	AGRICULTURAL TVET COLLEGE	

SMALL SCALE IRRIGATION DEVELOPMENT

LEVEL-II

MODEL TTLM

Learning Guide -15

Unit of competency: Assist irrigation construction work

Module title: Assisting irrigation construction work

LG CODE: AGR SSI1M 15 LO1-LO5

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Nominal Duration: 40 Hours

Instruction sheet	Learning guide #15

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

- ✓ Understand design drawing and specification
- ✓ Develop methods for implementing the construction operations
- ✓ Prepare project schedule for irrigation installation and construction
- ✓ Determine all the required resources for project
- ✓ Prepare completion and dilapidation report

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 –

- Copy of irrigation design drawing and specification is obtained
- Specify is reviewed for any unusual aspects of construction and use of materials
- Availability of skilled and semi-skilled man power is ascertained and selected to suit job requirements
- Check availability of material suppliers
- Site access limitation are assessed
- Relevant authorities controlling construction work are advised of commencement date for project as required
- Procedure are established for controlling and recording site deliveries
- Procedure are established for recording the construction progress
- Quality control method is followed
- Establish procedures of Occupational Health and Safety (OHS)
- Establish Procedure for dealing with environmental issues associated with ***irrigation construction*** work
- Construct operations are prepared in sequence

- Operate are entered into a manually prepared schedule or
- Adjust Timeframe to take account of anticipated delays
- Determine temporary services and site as required
- Select Input requirements and dates
- Determine On site labor requirements
- Record condition of completed and dilapidated structures
- Report Copies of submitted to supervisor

Learning Activities:-

1. Read the specific objectives of this Learning Guide.
2. Read the information written in the "Information Sheets"
3. Accomplish the "Self-checks"
4. If you earned a satisfactory evaluation proceed to "the next information sheet However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
5. Submit your accomplished Self-check. This will form part of your training portfolio (if necessary).
6. Read the "Operation Sheet" and try to understand the procedures discussed.
7. Request access to the materials required for that particular practical session. Practice the steps or procedures as illustrated in your learning guide. Go to your teacher if you need clarification or you want answers to your questions or you need assistance in understanding a particular step or procedure.

InformationSheet-1	Understand Design Drawing And Specification

1. INTRODUCTION

Specification is a way of describe or specifies the natures and class of work materials to be used in the work man ship. It should be express all the requirements of the work clearly and in concise form avoiding replication.

"**Specification** also referred to in the Tender and any modification there of or addition thereto as may from time to time be furnished or approved in writing by the Engineer.

"**Drawings**" drawings referred to in the Specification and any modification of such drawings approved in writing by the Engineer and such other drawings as may from time to time be furnished or approved in writing by the Engineer.

1.1. Obtaining copy of irrigation design drawing and specification

One copy of Drawings to be kept on Site One copy of Drawings, furnished to the Contractor as aforesaid, shall be kept by the Contractor on the Site and the same shall at all reasonable times be available for inspection and use by the Engineer and the Engineer's Representative and by any other person authorized by the Engineer in writing.

- **Design drawing and specification**

- ✓ The drawings and specifications represent the finished work. All bracing, temporary supports, shoring, masonry, etc. is the sole responsibility of the contractor. Observation visits to the job site by the landscape architect does not include inspection of construction methods and safety conditions at the worksite. These visits shall not be construed as continuous and detailed inspections.
- ✓ All forms and alignments of paving, layout, and special paving areas shall be reviewed and approved by the landscape architect prior to placing (give a minimum of 48 hours' notice).
- ✓ The contractor shall verify the location of all utilities prior to construction and shall be held liable for all damages incurred.

- ✓ The contractor shall note and install all sleeve locations shown on the irrigation plans in excess of existing sleeves per the landscape architect's approval.
- ✓ All construction and workmanship shall conform to the latest edition of the standard specifications for public works and the latest edition of the uniform building code.
- ✓ These notes shall be used in conjunction with the plans. any discrepancies shall be brought to the attention of the landscape architect prior to any installation processes.
- ✓ The contractor must check all dimensions, framing conditions and site conditions before starting work. The landscape architect shall be notified immediately of any discrepancies or possible deficiencies.
- ✓ Site clean-up shall take place on a daily basis.

