Install pressurised irrigation systems

AHCIRG345

Overview

- By the end of this topic, you should be able to:
  - Organise resources for installation work
  - Set out and prepare the site
  - Install irrigation components according to the irrigation plan
  - Commission irrigation system and rectify issues
  - Complete the irrigation work

What is an irrigation system?

- An irrigation system is a system of components which supplies and distributes a controlled amount of water. Modern irrigation systems may use tanks, reservoirs pipelines, pumps, sprinklers and monitoring equipment to supply and distribute water.
  - Systems may include connection to mains pressure, low pressure, below ground, above ground.
  - Systems may apply water using spray systems, dripper or capillary systems.
  - Systems range from manual operation and monitoring to fully automated with computer control and monitoring.

Working with others

- When undertaking irrigation tasks, you will likely be working as part of a team with others workers and possibly contractors.
- Observe the following tips regarding teamwork:
  - Use clear language and concepts (verbal and non-verbal)
    - Consider the varying cultural and ethnic backgrounds of your co-workers
    - Consider the message you are communicating and the best method to communicate this message (written, verbal)
    - Consider workplace expectations when communicating in written format (legible, clear and concise documentation)
  - Consider the abilities of your co-workers
  - Observe contractors' work to ensure they demonstrate an understanding of the requirements

Prepare for the work

- Before beginning your tasks, you must be aware of and adhere to legislated safety and environmental requirements. This may include:
  - Identifying and responding to any WHS hazards (e.g. underground services, manual handling injuries, safety of equipment)
  - PPE requirements – wear PPE that is well fitting and functioning (e.g. Gloves, goggles, gumboots, long sleeved shirt, long trousers, waders, wide brimmed hat, work boots). If your PPE is not functioning correctly, report this to your supervisor and organise a replacement. Discard according to workplace procedures and do not use. Keep your PPE and any safety equipment clean and hygienic.
  - Barriers and signage may be required to ensure the safety of workers and others (e.g. the public) by isolating the work area. You may need to install safety cones, bollards, flagging tape or nets.
  - Identifying any environmental impacts the work may cause (e.g. waterlogging, soil salination, erosion, ecological damage, dust, noise)
  - Recognised hazards must be reported to your supervisor, particularly emergency situations which require immediate reporting.

- Risk is measured in terms of the seriousness of the possible consequences of the hazard and likelihood that those consequences will occur, as in the matrix shown below:

Extreme	High	Medium	Low

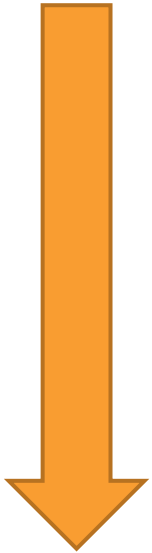
Consequences
- **A:** Death or Permanent Disability
- **B:** Serious Injury
- **C:** Lost Time Injury
- **D:** Casualty Treatment
- **E:** First Aid

Likelihood
- **1:** Very Likely
- **2:** Likely
- **3:** Possible
- **4:** Unlikely
- **5:** Very Unlikely

