Agricultural TVET College

Small Scale Irrigation Development

Level IV

Learning Guide#06

Unit of Competence:

Implement Onsite Irrigation Installation Work

Module Title:

Implementing Onsite Irrigation Installation Work

LG Code: AGR SSI4 M06 L01-L05

TTLM Code: AGR SSI4 TTLM06 1218V1

Instruction sheet	Learning Guide #06

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

- Implement effective communication
- Implement and monitor OHS and risk management procedures
- Organize the supply and installation of materials and equipment
- Supervise on-site operations
- Administer progress claims/payments

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:-

- Site instructions for irrigation installation work are recorded to comply with quality management requirements.
- Dates, times and personnel to attend site meetings are organized.
- First aid facilities are established as necessary.
- Plant and equipment requiring certificated operators are identified to comply with risk management procedures.
- Likely hazards are identified and precautions taken.
- Role of Construction Safety Supervisor is identified.
- Documentation for safety reporting is instigated.
- Material orders are placed according to appropriate schedule.
- Equipment is hired according to planned schedule.
- Maintenance procedures are established for equipment.
- Operations are implemented according to appropriate schedule and contract.
- Sub-contractor operations are co-ordinate and monitored, including all aspects of materials used and standards of workmanship.
- Problems and delays are addressed as they arise and action recorded.
- Industrial relations are monitored continuously and issues resolved to minimize impact on job progress.
- Revisions are made to project schedule, when required, and variations documented to comply with quality management procedures.
- Quality management procedures are applied continuously as per adopted standards for job.
- Safety procedures are monitored continuously, reports analyzed and procedures reviewed as required.
- Reports on current project status are prepared for management.
- Supervision of multiple projects is planned.
- Summary records are prepared for progress claims.
- Actual expenditure and earnings are checked against scheduled projected costs.

Learning Activities

1. **Read the specific objectives of this Learning Guide.**
2. **Read the information written in the "Information Sheet"**
3. **Accomplish the "Self-check".**
4. **If you earned a satisfactory evaluation proceed to the next "Information Sheet". However, if your rating is unsatisfactory, see your facilitator for further instructions or go back to Learning Activity.**
5. **Submit your accomplished Self-check. This will form part of your training portfolio.**
6. **Read and Practice "Operation Sheets".**
7. **If you think you are ready proceed to "Job Sheet".**
8. **Request you facilitator to observe your demonstration of the exercises and give you feedback.**

INFORMATION SHEET 1	Implement effective communication

1.1 . Recording site instructions for irrigation installation work

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. Irrigation installation work related to gravity and pressurized systems.

A pressure piped irrigation system is a network installation consisting of pipes, fittings and other devices properly designed and installed to supply water under pressure from the source of the water to the irrigable area

Type of installation

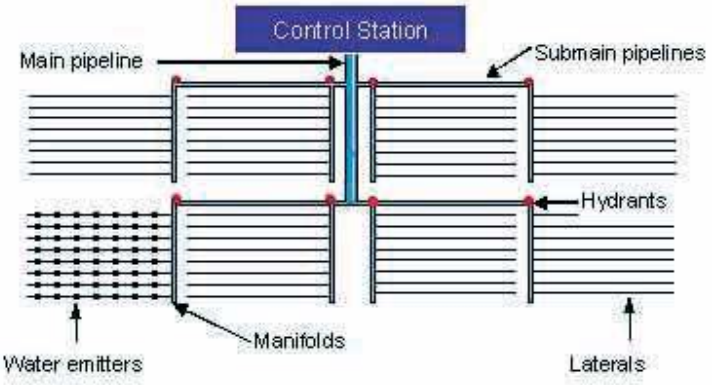
Systems can be classed as:

- ✓ Solid installations (fixed systems), where all the components are laid or installed at fixed permanent or seasonal positions.
- ✓ Semi-permanent installations, where the mains and sub mains are permanent while the laterals are portable, hand move or mechanically move.
- ✓ Portable installations, where all the component parts are portable.

In all piped systems the main component parts (Fig. 1.1) are:

- ✓ The control station (head control unit);
- ✓ The mains and sub mains (pipelines);
- ✓ The hydrants;
- ✓ The manifolds (feeder pipelines);
- ✓ The laterals (irrigating pipelines) with the emitters.

Figure 1.1 - Scheme of a network layout.



Installation of Micro Irrigation Systems is a very simple process. It can be divided in to three stages:

1. Installing water source (bucket, barrel, tank, pump, etc.).
2. Laying of pipes and emitters / micro-tubes / setting up sprinklers.
3. Commissioning

If there is no overhead tank then a water source must be created (i.e. a bucket, barrel, tank, etc.) It has to be installed above ground level on a stable support platform at the required height to achieve minimum pressure requirements for the system (minimum 1 meter). The system then can be connected to the water source. Micro-sprinkler and overhead sprinkler kits can be directly connected with the equivalent discharge outlet of a pump or water supply system. Make sure that the control valve and filter are connected to the system through the main line.

For drip systems, lateral pipes are laid on the ground in a straight line or along the plant rows. Emitters / micro tubes are pre-fixed on the lateral. They are placed at equal spacing so that plants receive a uniform amount of water. For sprinklers, stakes are used to place them properly. Care should be taken so that dirt, sand etc. does not enter into the pipes while making connections.

Before operating the system, end caps at the end of the laterals and sub-main are released so that if there is dirt in the pipes it is washed away and air is also driven out. Open the control valve and let the water flow freely through the pipes for some time (flush the system). Then close the end caps and ensure that water is coming out from each emitter.

In general, the following activities are involved in the installation of Micro Irrigation Systems:

1. Study installation sketch
2. Give layout for water tank / filter platform and trenches for pipes if required
3. Check components in the kit / material at site as per the list of materials in the user manual

4. Install water storage tank and filter on the platform
5. Connect filter to the water source / pump and the main line
6. Lay out the main line, sub-main and lateral pipes
7. Cover the pipe trenches if required
8. Place / fix the emitters / sprinklers (if micro tubes require inflated lateral pipes then fill the pipes with water then punch holes and fix micro tubes)
9. Start the pump / Open the valve and fill the pipes with water
10. Release all end caps / flush valves to clean the system of dirt
11. Check pressure and discharge and ensure all emitters are working
12. Operate according to schedule

1.2 . Organizing dates, times and personnel

Schedule:-is an organizational tool for employers to assist with notifying staff of assessment and meeting.

