CROP PRODUCTION Level II

Learning Guide # 71

Unit of Competence: Maintain drainage system

Module Title: Maintaining drainage system

LG Code: AGR CRP 2M 16 09 19

TTLM Code: AGR CRP2 TTLM 16 09 19v1

Lo1. Carry out pre- and post-season maintenance

Instruction	Learning Guide 71

This learning guide is developed to provide you the necessary information regarding the following learning outcomes, content coverage and topics –

- Preparing equipment through pre-season maintenance for effective operation in accordance with enterprise guidelines.
- Flushing, cleaning, closing down and maintaining post-season maintenances
- Dismantling, loading, transporting and storing equipment without damage

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Prepare equipment through pre-season maintenance for effective operation in accordance with enterprise guidelines.
- Flush, clean, clos down and maintain post-season maintenances
- Dismantle, load, transport and store equipment without damage

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, and Sheet 3
4. Accomplish the “Self-check 1, Self-check t 2 and Self-check 3 **in page -7, 10, and 12** respectively.

Information Sheet-1	**Preparing equipment through pre-season maintenance for effective operation in accordance with enterprise guidelines.**

Pre-season irrigation maintenance is as it sounds - maintenance that occurs prior to the start of a new season. Details of the irrigation plan and program are recorded and updated on a regular basis. All irrigation maintenance is recorded. Drainage system needs to be maintained prior to the new season starting. Before placing the System into service each season, check the following:

Visual Inspection: Make a visual check of all bolts in the System making sure something has not become loose during the idle period. When the System has been newly installed, all the bolts should be checked with an end wrench to make sure they have been tightened by the erection crew. One loose bolt may cause serious structural damages. Check the electrical boxes and wiring of the System to make sure the Ground Wires are secured and rodents or insects have not damaged the Systems' mechanisms.

Flushing/Draining the System: Place the Disconnect Switch in the "OFF" position. Only water is required for this procedure – the System does not need to move. DO NOT start the flushing procedure while the System is under water pressure. Removing Sand Trap Caps while the System is under pressure can cause personal injury or death! Remove the Sand Trap Cap and pump water through the System. This will flush out any foreign material that might plug the Sprinkler Heads or Sprinkler Valves. This is particularly important on newly installed Systems, because of possible straw, dirt or any other material may be accumulated in the pipe during erection. After the Sand Trap Cap is back in place, pump water through the System and check the Sprinklers for proper operation. The arc travel of the End Gun should be set as the diagrams show on page 16 of the owner's manual. Also, check the System water pressure to see if it is operating at the proper pressure. If the water pressure has fallen, your Well may need adjustment or repair, or after time, the Sprinkler Head nozzles may be worn. Repair or replace any worn or damaged sprinklers, pressure regulators, or fittings. These problems will reduce the uniformity of water application and should be corrected. If a Sprinkler Nozzle is replaced, make sure the new one is the same size. After flushing the System, check the function of the Low Pressure Drains

by pushing each one upward in a rotating motion. Low Pressure Drains are located on the bottom side of each Hook Joint, the Last Tower Top and on the End Boom Pipe.

Lubrication: Grease fittings are located on the Power Tower Cart (Lateral Move only), Pivot Point (8), at any optional Steel U-joints (1 each), and on any Towable Gearboxes (2 each). These fittings should be greased with good quality grease. Check the oil level in the center Drive and **Wheel Gearboxes**. Water condenses in the Gearboxes and should be drained. The water may be drained by loosening the drain plug on the bottom. When the plug is removed, if there is any water, it will be the first to drain out. Do not overfill any of these Gearboxes! Overfilling may result in seal damage. NOTE: Refer to the Reinke Wheel Gearbox Maintenance Section.

Switches: Main Control Panel Switches should be cycled and checked for proper System operation. All automatic controls such as Auto-Stop, End Gun, Tower Auto-Stop and Tower Auto-Reverse should be cycled to check for proper operation. Consult your Reinke Dealer or authorized Service Technician for assistance.

Booster Pump: If a Booster pump is installed on your System, it should be inspected for proper operation. A second person should be located near the End Boom. Turn the Percent Timer to zero and with power to the System, press the Start Button. When the System is at normal operating pressure, turn the End Gun Switch to the ON position and check the phasing of the Booster Pump. When viewing from above, the pump shaft should be turning in a clockwise direction when running. Operating the pump backward can damage the pump. When the End Gun switch is OFF, the Booster Pump should be OFF. If the phasing needs to be changed, contact your Reinke Dealer or Service Person.

Tires: Tire pressure should be maintained according to the chart in the owner's manual. Also, inspect the Tires for impending problems (cuts, breaks, etc.).

Generators: If your System utilizes Generator Belts, check them for proper tension and wear. Before starting the Engine, remove any rodent nests from the Engine Fan Cover. The Generator Pulley may initially be rotated either direction to generate power. *Caution. If the Generator rotation is ever reversed later, the System will be out-of-phase.* Call your Dealer or Service Person to correct the phasing problem if you plan to operate the Generator while rotating it in the opposite direction.

There are some fairly common problems that are picked up in a pre-season check of gardens. The process for fixing them is to:

1. Find them.
2. Write their position on an irrigation plan.
3. Write up an irrigation fault report for each.
4. Fix them.

Normally the first step in a pre-season check would be to find the irrigation problems and write their location on an irrigation plan.

You are required to write an irrigation fault report for each (five in total) of the problems identified on the plan.

Make sure to reference the plan in the irrigation fault report, as these two documents would normally be used together.

General:

- Do a general cleaning of hull, deck and topsides using a mild detergent
- Make sure drains and scuppers are clear
- Put on a good coat of wax
- Clean and polish metal with a good metal polish
- Clean teak and oil
- Clean windows and hatches
- Clean canvas, bimini and dodger
- Clean interior including bilges
- Check spare parts and tools and replace as necessary
- Make sure registration is current and onboard
- Check and replace wiper blades if necessary

Hull

- Check for hull abrasions, scratches, gouges, etc. and repair
- Check and replace zincs
- Check for blisters and refinish is necessary
- Check rub rails
- Check swim platform and/or ladder
- Inspect and test trim tabs
- Check shaft, cutlass bearing, strut and prop
- Check rudder and fittings
- Touch up or replace antifouling paint

Deck, fittings, safety equipment:

- Check stanchion, pulpits and lifelines for integrity
- Check ground tackle, lines, fenders, etc.
- Check chain plates and cleats
- Check hull/deck joint
- Check deck, windows, and port lights for leaks
- Inspect anchor windlass and lubricate
- Clean and grease winches
- Check and lubricate blocks, pad eyes, etc.
- Check dinghy, and life raft

Below decks:

- Check, test and lubricate sea cocks
- Check condition of hoses and clamps
- Make sure below waterline hoses are double clamped
- Check bilges pumps for automatic and manual operation
- Check for oil in bilges
- Check limber holes and make sure they are clear of debris

Water system:

- Flush water tank
- Check water system and pump for leaks and proper operation
- Check hot water tank working on both AC and engines
- Check for tank cap keys on board
- Check and clean shower sump pump screens

Self-Check -1	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

A . Explain the following terms?

