



Australian Government

Department of Education, Employment and Workplace Relations

AHCIRG410A Select and manage pumping systems for irrigation

Release: 1

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Modification History

Not applicable.

Unit Descriptor

This Unit covers the process of operating and maintaining irrigation pumping systems and defines the standard required to: select pumps and pumping equipment to meet design requirements; install and test pumps; develop procedures to maintain pumping systems; commission and test the pumping system; and carry out troubleshooting.

Application of the Unit

This Unit applies to irrigation installation site managers and managers of irrigation systems in the irrigation servicing, amenity horticulture and food and fibre production industries.

Licensing/Regulatory Information

All high voltage electrical work must be carried out by a qualified electrician.

Pre-Requisites

Not applicable.

Employability Skills Information

This Unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a Unit of Competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Identify irrigation system requirements from the irrigation design	1.1 The components for an irrigation pumping system are identified 1.2 The water source and height of pull for water into the system are determined 1.3 The water output for irrigation is determined 1.4 The total friction loss of irrigation components is calculated
2 Select pump according to type, installation, range of flow rates, operating head and delivery distance	2.1 The basic type of pump is selected based on the pump task and placement and the power source 2.2 The total operating head required is calculated 2.3 The required discharge for the pump is calculated based on the irrigation output required and friction losses in the system 2.4 The speed and power requirements of the pump motor are determined 2.5 The limiting suction lift of the pump is determined 2.6 Pump performance curves are interpreted in selecting an efficient irrigation pump 2.7 Size of impeller is determined from the pump curve
3 Install pumps	3.1 Pump is sited as close as possible to water source and level 3.2 Suction and delivery pipes are attached correctly 3.3 Pump connections are airtight 3.4 The pump is anchored on a base 3.5 Pump and motor connection are correctly aligned 3.6 Ventilation is provided for the motor 3.7 Filters and valves are fitted and valves are correctly oriented 3.8 Pump is connected to the irrigation controller if required
4 Commission and test irrigation pumps	4.1 Procedures are developed and implemented for carrying out pre-start checks 4.2 Pump start up procedures are developed and implemented 4.3 Pumps are pressure tested to check delivery performance 4.4 Power usage and water output is checked against requirements and pump specifications 4.5 Pumping system is checked for leakages and cavitation 4.6 Pump control systems are checked for accurate operation
5 Develop maintenance procedures for the pumping system	5.1 Routine maintenance procedures are developed to rectify the effects of normal wear 5.2 Periodic inspection checklists are developed to assist in maintenance scheduling 5.3 Pump overhaul or repairs are carried out 5.4 A pump maintenance record is kept, including details of the pump and all pumping system components for ordering

6 Carry out
troubleshooting on
pumping systems

- 6.1 Lack of discharge and/or pressure are investigated and settings or components changed
- 6.2 Loss of water suction is investigated and alteration made to placement or leakages fixed
- 6.3 Cavitation in pumps is investigated and settings or components changed
- 6.4 Excessive power consumption is investigated and design and pump selection reviewed and checks made for mechanical defects

Required Skills and Knowledge

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

Required skills include:

Ability to:

- interpret pump curves
- calculate pumping requirements
- select pumps, filters and valves
- calculate pressure loss due to irrigation components
- position pumps, valves and filters
- open and closing valves
- pressure test pumps
- monitor performance of pumps, valves and filters
- service, maintain and replace pumps, valves and filters
- use pressure testing equipment
- use recorded information to review energy and water efficiency for an irrigation system
- identify adverse environmental impacts of irrigation pumping activities and appropriate remedial action
- implement and follow relevant enterprise OHS and environmental policies and procedures.

Required knowledge includes:

Knowledge of:

- the relevant statutory and authority requirements related to the installation of commissioning domestic irrigation pumps
- levelling and alignment processes
- the application of mechanical, hydraulic and electrical principles
- properties of water including pressure and flow rates
- selection factors for pumps
 - source of water and lift
 - the required pumping flow rate and pressure
 - the total suction head
 - the total dynamic head
- types of pumps and application in irrigation
 - centrifugal
 - vertical turbine
 - submersible
 - propeller
- advantages and disadvantages of each pump type
- types suitable as booster and floating pumps

- pump power requirements
- discharge and flow rates
- pump efficiency
- minimum pressures for emitters and sprinkler heads
- types of impellers and their use
- cavitation - cause and effect
- net positive suction head (NPSH)
- pump positioning (driver alignment and suction length)
- pump components and their principles of operation
- pump gauges and controls
- types of valves
- automatic pump switches
 - timers
 - pressure switches
 - irrigation controllers
 - flow switches
- installation factors
 - adequate space, head room, ventilation and lighting
 - correct alignment procedures of pump and motor shafts with direct coupled units
 - provision for adjustment and ease of dismantling
- priming and operating pumps
- pump performance and pressure testing
- the sources of information and the processes for the calculation of material requirements and flow rates
- the process of installing and commissioning domestic irrigation pumps
- routine preventative maintenance
- overhaul or repair operations
- environmental procedures for installing and maintaining irrigation pumping systems
- OHS legislation.

Evidence Guide

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.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this Unit	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: • select pumps and pumping equipment to meet design requirements • install and test pumps • develop procedures to maintain pumping systems • commission and test the pumping system • carry out troubleshooting.
Context of and specific resources for assessment	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

The range statement relates to the Unit of Competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<i>Irrigation pumping systems</i> may include:	all types of pumps and components (including filters and valves) used to move water to or through an irrigation system.
<i>Types of pumps</i> may include:	• centrifugal (belt driven or coupled) • volute • diffuser • turbine • mixed flow • axial flow • radial flow propeller • electro-submersible • rotary • gear • lobe • screw • vane • reciprocating • piston • plunger • simplex • duplex • multiplex.
<i>Types of valves</i> may include:	• air release valves • air replenishment valves • backflow prevention valves • ball valves • butterfly valves • check valves • float valves • flow control valves • flow measuring valves • foot valves • gate valves

	• globe valves • pressure regulating valves • pressure relief valves • Schrader valves • scour valves • solenoid valves (pilot operated or direct acting).
Types of filters may include:	• centrifugal sand filters • media filters • screen or disc filters.
Irrigation controllers may include:	a range from simple time switches operating a single valve to programmable controllers operating a large number of valves on a complex schedule.

Unit Sector(s)

Irrigation