Select an organizational committee

The chair or co-coordinator is critical for the event .they will have to make all the final decision and solve any conflict. Ensure the committee members have the necessary skill and knowledge or there is sufficient time for them to be trained to fulfill their tasks in the meeting.

Finding a date and time that is suitable for your event is always a difficulty ,what may be great for you and organizing committee may clash with other major event at the work site . Try to find out as much as you can about what is happening the work site and the plan your event accordingly.

Self-Check 1	**Written Test**

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

1. Write all type of installation in on-site operation?(10pts)
2. What type of material we used in irrigation installation? (10pts)

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

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

INFORMATION SHEET 2	Implement and monitor OHS and risk management procedures

2.1 .Establishing first aid facilities

The purpose of first aid is to minimize injury and disability. In serious cases, first aid is necessary to sustain life.
First aid is the immediate and temporary care given to a victim of an accident or sudden illness before a physician or other qualified health personnel attends to provide treatment.
First aid kit is a box or cabinet used to contain first aid items. It may be static or mobile.
When the assessment of first aid requirements has been completed, the employer should provide the materials, equipment and facilities needed to ensure that the level of cover identified as necessary will be available to employee's at all relevant times. This will include ensuring that first aid equipment is suitably marked and easily accessible, i.e. available in all places where working conditions require it.
First aid kits should be made of suitable material and designed to protect the contents from damp and dust. Kits should be clearly identified as first aid containers; the marking used should be a white cross on a green background.

Number of first aid kit shall include:-

a. One first aid guide
b. One first aid record book ,or instruction on how first aid treatment records are to be maintained ,
c. One pencil,
d. six safety pen
e. one splinter tweezers
f. one pair of 100 mm scissors,
g. two pair of disposable ,latex glove , protection of spread of infection contagious condition
h. At least the following individually wrapped dressings:-
    - ✓ 1 roller bandage(50 mm wide),one roll of adhesive tape,
    - ✓ One marked plastic bag for disposal of biohazardious waste ,
    - ✓ One air way barrier device for rescue breathing antiseptics breathing,
    - ✓ Include some antiseptics

Developing and implementing first aid procedures

1. The employer must keep up-to-date written procedures for providing first aid at the worksite including
    a. The equipment, supplies, facilities, first aid attendants and services available,

b. The location of, and how to call for, first aid,
c. How the first aid attendant is to respond to a call for first aid,
d. The authority of the first aid attendant over the treatment of injured workers and the responsibility of the employer to report injuries to the board,
e. Who is to call for transportation for the injured worker, and the method of transportation and calling, and
f. Prearranged routes in and out of the workplace and to medical treatment.

2. The employer must post the procedures conspicuously in suitable locations throughout the workplace or, if posting is not practicable, the employer must adopt other measures to ensure that the information is effectively communicated to workers.
3. The first aid attendant and all other persons authorized to call for transportation for injured workers must be trained in the procedures.

2.2 .Identifying plant and equipment requiring certificated operators to comply with risk management procedures

Risk management procedures include identification and reporting of:

- hazards to health and safety, risk assessment procedures and
- implementation of risk control measures, safe operation of
- machinery and equipment, safe manual handling procedures,
- selection, use and maintenance of relevant personal protective
- clothing and equipment, safe procedures for working at heights and for outdoor work, including protection from solar radiation,
- Dust and noise

Risk management:-is the process of measuring or assessing risk and developing strategies to manage the risk .once risk have been identified and assess ,all techniques to manage the risk fall in to four major categories :-

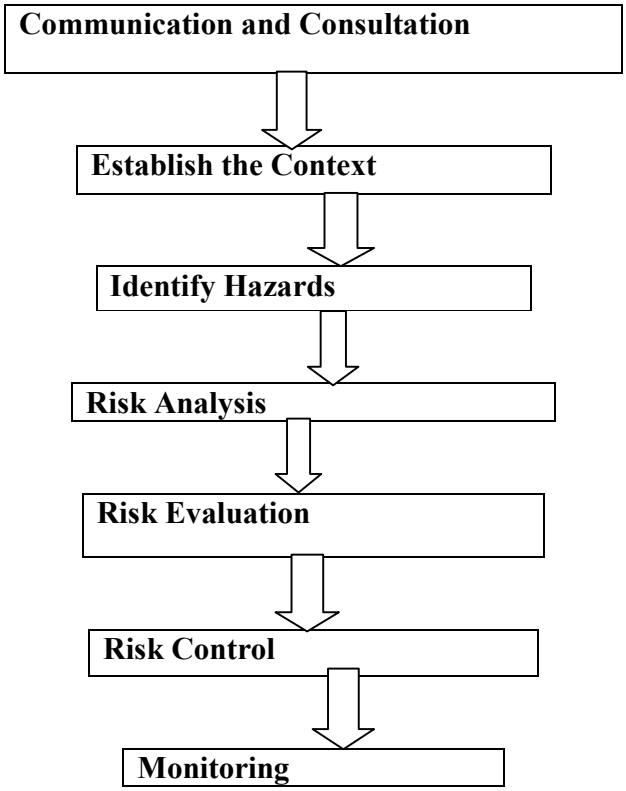
a. Avoidance (eliminate withdraw form or become involved)
b. Reduction (optimize)
c. Sharing (transfer)
d. Retention (accepts and budget)

A. RISK AVOIDANCE:-This includes not performing an activity could carry risk .e.g would be not buying a property or business in order to not take on the legal liability that come with it.
B. RISK REDUCTION:-involves reducing the severity of the loss from occurring .e.g sprinkler is designated to put out a fire to reduce the risk of loss by fire.
C. RISK SHARING:-sharing with another party the burden of loss or the benefit of gain, from a risk and measure to reduce risk. (e.g. transfer risk the third party through insurance)

D. RISK RETENTION:-involves accepting the loss or benefit of gain, from a risk when occurs .e.g war

Steps in the Risk Management Process

The following flowchart shows the steps involved in risk management. Each step is explained in further detail in the subsequent pages.