1. Visual Inspection (5pts)
2. Flushing/Draining the System? (5pts)
3. Lubrication?5pts
4. What is Pre-season irrigation maintenance? 5 pts

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ **Date:** _____

Information Sheet-2	Flushing, cleaning, closing down and maintaining post-season maintenances

2.1. Post-season flushing, cleaning, closing down and maintenance of the system

A subsurface drainage system will repay any time and effort involved in maintenance. Even though the system is well constructed and expected to last a lifetime, it will not do so unless it is carefully maintained.

Vigilance is important. If a new subsurface drainage system is given careful maintenance for two or three years, it will require little effort thereafter, for within that time any weak spots in the drain line, and over sections in the backfill which have developed can be remedied.

Given four things, an under drainage system should serve a lifetime. They are:

(1) Good quality pipe;
(2) The best possible design;
(3) Proper installation, and
(4) Continued maintenance.

Open ditches can be kept in efficient working condition only by careful maintenance. Trees, brush, and weed growth in the ditch slow down the water, causing excessive silting; this submerges the drain outfalls and reduces the ditch capacity. Trees, weeds, logs, brush, old fencing, and other debris should be cleared from the channel. These are a real hazard where culverts or bridges may be blocked by this refuse.

Burning and the application of chemicals are sometimes effective weed control, but the use of chemicals may create a hazard to livestock that use the drainage water for drinking purposes, or cause pollution downstream. A permit is required for burning and for the use of chemicals

Cleaning subsurface drains uses the same procedures as those used with sanitary sewers. Holes are dug down to the drain at intervals of 10 to 25 m, depending upon the size of the drain and the amount of sediment to be removed. A short section of the drain is removed to allow a fabricated

6 m diameter steel rod with a hook or corkscrew end, or short- jointed sewer rods, to be inserted into the drain. It may be convenient to dig the hole below the level of the drain as a temporary sediment basin.

Cleaning Water Lines

If there is heavy scaling on the collector and/or blocked water passages, consult for cleaning recommendations.

Chlorine present in tap water is harmful to the klystron water passages. Thorough flushing with de ionized water will remove all traces of chlorine. *Never* use tap water for final refill or for makeup water.

Other cleanliness issues

The sight glass and float of the water-flow indicators must also be kept clean to achieve efficient system operation. The water-flow indicators usually become contaminated during use, and this contamination collects on the sight glass and float, making the readouts difficult to see. If too much contamination is present on the glass and float, they may stick and produce an erroneous reading. The detergent and cleaning solutions may not remove all of this contamination. If this is the case, the flow meter must be removed and cleaned and the glass surface brushed.

Flushing

To flush and clean a drain, a reasonable supply of water must be available. One method to consider is using an irrigation system. A large volume of flow rather than high pressure should be used. The effect of jetting with high pressure will not be felt any great distance down the drain. If the water supply is limited, a catch basin, or hole at the upper end of the plugged section will serve as a water reservoir. Block off the upper end of the drain and fill the catch basin or hole with water, then remove the block and allow the water to flush suddenly through the drain. This simple procedure of flushing may solve the problem

It is good engineering practice to flush all cooling passages before installing the device. VEDs that have been in service for some time will develop scale on the collector. Contaminated water also contributes to dirty water lines.

Self-Check 2	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. List the four things, an under drainage system should serve a lifetime? Explain it. (10 pts)
2. List the advantages of pre-season maintenance? (5pts)
3. What is the purpose of flushing and cleaning the system? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ **Date:** _____

Information Sheet-3	Dismantling, loading and transporting equipment requiring storage

3.1. Dismantling, loading and transporting equipment requiring storage

Before loading and transporting irrigation equipment, it is necessary to dismantle properly, so that it can be easily packed and get ready for transportation .Material handling equipment (MHE) is used for the movement and storage of material within a facility or at a site. Material handling equipment can be classified into the following five major categories:

I. ***Transport Equipment.*** Equipment used to move material from one location to another (e.g., between workplaces, between a loading dock and a storage area, etc.). The major subcategories of transport equipment are conveyors, cranes, and industrial trucks. Material can also be transported manually using no equipment.

II. ***Positioning Equipment.*** Equipment used to handle material at a single location so that it is in the correct position for subsequent handling, machining, transport, or storage. Unlike transport equipment, positioning equipment is usually used for handling at a single workplace. Material can also be positioned manually using no equipment.

III. ***Unit Load Formation Equipment.*** Equipment used to restrict materials so that they maintain their integrity when handled a single load during transport and for storage. If materials are self-restraining (e.g., a single part or interlocking parts), then they can be formed into a unit load with no equipment.

IV. ***Storage Equipment.*** Equipment used for holding or buffering materials over a period of time. Some storage equipment may include the transport of materials. If materials are block stacked directly on the floor, then no storage equipment is required.

V. ***Identification and Control Equipment.*** Equipment used to collect and communicate the information that is used to coordinate the flow of materials within a facility and between a facility and its suppliers and customers. The identification of materials and associated control can be performed manually with no specialized equipment.

Transporting and stacking large equipments has caused numerous injuries to and deaths of operators of the machinery and people near the scene of operations. Many accidents occur when

equipments topple off the forks of a front-end loader and strike the operator. Accidents can be avoided by using suitable equipment for the job and by taking care when using the equipment.

Equipment Handling Attachments

It's important to use only properly designed and constructed mechanical handling equipment, for example a loader, lift truck or rough terrain handler, with a proprietary handling attachment to ensure the equipment is secure from movement during lifting. Ensure your machinery is properly maintained.

Safety in Handling and Transporting

The equipment has to be purposely designed to secure the equipments or to restrain it that it cannot fall when raised.

Where possible, avoid using parts and attachments not purpose-built for the particular model of front-end loader you are using. Any modifications made to existing equipment must be purposely designed and the work should be carried out by qualified persons.