1.2. Reviewing specification for any unusual aspects of construction and use of materials

Contract documentation is reviewed to identify any unusual aspect of construction, use of materials or penalties. Availability of selected subcontractors to suit the job requirement is determined. Site access requirement and limitations are identified and actions taken to facilitate entry.

- **Specification of Construction use of material for drip**

- **QUALITY**

Use materials which are new and without flaws or defects of any type, and which are the best of their class and kind.

- **SUBSTITUTIONS**

Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at the option of the Contractor.

- **IRRIGATION TAP AND WATER METER**

A. Provide materials required by local codes for installation of the municipal water tap and associated piping.

B. Provide materials required by local code for installation of the water meter and vault and associated piping.

- **SLEEVING**

A. Sleeving beneath drives and streets shall be PVC Class 200 pipe with solvent welded joints.

B. Sleeving diameter: equal to twice that of the pipe or wiring bundle.

- **PIPE AND FITTINGS**

A. Mainline Pipe and Fittings:

1. Use rigid, un plasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
2. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 200 in the case of small nominal diameters which are not manufactured in Class 200.
3. Use solvent weld pipe for mainline pipe with a nominal diameter less than 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.

B. Lateral Pipe and Fittings:

1. For drip irrigation laterals downstream of zone control valves, use UV radiation resistant polyethylene pipe manufactured from Prime Union Carbide G-resin 7510 Natural 7 manufactured by Union Carbide or a Union Carbide Licensee with a minimum of 2% carbon black, and minimum nominal pipe ID dimension of 0.810" for 3/4 inch pipe. Use PVC/compression line fittings compatible with the drip lateral pipe. Use tubing stakes to hold above-ground pipe in place.

C. Specialized Pipe and Fittings:

2. Copper pipe: Use Type "K" rigid conforming to ASTM Standard B88.
   Use wrought copper or cast bronze fittings, soldered or threaded per the installation details. Use a 95% tin and 5% antimony solder.
3. Use a dielectric union wherever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).
4. Assemblies calling for pre-fabricated double swing joints shall utilize LASCO Unitized swing joints or approved equal. Swing joints shall be rated at 315 psi, and use O-ring and street elbow construction.
5. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80

nipples and PVC Schedule 80 threaded fittings.

6. Joint sealant: Use only Teflon-type tape pipe joint sealant on plastic threads.Use non hardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.

- **MAINLINE COMPONENTS**

A. Main System Shutoff Valve: As per local practice and in compliance with local code.

B. Winterization Assembly: As per local practice and in compliance with local code.

C. Backflow Prevention Assembly: As presented in the installation details.

D. Quick Coupling Valve Assembly: Double swing joint arrangement as presented in the installation details.

- **DRIP IRRIGATION COMPONENTS**

A. Remote Control Valve (RCV) Assembly for Drip Laterals: As presented in the installation details. Use wire connectors and waterproofing sealant to join control wires to solenoid valves. Use standard Christy I.D. tags with hot-stamped black letters on a yellow background. Install a separate valve box over a 3-inch depth of 3/4-inch gravel for each assembly.

B. Drip Emitter Assembly:

1. Barb-mounted, pressure compensating emitter device as presented in the installation details. The device shall be Rain Bird XB-20.
2. Install emitter types and quantities on the following schedule:
   a. *Ground cover plant*: 1 single outlet emitter each or 1 single outlet emitter per square foot of planting area, whichever is less.
   b. Shrub: 2 single outlet emitters each.
   c. Tree: 8 single outlet emitters each.
3. Use 1/4-inch diameter flexible plastic tubing to direct water from emitter outlet to emission point. Length of emitter outlet tubing shall not exceed five feet.Secure emitter outlet tubing with tubing stakes.

C. Flush Cap Assembly: as presented in the installation details. Locate at the end of each drip irrigation lateral pipe. Install a separate valve box over a 3-inch depth of 3/4-inch

gravel for each assembly.

- **CONTROL SYSTEM COMPONENTS**

A. Irrigation Controller Unit:

1. Rain Bird UNIK Battery-operated controller with one (1) field transmitter for the project, and one 1) control module for each remote control valve on the project.

- **OTHER COMPONENTS**

A. Tools and Spare Parts: Provide operating keys, servicing tools, test equipment, other items, and spare parts indicated in the General Notes of the drawings.

