



NQF Level: 4 US No: 116317

Assessment Guide

Primary Agriculture

Installation and Management of an Irrigation System



Assessor:

Workplace / Company:

Commodity: Date:

Before we start...

This assessment guide contains all necessary activities and instructions that will enable the assessor and learner to gather evidence of the learner's competence as required by the unit standard. This guide was designed to be used by a trained and accredited assessor whom is registered to assess this specific unit standard as per the requirements of the AgriSETA ETQA.

Prior to the delivery of the program the facilitator and assessor must familiarise themselves with content of this guide, as well as the content of the relevant Learner Workbook.

The assessor, facilitator and learner must plan the assessment process together, in order to offer the learner the maximum support, and the opportunity to reflect competence.

The policies and procedures that are required during the application of this assessment are available on the website of the AgriSETA and should be strictly adhered to. The assessor must familiarise him/herself with this document before proceeding.

This guide provides step-by-step instructions for the assessment process of:

Title: Installation and Management of an Irrigation System
US No: 116317 NQF Level: 4 Credits: 3

This unit standard is one of the building blocks in the qualification listed below. Please mark the qualification you are currently assessing, because that will be determined by the context of application:

Title	ID Number	NQF Level	Credits	Mark
National Certificate in Animal Production	48979	4	120	<input type="checkbox"/>
National Certificate in Plant Production	49009	4	120	<input type="checkbox"/>

Please mark the learning program you are enrolled in:

Are you enrolled in a:	Y	N
Learnership?	<input type="checkbox"/>	<input type="checkbox"/>
Skills Program?	<input type="checkbox"/>	<input type="checkbox"/>
Short Course?	<input type="checkbox"/>	<input type="checkbox"/>

Note to Assessor:

If you are assessing this module as part of a full qualification or learnership, please ensure that you have familiarized yourself with the content of the qualification.

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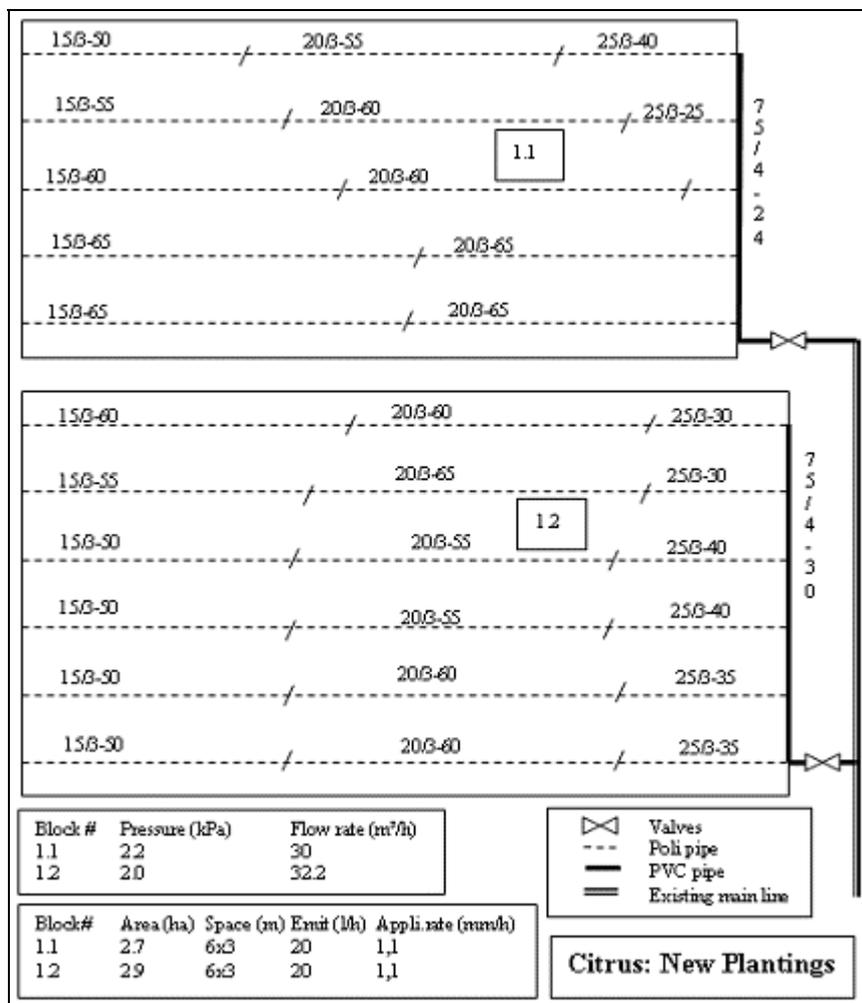
SO 1

Instructions to learner:

Group Activity

Learner Guide: Page 19 Facilitator Guide: Page 11

Study the irrigation design plan below.