Matrix	A	B	C	D	E
1	E	E	H	H	M
2	E	H	H	M	M
3	H	H	M	M	L
4	H	M	M	L	L
5	M	M	L	L	L

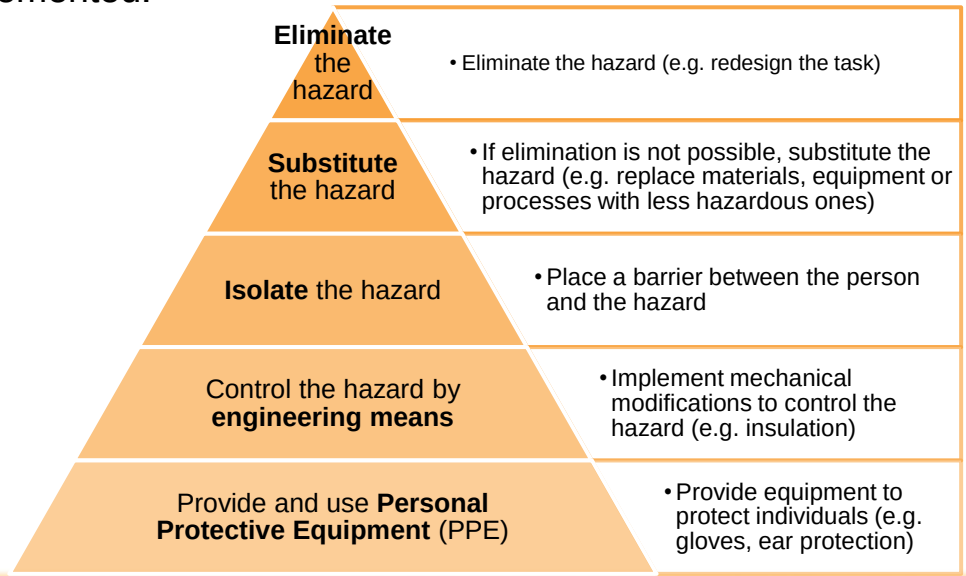
Workplace risk control

- The hierarchy of control gives priority to the order in which hazard and risk controls should be implemented.



Most effective

Least effective



Machinery, tools and equipment

- Machinery, tools and equipment selected must be suitable for the task. It is important to check your tools for safe operation and complete pre-start checks on all equipment and machinery to ensure everything you are using is in serviceable condition. Pre-start checks should be completed according to manufacturer guidelines and workplace instructions.
- You may need to use any of: Broom, hammer, marking paint, mechanical trenching machine, pipe cutter, rake, rubber mallet, saw, spade, screwdriver, standard shovel, tape measure, thread seal tape, trenching shovel, mechanical trenching machine, trowel, wire strippers

Check the water source

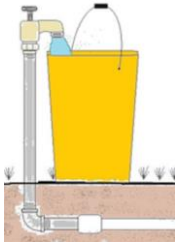
- It is important to check the water quality, as this will affect the irrigation system.
  - Two issues you may encounter with water quality include:
    - Chemical: Acidic, alkaline, concentrations of certain elements
    - Physical: Algae growth
- Water filtration techniques may need to be implemented such as:
  - Disk filters
  - Cartridge filters
  - Centrifugal filters
  - Media filters
  - Screen filters

Direction of water flow and flow rate

- Features of the landscape may affect the direction of the water flow, these include:
  - Elevation
  - Slope and
  - Orientation of the terrain
- You need to determine the flow rate of your water source before installing irrigation to determine how many sprinklers you can install and what size pipes you should use.
- To calculate flow rate use the following formula:
  - [Quantity (litres) x 60] ÷ time (seconds)

Flow rate

- To determine the flow rate from a water source, observe the following steps:
  - Connect plastic pipe to pressure gauge assembly
  - Connect pressure gauge assembly to water source
  - Turn tested gate valve on fully
  - Observe water flowing from source through the pipe
  - Close the gate valve until the pressure gauge reads within the normal operatig pressure
  - Insert the pipe into a 9L bucket and start the stopwatch
  - Time how long it takes to fill the 9L bucket
  - Calculate the flow rate using the appropriate formula.



What is an irrigation system?

- A pressurised irrigation system consists of many components, including:

Equipment	Definition
Drip tape	Water distribution system that operates at very low pressure
Emitter	Two main types: Allow water to seep into the root zone or direct water into the air. Includes pop-up sprinklers
Filter	Removes debris from systems
Fittings	Used to join pipes together. Poly fittings have barbed ends which are pushed into the pipes to connect them together.
Gate valve	Used primarily as a shut-off valve, as opposed to flow control.
Master valve	Ensures that at the end of the watering cycle the water is turned off at a central valve
Poly pipe	Provides an outlet for water to travel through.
Pump	Delivers water to irrigation system. Ensures consistent water delivery.

Irrigation Plan

- You will need to access the appropriate plan to be able to familiarise yourself with the task requirements:
  - The irrigation plan outlines the scope and requirements for the irrigation job, including:
    - The site location
    - Types and amounts of irrigation equipment and resources required
    - Where existing underground services are located
  - An ASCOM plan will show all wiring, pipes, valves and sprinkler locations (including variations from the original site plans)
  - It is important to speak with your supervisor to confirm your understanding of the plan and component requirements.
    - When engaging with your supervisor, apply active listening and question/clarify any unclear instructions.

System drawings and specifications

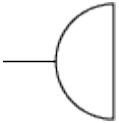
- System drawings and specifications clarify equipment and parts required. All work must be consistent with these and the irrigation system plans.
- System drawings and specifications are usually supplied by the manufacturer with the system being installed.

