



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **AHCIRG503A Design irrigation, drainage and water treatment systems**

**Release: 1**

## AHCIRG503A Design irrigation, drainage and water treatment systems

### Modification History

Not Applicable

### Unit Descriptor

<b>Unit descriptor</b>	This unit covers the designing of irrigation, draining and water treatment systems and defines the standard required to: identify design requirements for drainage and water treatment; determine specifications for suitable pumping and power systems; design distribution, drainage, storage and treatment systems; design water transfer, recharge, reuse and harvesting systems to conserve natural resources and; assess the environmental impacts of the irrigation system to ensure it will comply with environmental protection agency regulations.
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### Application of the Unit

<b>Application of the unit</b>	This unit applies to those who design irrigation, drainage and/or water treatment systems with advice from technical advisers.
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### Licensing/Regulatory Information

Not Applicable

### Pre-Requisites

<b>Prerequisite units</b>		

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## Elements and Performance Criteria Pre-Content

Not Applicable

## Elements and Performance Criteria

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
1. Determine design requirements	<p>1.1. Water is predicted to be available in sufficient quantity and quality for the particular crop or situation at the time it is needed by the enterprise.</p> <p>1.2. Water transfer, recharge, reuse and harvesting systems are designed to conserve natural resources.</p> <p>1.3. The process of collecting or storing water does not degrade the water quality for the enterprise or the environment.</p> <p>1.4. Construction specifications define the work required to make suitable water available to the enterprise in accordance with environmental and Occupational Health and Safety (OHS) requirements.</p> <p>1.5. Environmentally sensitive areas are identified and protected according to local, State and National legislation.</p> <p>1.6. Design calculations and decisions are documented to enterprise requirements.</p>
2. Define pumping and power systems	<p>2.1. Pumps are selected to deliver water efficiently when needed, from the water storage at the flow and pressure required to operate the distribution system to the design specifications.</p> <p>2.2. The pump motor combinations are efficient and the pumps are reliable, functional, serviceable and flexible for the intended application.</p> <p>2.3. Energy requirements are determined, and layout of electricity lines are determined and checked with local authority.</p> <p>2.4. The relationship between capital and operational costs are optimised including a comparison of energy sources.</p> <p>2.5. Structures, valves and accessories are selected and integrated into a functional system that can be monitored and maintained according to enterprise guidelines.</p> <p>2.6. Performance indicators, design calculations and decisions are documented according to enterprise guidelines.</p> <p>2.7. Construction specifications define work required to make suitable pumping and power system available to enterprise.</p> <p>2.8. Power supply design specification is checked with power authorities.</p>

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
3. Design an irrigation distribution system	<p>3.1. Detailed topographic survey is conducted or an accurate map is obtained showing extent of irrigation, planting layout, physical constraints and contours with suitable interval.</p> <p>3.2. Detailed soil survey is conducted at suitable intervals and mapped to show variation in readily available water.</p> <p>3.3. Water budgets are determined having regard to the evapotranspiration state of the crop/plants, soil moisture characteristics and cultural practices.</p> <p>3.4. Distribution systems are evaluated and designed with respect to a range of key variables.</p> <p>3.5. Pipes, valves and fittings are sized according to design system specifications so that capital cost is balanced against operation costs over the anticipated system life.</p> <p>3.6. Flows, water levels and pressures are calculated and documented to be within the acceptable tolerances for optimum performance.</p> <p>3.7. Flows, water levels and pressures are achievable by the pumps operating at optimum efficiency and according to enterprise standards.</p> <p>3.8. Mechanisms for controlling and adjusting pressure are included, and isolation valves direct water to areas with different irrigation schedules.</p> <p>3.9. Channel systems and attendant structures are designed according to industry recommendations, and channel flow velocities are calculated according to enterprise standards.</p> <p>3.10. Soil types have been compared for erodeability and suitable fill has been selected for construction according to enterprise standards.</p> <p>3.11. Construction plans and specifications define work required to achieve the required standards of uniformity and efficiency of water application according to industry standards</p>
4. Design a drainage, storage and treatment system	<p>4.1. Regional geology and geography is investigated to predict sustainability of irrigation and storage.</p> <p>4.2. Site investigations to assess depth of clay, depth of ground water, soil and water salinity, and structural or chemical impediments are used to determine the most cost effective storage system.</p> <p>4.3. Predictions of leaching fractions and salt movements</p>