Draft an action plan with specific duties, timeframes and deliverables according to your interpretation of the design plan.

Model Answer(s):

Actions

The following actions can be included:

1. Clearing of the new field e.g. removing bushes, trees
2. Terrain rehabilitation of dongas, anthills, dips etc
3. Land preparation (liming, ripping, ridging)
4. Pegging out of new blocks
5. Ordering materials according to design plan
6. Digging trenches
7. Laying of main and sub main-lines
8. Laying of laterals and emitters
9. Flushing of system
10. Irrigating and system testing
11. Planting of the crop

Duties

Duties can follow the same steps as for actions, but focus on coordinating and management each step. Duties can cover areas such as:

1. Coordinating the clearing by either with the use of machines or manual labour.
2. Assessing what if any terrain rehab is necessary.
3. Coordinating the land prep. This is a major duty that the student can integrate from other unit standards.
4. Pegging out is a major duty.
5. Ordering, coordinating delivery time tables and stock control.
6. Digging of trenches as described in previous unit standards.
7. Laying pipes, installing emitters and flushing of systems as described.
8. System testing for leaks and performance.

Timeframes

Timeframes would differ depending on available resources. Timeframes must however aim to let as many actions as possible run concurrently in order to ensure that the project is completed in the shortest possible time. An example is where as block 2 are ripped; the ridging is started on block 1. Timeframes must also be realistic in allowing enough time but not delaying the project.

Deliverables

Deliverables can be based on the successful completion of the duties. The system testing or evaluation is a major deliverable as this will tell if the system is operating successfully or not.

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SO 1

Instructions to learner:
Group Activity

Learner Guide: Page 27 Facilitator Guide: Page 11

Complete the practical duties listed and include naturally occurring evidence in the form of reports, job cards, pictures, meeting minutes, and performance management assessments.

1. Peg out a block according to an irrigation design plan.
2. Dig conveyance system trenches according to specifications.
3. Install irrigation pipes, valves, and filters.
4. Back-fill the trenches according to specifications.
5. Test the irrigation system.

Write key-notes for yourself about what you did and attach signatures from your mentor, coach or superior proving that you have successfully completed the tasks.

Model Answer(s):

Key Notes:			
No model answer provided. To complete practical duties.			
Learner's Signature		Date:	
Assessor's Signature		Date:	

My Notes ...

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Instructions to learner:

Group Activity

Learner Guide: Page 28 Facilitator Guide: Page 11

Complete the worksheet below

Model Answer(s):

Describe how you would orientate the plan to the field?

The plan must be turned so that landmarks on the plan agree with the actual landmarks, such as dams, canals, koppies, or any other distinguishable feature that is shown on the map. Familiarise yourself then with the block and pipe layout on the plan and compare it with the actual block and pipe layout.

Describe in your own words how colours and symbols are used on irrigation design plans?

On an irrigation design plan symbols or different colours are used to depict the various pipes, valves and other features. Usually, a key is provided with the symbols and their meaning.

What does the following notations mean:

110/6-80	Pipe with nominal diameter of 110mm, class 6, 80m in length
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25/3-150	Pipe with nominal diameter of 25mm, class 3, 150m in length
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Describe how you would demarcate a trench and discuss the requirements for a trench in terms of dimensions.

The centre of the trench can be pegged with pegs about 50m to 100m apart. Tie a wire or a rope to the pegs to draw a line between them, and use ordinary lime to mark out the line of the trench. When the trenches are dug, the chalk line must be in the centre of the trench.

Trenches are dug about 400mm to 600mm wide, depending on the size of the pipe. Trenches are usually about 600mm deep. Trenches for pipes that go through lands and roads, such as mainlines and sub-mainlines, should be 1,000mm deep. Trenches for mother lines can be a bit shallower, at about 400mm.