Symbols and meanings

- Some common symbols that may be found on an irrigation plan:

Direction of water flow

Filter



Flushing valve

Gate valve

Micro sprayer

Water source

- Although irrigation plans should show underground services and utilities lay out, it is advisable to ensure you access the most current drawings of these locations.
- The National service available for checking a site for underground services is Dial Before You Dig (DBYD). This free service can provide you with underground service locations before you begin any excavation work. DBYD can provide location for any of the following:
  - Gas
  - Electrical
  - Water
  - Communication

Irrigation efficiency

- Irrigation designers and installers must adhere to relevant Australian standards as well as local water authority regulations when designing, installing and commissioning irrigation systems.
- The following factors affect irrigation efficiency:
  - System design
  - Soils
  - Pump flow rate
  - Irrigation scheduling
  - Application depth
- Commissioning documentation should show that the system was checked, and that it was installed and working properly when it was handed over. It should describe the installation and testing procedures followed and the results obtained.

Assembling an irrigation system

- When assembling an irrigation system, undertake the following steps:
  - Mark the location for the trenches
    - Excavation lines can be marked using marker paint or chalk
  - Excavate the trenches to the required depth
    - Services, features and facilities may need to be appropriately protected
    - Avoid damage to established plants and features
    - Avoid placing trench soil onto garden beds which are mulched, as it will be difficult to remove and replace the soil on completion of the job
  - Install the valve manifold -The manifold distributes water to your valves, which are all individually connected.
  - Cut and run the PVC pipe – to specifications
  - Attach fittings – use thread seal tape to ensure joints are properly sealed.

Flushing

- Pipeline flushing is needed to remove any particles that accumulate in pipelines before they build up to sizes and amounts that cause plugging problems.
- Flushing should be undertaken as part of installation but also as a routine maintenance activity.
- For proper flushing to occur, the discharge velocity must be high enough to dislodge and transport particulate matter from the pipelines.

Calibrate and start-up

- Adhere to the manufacturer instructions or operators manual for start-up sequence.
- Monitoring equipment should be calibrated to match the installed system. You may have to check the calibration certificate as part of the pre-operational checks for some instruments and equipment.
  - Equipment is calibrated to:
    - Meet regulatory compliance requirements
    - To ensure ongoing accuracy of all measurements
    - For environmental reasons

Checking irrigation system

- It is essential to check an irrigation system after installation
  - Check the system configuration and capacity matches the installation plan
  - Check the overall system for any missed cemented joints and incomplete installation
    - Ensure joints a properly sealed using thread seal tape
  - Check that all pipe work is at the same level to ensure efficiency
    - Elevation, slope and orientation of terrain all affect the direction of water flow
  - Ensure that all pipe work is buried to the correct depth
  - Flush the system
    - Force water through the irrigation system using a hose in order to clean out the silt and test each lateral

Checking irrigation system

- To test an irrigation system, undertake the following steps:
  - Open the furthermost solenoid valve
  - Open the main valve
  - Allow the system to run until the water is clear
  - Turn off the furthermost solenoid
  - Check for leaks along the mainline, especially around control valves
  - Leave joints exposed until pressure tested
  - Turn off main valve
  - Turn on each station individually using the controller

Checking irrigation system

- You may encounter a range of issues when testing an irrigation system, such as:
  - No water
    - Check that the main water valve is turned on
    - There may be debris clogging the system (e.g. at valve, sprinkler, or filters)
  - Water leaks
    - Pipes may be broken, cracked or damaged
    - There may be debris clogging the system (e.g. at valve, sprinkler, or filters)

Take corrective actions according to the operation's manual

Using an irrigation system

- Some tips for using an irrigation system:
  - You should monitor irrigation times to deliver sufficient volume without overwatering
  - You may be required to regulate an irrigation system more than once to maintain correct operating pressure and water flow
  - If similar components in a system are starting to break down, you should consider replacing them all rather than repairing them
  - Note that water molecules hold more tightly to the fine particles of a clay soil than to coarser particles of a sandy soil, so clays generally retain more water
    - Soil properties including soil texture, clay mineralogy, organic carbon content and bulk density are important determinants of soil water retention behaviour
    - Soil water content can be measured using a known volume of the material and a drying oven
    - Geophysical sensors are often used to monitor soil moisture continuously in agricultural and scientific applications

Work completion process

- Work completion processes include:
  - Restoring the worksite – returning the work area to equal the condition prior to work beginning
  - Work outcomes to be reported to supervisor
  - Disposal of materials that cannot be reused or recycled safely following SDS requirements if required
  - Routine maintenance tasks on tools and equipment
    - All tools and equipment should be cleaned and checked for serviceability before storing
    - Faults and issues must be recorded and reported to supervisor
  - Cleaned tools and equipment should be stored in the designated storage area to avoid damage, theft or loss and to ensure the item is ready for the next use.

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