- **Specification of Construction use of material for sprinkler**

a) **Sprinklers and Valves:** All sprinklers, spray heads and valves shall be constructed of either cast bronze, brass, stainless steel or durable plastic or a combination of these materials. Where indicated on the Drawings, covers of sprinkler heads shall be no greater than 80mm in diameter and constructed of a rubberized or other suitable material to prevent injury to persons. Pop-Up Sprinkler heads shall only rise out of their housings under mains pressure or by use of a special tool for inspection, maintenance or adjustment purposes, and shall be of pressure regulating type, PSAM PRS (pressure regulating stem. All sprinklers shall be fitted with anti -drain valves. All sprinkler heads shall be as vandal resistant as practicable. Sprinkler heads shall be as specified.

b) **Pipework:** PVC class 12 pressure pipe and fittings shall be used throughout the contract. All joints shall be solvent welded, unless otherwise specified. All pipes, fittings, solvent and cements shall conform to the appropriate codes. Specification: Section 14 – Irrigation (Design and Construction) Frankston City Council (Last Updated 16/08/00) Page 3 of 5

c) **Risers**: All risers shall be constructed using articulated joints, to minimize the risk of accidental breakage or leakage.

d) **Electrical Wiring**: The electrical wiring from the control panel to the solenoid valves shall be sized according to the manufacturer's specifications. Wire connections to valves, and buried joints, shall be made by means of an approved wire connector - sealing cement system, e.g. "Gel-tite". All wiring shall be taped to the underside of the PVC pipe or housed in a separate conduit laid beside the PVC pipe. All above ground wiring shall be run in electrical conduit with appropriate tees and elbows as required. The location of the GPO for the controller should be confirmed by the Contractor.

e) **Valve Boxes**: All valves shall be located in durable, lockable, valve boxes with free draining material below the pipework, i.e. gravel. All valve box locations shall conform to the designated valve schedule, shown on the drawings. Valve boxes shall be of lockable non-metal construction.

f) **Electrical Conduit:** Above ground wiring shall be installed in electrical conduit and suitably supported with brackets as specified to conform to the appropriate codes.

g) **Copper Tube**: Exposed copper tube and installations below paving shall be of Type 'A' and sized accordingly to the design requirements. Copper tube installed elsewhere shall be of Type 'B' and sized according to the design requirements.

h) **Control Panel**: (to be confirmed by Frankston City Council) The control panel shall be as specified housed in a metal lockable cabinet where specified. The location of the control panel should be confirmed by the Contractor and approved by the Superintendent. The GPO shall be located inside the lockable cabinet.

The control panel shall have the following features: -

- ✓ A 24-hour clock (with provision for starts at any hour).
- ✓ A 7 day calendar (with provision for starts on any day)
- ✓ Independent timing for each station.
- ✓ Adjustable station timing.
- ✓ Manual over-ride control (to allow operation of any station at any time).
- ✓ Multiple program capacity
- ✓ Capabilities to include remote site controlling and moisture sensing.

1.3. Developing a project plan with tasks, responsibilities and Timelines

- Developing a Project Plan: What to Include?

- ✓ **An executive summary/project vision** – comprising a brief description of the project and clearly demonstrating the aims and objectives (e.g. SMART targets) of the project.
- ✓ **Details about the content and context of the project** – is it a new project, or does it build on Previous experience?
- ✓ **Key roles and responsibilities** – details of individuals involved in the design and delivery of the Project and the tasks assigned to them. Who is ultimately responsible for the project and final decisions e.g. the principal funding applicant. This is extremely important for any project, but even more so when a project is a collaboration between different organizations. Keys tasks and deliverables required to achieve the objectives of the project (key tasks broken down into sub-tasks if required).

- ✓ **Resources necessary** to achieve the aims of the project, (real, virtual, people, organizations etc.)
- ✓ **Project timeline and key milestones** – all tasks put into a sensible order with sufficient timescales. Start and end dates should be clearly identified. Gantt charts are a useful planning tool for this:
- ✓ **Budget and Costing** – a budget showing a breakdown of all the project costs linked to key tasks and deliverables e.g. salaries, consultancy fees, communication with stakeholders, materials consumables, venue/access charges, events, equipment, travel & subs, consumables, evaluation etc.
- ✓ **Contingency plans** – allow time and budget for 'contingencies' and detail how any project issues and changes to the scope of the project will be managed. Risks to the project should be continuously assessed and mitigated for as far as possible.
- ✓ **Communication strategy/mechanisms** – how will communications with all stakeholders be managed? Including methods of and frequency of communication. This should also include plans for marketing and promotion, dissemination and sharing any learning.
- ✓ **Monitoring and evaluation strategy** – what are the intended impact(s) and outcomes, and how will you measure success?
- ✓ **Record keeping/document management system** –The person(s) responsible for record keeping and managing all the project documents (i.e. funding proposal, detailed project plan, interim reports, stakeholder communications, processes for change, health and safety documents etc.) needs to be