Self-Check -3	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. What is dismantling? Explain it. (10 pts)
2. List the Material handle major classification categories? (5pts)
3. What is the purpose of dismantling? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ **Date:** _____

CROP PRODUCTION Level II

Learning Guide # 72

Unit of Competence: Maintain drainage system

Module Title: Maintaining drainage system

LG Code: AGR CRP 2M 16 09 19

TTLM Code: AGR CRP2 TTLM 16 09 19v1

LO2. Carry out routine maintenance activities

Instruction	Learning Guide 72

This learning guide is developed to provide you the necessary information regarding the following learning outcomes, content coverage and topics –

- Carrying out all maintenance activities according to the maintenance program
- Flushing and cleaning drainage system and replacing with simple components
- Inspecting and recording drainage system for leaks and operating faults
- Maintaining operation area in a clean and safe condition following OHS Procedures

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Carry out all maintenance activities according to the maintenance program
- Flush and clean drainage system and replacing with simple components
- Inspect and record drainage system for leaks and operating faults
- Maintain operation area in a clean and safe condition following OHS Procedures

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -17, 18, 22 and 24** respectively.

Information Sheet-1	Carrying out all maintenance activities according to the maintenance program

1.1 Carrying out maintenance activities.

Maintenance activities can be more easily undertaken in the off-season, as during this period, labor from the farming community is normally plentiful. Furthermore, if farmers are engaged in maintenance work on their own land for their own benefit, they' are more likely to work willingly. Also, operational personnel are more free at that time of the year and can be engaged to supervise or execute part of the maintenance work themselves**.**

The irrigation network is perhaps the most costly element of an irrigation scheme and is designed to last a long time. However, all too often one finds that irrigation schemes not long constructed bear little resemblance to the original construction and design. Silt deposition, weed infestation, malfunctioning of structures and other undesirable situations make it practically impossible to control the flow in these canals. As a result, the system is unable to deliver the necessary water and distribute it equitably. It is not surprising that farmers working in those irrigation schemes sometimes feel frustrated because they know the potential benefits of irrigation and yet cannot realize their expectations.

On the other hand, there are many examples illustrating that with proper maintenance and cooperation among farmers in this task, irrigation systems may last much longer than their original designers or constructors ever envisaged. Irrigation schemes that have been in operation for centuries can be found in Spain, Egypt, Italy, Pakistan and other countries, and are a living testimony that properly maintained irrigation schemes can be of permanent benefit to many generations.

Planning the activities to be undertaken in the following year is particularly important in countries where government allocations for operation and maintenance are made on the basis of planned expenditure. A good justification of the work to be done and the consequences if it is not undertaken is of foremost importance to obtain financing for maintenance work. Even where this is not the case, planning the activities that can be executed within the limited resources available is a useful exercise.

Types of maintenance

There are three main types of maintenance, namely:

- Routine or normal maintenance which includes all work necessary to keep the irrigation system functioning satisfactorily and is normally done annually;
- Special maintenance including repairs of damage caused by major disasters, such as floods, earthquakes and typhoons.
- Deferred maintenance including any work necessary to regain the lost flow capacity in canals, reservoirs and structures when compared to the original design. It often includes large modifications to the canal system and structures arising from important changes (cropping patterns, drainage problems, etc.) that have occurred in an irrigation scheme.

2.2. Servicing mechanical equipment in accordance with the operators' manual or as directed.

The Maintenance Service is entrusted with the overall responsibility for keeping the irrigation and drainage systems working in a satisfactory manner, within the limitations imposed by the initial design.

Similarly to the Operation Service, the main functions to be undertaken are:

- ✓ Planning the maintenance activities;
- ✓ Implementing the maintenance activities planned and those unforeseen;
- ✓ Monitoring the above mentioned activities.

A Maintenance Service requires data for good planning which can be obtained by regular monitoring. Without reliable data on costs for the different units of work and on productivity no realistic planning can be done. Later in this text, productivity data are given for machinery and manpower engaged in maintenance operations. They will be helpful when planning and costing activities if no better data are available, but a project should endeavor to have its own data based on the specific conditions of the area.

Self-Check -1	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. When maintenance activities can be done? Explain it. (10 pts)
2. List the types of maintenance? (5pts)
3. List the Operation Service, the main functions to be undertaken? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ **Date:** _____

Information Sheet-2	**Flushing and cleaning drainage system and replacing simple components.**

Flushing

This method consists of pumping water under pressure into the distribution systems, thus removing the dirt by jet action. It can be done with a high pressure nozzle (80-100 atmosphere) delivered from a farm tractor of about 40 hp, or with a low pressure nozzle (20 atmosphere) delivered from a movable motor; 1000 m/day of tile drain can be cleaned with this machine. Its disadvantage is that it only removes a small portion of the silt and in sandy soils there is the risk of sand entering the pipes. With this method drains of up to 350 m can be cleaned.

To flush and clean a drain, a reasonable supply of water must be available. One method to consider is using an irrigation system. A large volume of flow rather than high pressure should be used. The effect of jetting with high pressure will not be felt any great distance down the drain. If the water supply is limited, a catch basin, or hole at the upper end of the plugged section will serve as a water reservoir. Block off the upper end of the drain and fill the catch basin or

hole with water, then remove the block and allow the water to flush suddenly through the drain. This simple procedure of flushing may solve the problem

Cleaning

Cleaning subsurface drains uses the same procedures as those used with sanitary sewers. Holes are dug down to the drain at intervals of 10 to 25 m, depending upon the size of the drain and the amount of sediment to be removed. A short section of the drain is removed to allow a fabricated 6 m diameter steel rod with a hook or corkscrew end, or short- jointed sewer rods, to be inserted into the drain. It may be convenient to dig the hole below the level of the drain as a temporary sediment basin

2.5 Maintaining Operation area

Maintenance of operation area one of the maintenance activities carried out in drainage systems. To maintain operation area, follow the following:

1) The job site shall be kept in a neat, clean, and orderly condition at all times during the installation process.
2) All scrap and excess materials are to be regularly removed from the site and not buried in trenches.
3) Trenching, laying pipe and backfilling shall be continuous so that the amount of open trench at the end of each work day is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility flagging tape.

Self-Check 2	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. Write some of the maintenance activities carried out in a drainage system? (5 pts)

2. Write how you could flush and clean supply and distribution systems? (5 pts)

3. List the steps you use to inspect for leaks, operating faults and dry areas? (5 pts)

4. How do you maintain operation area? (5 pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ Date: _____

Information Sheet-3	Inspecting and recording drainage system for leaks and operating faults

3.1 Inspecting components for wear or blockage and reporting or replacing according to enterprise guidelines.

The following points will help you inspect an irrigation system for wear or blockage and correct many of the problems you find. The result should be substantial water savings for you and your community. Note that some communities, water utilities, and businesses offer landscape water audits for those who want this service.