Describe how to install different types of pipes, bends and end caps.

Pipes are installed in trenches as follows:

- Before installing pipes in trenches, ensure that the trenches are free of stones and sharp edges.
- Asbestos cement pipes and large PVC pipes must be laid on a bed of sand.
- Place the first pipe into the trench and secure it by backfilling the trench near the ends of the pipe.
- Place a collar over the end of the pipe. Make sure that the collar and the end of the next pipe is clean.
- Lubricate the inside of the collar and the end of the next pipe with pipe lubricant. Do not use oil because this will cause the rubbers to perish.
- Insert the end of the second pipe into the collar.
- Place a wooden block against the open end of the second pipe and tap the block with a hammer

to force the pipe into the collar. The force that is required depends on the size of the pipe.

- Drive the pipe up to where the depth is marked on the pipe. Take care not to pinch the rubbers.
- If the pipe refuses to go into the collar, remove the pipe and inspect the collar as the rubbers may have shifted.
- Ensure that there are no foreign objects inside the pipes that can cause blockages in the irrigation system.
- As the pipes are laid they can be backfilled near the edges. Joints must be left open at first to check for leaks.

Pump and filter bank installation is a specialised job that should be carried out by a competent contractor.

Inline filters can however be installed very easily. The filter is attached to risers so that it is above ground. At the bottom end of the risers are riser outlet bends which are spigot formed to slide over the pipe. At the back of each riser leg, a Y-standard is hammered into and tied down on to the riser to keep the leg from popping out. The valve clusters are installed in the same way.

Grommets are installed by sawing a hole in the mother line, and inserting a rubber ring into the hole. The ring has a groove that fits into the sides of the pipe. The coupling is inserted into the lateral and then pushed into the rubber ring. There is also another type of grommet that is pushed into the hole and the retaining nut on the grommet is tightened.

Nylon couplings and reducers are pushed into the poly pipe. No clamps are needed as long as the working pressure is within limits.

Micros have a tube that is fitted with a barb and drippers have the barb moulded onto them. A hole is punched in to the poly pipe and the barb inserted into the hole.

Describe the testing of the irrigation system.

The various components of the irrigation system are tested as they are installed, and the performance of the entire system is tested once the installation is complete.

As the pipes are laid and flushed, joints are inspected for leaks. Once the pipes are partially backfilled with the joints exposed, the system is slowly brought up to working pressure. The blocks that are grouped in operations are opened. Pressure readings are taken before and after the valves, and these are compared with the values noted on the irrigation design plan in the Pressure and Flow at Nodes table. If the readings are not correct, it may be an indication of wrong pipe size, incorrect hydraulic valve settings, or pump or filter malfunction.

Hydraulic valves are calibrated at this time. The pressure gauge is inserted downstream after the valve and the valve is opened. Note the pressure reading. Once the pipes in the block are filled, the valve is switched to automatic. If the pressure reading drops, the screw on the pilot is turned slowly in a clockwise direction. If the pressure rises, the screw on the pilot is turned anticlockwise. The process is repeated by adjusting the pilot, checking the pressure again after a while, and adjusting the pilot again if necessary.

Once the hydraulic valves have been calibrated, the pressures in the lateral lines can be checked. Check the pressure at the end of each lateral which should be close to the pressure that the valve is set at. Alternatively, each lateral can be assessed visually and the pressure of the laterals measured that appears to have a different distribution pattern than the other lines.

Emitter delivery can also be checked to see if it corresponds with the irrigation plan. Place the emitter in a suitable container. After a while (1 to 30 minutes), remove the container and measure the amount of water. Calculate the emitter delivery per hour. When this test is done with a representative sample of at least 25 points over the whole block, the CU (Coefficient of Uniformity) can be calculated. If the CU is 90% or above the uniformity is good.

After this test is done and the system has been operating for a couple of days, inspect joints for leaks. If no leaks are found, the trenches can be backfilled completely.

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SO 2

Instructions to learner:

Group Activity

Learner Guide: Page 36 Facilitator Guide: Page 13

Draft duty lists for the team on the daily, weekly, monthly, seasonal and yearly maintenance of the irrigation system.