Communication and Consultation

Communication and consultation should take place during all stages of the risk management process.

A consultative approach can:-

1. Help establish the context appropriately
   - ✓ ensure that all hazards are adequately identified
   - ✓ bring different areas of expertise together for analyzing risks
2. Enhance appropriate change management during the risk management process.

Establish the Context

The first step in the risk management process is to define the scope of the risk management activity. The purpose of this step is to establish the parameters of the process including the

criteria by which risks will be assessed. Therefore, this step defines the strategic and organizational context in which the remainder of the risk management process operates.

This includes:

- ✓ defining the external and internal stakeholders and their objectives;
- ✓ defining the organizational context - this is the context within which the risk management policy is to be implemented, including defining each person's responsibilities and resource requirements;
- ✓ establishing the risk management context including: - defining the scope for risk management of the specific activity;
- ✓ setting an overall time frame for completion of the risk management process;
- ✓ identifying the resources required and distributing the responsibilities for conducting the remainder of the process;
- ✓ Developing the risk evaluation criteria - these may be legal, social or financial;
- ✓ Planning the structure of the risk management process into logical elements.

Risk Assessment

Risk assessment is the overall process of risk identification, risk analysis and risk evaluation.

When a Risk Assessment Should Be Carried Out

A risk assessment should be undertaken when:

- ✓ there is uncertainty about how a hazard may result in a injury or illness
- ✓ the work activity contains numerous hazards and there is uncertainty on how the hazards will interact with each other to produce new risks
- ✓ there is a change in the workplace that may impact on the effectiveness of control measures

A risk assessment may not be necessary if: legislation requires that a hazard is to be controlled in a specific way guidance material, such as a code of practice, establishes a method of controlling a hazard that is applicable to work environment and a decision is made to adopt this method a decision is made to implement well known industry specific best practice controls which are suited to the circumstance.

Identifying Hazards

This is the most important step in the risk management process. A hazard which is not identified cannot be controlled. Accordingly, it is crucial that this step is as comprehensive as possible. Ideally, hazard identification will be conducted in close consultation with the people performing the activity.

The projects has developed risk management guidelines that provide a systematic process to ensure hazards are identified in the workplace and that procedures are in place and are used to identify, assess and control risk:

- ✓ before setting up and using a workplace;

- ✓ when planning work processes;
- ✓ before installing, commissioning or erecting plant;
- ✓ whenever changes are made to: - the workplace;
  - The system or method of work;
  - The plant and equipment used;
  - The chemicals used;
- ✓ Whenever new information regarding work processes becomes available.

Processes which the project utilizes to identify hazards include:

- ✓ hazard reporting;
- ✓ workplace inspections; &
- ✓ Inspection and testing.

Other methods of hazard identification include but are not limited to the following:

- ✓ legislation, codes of practice or Australian Standards;
- ✓ Pre start job review procedure (Facilities Management Division)
- ✓ workplace surveys;
- ✓ incident analysis;
- ✓ personal observations;
- ✓ health & safety committee items or discussions;
  - o review of documents, reports and risk register;
  - o warning labels or signs (including laboratory entry or HAZCHEM placards);
  - o material safety data sheets (MSDS);
  - o manufacturer's manuals or instructions;
- ✓ technical journals;
- ✓ Consultant's reports.

Hazard Reporting

Information regarding the process of reporting a hazard using Safety Net, the project online hazard and incident reporting system, is outlined in the Hazard/Incident Report Form User Guide.

Identified OHS hazards are to be assessed, controlled and reported via the following process:

- ✓ if there is an immediate risk of injury or illness, appropriate steps must be taken to ensure the safety of nearby persons;
- ✓ the appropriate supervisor of the area, equipment or activity is to be notified including information on the hazard, estimated risk and control measures which have been implemented;

- ✓ any further actions to prevent illness or injury are to be determined by the supervisor in consultation with employees and implemented accordingly to reduce the level of risk to an acceptable level;
- ✓ A hazard/incident report form is to be completed on Safety Net by the person who identified the hazard outlining the steps undertaken, proposed corrective actions and submitted to the appropriate supervisor(s).

Workplace Safety Inspections

Workplace safety inspections are a systematic process of visually inspecting the workplace to identify hazards which require control measures to reduce the risk of injury. Workplace safety inspections are to be conducted according to their degree of risk as outlined in the Workplace Safety Inspection Guidelines.

Workplace Safety Inspections are conducted using checklists to prompt the person(s) conducting the inspection to identify hazards.

Inspection and Testing

The Plant & Equipment, Inspection, Testing and Monitoring Guidelines outline the requirements for the implementation of the project inspection and testing program for all applicable plant, equipment and facilities.

Assessing Risk

After all the hazards for the activity, process or equipment have been identified, the risk of each hazard needs to be assessed.

The assessment of risk is to be conducted in consultation with employees having regard to the likelihood and consequence of injury, illness or incident occurring, based upon the:

- ✓ legal requirements;
- ✓ evaluation of available information;
- ✓ records of incidents, illness and disease; and
- ✓ The potential for emergency situations.

Risk is the probability of an event having an impact (usually adverse) on the activity's objectives. It is a function of both consequences and likelihood. The greater the consequences, the greater the risk. Similarly, the more certain the event, the greater the risk.

Assessing risk is a two-step process requiring analysis and evaluation: Risk analysis is the process of identifying the likelihood and consequences of an event - that is, quantifying the risk - taking into account existing controls. This does not necessarily mean assigning a numerical value to the risk. Indeed, this may be inappropriate in some circumstances because it inevitably involves putting a value on human life or limb. Furthermore, there is no point in assigning values if those values do not translate into meaningful policy prescription. Ultimately, the aim of the exercise is to rank risks in order of priority.

Evaluating risks: - Risk evaluation is the process of comparing quantified levels of risk against established criteria and parameters.