1.4. Ascertaining and selecting availability of skilled and semi-skilled man power

Employees are the most important asset for a business. They serve to create or promote an organization's culture, and they significantly affect the success of a business. In challenging economic times, the cost of hiring inefficient personnel may prove to be detrimental to the profitability of an organization. An effective and thorough manpower-recruiting process requires an employer to carefully choose the most talented employees who will positively benefit the organization or business.

- **The selection Process of skilled man power takes place in following order-**

1. **Preliminary Interviews-** It is used to eliminate those candidates who do not meet the minimum eligibility criteria laid down by the organization. The skills, academic and

family background, competencies and interests of the candidate are examined during preliminary interview. Preliminary interviews are less formalized and planned than the final interviews. The candidates are given a brief up about the company and the job profile; and it is also examined how much the candidate knows about the company. Preliminary interviews are also called screening interviews.

2. **Application blanks-** The candidates who clear the preliminary interview are required to fill application blank. It contains data record of the candidates such as details about age, qualifications, reason for leaving previous job, experience, etc.
3. **Written Tests-** Various written tests conducted during selection procedure are aptitude test, intelligence test, reasoning test, personality test, etc. These tests are used to objectively assess the potential candidate. They should not be biased.
4. **Employment Interviews-** It is a one to one interaction between the interviewer and the potential candidate. It is used to find whether the candidate is best suited for the required job or not. But such interviews consume time and money both. Moreover the competencies of the candidate cannot be judged. Such interviews may be biased at times. Such interviews should be conducted properly. No distractions should be there in room. There should be an honest communication between candidate and interviewer.
5. **Medical examination-** Medical tests are conducted to ensure physical fitness of the potential employee. It will decrease chances of employee absenteeism.
6. **Appointment Letter-** A reference check is made about the candidate selected and then finally he is appointed by giving a formal appointment letter.

1.5. Checking availability of materials with suppliers

- ***Sources and Availability of Raw Materials and Supplies***

The purchase price of these raw materials and other materials fluctuates depending on the supply-demand situation, as well as the rising cost of certain raw materials and fuel, among others. We work hard to lessen the effect of these fluctuations and to absorb rising costs by making steady internal improvements, including cost reductions.

- **Supplier selection process**

Choosing the right supplier involves much more than scanning a series of price lists. Your choice will depend on a wide range of factors such as value for money, quality, reliability and service. How you weigh up the importance of these different factors will be based on your business' priorities and strategy. This guide illustrates a step-by-step approach you can follow that should help you make the right choices. It will help you decide what you need in a supplier, identify potential suppliers and choose your supplier.

1. Thinking strategically when selecting suppliers
2. What you should look for in a supplier
3. Identifying potential suppliers
4. Drawing up a shortlist of suppliers
5. Choosing a supplier
6. Getting the right supplier for your business

1. Thinking strategically when selecting suppliers

The most effective suppliers are those who offer products or services that match - or exceed - the needs of your business. So when you are looking for suppliers, it's best to be sure of your business needs and what you want to achieve by buying, rather than simply paying for what suppliers want to sell you. For example, if you want to cut down the time it takes you to serve your customers, suppliers that offer you faster delivery will rate higher than those that compete on price alone.

2. What you should look for in a supplier

Remember - if they let you down, you may let your customer down

- **Reliability**
- **Quality**-The quality of your supplies needs to be consistent - your customers associate poor quality with you, not your suppliers.

- **Value for money-**The lowest price is not always the best value for money. If you want reliability and quality from your suppliers, you'll have to decide how much you're willing to pay for your supplies and the balance you want to strike between cost, reliability, quality and service.