Model Answer(s):

Daily

- Check that block pressures are within prescribed limits.
- Check for clogged, broken or misplaced emitters. Repair, replace, unplug or reposition emitters.
- Check for leaks in pipes and other equipment and other water wastage, and repair if found.
- Flush primary filters as prescribed.
- Check that fertigation applications are within specifications.

Weekly

- Flush lateral lines as prescribed.
- Flush secondary filters as prescribed
- Check that system pressure and flow is as per irrigation design plan.
- Check that pump operation is within prescribed parameters.
- Check that block pressures are as prescribed where automated valves are used.
- Check pump oil levels as prescribed.
- Inspect fertigation plant.

Monthly

- Visually check valves, water meters and gauges and look for damage and / or vandalism.
- Open and inspect filters as prescribed.
- Check for leaks at pump station through which water is lost or through which the pump can suck air.
- Grease the pump motor as prescribed.
- Perform discharge tests

Yearly

- Service valves and physically check correct operation.
- Thoroughly clean filters and replace sand in sand filters.
- Change oil in pump.
- Take a water sample at the end of lateral lines and send it for analysis.
- Replace sprinkler nozzles and other parts when necessary.



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SO 2

Instructions to learner:

Individual Activity

Learner Guide: Page 37 Facilitator Guide: Page 13

Complete the worksheet below

Model Answer(s):

Use the maintenance plan in section 2 and adjust to apply to the farm you work on. Mention how and why the intervals of certain tasks will be lengthened or shortened.

No model answer, depending on learner context.

What symptoms can be indicative of a higher system flow?

Pump: Amp reading is higher than expected

Pump: Pressure reading is the same or lower than expected

Pump: Flow meter reading higher than expected

Pressure at Nodes: Lower than expected

Pressure at Blocks: Lower than expected

CU/ Discharge Test: Uniformity might be good, but the flow of all emitters can be higher

What symptoms can be indicative of a lower system flow?

Pump: Amp reading is lower or higher than expected

Pump: Pressure reading is higher or lower than expected

Pump: Flow meter reading is lower than expected

Pressure at Nodes: Higher or lower than expected

Pressure at Blocks: Lower or higher than expected

CU/ Discharge Test: Poor uniformity with low emitter delivery

Describe the symptoms for a blocked impeller, filter and pipe.

Blocked Impeller: Low pressure reading at pump and in the rest of the system

Blocked Filter: High pressure at pump, but low pressure after filter bank

Blocked Pipeline: High pressure up to the filter and some nodes, but at other nodes the pressure is low

My Notes ...

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SO 3

Instructions to learner:

Individual Exercise

Learner Guide: Page 42 Facilitator Guide: Page 15

Obtain an irrigation schedule of the farm where you are performing your practical work. Draft an additional report explaining in detail how the following influenced the irrigation schedule and how it would influence adjustments to the schedule:

1. The use of tensiometers and tensiometer readings
2. The taking of soil samples and analyses of soil sample reports
3. The use of a probe
4. The considerations of the previous week's and month's scheduling programmes
5. Current flow rates and flow rate readings
6. Weather station information and data
7. 7-day weather forecasts

Model Answer(s):

No model answers, depending on learner context.

My Notes ...

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SO 4

Instructions to learner:

Individual Exercise

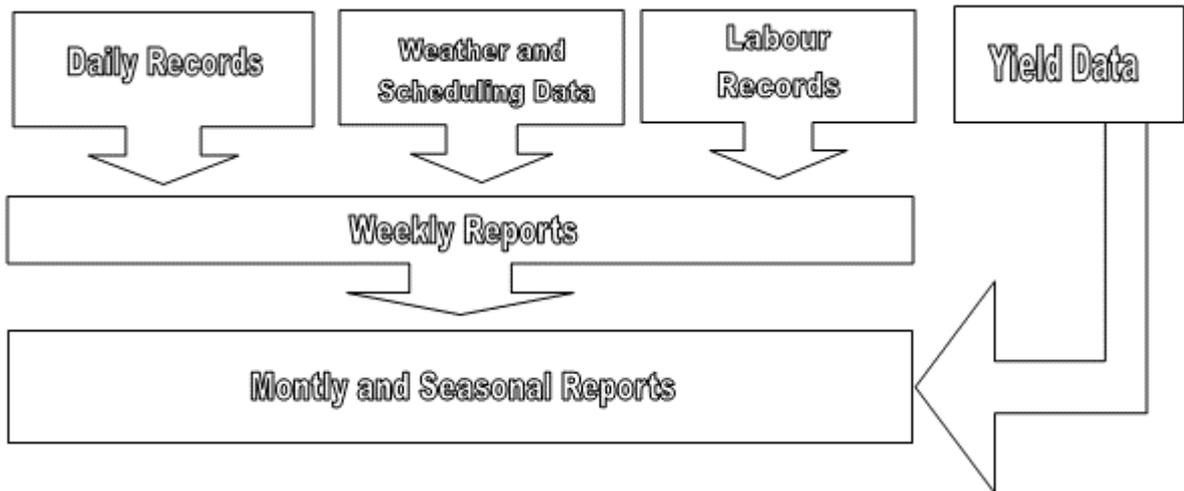
Learner Guide: Page 49 Facilitator Guide: Page 17