2.3 .Implementing risk control measures

The projects have in place several tools to ensure that risk management is implemented. The following links to procedures and forms facilitate the risk management process:

- ✓ Incident Management and Reporting Guidelines
- ✓ Safety Net - Hazard and Incident Reporting Form
- ✓ Safety Net - Risk Assessment Form
- ✓ Risk Assessment Form
- ✓ Safe Work Procedures Guidelines
- ✓ Safety Net - Safe Work Procedure Form
- ✓ OHS Purchasing Guidelines
- ✓ OHS Design Guidelines
- ✓ Workplace Safety Inspection Guidelines
- ✓ Risk Register
- ✓ Pre Start Job Review Guidelines

Minimum training requirements for the implementation of OHS risk management includes the knowledge of the information contained in these guidelines.

Program Evaluation

In order to ensure that these guidelines continue to be effective and applicable to the project the risk management program will be reviewed triennially by the OHS Unit in consultation with the OHS Committee. The review is to focus on the effectiveness of the methods used to identify, assess and control risk in the workplace.

Conditions which might warrant a review of the guidelines on a more frequent basis would include:

- ✓ reported hazards or injuries;
- ✓ non-conforming systems;
- ✓ legislative changes
- ✓ OHS Committee concern.

2.4 .Identifying and taking precautions of likely hazards

Hazard identification is the systematic identification of all hazards in the workplace that have the potential to cause workplace injury. It is important to carry out a new hazard assessment if there are significant changes to the workplace such as changes in operations, changes in equipment, changes in employee numbers, or changes in site location. The results of the hazard assessment should be communicated back to employees, explaining what occurred, the findings, and what will happen next.

Control risks to workplace health and safety through the:

- ✓ identification of actual and potential hazards

- ✓ assessment of the risk of injury associated with those hazards
- ✓ Implementation of control measures which aim to eliminate workplace health and safety risks where possible. Where this is not possible the risk must be minimized so far as is reasonable practicable.
- ✓ Monitoring, review and evaluation of the effectiveness of corrective measures.

Precaution:-is action taken to avoid a dangerous or undesirable event. e.g safety first sign ,warning sign ,danger and poison sign, flammable sign.

2.5. Identify role of Construction Safety Supervisor

Supervisors are the key people responsible for ensuring that the work environment and the work itself, is safely performed. Supervisors also play a role with completion of risk assessments and hazard inspections in work areas.

Supervisors are to facilitate the risk management process by ensuring:

- ✓ hazards are reported in a timely manner,
- ✓ the importance of risk management is communicated to employees, and
- ✓ corrective actions and/or control measures are identified and implemented
    - to oversee daily operation at site
    - Employees to be trained about site-specific risk and control measures before starting work on construction site.

2.6 .Investigating documentation for safety and environment

Documentation:-are information or meaningful data and its supporting medium (e.g paper electronics etc…) in this context it is distinct form policies, processes or procedures, objectives, requirements, responsibilities or work instructions.

Identified OHS hazards are to be assessed, controlled and reported via the following process:-

- ✓ if there is an immediate risk of injury or illness, appropriate steps must be taken to ensure the safety of nearby persons;
- ✓ the appropriate supervisor of the area, equipment or activity is to be notified including information on the hazard, estimated risk and control measures which have been implemented;
- ✓ any further actions to prevent illness or injury are to be determined by the supervisor in consultation with employees and implemented accordingly to reduce the level of risk to an acceptable level;
- ✓ a hazard/incident report form is to be completed on Safety Net by the person who identified the hazard outlining the steps undertaken, proposed corrective actions and submitted to the appropriate supervisor(s).

Self-Check 2	Written Test

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

1. Write the advantage of establishing first aid facilities for implementing on site irrigation installation work?(5pts)
2. Write the risk management procedures?(5pts)
3. Write the procedures and forms to facilitate risk management process?(5pts)
4. How to control risk in the work place health and safety manner condition? (5pts)

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

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

INFORMATION SHEET 3	Organize the supply and installation of materials and equipment

3.1 .Placing material orders

Irrigation system installations consist of various pipes, fittings, valves and other equipment depending on the kind of system and the type of installation. Most installations have the same structure, and thus a relatively small range of equipment can meet the requirements of a whole region.

Irrigation equipment is required such as:

- ✓ Pipes;
- ✓ Pipe connector fittings;
- ✓ flow control devices;
- ✓ Filters;
- ✓ fertigation equipment;
- ✓ Water emitters;
- ✓ Automation equipment;
- ✓ Operation equipment;
- ✓ Water-lifting devices.

FIGURE 3.1 - Rigid PVC pipe

FIGURE 3.2- Polypropylene (PP) fittings with a lock connector

FIGURE 3.3 - Various shut-off valves. From left to right a gate, a butterfly and ball valves.