- **Strong service and clear communication:** You need your suppliers to deliver on time, or to be honest and give you plenty of warning if they can't. The best suppliers will want to talk with you regularly to find out what needs you have and how they can serve you better.
- **Financial security**: It's always worth making sure your supplier has sufficiently strong cash flow to deliver what you want, when you need it. A credit check will help reassure you that they won't go out of business when you need them most.
- **A partnership approach**: A strong relationship will benefit both sides. You want your suppliers to acknowledge how important your business is to them, so they make every effort to provide the best service possible. And you're more likely to create this response by showing your supplier how important they are to your business.

3. Identifying potential suppliers

Here are five tips for finding the right suppliers for your raw materials or other company procurement requirements.

A. SET YOUR CRITERIA.

Create a list of the supplier's selection criteria that companies need to fulfill to be able to provide you with the items you need. This could include issues like:

- ✓ Lead times from receipt of your order to delivery
- ✓ Minimum and maximum order quantities
- ✓ Storage and handling facilities
- ✓ Specific methods of delivery
- ✓ Quality assurance processes
- ✓ Payment terms and conditions
- ✓ Return policy
- ✓ Contactable references

Setting the criteria in advance will enable you to evaluate potential suppliers on each of the listed items and ensure that you don't overlook any important requirements.

B. DEFINE YOUR PROCESS.

Identify the methods that you will use to find suitable suppliers. Decide whether you will publish your requirements in trade publications and call for bids, or whether you will approach selected companies directly for proposals and estimates. Allocate a time frame for conducting your supplier's selection process. Appoint qualified members of your team to review the proposals and recommend a short list of suppliers to choose from.

C. CALL FOR BIDS.

Put out a call for bids according to the selection process you chose. This could be a Request for Proposal (RFP) or a Request for Quotation (RFQ). Whatever form it is, it should include full details of the products or services you need, along with quantities, delivery dates, and quality standards identified in your criteria. Ask bidders to provide detailed information on the processes they use, the stability of their raw material suppliers (if applicable), and reasons why you should choose them.

D. EVALUATE THE BID SUBMISSIONS.

Compare each submission you receive against a checklist of criteria for suppliers and question any items that appear to be lacking in clarity. The American Society for Quality suggests taking steps to ensure the validity of the submission. Review the scope of the services outlined in the proposal and consider whether they match your requirements. Decide on each criteria's importance and score all submissions against this for an objective method of evaluation. Identify what the agreement or contract period with each potential supplier comprises to ensure you aren't drawn into a situation that could be damaging to your business.

E. MONITOR THE SUPPLIER PERFORMANCE.

Even the most reliable supplier can occasionally slip up. Make sure they have a direct contact point at your company and conduct regular performance reviews. This will help you keep tabs on their work and make sure they're fulfilling their end of the agreement. These reviews will also help you when it comes time to talk about contract renewal, so you know where you stand. Following these tips will enable you to successfully select suppliers who can support your business requirements by delivering the appropriate goods and services you need on time and

within budget. This will help you improve your productivity and ensure you produce quality goods/services.

4. DRAWING UP A SHORTLIST OF SUPPLIERS

Once you've got a clear idea of what you need to buy and you've identified some potential suppliers, you can build a shortlist of sources that meet your needs.

When considering the firms on your shortlist, ask yourself the following questions:

- ✓ Can these suppliers deliver what you want, when you want it?
- ✓ Are they financially secure?
- ✓ How long have they been established?
- ✓ Do you know anyone who has used and can recommend them?
- ✓ Are they on any approved supplier lists from trade associations or government?

Do some research and try to slim your list down to no more than four or five candidates. It's a waste of time for you and the potential supplier if you approach them when there's little chance of them fulfilling your requirements.

5. CHOOSING A SUPPLIER

Once you have a manageable shortlist, you can approach the potential suppliers and ask for a written quotation and, if appropriate, a sample. It's best to provide them with a clear brief summarizing what you require, how frequently you'll require it and what level of business you hope to place.

✓ Get a quotation

It's worth asking potential suppliers to give you a firm price in writing for, say, three months. You can also ask about discounts for long-term or high-volume contracts.

✓ Compare potential suppliers

When you've got the quotation, compare the potential suppliers in terms of what matters most to you. For example, the quality of their product or service may be most important, while their location may not matter. Price is important, but it shouldn't be the only reason you choose a supplier. Lower prices may reflect poorer quality goods and services which, in the long run, may not be the most cost effective option. Be confident that your supplier can make a sufficient margin at the price quoted for the business to be commercially viable.

