



# SABI

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**Reviewed and updated**  
**South African Irrigation Design**  
**and User Manual**

**IRRIGATION**  
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# The Reviewed and Updated South African Irrigation Design and User Manual

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**S**outh Africa is located in a water-constrained region. Therefore, it is very important that efforts are made to utilize water more efficiently. In an initiative from the Water Research Commission (WRC) a report was issued in 2010 on: "Standards and Guidelines for Improved Efficiency of Irrigation Water Use from Dam Wall Release to Root Zone Application".

The report recommends, among other aspects, that information on improved water use efficiency should be shared with everyone involved in the irrigation industry. This includes irrigation equipment suppliers as well as irrigation management services, as well as farmers because they perform an important role in water management at the farm level.

Until recently the main sources of locally relevant information on the design and management of irrigation systems were the Irrigation Design Manual and the Irrigation Users' Manual which were originally published by the Agricultural Research Council (ARC) in 1996 and 2002. The Design Manual was updated in 2003. These manuals are widely used in the South African irrigation industry.

The updated "Irrigation Design Manual" (IDM) consists of twenty chapters of highly technical information, while the "Irrigation Users' Manual" (IUM) has sixteen

chapters, consisting of information that is relevant to irrigation system users.

New chapters added to the IDM include: Greenhouse irrigation systems (Chapter 14) Documentation and drawings

(Chapter 18), Feasibility studies (Chapter 19) and Terminology, conversion tables, design norms, and an overview of design software (Chapter 20).

The new chapters added to the IUM are Greenhouse irrigation systems (Chapter 13) and Terminology, conversion tables, design norms, and overview of scheduling software (Chapter 16).

In both manuals, all the other chapters were reviewed, restructured, and updated where deemed necessary.

## Greenhouse irrigation systems added

The chapter on greenhouse irrigation systems is a valuable addition to the manuals. A greenhouse irrigation system design is done on the same principles as micro and drip irrigation, but with a few adaptations to facilitate more frequent and intensive irrigation strategies. However, the management requirements for these systems are more comprehensive and require more sophisticated equipment and application techniques.

A significant addition to the chapter on system planning



(Chapter 6) is the elaboration on irrigation system efficiency under the section on Irrigation Requirements. The water balance approach is used. The assumption is that the maximum theoretical efficiency of any irrigation system should be 100%. Assumptions are then made for acceptable losses that can occur in any system, and the total losses are deducted from 100%, to obtain the maximum recommended efficiency. The minimum acceptable value is based on the previous norms.

#### Pipe hydraulics & components

In the chapter about Pipe hydraulics (Chapter 8), a section on the components of an irrigation

system was added. This is important in the design of the irrigation system after the planning phase. In addition, two sections were added to this chapter where the on-farm and in-field parts of an irrigation system are discussed. The purpose of the on-farm water supply system is to convey the water from the source to the in-field part in the most economic and energy-efficient way. This includes rising main pipelines, gravity pipelines, and economic pipe sizing. The purpose of the in-field part is to distribute water uniformly across the field to satisfy the demand of the crop. The focus of this section is on the selection of emitters and their pressure-discharge relationships,

the design of steady-uneven systems and the hydraulic gradient thereof, pressure variation in systems as well as pipe sizing using the Jensen Frattini factor. A table with the allowable pressure variation in different irrigation systems is also included.

One of the key improvements to the manuals includes a complete section on variable speed drives (VSDs). A VSD is a device that facilitates variation of the speed of a normal fixed-speed motor. It is a type of adjustable-speed drive used in electro-mechanical drive systems to control the motor speed and torque by varying input alternating current frequency and voltage. This enables accurate control of the motor speed over

a broad range.

The two manuals are valuable and comprehensive effective reference tools for the irrigation system designer as well as the irrigation system user.

The manuals were reviewed and updated by a team of irrigation experts from the ARC and private companies with inputs received from the industry under guidance from the WRC.

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## NEWLY revised Irrigation Design Manual and Irrigation User Manual now available

The ARC-Natural Resources and Engineering division, supported by the Water Research Commission, is proud to announce that the new edition of the Irrigation Design Manual, as well as the Irrigation User manual, is now available in PDF format and on CD.

The Irrigation Design Manual consisting of 20 chapters contains valuable updated information for the design of irrigation systems and the User Manual consisting of 16 chapters contains information on the erection, installation, and maintenance of irrigation systems.

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