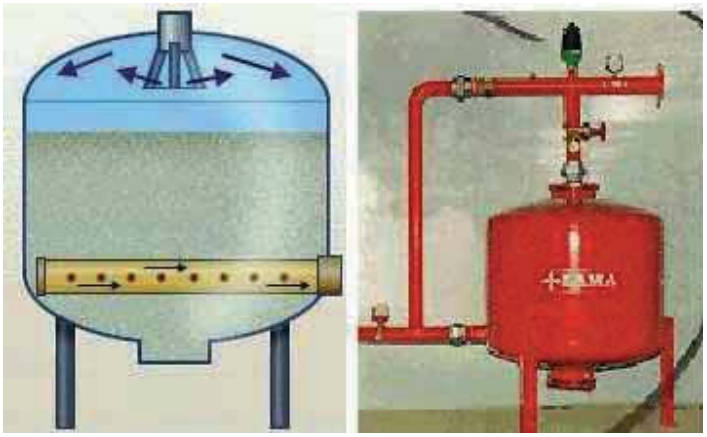


FIGURE 3.4 - Scheme and photograph of a gravel filter

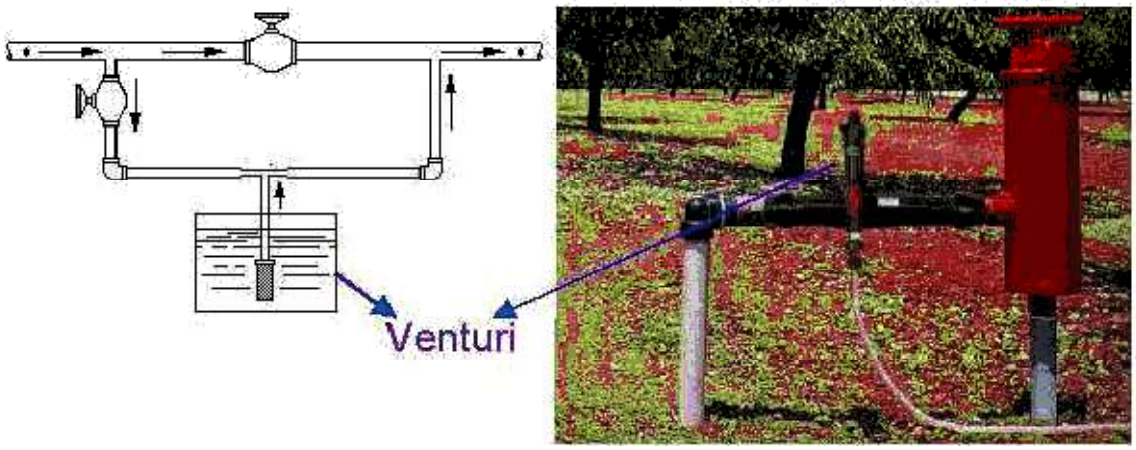


FIGURE 3.5 - Scheme and photograph of a Ventury type fertilizer

FIGURE 3.6 - A microsprinkler with a rotating spinner

FIGURE 3.7 - Operational scheme and photograph of an electric control valve

FIGURE 3.8- Left: a rotodynamic pump powered by a tractor.
Right: a pumping unit with rotodynamic pumps in parallel

Tools Required

Normally the following tools are required for installation of a system:

• Spade • Trenching shovel • Tape measure
• String line • Secateurs • Multi grips
• Wire cutters • LDPE cutter or secateurs

3.2 .Preparing equipment and planning schedule

The purchasing of irrigation equipment or execution of services, such as the installation, operation and maintenance of irrigation networks and or pumps, should be subject to public tender. For equipment and services up to a value of US$500, the purchase can be effected through 'quotations', i.e. written quotations may be asked from a representative number (2-3) of suppliers. Where the value of the equipment exceeds a certain amount, e.g. US$600, their purchase should be affected through tender. This is done in accordance with the 'stores regulations' applied in the project or the country concerned. Wide publicity should be given to every 'notice inviting tenders' (invitation for tenders). This must include the name of the buyer, a brief description of the items for which tenders are invited, the address for delivery of equipment, and the closing date and time of the tenders. Moreover, it should include a statement that the buyer is not bound to accept the lowest or any other tender, and also state to whom the bidders must apply for full particulars. In the case of 'local tenders' for the purchase of relatively limited quantities, the tender document that must be available and given to prospective bidders on request should include only the general conditions of the tender and the technical specifications of goods. It is important that all required conditions be clearly stated in detail in

the tender document, including the time and method of delivery, i.e. FOB, CIF, ex-stock; method of payment, i.e. letter of credit, cash against documents, payment on delivery, etc.; and other related information. For tenders over US$3 000, bidders should furnish a bank guarantee or cheque equal to 10 percent of the value of the tender price. An example of this kind of tender is given below. In the case of 'international bids', the contract documents must include, in detail, the following:

• Invitation for bids (as described above);

• Instructions to bidders (source of funds, eligible bidders, goods and services, cost, content of bidding documents, preparation and submission of bids, opening and evaluation, award of contract, etc.);

• General conditions of contract (definitions, country of origin and standards, performance, security, inspection and tests, insurance, transportation, warranty, payment, amendments, delays, force majeure, etc.);

• Special conditions;

• Technical specifications (general, materials and workmanship, schedules of requirements/bill of quantities, and particular technical requirements/specifications);

• Bid form and price schedules;

• Contract form, bid security and performance security.

Tenders for the supply of irrigation equipment

Tenders are hereby invited for the supply of irrigation equipment required for a private farm in the Project area, as per attached quantities, description and specification.

General conditions of tenders

Price: Bidders to quote prices per unit and total, CIF nearest port, Republic of …, full liner terms, including bank charges on the attached price schedules. Prices to be firm for at least 90 calendar days from the closing date of tender.

Delivery: Date of delivery in the project site should not exceed 60 days from the time of awarding the tender.

Payment**:** The Project shall make all necessary arrangements towards the opening of the letter of credit in US dollars for goods to be supplied in its name and on behalf of the supplier within seven days after receiving the import license. The Project shall make a first payment of 50 percent of the value of the tender upon submission of all the necessary shipping documents.

Bill of quantities

Item	Description	Unit	Quantity	Rate (US$)	Amount (US$)
1.	1. HDPE pipe ø 75 mm	m	300		

3.3 . Establishing maintenance procedures

Maintenance is largely preventative. Silt and organic matter should be excluded from the system as much as possible using settling ponds and filtration.
Regularly walk the field to check on the system and address problems quickly. Take samples from the ends of laterals and let it stand overnight to check for sediment. Test the water periodically. Check laterals for any deposits.

Flush the system regularly as determined by your water quality. Monitoring and recording system flow rates on a water meter can indicate if clogging is occurring and flushing required. Start the flushing process from the pump onwards. Make sure the filters are clean and pressures set correctly. Systematically clean the mainline, sub-mains, laterals and flushing manifold. Inlet water pressure may need to be increased to achieve the necessary flushing velocity in the laterals check if this is needed on your design specifications.

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.

Operation is the organized procedure for causing a piece of equipment, a treatment plant, or other facility or system to perform its intended function, but not including the initial building or installation of the unit. Maintenance is the organized procedure for keeping the equipment, plant, facility or system in such condition that it is able to perform its intended function continually and reliably.