- Examine the condition and type of irrigation heads. Make regular checks for blocked, damaged or missing spray heads and leaking lines.
- Slopes and breams are hard to water efficiently because the water applied naturally runs off. Nozzles with a lower precipitation rate may be required on slopes in addition to using cycle and soak applications.
- Evaluate **dry spots**. Dry spots may be caused by poor coverage if irrigation heads have been installed too far apart or not in a recommended square or triangle pattern. Other causes can be low system water pressure, a plugged nozzle or a south, west or windy exposure.
- Evaluate **wet spots**. Wet areas may be due to normal system drainage—draining of water to the lowest point (head) in a zone after the zone shuts off. However, a leaky valve that causes constant seepage out to the heads is like a dripping indoor faucet. Open the valve box and either replace worn diaphragms in the solenoid valves, or with sealed units, replace the entire valve.
- Adjust run times on the controller accordingly. A shady or northern exposure will likely require 1/2 the water of a level, sunny landscape. A south or west-facing slope may require two times the water of a level landscape area that is in full sun.

3.2. Visually inspecting drainage system for leaks and operating faults, and recording observations

The following questions will help you inspect an irrigation system and correct many of the problems you find. The result should be substantial water savings for you and your community. Note that some communities, water utilities, and businesses offer landscape water audits for those who want this service.

Step 1. Examine the condition and type of irrigation heads. Make regular checks for damaged or missing spray heads and leaking lines. Are there heads that spray a hard surface or that leave part of the landscape without water? Are any nozzles clogged? Are irrigation heads buried by surrounding grass or other plant growth? Twist to raise or if necessary dig out and reposition heads on flexible risers (swing pipe), or add a threaded riser to raise heads on inflexible risers to grade level.

What types of heads are installed? Spray heads deliver the same amount of water in 1/3 the time of rotors. Rotor heads are well suited to irrigating large turf areas and are rated more efficient than spray heads. Set a zone with rotor heads to run three times the number of minutes of a spray head zone if the same amount of water is required on the two landscape locations. The heads on one zone should all be of the same type. Replace different heads so all the heads within the same zone match.

Step 2. Is the area level or on a slope? Slopes and berms are hard to water efficiently because the water applied naturally runs off. Nozzles with a lower precipitation rate may be required on slopes in addition to using cycle and soak applications. Adjust run times on the controller accordingly.

Step 3. Evaluate **dry spots**. Dry spots may be caused by poor coverage if irrigation heads have been installed too far apart or not in a recommended square or triangle pattern. Other causes can be low system water pressure, a plugged nozzle or a south, west or windy exposure.

Step 4. Evaluate **wet spots**. Wet areas may be due to normal system drainage—draining of water to the lowest point (head) in a zone after the zone shuts off. Wet spots could also be present in north-facing exposures or shaded areas that are over-irrigated. However, a leaky valve that causes constant seepage out to the heads is like a dripping indoor faucet. Open the valve box and either replace worn diaphragms in the solenoid valves, or with sealed units, replace the entire valve.

Step 5. Is the exposure full sun, shade, southwest slope, or something else? Adjust run times on the controller accordingly. A shady or northern exposure will likely require 1/2 the water of a level, sunny landscape. A south or west-facing slope may require two times the water of a level landscape area that is in full sun.

Step 6. What type of plants are being grown? Group plants with similar water requirements together and water appropriately. An established border of medium to low water-using shrubs require less irrigation than bluegrass turf or a vegetable garden.

Step 7. Calculate precipitation rates and determine run times to set the controller. If you are unsure or need to confirm the manufacturer's ratings of how much water spray heads deliver per hour (precipitation rate), follow these steps. Place four identical, straight-sided cans between irrigation heads in a zone. Operate the zone for 15 minutes. Pour water from three of the cans into the fourth. Use a rule and measure, in inches, the depth of water collected in can four. Because each can represents 15 minutes or one-quarter hour of collection time, the total water in the fourth can represents four times 15 minutes or one hour of collection. Therefore, the water measured in can four is the sprinkler precipitation rate in inches per hour for that zone.

To convert precipitation rates to minutes of run time for a zone, divide the water you want to apply in inches (ET) by the precipitation rate calculated in inches per hour, and multiply by 60 minutes per hour. The result is the run time in minutes for setting the controller.

Self-Check -3	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. What is the first step for visually inspecting drainage system? (5 pts)

2. What is the purpose of Inspecting components**?** (5 pts)

3. List the steps you use to inspect for leaks, operating faults and dry areas? (5 pts)

Note: **Satisfactory rating - 10 points and above** **Unsatisfactory - below 10 points**

You can ask your teacher for the copy of the correct answers

Name: _____ Date: _____

Information Sheet-4	**Maintaining Operation area in a clean and safe condition and OHS procedures**

Site maintenance

1) The job site shall be kept in a neat, clean, and orderly condition at all times during the installation process.
2) All scrap and excess materials are to be regularly removed from the site and not buried in trenches.
3) Trenching, laying pipe and backfilling shall be continuous so that the amount of open trench at the end of each work day is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility flagging tape.

Irrigation work sites are expected to be clean, tidy, comfortable, good and well maintained to create conducive environment for work. Cleanliness is the most essential elements in maintaining a healthy and safe work environment. Not only does a clean workplace reflect the professionalism of a business or facility and help motivate employees, it also promotes a healthy workforce as a clean environment prevents accidents and the spread of germs.

Many office managers strive to maintain a clear work site policy, few succeed. However, each employee Like Health & Safety, is the responsibility in maintaining a clean work environment. However, there is only so much cleaning the team can do during each shift and in such cost conscious times it makes sense for employees to adopt some simple good housekeeping practices and allow the cleaning team to concentrate on hygiene and deep cleaning tasks.

Self-Check-4	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. List the main activities of site maintenance? (10 pts)
2. What is the importance of cleaning the environment? (10 pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ Date: _____

CROP PRODUCTION Level II

Learning Guide # 73

Unit of Competence: Maintain drainage system

Module Title: Maintaining drainage system

LG Code: AGR CRP 2M 16 09 19

TTLM Code: AGR CRP2 TTLM 16 09 19v1

LO3. Maintain system component

Instruction	Learning Guide 73

This learning guide is developed to provide you the necessary information regarding the following learning outcomes, content coverage and topics –

- Carrying out system maintenance at schedule time
- Inspecting components, reporting or replacing wear or blockages
- Maintaining operation area in a clean and safe condition as per OHS requirements

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Carry out system maintenance at schedule time
- Inspect components, reporting or replacing wear or blockages
- Maintain operation area in a clean and safe condition as per OHS requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2 and Self-check 3, **in page - 29, 31 and 33** respectively.