Check that the supplier you employ is the one that will be doing the work. Some suppliers may outsource work to subcontractors, in which case you should also investigate the subcontractor to determine if you are happy with this arrangement. Wherever possible it is always a good idea to meet a potential supplier face to face and see how their business operates. Understanding how your supplier works will give you a better sense of how it can benefit your business. And remember that your business' reputation may be judged on the labor practices of your suppliers. It makes good business sense to consider the ethical dimensions of your supply chain.

✓ **Negotiate terms and conditions**

Once you've settled on the suppliers you'd like to work with, you can move on to negotiating terms and conditions and drawing up a contract. See our guide on how to negotiate the right deal with suppliers.

6. GETTING THE RIGHT SUPPLIER FOR YOUR BUSINESS

Know your needs: Make sure you know what you need. Don't be tempted by sales pitches that don't match your requirements. Understand the difference to your business between a strategic supplier, who provides goods or services that are essential to your business - such as high-value raw materials - and non-strategic suppliers who provide low-value supplies such as office stationery. You will need to spend much more time selecting and managing the former group than the latter.

Spend time on research: Choosing the right suppliers is essential for your business. Don't try to save time by buying from the first supplier you find that may be suitable.

Ask around: People or other businesses with first-hand experience of suppliers can give you useful advice.

Credit check potential suppliers: It's always worth making sure your supplier has sufficiently strong cash flow to deliver what you want, when you need it. A credit check will also help reassure you that they won't go out of business when you need them most.

Price isn't everything: Other factors are equally important when choosing a supplier - reliability and speed, for example.If you buy cheaply but persistently let down your customers as a result, they'll start to look elsewhere.

Agree on service levels before you start: It's a good idea to agree on service levels before you start trading so you know what to expect from your supplier - and they know what to expect from you. See our guide on how to manage your suppliers.

Don't buy from too many suppliers... It will be easier for you to manage - and probably more cost-effective - if you limit the number of sources you buy from. This is particularly the case with low value-added suppliers.

...**but don't have just a single supplier:** It's always worth having an alternative supply source ready to help in difficult times. This is particularly important with regard to suppliers strategic to your business' success.

1.6. Assessing site access limitations

"Site" means the land and other places on, under, in or through which the permanent Works or Temporary Works designed by the Engineer are to be executed and any other lands and places provided by the Employer for working space or any other purpose as may be specifically designated in the Contract as forming part of the Site. The Contract Manager and his Delegated staff must be allowed access to the Site and any place where work in connection with the Contract is carried out Access to Water & Sanitation.

- ✓ **Sanitation Facilities**

It is common for many international organizations to use access to safe drinking water and hygienic sanitation facilities as a measure for progress in the fight against poverty, disease, and death. It is also considered to be a human right, not a privilege, for every man, woman, and child to have access to these services.

- ✓ **Drinking Water Sources**

According to the World Health Organization and UNICEF, in 2010, 89% of the world's population used drinking water from improved sources (54% from a piped connection in their dwelling, plot or yard, and 35% from other improved drinking water sources), leaving 780 million people lacking access to an improved source of water . Access to safe drinking water is measured by the percentage of the population having access to and using improved drinking water sources. Improved drinking water sources should, but do not always, provide safe drinking water, and include:

- ✓ Piped household water connection

- ✓ Public standpipe
- ✓ Borehole
- ✓ Protected dug well
- ✓ Protected spring
- ✓ Rainwater collection
- ✓ Unimproved drinking water sources include:
- ✓ Unprotected dug well
- ✓ Unprotected spring
- ✓ Surface water (river, dam, lake, pond, stream, canal, irrigation channel)
- ✓ Vendor-provided water (cart with small tank/drum, tanker truck)

1.7. Advising relevant authorities and controlling construction work

According to the Project Management Institute (PMI), project management is "the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality, and participating objectives." You can extend PMI's definition to construction project management, wherein a construction project manager uses the same model to achieve the same goal, only in a construction context. At its most fundamental level, construction project management handles the planning, coordination, and execution of a construction project, whether it's agricultural, residential, commercial, institutional, industrial, heavy civil, or environmental.

Construction project management typically includes complicated tasks that can shift wildly, depending on the work at hand, and it requires strong skills in communication, deep knowledge of the building process, and the ability to problem-solve. Construction project management is a complex field, requiring knowledge in many different areas like finance, mediation, law, business, and more.