Self-Check 3	**Written Test**

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

1. How to organize the supply materials and equipments during the installation of pressurized irrigation system?(10pts)
2. Write all maintainace procedures of irrigation installation and list all material used to on-site operation? (10pts)

Note: **Satisfactory rating - 15 points and above Unsatisfactory - below 15 points**
You can ask your teacher for the copy of the correct answers

INFORMATION SHEET 4	Supervise on-site operations

4.1. Implementing operations

Implement operations according to appropriate schedule and Contract Operation is the organized procedures for causing a piece of equipment, a treatment plant, or other facility or system to perform its intended function, but not including the initial installation of the unit.

A contract in which the government or organization undertaking a construction project makes only one party responsible for all services connected with the work, including planning, design, drawing up of specifications and construction. This type of contract may be made on a firm-price or cost-plus basis. It is based on function specifications describing the general features and requirements of the finished works (e.g. an irrigation system). The contractor draws up all the detailed engineering designs and specifications, and performs the construction and testing. The work is considered complete when the contractor turns over the works in satisfactory operation to the owner. Supervisors are the key people responsible for ensuring that the work environment and the work itself, is safely performed. Supervisors also play a role with completion of risk assessments and hazard inspections in work areas. Explanation.—for the purposes of this sub-clause, "works contract" means a contract wherein,—

1. Transfer of property in goods involved in the execution of such contract is livable to tax as sale of goods, and
2. Such contract is for the purposes of carrying out,—

(a) Erection, commissioning or installation of plant, machinery, equipment or structures, whether pre-fabricated or otherwise, installation of electrical and electronic devices, plumbing, drain laying or other installations for transport of fluids, heating, ventilation

or air-conditioning including related pipe work, duct work and sheet metal work, thermal insulation, sound insulation, fire proofing or water proofing, lift and escalator, fire escape staircases or elevators; or

(b) Construction of a new building or a civil structure or a part thereof, or of a pipeline or conduit, primarily for the purposes of commerce or industry; or

(c) Construction of a new residential complex or a part thereof; or

(d) Completion and finishing services, repair, alteration, renovation or restoration of, or similar services, in relation to (b) and (c); or

(e) Turnkey projects including engineering, procurement and construction or

(f) Commissioning (EPC) projects; "Works contract", for the purposes of section.

4.2. Recording and addressing problems and delays

Projects are designed to address the problems faced by beneficiaries. A properly planned project addressing the real needs of the beneficiaries cannot be achieved without an analysis of the existing situation. However, the existing situation is likely to be perceived in different ways by different groups of stakeholders. Thus it is important to bring together representatives of all key stakeholders in the Analysis Phase. This is usually done in a workshop environment where problems and issues are discussed openly. There are three stages to the Analysis Phase: Problem Analysis; Analysis of Objectives; Strategy Analysis.

Problem Analysis

Problem analysis identifies the negative aspects of an existing situation and establishes the 'cause and effect' relationships between the problems that exist. It involves three steps:

1. Identification of the stakeholders affected by the proposed project
2. Identification of the major problems faced by beneficiaries
3. Development of a problem tree to establish causes and effects

Stakeholder analysis provides a useful starting point for problem analysis. It involves the identification of all stakeholder groups likely to be affected (either positively or negatively) by the proposed intervention. With the use of interview and discussion techniques, the interest that each stakeholder group has in the project is documented. Using the information gained by stakeholder analysis, project planners are better able to organize the preparation process, and in particular to plan the necessary research required prior to the conduct of a participatory planning workshop.

Instruction 1: Analyze problems & objectives

- ✓ Identify and list problems & objectives in the document
- ✓ Prepare an objective tree
- ✓ Compare objective tree with problem analysis
- ✓ Formulate questions on adequacy of problem analysis, and logical gaps or inconsistencies in the objective tree

The rehabilitation and extension of the Western Coast Irrigation System relates to the Governments general program me of agricultural diversification, with a view to increasing food self-sufficiency. The project area is located in the Western Coast area, which is characterized by a dry climate, necessitating irrigation for agricultural production.

Under the responsibility of the Irrigation Authority the project will improve crop yields on the 1496 ha which are presently under cultivation, after introduction of modern irrigation techniques, and will provide an additional area of 552 ha for cultivation. The project is expected to generate an additional production of 2,300 tonnes of cash crops and vegetables annually, and an additional 6,000 tonnes of sugar. The region is characterized by a dry climate. Its soils are generally of good quality, suitable for agriculture, but this activity is limited by the high water deficit that results from low rainfall. For this reason, only 6300 ha are cultivated; this being the maximum area that can be irrigated from existing water sources. The main irrigation canal has suffered extensive damage through landslides along its upper reaches. Water losses are estimated at 53%.

As a result, cultivation of land has been gradually abandoned in some places, particularly at the end of the canal where most of the small and medium scale farmers are concentrated.

4.3. Monitoring industrial relations and resolving issues continuously

Project monitoring is an integral part of day-to-day management. Its purpose is to provide the information by which management can identify and solve implementation problems, and assess progress in relation to what was originally planned**.** The flow of information between the project and the Commission is the subject of a separate system, which operates on a more aggregate or institutional level. This level of monitoring is not dealt with in this handbook, where the focus is at project-level. In fact, a monitoring system is currently being designed to gather summary information for all Commission-managed projects.

- ✓ **Monitoring** can be defined as the systematic and continuous collecting, analysing and using of information for the purpose of management control and decision-making.
- ✓ Project monitoring is an integral part of day-to-day management.Its purpose is to provide the information by which management can identify and solve implementation problems, and assess progress in relation to what was originally planned.
- ✓ There are five steps in the design and specification of a monitoring system:
    - Analyze project objectives
    - Review implementation procedures
    - Review indicators
    - Design report formats
    - Prepare an implementation plan for the monitoring system
- ✓ It is important to relate information needs to the different levels of the management structure. In reality, the level of detail of information required and the frequency of reporting will vary according to the level of management.
- ✓ By reviewing an implementation procedure (who does what) in consultation with partner institution staff, the various roles, functions and responsibilities are clarified, and a clear link can be made between information needs and levels of management.