Information Sheet-1	Carrying out system maintenance at schedule time

1.1. Maintaining system components

Drainage maintenance should always be programmed from downstream to upstream and as far as possible completed within an irrigation season. The intervals in regular maintenance should not exceed periods of 2-3 years between two consecutive cleanings.

Tile drains are subject to two main problems:

(a) Obstruction due to silting and plant roots, and

(b) Mineral deposits.

The most common is the first. Mineral deposits of iron and manganese occur quite frequently in some irrigation schemes and the time necessary for such depositions varies widely from a few months to 30-40 years, depending on the mineral composition of the soil.

The retention in good working order of open drains includes the following operations:

- ✓ Light deforestation
- ✓ Weed control in the canal section
- ✓ Weeding grass in the canal section
- ✓ Maintenance of flow gauges and other measuring devices
- ✓ Removal of silt
- ✓ Maintenance of pumping stations where water cannot be evacuated by gravity.

For practical purposes, the maintenance of open drains is very similar to that of earth irrigation canals. However, all too often drainage networks receive much less attention than the irrigation ones. The result is that during heavy rain, when they are much needed, they do not work as they should.

1.2 carrying out System maintenance at scheduled times

In order to be able to formulate a maintenance program, the following steps must be taken:

i. Make an inventory of all the works that require maintenance;
ii. Determine the volume of maintenance activities to be undertaken annually;
iii. Establish the optimum cycle of maintenance for each type of work;
iv. Determine the machinery and manpower requirements to undertake the maintenance;
v. Budgeting and establishing the maintenance priorities.

The optimum cycle of maintenance is the time that can safely elapse between two consecutive maintenance operations of a constructed element (canal, road, drain, etc.) without that element failing and disrupting the efficient operation of the whole. A certain degree of malfunctioning (10-20 percent reduction in absolute efficiency with respect to the design) is normally acceptable between the two consecutive maintenance operations.

Types of maintenance

There are three main types of maintenance, namely:

- Routine or normal maintenance
    - Includes all work necessary to keep the irrigation system functioning satisfactorily and is normally done annually;
- Special maintenance
    - Including repairs of damage caused by major disasters, such as floods, earthquakes and typhoons.
- Deferred maintenance
    - Including any work necessary to regain the lost flow capacity in canals, reservoirs and structures when compared to the original design.

Self-Check-3	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. List the main types of maintenance activities? (10 pts)
2. Write how you can maintain operation area? (10 pts)
3. Drains are subject to two main problems explain them? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ **Date:** _____

Information Sheet-2	Inspecting components, reporting or replacing wear or blockages

Inspecting components for wear or blockage and reporting or replacing according to enterprise guidelines.

- The following points will help you inspect an irrigation system for wear or blockage and correct many of the problems you find.
  - The result should be substantial water savings for you and your community.
  - Examine the condition and type of irrigation heads.
  - Make regular checks for blocked, damaged or missing spray heads and leaking lines.
  - Slopes and breams are hard to water efficiently because the water applied naturally runs off.
  - Evaluate **dry spots**. Dry spots may.
  - Evaluate **wet spots**.
    - ✓ Wet areas may be due to normal system drainage—draining of water to the lowest point (head) in a zone after the zone shuts off.
    - ✓ However, a leaky valve that causes constant seepage out to the heads is like a dripping indoor faucet.
    - ✓ Open the valve box and either replace worn diaphragms in the solenoid valves, or with sealed units, replace the entire valve.
  - Adjust run times on the controller accordingly.
  - A shady or northern exposure will likely require 1/2 the water of a level, sunny landscape.
  - A south or west-facing slope may require two times the water of a level landscape area that is in full sun.

• **Self-Check-2**	**Written Test**

Name: _____ **Date:** _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. Define inspection (10 pts)

2. Why slopes and breams are hard to water efficiently? (10 pts)

3. Define wear or blockage of system components**?** (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ **Date: _____**

Information Sheet-3	**Maintaining operation area in a clean and safe condition as per OHS requirements**

Maintaining operation area in a clean and safe condition

Site maintenance

1) The job site shall be kept in a neat, clean, and orderly condition at all times during the installation process.
2) All scrap and excess materials are to be regularly removed from the site and not buried in trenches.

3) Trenching, laying pipe and backfilling shall be continuous so that the amount of open trench at the end of each work day is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility flagging tape.

Irrigation work sites are expected to be clean, tidy, comfortable, good and well maintained to create conducive environment for work. Cleanliness is the most essential elements in maintaining a healthy and safe work environment. Not only does a clean workplace reflect the professionalism of a business or facility and help motivate employees, it also promotes a healthy workforce as a clean environment prevents accidents and the spread of germs. Many office managers strive to maintain a clear work site policy, few succeed. However, each employee as Health & Safety is responsibility in maintaining a clean work environment. However, there is only so much cleaning the team can do during each shift and in such cost conscious times it makes sense for employees to adopt some simple good housekeeping practices and allow the cleaning team to concentrate on hygiene and deep cleaning tasks.

Self-Check 3	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. Explain how you could clear silt from channels, drains, sumps and crossings? . (5 pts)
2. How could you control weeds from outlets? (5pts)
3. What is the advantage maintaining operation area? (5pts)
4. Write the recognized mechanical and chemical methods of weed control? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

Name: _____ **Date:** _____

CROP PRODUCTION Level II

Learning Guide # 74

Unit of Competence: Maintain drainage system

Module Title: Maintaining drainage system

LG Code: AGR CRP 2M 16 09 19

TTLM Code: AGR CRP2 TTLM 16 09 19v1

LO4. Monitor and control weed growth

Instruction	Learning Guide 74

This learning guide is developed to provide you the necessary information regarding the following learning outcomes, content coverage and topics –

- Clearing silts from channels, drains, sumps and cross with no disruption
- Checking system to ensure weed free and unobstructed water flow from outlets
- Minimizing damage to plants, structures and fittings through mechanical and chemical methods of weed control
- Maintaining operation area in a clean and safe condition as per OHS requirements

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Clear silts from channels, drains, sumps and cross with no disruption
- Check system to ensure weed free and unobstructed water flow from outlets
- Minimize damage to plants, structures and fittings through mechanical and chemical methods of weed control
- Maintain operation area in a clean and safe condition as per OHS requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -39, 40, 44 and 46** respectively.

