: the process of removing particles from the irrigation water.

fish: [from the federal *Fisheries Act*] includes fish or parts of fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals

fish screening: see intake

flow: the rate of water discharged from a source, expressed in a volume over a time period, such as cubic metres per second (m^3/s)

flow control valve: a device for regulating the flow to a sprinkler or an irrigation system

H

handmove system: a system of piping which is moved manually after uncoupling the pipes

I

instantaneous application rate (IAR): the rate water is applied to the soil by a single sprinkler over a given area.

intake: a structure or mechanism to divert water into a domestic or irrigation system

fish screening: a specific design to both prevent fish from being drawn into a water system (with screen openings that do not exceed 2.54 mm) and to prevent fish being forcefully drawn against the screen (by ensuring low intake water velocity), as outlined in Water Intakes

irrigation: the controlled withdrawal of water from an assured supply and its application as crop water to the soil to replenish water removed by evaporation, by growing plants, and by drainage below the root zone; as needed by climatic conditions

irrigation efficiency: the ratio of the average depth of water that is beneficially used to the average depth applied, expressed as a percentage

irrigation gun: water is sprayed or sprinkled in high volumes through the air to the ground surface; may be used to apply liquid manure onto soil

irrigation interval: the average time interval between the commencement of successive irrigation on a field

irrigation scheduling: applying irrigation in the correct amount to the right place at the right time

irrigation set: the area of a field irrigated at one time

irrigation system uniformity: the ability of a system to apply water evenly over the crop; desirable to minimize water use and particularly important when chemigating; will vary with system design, maintenance, etc.

irrigation water quality: see [water quality](#)

over-irrigation: a condition where irrigation is applied significantly more than what is needed by the crops, causing negative impacts on the crops and soil.

sprinkler irrigation: water is sprayed or sprinkled through the air to the ground surface

subirrigation: application of irrigation water below the ground surface by raising the water table to within or near the root zone

trickle irrigation: a method of microirrigation where frequent, low pressure of water is applied to the soil surface as drops or small streams through emitters at the plant location; includes tape, drip emitter or spray emitter systems

under-irrigation: a condition where irrigation is significantly less than what is needed, causing negative impacts on the crops and soil.

L

lateral line: in sprinkler irrigation, the pipe lines upon which the sprinkler heads are mounted

M

mainline: pipes used to supply water to the lateral lines.

maximum soil water deficit (MSWD): the maximum amount of water allowed to be removed from the soil before irrigation is required.

O

overlap application rate (OAR): the rate water is applied to the soil by a series of sprinklers over an irrigation interval.

P

peak flow rate: the amount of flow required by an irrigation system during peak conditions

permanent wilting point (PWP): the soil water content at which a plant is not able to extract sufficient water from the soil to meet its needs.

precipitation: (1) [from the *Organic Matter Recycling Regulation*] as determined by the Canadian Atmospheric Environmental Service Reports of Environment Canada; (2) the process by which water vapour condenses in the atmosphere or onto a land surface in the form of rain, hail, sleet or snow

high precipitation: greater than 600 mm precipitation October 1st to April 30th inclusive

low precipitation: less than 600 mm precipitation October 1st to April 30th inclusive

S

set time: the amount of time required to apply the designed depth of water in one location.

soil: a mixture of living organisms (such as bacteria, fungi, plant roots), mineral particles, water, air, and dead organic matter; includes the entire mantle of unconsolidated material above bedrock; provides nutrients, moisture, and anchorage for land plants.

solid set system: a solid set system may be either permanent or portable and will cover a complete field with pipes and sprinklers. The entire field

can be irrigated at once or smaller sections, simply by the operation of zone or lateral valves.

stationary gun: large volume impact sprinkler.

T

total dynamic head: the energy exerted by the pump which is equal to the sum of static lift, friction head, static discharge head and pressure head.

transpiration: the process by which water absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface, principally from the leaves

traveling gun: large volume impact sprinkler that is being moved continually when operating

W

water: [from the *Waste Management Act*] includes groundwater (as defined in the *Water Act*) and ice

water licence: a legal document issued under the *Water Act* which specifies the terms and conditions under which a right to use (surface) water is granted

water quality: a term used to describe the chemical, physical, and biological characteristics of water with respect to its suitability for a particular use.

water purveyor: usually irrigation districts, municipalities or improvement districts who provide irrigation water at a rate and limit.

wheelmove system: a system that usually employs a lateral pipeline as an axle. Wheels are mounted on the lateral, and the lateral is moved at right angles to its longitudinal axis by rotating the pipeline by engine power.

Z

zone: a portion of an irrigation system that is controlled by one valve