4.4. Making revisions and documenting variations of project schedule

The level of detail of information required and the frequency of reporting will vary according to the level of management. For example, project administrators will need information about day-today activities, while the contractor will require more summarized information about achievement of outputs or deviations from the work plan which he/she may need to forward to the programmed implementation agency. A review of implementation procedures involves a review of what activities will be undertaken and by whom. This should be done with reference to the activity schedule. By reviewing implementation procedures (who does what) in consultation

with partner institution staff, the various roles, functions and responsibilities are clarified, and a clear link can be made between information needs and levels of management. This process can be assisted by drawing up a table which lists the information user, what is required, the source of the information, and who is responsible for preparing the report. get together on a regular basis to review progress against the plan. This may be an opportunity for written reports to be presented and discussed, or simply for a rapid oral assessment of current issues and problems. However, reviews can be damaging if they are too frequent or too drastic. The temptation is often to go back to the plan and adjust it in the light of experience. This is acceptable up to a point, but if you find yourself spending more time *planning* than *doing*, then you have obviously got the balance wrong. It is also at times of crisis that organizations focus more on task accomplishment and forget about the process.
Try to build on achievements rather than just continually adjusting the plan.

4.5. Applying quality management procedures

At field-level, project preparation, implementation and evaluation are undertaken by consultants or partner governments and organizations. The role of Commission staff is to manage the process of preparation, implementation and evaluation. As process managers, you therefore need tools and techniques which help you to support and control the quality of outputs produced during the process – for example, to identify information needs for preparatory studies; to plan appraisal missions; and to check the quality of project proposals.

1. ***Total quality management*** is a continuous effort by the management as well as employees of a particular organization to ensure long term customer loyalty and customer.

2. ***Quality Assurance***
   - ✓ All irrigation work shall be done by a suitably experienced and qualified irrigation contractor, having trained and competent personnel adequate for the scope of work. Utilizing Staff certified by the IIABC in such disciplines as Certified Irrigation Technician (level 1 or 2), Certified Designer (Commercial or Residential), Certified Irrigation Auditor, etc. are recommended.
   - ✓ The contractor shall be a member in good standing of the Irrigation Industry Association of B.C. and have met the qualification standards currently applied to contractors by that organization.
   - ✓ A written guarantee of the installed system shall be provided to the owner covering workmanship and materials for a minimum of one year.

4.6. Monitoring safety procedures and analyzing reports.

Project managers will want to review progress very frequently, perhaps weekly or fortnightly, against their contracted budget and planned activities. Much of this data will be of an operational

nature for internal use by the project team. A few selected items, plus aggregated data on equipment and materials, are considered 'key' indicators for reporting in the progress reports. Monitoring cannot be described as being successful simply because the required information is collected. The information collected must be communicated - in the right form, to the right person, at the right time. Only then can timely and appropriate management decisions be made to address problems and ensure that the project is brought 'back on track'.

4.7. Preparing reports on current project status

Mechanisms for communication must be established to ensure that the necessary information is generated and utilized in a timely and effective manner they are periodic summaries (perhaps weekly, monthly or quarterly) of project progress incorporating key information from the physical and financial indicators included in the log frame, activity schedule and cost schedule. It is not sufficient for team members to report simply that 'things are going according to plan'.

4.8. Planning supervision of multiple projects

Continuous monitoring and auditing is required to supervise any contract. This can be carried out by the dam owner, government agencies or consultants appointed to supervise a contract being funded by an international financing agency. For all but the former, the supervisor must in turn be monitored and audited to ensure compliance with the contract and to encourage cost effectiveness and to avoid corruption. The World Bank establishes a panel of experts for every large dam contract and these personnel are fully independent and are able to carry out regular (and irregular) monitoring and auditing activities throughout the duration of the contract. Particular attention should be paid to contract variations. Any variation should be scrutinized both individually and in aggregate, and once a financial ceiling is reached (based on the contract price and usually in the range of 10-15 percent) the independent outside experts should be called in. Any proven case of variation in response to bribery and corruption should cause the immediate cancellation of the contract (without any penalty payment to the contractor) and dismissal and prosecution of any supervision personnel involved. For all contracts, an effective dispute resolution organization/entity is required. As with the panel of experts, this should be independent and suitably qualified to resolve disputes impartially and in the interest of fairness and integrity. This may be a government agency or could be based in the private sector. Details of such an agency should be clearly stated in all tender and contract documents.

Self-Check 4	**Written Test**

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

1. How to address problems of on-site operation irrigation project?(5pts)
2. In what method to supervise multiple irrigation projects?(5pts)
3. Define irrigation quality management?(5pts)
4. Assume you are contractor of irrigation project how do you supervise, monitor, and revised and record on-site operation construction work? (5pts)

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

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

INFORMATION SHEET 5	**Administer progress claims/payments**

5.1 .Preparing summary records

The Principal's obligations to make progress payments are governed by the terms of the contract between the Principal and the contractor or service provider and by the *Building and Construction Industry Security of Payment Act, 1999* (NSW) ("the Act"). The Act is available on the Internet at: *www.austlii.edu.au/au/legis/nsw/consol_act/bacisopa1999606/* The Act provides a statutory right to progress payments for a person (or company) that has undertaken to carry out construction work or to supply related goods and services under a construction contract. Related goods and services are defined in sections 5 and 6 of the Act and include "architectural, design, surveying or quantity surveying services in relation to construction work". [See section 6(1)(b)(ii) of the Act]. An agreement with a consultant or project manager providing services in relation to a construction project may be a construction contract as defined in the Act.

Requirements of the Act the **Payment Claim**

Under the Act, a person "who is or who claims to be entitled to a progress payment (the ***claimant***) may serve a payment claim on the person who, under the construction contract concerned, is or may be liable to make the payment". [See section 13(1) of the Act]. Notwithstanding anything to the contrary that may be stated in the contract, a payment claim is a valid payment claim under the Act if it meets the criteria set out in section 13(2) of the Act, which states: 13(2) a *payment claim*:

(a) Must identify the *construction work* (or *related goods and services*) to which the *progress payment* relates, and

(b) Must indicate the amount of the *progress payment* that the *claimant* claims to be due (the "claimed amount"), and

(c) Must state that it is made under this Act.