Information Sheet-1	Clearing silts from channels, drains, sumps and cross with no disruption

Monitoring and controlling weed growth

Weeds are normally removed by cutting, mowing or dredging. Emergent and submerged weeds are best cut near the base of the stem, leaving roots and rhizomes undisturbed. Weeds need cutting at regular intervals throughout the season and the interval varies according to the environmental conditions and species. In temperate zones during the summer, it is usually no more than four weeks. The stage of growth at which the plant is cut affects the rate of growth; cutting at an early growth stage tends to be more effective than at a later one.

Four main methods are used to control canal vegetation. The choice depends primarily on the availability of labour, the predominant environmental and economic conditions.

a. Manual

Much of what has been said for the manual removal of silt applies to this method of weed control. However, since it requires a little more skill, the choice of an appropriate hand tool is more important and will lead to relatively, high productivity.

b. Mechanical

There are many types of specially designed machines available for specific weed control purposes. In some cases, it is preferable to adapt a regular farm, tractor for use with different attachments. Rubber wheeled 40-60 hp farm tractors can travel along channel banks with a maximum slope of 1:3 percent using the PTO (power take-off) for the implement. This operation requires neither specialized operator nor training nor equipment. For slopes steeper than 1:3 percent, hydraulically operated machines are available. Tractor-dragged chains are more effective on steeper slopes. Two 60 hp tractors can easily handle channels 6 m wide. Mower and cutter attachments are used mainly for grass and reeds on banks of watercourses, while buckets are more appropriate for emergent and submerged weeds. Launches can be used for mowing and

cutting emergent weeds on banks, if the size of the channel permits their passage. Boats with cutting attachments are particularly useful for large waterways of shallow depth (up to 2.5 m) and where floating vegetation prevails.

c. Chemical

Chemicals have been developed which can control weeds effectively and safely, provided that adequate precautions are taken. They also offer an economic system of weed control in certain circumstances. The use of herbicides should, however, be limited because of their possible adverse effects on the environment. It is known that some herbicides may affect the quality of water to the extent that it becomes harmful to humans, animals and crops. Therefore, they should be selected with care. Where their use may prove hazardous, it may be necessary to limit or even prohibit them. Table 6 gives a summary of some available herbicides and their use.

d. Biological

Biological control may become more important in the future in view of the disadvantages of other methods (high costs, danger to the environment). The most common method is the introduction of an animal, fish or insect which feeds especially on the problem plant. Recently, attention has been given to the use of the grass carp (Ctenopharyngodon idella) for the control of submerged weeds and, in some cases, it appears to be an economical and effective way of control.

The introduction of competing plants (grasses) has been tried but this is not appropriate in watercourses where the flow must be unobstructed.

Sometimes weed growth can be prevented by fluctuations in the water regime, for example, holding a canal dry for 3-6 days is most effective in the control of algae. In the Bhukra Irrigation System in India, a system was developed to drain the canals and let them dry for five days; this prevented weed growth for six months. However, the success of this method depends on the weed species.

4.1 Clearing silt from channels, drains, sumps and crossings

Silt clearance

Silt is still removed manually in many parts of the world, provided that the water levels in the canals can be lowered sufficiently or, even better, the canals dried for several days. This method is quite effective, although the actual organization of the work can be a problem.

Where water-borne diseases are known to be prevalent, the use of labour should be restricted to those canals that can be dried completely for several days, otherwise mechanical means should be adopted.

Productivity of labor is generally low due to the muddy conditions in which they often work. Although some effort has been made to increase productivity by developing more appropriate tools like dredging scoops, specially designed digging hoes and forks, traditional tools (head baskets and shovels) are still used and productivity remains low. Output therefore varies widely from 2 to 8 m^3/manday, depending on several factors such as working conditions, tools, lifting and hauling distance.

Several types of machines are utilized for silt removal and canal reshaping. The productivity depends largely on how well suited the machine is to the particular work. As already mentioned, only large irrigation schemes are likely to have specialized machinery for each type of maintenance work. Table 3 rates the productivity of machinery most commonly used for removing canal silt and reshaping, but most of these machines can do a certain amount of weed clearance at the same time, which affects their productivity. The given rates are applicable to medium or small size canals and refer mostly to dry working conditions. The output will be reduced by 20-30 percent under wet conditions except for the machines (dredgers) specially designed to work in running water.

The selection of machinery is mainly influenced by its reach and working conditions: wet or dry, accessibility, amount and type of work, weed infestation, etc.

Self-Check – 1	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. What is weed control? (5 pts)
2. List weed control methods? (5pts)
3. What is Silt clearance? (5pts)
4. Write the recognized mechanical and chemical methods of weed control? (5pts)

Name: _____ **Date:** _____

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

Information Sheet-2	Checking system to ensure weed free and unobstructed water flow from outlets

2.1. Ensuring a weed free and unobstructed water flow from outlets

The outlets of a system should be free from weed infestation to have efficient system. Weed infestation can seriously impede the flow of canal water not only in tropical conditions but also in semi-arid and arid climates. There are two groups of weeds:

- Earth weeds: they root in the soil and their habitat is not the water; they proliferate on the canal slopes and in the banks, benefitting from favourable soil moisture conditions;
- Aquatic weeds: they can either root in the water or the earth but their habitat is in the water. Robson (1976) classifies them as follows:

- ✓ emergent plants - these are plants growing in the water and whose foliage emerges above the surface, e.g. the common read (Phragmites communis);
- ✓ floating leaved plants - there are two sub-groups with floating leaves: in one, the plants are rooted in the mud and their leaves float flat on the surface, in the other, plants are not rooted but free-floating on the surface;
- ✓ submerged plants - this group consists of plants whose foliage is totally submerged; a number of them produce flowers which emerge above the surface; one or two plants are free-floating, but most are rooted in the mud;
- ✓ algae - this group consists of a variety of algae of various forms, including unicellular algae and the large filamentous forms.

The relevance of the type of weed to the method of control will become apparent when control measures are discussed. Some of these weeds, such as nutgrass (Cyperus rotundus), are not only a problem in the operation of the canals but can become a menace for the farmers when water transports them into fields. There they reproduce rapidly and become a serious problem because of the difficulty of eradicating them.

Another hazard of weed infestation is the shelter and good breeding conditions they offer for vectors (mosquitoes, snails, etc.) of debilitating diseases.