- **Materials Management**

Materials management is an important element in project planning and control. Materials represent a major expense in construction, so minimizing procurement or purchase costs presents important opportunities for reducing costs. Poor materials management can also result in large and avoidable costs during construction. First, if materials are purchased early, capital may be tied up and interest charges incurred on the excess inventory of materials. Even worse, materials may deteriorate during storage or be stolen unless special care is taken. For example, electrical

equipment often must be stored in water proof locations. Second, delays and extra expenses may be incurred if materials required for particular activities are not available. Accordingly, insuring a timely flow of material is an important concern of project managers.

Materials management is not just a concern during the monitoring stage in which construction is taking place. Decisions about material procurement may also be required during the initial planning and scheduling stages. For example, activities can be inserted in the project schedule to represent purchasing of major items such as elevators for buildings. The availability of materials may greatly influence the schedule in projects with a fast track or very tight time schedule: sufficient time for obtaining the necessary materials must be allowed. In some case, more expensive suppliers or shippers may be employed to save time.

Materials ordering problems lend themselves particularly well to computer based systems to insure the consistency and completeness of the purchasing process. In the manufacturing realm, the use of automated materials requirements planning systems is common. In these systems, the master production schedule, inventory records and product component lists are merged to determine what items must be ordered, when they should be ordered, and how much of each item should be ordered in each time period.

Self-Check 1	Written Test

Name: _____ Date: _____

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

1. Define the word specification and drawing? (5pts)
2. How can we develop a project plan?(5pts)
3. List the steps to select skilled man power?(5pts)
4. How can we decide potential material supplier?(5pts)

Note: satisfactory Rating: 10 and above pts. Unsatisfactory rating: below 10 pts

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

Information Sheet-2	Develop Methods For Implementing the Construction Operations

2.1 Establishing procedures for controlling and recording site deliveries

Site deliveries: It is important that deliveries are brought onto the site just in time**,** neither too early nor too late. Always provide a delivery date when an order is placed. Usually site deliveries are controlled and recorded using a delivery sheet and diary entries the goods. If some items are missing from the delivery, you need to phone the supplier. A subsequent delivery is then organized. Sometimes a company representative will be sent with the missing supplies. Occasionally, another order needs to be sent, quoting the same order number with an ' added to indicate that a delivery has been 'short' in the goods received. The process is similar for larger builders but often they have a delivery acceptance slip to be filled in by the site supervisor which is then forwarded to the site office.

Small builders generally do not have set delivery procedures as the builder is frequently not on-site when deliveries are made. However, it is important to physically check each delivery against the delivery sheet at the earliest possible opportunity. Every item on the delivery sheet should be located and ticked off on the sheet. If your sub-contractors are reliable, they may notify the builder when a delivery arrives. If the builder is not able to be present for the delivery, the delivery sheet can be collected next time the builder is on-site. Usually the delivery sheet is left in a sealed envelope with the goods. Delivery method: There are many approaches to achieve successful project design and construction. The Delivery Methods are driven by the project's scope, budget, and schedule. Some of these methods include Traditional (Design/Bid/Build), Integrated Delivery Process (where all stakeholders have a financial incentive to work together to produce the desired results), CM (also called CMc, or Construction Manager), Design-Build, Bridging, Lease/Build and Lease Buy Back. The selection of a delivery method will in turn influence the team composition, schedule, budget, and management plans to be followed throughout the process. Excellence in Project Management with a successful outcome is achieved through a structured process that includes multiple phases:

- Initiation and Planning
- Execution
- Monitoring and Control
- Closeout

The process balances the key project constraints and provides a tool for making decisions throughout the project based on stakeholder values, performance metrics, established procedures and project goals. Effective project management includes strategies, tactics, and tools for managing the design and construction delivery processes and for controlling key factors to ensure the client receives a facility that matches their expectations and functions as it is intended to function. Improvements in building quality directly contribute to reduced operational costs and increased satisfaction for all of the stakeholders. Successful project delivery requires the implementation of management systems that will control changes in the key factors of scope, schedule, budget, resources, and risk to optimize quality. It is critical to establish the qualities of the project that are necessary to satisfy client and end user needs and expectations, once it is delivered and in use. Value for the money in construction requires completing a project on time,

on budget and to a level of functionality that meets the determined needs. A well-programmed project will continue to provide value and meet user needs throughout its lifetime and will contribute positively to the environment in which it is located with a wide range of social and economic benefits. Early investment in planning, programming, and design can help deliver these benefits and avoid unnecessary costs and delays. Responsibility for delivering a project as planned rests with the entire team. When evaluating options, the whole-life value should be considered and not limited to the short term initial investment. Factors that affect the longer term costs of a facility, such as maintainability, useful service life, and resource consumption should be integrated into the decision matrix.