5.2 .Checking actual expenditure and earnings against projected costs

Expenditure; - payment of cash or equivalent for goods or services or a charge against available fund in settlement of an obligation on evidenced by the receipt or other such document.

The Payment Schedule

The Principal, as the person liable for making payments under a contract, is known under the Act as the ***respondent***. The respondent must respond to the payment claim by issuing a payment schedule to the claimant. It is most important to issue a payment schedule within the period stated in the contract or within 10 business days of receipt of a payment claim, whichever period expires earlier. Under the Act, a business day is any day other than a Saturday, Sunday, public holidays or 27, 28, 29, 30 or 31 December. If a valid payment schedule is not issued within 10 business days (or less if specified in the contract) of receipt of a payment claim, the Principal becomes liable to pay the claimed amount on or before the due date for payment. [See section 14(4)(b) of the Act]. The standard form contracts in the NSW Government *Procurement System for Construction* require that a payment schedule be issued within 10 business days of receipt of a payment claim, consistent with the provisions of the Act. To satisfy section 14(2) of the Act, a payment schedule:

(a) Must identify the payment claim to which it relates, and

(b) Must indicate the amount of the payment (if any) that the respondent proposes to make (the ***scheduled amount***).

If it proposed to pay an amount that is less than the amount claimed, it is most important to include in the payment schedule reasons why the amount is less. These are the "reasons for withholding payment" referred to in the Act. The claimant may refer a payment claim for adjudication under the Act if:

 the scheduled amount is less than the claimed amount and the claimed amount is not paid in full by the due date; or

 the respondent does not issue a payment schedule within time; or

 the respondent fails to pay the scheduled amount in full.

If the claimant makes an adjudication application, the respondent may make an ***adjudication response*** justifying the Principal's position. The reasons given in the payment schedule form the basis of any adjudication response. Further, the respondent cannot include in the adjudication response any reasons for withholding payment that were not included in the payment schedule. [See section 20(2B)of the Act]. The effect of this is that, if the respondent has not issued a payment schedule, the adjudicator cannot take into account any reasons the respondent has for withholding payment. The most likely outcome of the adjudication process would therefore be that the claimant receives the claimed amount in full. The reasons given in the payment schedule must be justifiable and should refer to provisions of the contract, such as the claimant's failure to meet the requirements of the contract or the respondent's entitlement to make deductions for costs incurred. It is advisable to obtain advice on drafting the reasons for withholding payment that are to be included in a payment schedule, particularly if the claimant is likely to disagree.

Calculation of the Progress Payment

Section 9 of the Act states that the amount of the progress payment is to be:

(a) the amount calculated in accordance with the terms of the contract, or

(b) if the contract makes no express provision with respect to the matter, the amount calculated on the basis of the value of construction work carried out or undertaken to be carried out by the person (or of related goods and services supplied or undertaken to be supplied by the person) under the contract.

The standard form contracts in the NSWGovernment *Procurement System for Construction* provide for documenters to specify how a progress payment is to be calculated. If the contract makes no express provision, the value of the progress payment is to be determined under section 10(2)(b) of the Act: … having regard to:
(i) the contract price for the goods and services, and

(ii) any other rates or prices set out in the contract, and

(iii) any variation agreed to by the parties to the contract by which the contract price, or any other rate or price set out in the contract, is to be adjusted by a specific amount, and

(iv) if any of the goods are defective, the estimated cost of rectifying the defect

The Due Date for Payment

It is most important to pay the progress payment on or before the due date for payment. The due date for payment is the date on which payment becomes due and payable in accordance with the terms of the contract, or, if the contract makes no express provision with respect to the matter, the date occurring 10 business days after a valid payment claim is received. Contracts should contain express provisions in respect of the due date for payment. They may include requirements that the contractor or service provider must fulfill before becoming entitled to payment, such as:

 Provision of a signed statutory declaration that all employees, subcontractors and suppliers have been paid; or

 Provision of security; or

 Copies of current insurance policies; or

 Provision of certain information

These are sometimes called "Conditions Precedent" to payment. For example, the standard form Agreements for consultancy and project management services provide for the due date for payment to be within:

(a) 20 Business Days after the Principal receives the Consultant's payment claim, or

(b) 5 Business Days after the Principal receives the documents specified in clauses 5.8 and 5.9, or

(c) 5 Business Days after the Consultant has provided the Principal with the access or information specified in clause 10.2 whichever period expires later.

Payment process

Upon receipt of a payment claim, assess the amount of the progress payment to which the claimant is entitled. Base the assessment on the provisions of the contract or, if there are no express provisions, on section 10(2) of the Act, as described above. As the payment schedule will indicate the amount the Principal will pay, it may be necessary to obtain approval to issue the payment schedule from an officer with the appropriate financial delegation. Issue a payment schedule that complies with section 14(2) of the Act (see above). Refer to *Sample letter 13D (Minor Works)* or *Sample letter 63A (GC21)* or the generic *Sample payment schedule* for other forms of contract. If it is proposed to indicate in the payment schedule a scheduled amount that is less than the claimed amount, or if it is intended to withhold any part of the claimed amount, include in the payment schedule all of the reasons why the scheduled amount is less or payment is to be withheld. If the claim states that it has been made under the *Building and Construction Industry Security of Payment Act 1999* (NSW) and there is likely to be disagreement over the amount paid, obtain advice on drafting the reasons for withholding payment. These will form the foundation of an adjudication response if the payment claim is referred to adjudication. Determine the due date for payment having regard to the date of the payment claim, the date of receipt of any documents or information required before an entitlement exists under the provisions of the contract, and whether a statutory declaration has been received. Obtain all necessary approvals for payment of the scheduled amount. It may be necessary to obtain approval from an officer with the appropriate financial delegation to authorize payment of the scheduled amount. Ensure that the scheduled amount is paid on or before the due date for payment

The sequence of payments to the contractor will have been outlined in the tender and contract documents. Usually these will have been negotiated at contract signing and any variations allowed outlined in the tender documents.

Self-Check 5	**Written Test**

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

1. Define progress claim?(5pts)
2. How to prepare summery progress claim?(10pts)

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

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