Draw a flow diagram with attached notes, details and training schedules for the preparation of reports regarding management of the irrigation system.

Model Answer(s):

The learner must attach notes on the nature and source of each type of record as well as how he /she intends to combine this data into the relevant weekly , monthly and seasonal reports. The notes must also include a section on how reports can assist with the management of an irrigation system as well as comparing events / data with previous events or data.

Example:



My Notes ...

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SO 4

Instructions to learner:

Individual Exercise

Learner Guide: Page 50 Facilitator Guide: Page 17

Use the examples of records in section 1 and adapt it to suit your specific conditions. Prepare a form that captures the yield per block.

Model Answer(s):

Labour records: Can include more or less irrigation blocks / operations depending on the number of blocks / operations that are controlled by a specific labourer. It can also include other tasks that are performed by the labourer as well as comments / observations.

Daily records: The number of fields will vary depending on the farm. This report can also be used to capture data regarding fertigation by inserting applicable fields such as type of fertilisers mixed into tanks, amount of fertilisers, EC, pH, dosing meter readings and which blocks received fertigation. The same principle applies for weekly activities / reports.

Weather and scheduling reports: Fields can vary to include applicable measurements.

Yield records: Should at least contain the following fields:

- Block number
- Cultivar
- Date of picking
- Number of units picked (number of bags, bins or crates)
- The mass as recorded on a weight slip if applicable.

My Notes ...

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Summative Test and Attitude & Attribute Evaluation

Before the knowledge test is undertaken, the learner must be reminded of what is expected from him / her in terms of summative and reflexive competence. Read and explain to the learner, the **Preparation for Your Final Assessment** section in the learner workbook. Learners and assessor should sign off this section to acknowledge that this step was completed.

Please set up a knowledge test from the questions given as a guideline to learners and supply each learner with a test sheet.

Supply each report with the following heading:

Unit Standard:	116317	NQF Level:	4
Learner Name:			

Questions	Model Answers
<p>1. You are now ready for step six of the assessment process, during which you will be asked to write a report for the farm on which you are completing your practical duties comparing the current management of the irrigation system versus the ideal long-term efficient management of the same irrigation system. Make constructive observations and suggestions for possible improvements. Include information regarding the following:</p> <ul style="list-style-type: none"> • General record keeping of all irrigation practices • Periodic scientific appraisal and improvement of irrigation practices • Compare records pertaining to water use versus crop yield versus climatic data and make recommendations. • Assess the format in which format records are kept, being hand written, electronic, manual, computerised, etc. and make recommendations on how these can be improved. • Discuss the first line maintenance and checking an evaluation of all instruments, i.e. calibrated to assure validity and avoid instrument drift or calibration drift. 	<p>No model answers – different contexts</p>

Assessment Feedback Form

Comments / Remarks	
<p>Feedback to learner on assessment and / or overall recommendations and action plan for competence:</p>	
<p>Feedback from learner to assessor:</p>	
<p>Assessment Judgement You have been found:</p> <p><input type="radio"/> Competent</p> <p><input type="radio"/> Not yet competent in this unit standard</p>	<p>Actions to follow:</p> <p><input type="radio"/> Assessor report to ETQA</p> <p><input type="radio"/> Learner results and attendance certification issued</p>
<p>Learner's Signature:</p>	<p>Date:</p>
<p>Assessor's Signature:</p>	<p>Date:</p>
<p>Moderator's Signature:</p>	<p>Date:</p>