Self-Check -2	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. What is Earth_weeds? . (5 pts)
2. What is emergent plants? (5pts)
3. What is aquatic_weeds? (5pts)

Name: _____ **Date:** _____

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

Information Sheet-3	Minimizing damage to plants, structures and fittings through mechanical and chemical methods of weed control

3.1. Minimizing damage to plants, structures and fittings through the use of recognized mechanical and chemical methods of weed control

Methods of Weed Control

Weed management decisions vary according to plant life cycles, infestation size, environmental parameters and management objectives. Hand-pulling a perennial weed species such as Canada thistle or leafy spurge is a futile effort, but very effective for control of a biennial plant such as diffuse knapweed. Releasing biocontrol insects for control of dalmatian toadflax on a 500 acre property is wise, but relying on insects for controlling small patches on a 40 acre pasture is inefficient. Successful weed management requires proper plant identification, selection of effective management methods and monitoring the effects over time.

Preventive Control

Prevention is the most essential aspect of weed management. Once a noxious weed infestation becomes established, any increase in size and density creates increasingly more expensive management efforts. Awareness of weed seed sources and plant identification is a must. Feel free to call the Weed District office for help with identification or to set up a site visit, and recognize:

Weed seed can be spread from neighboring properties, adjacent road rights-of-way and trails. Direct sources are often livestock, manure, seed, hay, vehicles and equipment.

Disturbed ground is most vulnerable to weed invasion; new roads, pipelines and other sites where competitive vegetation has been removed. With no restoration (see cultural control) weeds will likely appear.

Early detection and rapid response saves time and money. Aggressive management action on small, newly established infestations can result in eradication. "An ounce of prevention is worth a pound of cure."

Cultural Control

Cultural control, the establishment of competitive and desired vegetation, prevents or slows down invasion by weedy species and is a key component of successful weed management. Weeds are typically opportunistic and readily invade disturbed sites. Impacts from road construction, intensive livestock grazing, densely populated prairie dog colonies and other disturbances that damage or remove desirable and competitive vegetation create sites for noxious weed invasion. Controlling weeds on such sites can be futile without vegetative restoration, as weeds will readily re-invade the disturbed area. Establishment of grassland or pasture can be challenging. Success often depends on proper species selection suitable for a particular soil type, moisture regime and growing season. Other factors such as soil compaction, seeding depth, time of year, and weed control during establishment can be critical to success.

Chemical Control

Herbicide application can provide the most effective and time-efficient method of managing weeds. Numerous herbicides are available that provide effective weed control and are selective in that grasses are not injured. Along with herbicide use is user responsibility and compliance with all product label requirements for herbicide handling, use, and cleanup. Always read the label and keep in mind the label is legally binding. When using herbicides be mindful of proximity to water, trees, shrubs and other desirable vegetation.

Herbicides are applied by spot spraying - single nozzle application targeting individual plants, or broadcast spraying - multiple nozzles covering an entire area. Whatever method is used,

calibration of spray equipment (gallons per acre spray output) is essential for accurate delivery and mixing calculations. Estimating or guessing sprayer output can lead to misapplication which either injures non-target plants or results in failure to control the target weed species.

Mechanical Control

Mechanical control consists of methods that kill or suppress weeds through physical disruption. Such methods include pulling, digging, disking, plowing and mowing. Success of various mechanical control methods is dependent on the life cycle of the target weed species.

- ✓ Hand pulling and digging are effective on annual and biennial species such as kochia, musk thistle, and diffuse knap weed. It is important to remove the upper 2-3 inches of taproot to prevent re-growth. Hand pulling or digging a perennial weed such as leafy spurge can be a futile effort unless one has the time necessary to diligently dig or pull re-growth over several seasons.

Shallow tillage with a disk or sweep is effective for controlling annual species such as cheat grass or kochia, but can actually be counterproductive if trying to control perennial weeds such as Canada thistle, field bindweed, leafy spurge or Russian knapweed. Perennial root systems often have meristematic buds that can set roots and produce a new plant from root segments deposited on the soil surface. Shallow tillage of perennial weeds can result in a larger, denser and more uniform infestation than the initial patch.

Moldboard plowing (complete turnover of the top 10-12 inches of soil) disrupts underground root systems and buries seed from the surface to a depth too deep to germinate. This type of tillage is seldom feasible to practice on a regular basis.

Mowing is a suppression measure that can prevent or decrease seed head production. Mowed weeds will re-grow and set seed from a reduced height so a combined control method is

necessary to be effective. Mowing causes perennial plants to weaken when forced to send up carbohydrates from underground root reserves to nourish re-growth. So mowing a perennial weed such as Canada thistle a couple of times during the summer can significantly weaken the plants, and when combined with a fall herbicide application, provides excellent control.

Self-Check -3	**Written Test**

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. What is Preventive Control method of weed**? (5 pts)**

2. What is Cultural control method of weed? (5pts)

3. What is Mechanical control method of weed? (5pts)

Name: _____ Date: _____

Note: **Satisfactory rating - 15 points and above Unsatisfactory - below 15 points**

Information Sheet-4	Maintaining operation area in a clean and safe condition as per OHS requirements

4.1. Maintaining operation area in a clean and safe condition

Site maintenance

4) The job site shall be kept in a neat, clean, and orderly condition at all times during the installation process.
5) All scrap and excess materials are to be regularly removed from the site and not buried in trenches.
6) Trenching, laying pipe and backfilling shall be continuous so that the amount of open trench at the end of each work day is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility flagging tape.

Irrigation work sites are expected to be clean, tidy, comfortable, good and well maintained to create conducive environment for work. Cleanliness is the most essential elements in maintaining a healthy and safe work environment. Not only does a clean workplace reflect the professionalism of a business or facility and help motivate employees, it also promotes a healthy workforce as a clean environment prevents accidents and the spread of germs. Many office managers strive to maintain a clear work site policy, few succeed. However, each employee as Health & Safety is responsibility in maintaining a clean work environment. However, there is only so much cleaning the team can do during each shift and in such cost conscious times it makes sense for employees to adopt some simple good housekeeping practices and allow the cleaning team to concentrate on hygiene and deep cleaning tasks.

Self-Check 4	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. Explain how you could clear silt from channels, drains, sumps and crossings? . (5 pts)

2. How could you control weeds from outlets? (5pts)

3. What is the advantage maintaining operation area? (5pts)

4. Write the recognized mechanical and chemical methods of weed control? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

Name: _____ **Date:** _____

CROP PRODUCTION Level II

Learning Guide # 75

Unit of Competence: Maintain drainage system

Module Title: Maintaining drainage system

LG Code: AGR CRP 2M 16 09 19

TTLM Code: AGR CRP2 TTLM 16 09 19v1

LO5. Record and report maintenance activities

Instruction	Learning Guide 75

This learning guide is developed to provide you the necessary information regarding the following learning outcomes, content coverage and topics –

- Recording all damage and blockage by pest and vermin
- Recording and reporting damage or faulty equipment's and taking action
- Recording and reporting all routine maintenance activities

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Record all damage and blockage by pest and vermin
- Record and report damage or faulty equipment's and taking action
- Record and report all routine maintenance activities

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3 and Sheet 4".
4. Accomplish the "Self-check 1, Self-check t 2 and Self-check 3, **in page - 50, 51 and 53** respectively.
5. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1 and Operation Sheet 2 " **in page 54 and 55.**
6. Do the "LAP test" **in page – 57** (if you are ready).