ELEMENT	PERFORMANCE CRITERIA
	<p>are documented, and soil amelioration and drainage management plans are developed.</p> <p>4.4. The need for leachate interception and dewatering system is determined, and if required, construction specification prepared for interception and collection, water treatment, disposal, and reuse or recycle.</p> <p>4.5. Drains and structures are capable of carrying the design water volumes and intensities according to enterprise standards.</p> <p>4.6. Damage from water logging is minimised according to enterprise standards.</p> <p>4.7. Hydrological calculations predict volumes and rates of surface run-off according to enterprise standards.</p>
5. Determine capital expense budget	<p>5.1. Design calculations and decisions are documented and relevant information is communicated clearly through plans, specifications and manuals.</p> <p>5.2. Design output is checked by a competent designer against enterprise objectives.</p> <p>5.3. Materials requirements are determined and documented from plans and specifications.</p> <p>5.4. Labour requirements are estimated, based upon documented work schedule with reasonable allowance for variances in work schedules.</p> <p>5.5. Costing attributed to each component is based upon quoted information from suppliers, or sound analysis of individual elements.</p>
6. Determine operating expense budget	6.1. Operating expense budget indicates all expenses applicable to the completed irrigation system.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

#### Required skills

- collect and analyse information
- identify adverse environmental impacts of irrigation, drainage and water treatment activities and appropriate remedial action
- identify design requirements

**REQUIRED SKILLS AND KNOWLEDGE**

- develop specifications
- compare costings
- develop budgets
- document outcomes
- develop and implement relevant enterprise OHS and environmental procedures
- use literacy skills to fulfil job roles as required by the organisation. The level of skill may range from reading and understanding documentation to completion of written reports
- use oral communication skills/language competence to fulfil the job role as specified by the organisation including questioning, active listening, asking for clarification, negotiating solutions and responding to a range of views
- use numeracy skills to estimate, calculate and record complex workplace measures
- use interpersonal skills to work with others and relate to people from a range of cultural, social and religious backgrounds and with a range of physical and mental abilities.

**Required knowledge**

- design processes
- developments in irrigation technology
- drainage and storage development technology
- latest treatment technology
- automatic control and monitoring systems
- waste management and environmental issues
- budgeting
- contractual development and obligations
- environmental protection agency regulations
- environmental impacts of irrigation, drainage and water treatment using water from any ground or underground source
- cost/benefit analysis
- OHS and environmental protection legislation, codes of practice and enterprise policies and procedures.

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
<b>Overview of assessment</b>	
<b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>	<p>The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy holistically all of the requirements of the performance criteria and required skills and knowledge and include achievement of the following:</p> <ul style="list-style-type: none"> <li>• identify design requirements for drainage and water treatment</li> <li>• determine specifications for suitable pumping and power systems</li> <li>• design distribution, drainage, storage and treatment systems</li> <li>• design water transfer, recharge, reuse and harvesting systems to conserve natural resources</li> <li>• assess the environmental impacts of the irrigation system to ensure it will comply with environmental protection agency regulations.</li> </ul>
<b>Context of and specific resources for assessment</b>	Competency requires the application of work practices under work conditions. Selection and use of resources for some worksites may differ due to the regional or enterprise circumstances.

## Range Statement

<b>RANGE STATEMENT</b>	
The range statement relates to the unit of competency as a whole.	
Reuse systems may include:	<ul style="list-style-type: none"> <li>• dis-infestation and filtering equipment.</li> </ul>
Irrigation distribution systems covered by this standard are:	<ul style="list-style-type: none"> <li>• micro-irrigation systems</li> <li>• spray irrigation systems</li> <li>• surface irrigation systems</li> <li>• basin irrigation.</li> </ul>



<b>RANGE STATEMENT</b>	
Systems may range from:	<ul style="list-style-type: none"> <li>• manual operation and monitoring to fully automated with computer control and monitoring.</li> </ul>

### **Unit Sector(s)**

<b>Unit sector</b>	Irrigation
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### **Co-requisite units**

<b>Co-requisite units</b>		

### **Competency field**

<b>Competency field</b>	
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