Information Sheet-1	Recording and reporting damage or faulty equipment's and taking action

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1.1. Recording damage and blockage caused by pests and vermin.

Each irrigation worker shall maintain any records and make any reports in connection with the activities as may be required by the conditions or by the rules, regulations, and orders of the enterprise. Records which are required by the regulations in this part or by license conditions must be maintained for a period specified by the appropriate regulations or by license condition. Records which must be maintained pursuant may be the original or a reproduced copy or a microform if this reproduced copy or microform is capable of producing copy that is clear and legible at the end of the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures.

The reports shall include:

- specification of the quantity of each of the principal damage and blockage caused by pests and vermin ,
- specification of the quantity of each of the principal location and the section of the system affected
- a summary of licensee disposal unit survey and maintenance activities,
- a summary, by waste class, of activities and quantities disposed of,
- any instances in which observed site characteristics were significantly different from those described in the application for a license; and
- any other information the Commission may require.

Self-Check -2	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. why records stored in electronic media (5pts)
2. List some reports that shall records ? (5pts)

Note: **Satisfactory rating - 10 points and above** **Unsatisfactory - below 10 points**

You can ask your teacher for the copy of the correct answers

Name: _____ Date: _____

Information Sheet-2	Recording all damage and blockage by pest and vermin

.2 Recording and reporting, damage or faulty pumps, valves, electrical components and computer systems and action taken to effect repairs.

Damaged or faulty pumps, valves, electrical components, etc in irrigation systems should be recorded and reported to the supervisor. Maintenance and repair to these damaged parts should also be carried as soon as possible to avoid leakage and water losses.

The record of damaged or faulty pumps, valves, electrical components may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures.

The reports on damaged or faulty pumps, valves, electrical components shall include:

- specification of the quantity of each of the principal damage and blockage

- specification of the quantity of each of the principal location and the section of the system affected
- a summary of maintenance activities,
- a summary, by waste class, of activities and quantities disposed of,
- any instances in which observed site characteristics were significantly different from those described in the application for a license; and
- any other information the Commission may require

Self-Check -2	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

1. why maintenance and repair to these damaged parts should also be carried as soon as possible (5pts)
2. Reports on damaged or faulty pumps, valves, electrical components shall include? (5pts)

Note: **Satisfactory rating - 10 points and above** **Unsatisfactory - below 10 points**

You can ask your teacher for the copy of the correct answers

Name: _____ Date: _____

Information Sheet-3	Recording and reporting all routine maintenance activities

3.1. Recording and reporting routine maintenance activities

The record on routine maintenance activities of open drains includes at least the following operations:

- a record on light deforestation on drainage
- a record weed control in the canal section
- a record on seeding grass in the canal section
- a record on maintenance of flow gauges and other measuring devices
- a record on removal of silt
- a record on maintenance of pumping stations where water cannot be evacuated by gravity.

Drainage maintenance should always be programmed from downstream to upstream, and as far as possible completed within an irrigation season. The intervals in regular maintenance should not exceed periods of 2-3 years between two consecutive cleanings.

Drains are subject to two main problems:

(a) Obstruction due to silting and plant roots, and

(b) Mineral deposits.

The most common is the first. Mineral deposits of iron and manganese occur quite frequently in some irrigation schemes and the time necessary for such depositions varies widely from a few months to 30-40 years, depending on the mineral composition of the soil.

Note: After completing the records, a report has to be submitted to authorize personnel for corrective measures.

Self-Check -3	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**

3. Write record on routine maintenance activities of open drains operations (5pts)
4. Write the two drain problems? (5pts)
5. Write drainage maintenance directions? (5pts)

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answers

Name: _____ Date: _____

Operation Sheet-1	Identification of irrigation tools and equipment

Objective: to enable the trainees

- ✓ How to select irrigation tools and equipment.
- ✓ How to maintain irrigation components

1. Irrigation tools and equipment

- Identification of irrigation tools and equipment, due to that student will enable how to handle materials and equipment, develop skills include the ability to prepare materials, tools and equipment for irrigation work, work with a range of materials including plastic and metal pipes and components using hand tools commonly used in irrigation work.

1. Water tank (Roto)
2. T-PICES
3. Connectors
4. Laterals lines
5. On-line Emitters
6. Filter
7. Drain outlet 3/4"
8. Ball valve 3/4" female
9. Comp. Elbow
10. Comp. Tee
11. Barbed Tee
12. Line end 16mm
13. Puncher 16mm
14. Puncher 9mm

Tools and equipment may include:

Leveling equipment, wheelbarrow, string lines, tape measures, marking gauges, spades, shovels, crow bars, rakes, brooms, sanding blocks and hacksaws are needed.

Operation Sheet-2	Identification of weed control methods

Objective: to enable the trainees

- ✓ How to select weed control materials.
- ✓ How to apply weed control methods

2. weed control tools and equipment

- Identification of weed control tools and equipment, due to that student will enable how to handle materials and equipment, develop skills include the ability to prepare materials, tools and equipment for weed control, work with a range of materials components using hand tools commonly used in weed control work.

1. Preventive Control
2. Cultural Control
3. mechanical control
4. chemical weed control

Tools and equipment may include:

- ✓ Measuring tape
- ✓ Meter
- ✓ Spade
- ✓ Pickaxe
- ✓ Rope
- ✓ Pegs
- ✓ Rack
- ✓ sickle
- ✓ machete

Procedures

1. Identify the site which invaded with weed.
2. Collect the tools and equipment's required for weed control
3. Select weed control method
4. Apply the selected method
5. Remove weeds
6. Repeat the method until the weed is totally remove

Precautions

Protect yourself while you apply different weed control methods.

Lap Test	Practical Demonstration

Name: _____ Date: _____

Time started:_____ Time finished:_____

Instructions:

1. You are required to perform any of the following:

   1.1 Request your teacher tools and equipment for irrigation work then perform the following task in front of your teacher-

   A . Identify for what purpose do the tools and equipment used in irrigation.

   B. Identify maintenance activities of irrigation components.

   C. Identify weed control methods

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