- **Project Delivery Teams**—How to assemble and effectively manage the project team.
- **Risk Management**—Provides details on how risk analysis is used as an organized method of identifying and measuring risk.
- **Building Commissioning**—provides an overview of commissioning drivers, benefits, goals, and principles for improving building quality.

Schedule Management: A project schedule establishes a timeline for delivering the project and most importantly, the project activities and their respective inter-relationships. Avoiding missing deadlines for delivery of key project components is a key objective of schedule management. Comprehensive project schedules will identify all of the project's stages, phases, and activities assigned to each team member mapping them to a timeline that measures key dates that are used to keep track of work progress. Schedule management interfaces directly with scope, cost, and quality optimization and team member roles and activities must be defined, coordinated, and continually monitored. It is the goal of every project manager to look for efficiencies in all of these areas as a project progresses. The materials for delivery to and from a construction site may be broadly classified as : (1) bulk materials, (2) standard off-the-shelf materials, and (3) fabricated members or units. The process of delivery, including transportation, field storage and installation will be different for these classes of materials. The equipment needed to handle and haul these classes of materials will also be different. Bulk materials refer to materials in their natural or semi-processed state, such as earthwork to be excavated, wet concrete mix, etc. which are usually encountered in large quantities in construction. Some bulk materials such as earthwork or gravels may be measured in bank (solid in situ) volume. Obviously, the quantities of materials for

delivery may be substantially different when expressed in different measures of volume, depending on the characteristics of such materials.

2.2 Establishing procedures for recording the construction progress

The Contractor shall give written notice to the Engineer whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval, is issued by the Engineer within a reasonable time. The notice shall include details of the drawing or order required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late. During the progress of the works the Contractor shall keep the site reasonably free from all unnecessary obstruction and shall store or dispose of any Constructional Plant and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.

Project Recordkeeping and Documentation

General: The Chief Inspector is responsible to ensure that all forms and reports documenting the contractors work, as well as those that may be required by other units of the Department and State and Federal agencies, are accurate and complete. Notes and explanations must supplement the records, if needed, to make the records as clear and complete as possible. At the end of the workday, project records are to be kept in a secure location. Volume III records should always be stored in the fireproof safe if one is available, when not in use. Other records should also be kept in the safe if there is sufficient room.

The Department's standardized system for recording and documenting construction work is presented in this section. Project records must be accurate and complete. They may be subject to detailed review and audit by State and Federal personnel at any time, even years after project completion, and they may also be required for court-claim action.

Some guiding principles are as follows:

- ✓ The records should be complete, but sufficiently simple and clear that an informed layman can understand what is presented.
- ✓ Full signature and printed name is required on all prepared forms and attached notes, including but not limited to inspectors, project engineer, checked by names, etc.
- ✓ All computations for payments for metric projects must be made in metric units. Conversions of computations made in English units to metric units are not permitted. Computations for projects designed in English units will remain in English units.

Documentation: The Technical Specification includes documentation and reporting requirements. Contractor's documentation must cover all aspects of program activities, and includes**, Daily** Inspection Reports and Daily Test Reports. After approval by the CM, the Contractors will document the activities.

Beyond the data reporting required procedures conducted to confirm that construction activities meet applicable design criteria, plans and specifications included on a routine basis in the monthly progress reports under the CD.

Daily record keeping: Project documents will be managed through a combination of a secure document filing and storage system and a computerized document tracking system. Sufficient records shall be prepared and maintained as work is performed to furnish documentary evidence of the quality of construction and laboratory analysis and of activities affecting quality. Each contractor technician shall maintain a daily log of all inspections performed for both contractor and subcontractor operations on a form acceptable to the work. The Daily Inspection and Daily Test reports shall be signed by the responsible body

Daily construction report: A daily construction report will be prepared and signed by each field expert. The report will include a summary of the contractor's daily construction activities. Supporting inspection data sheets will be attached to the daily report where needed.

At a minimum, the daily construction report will include the following information:

- Date, project name, location, and other identification
- Description of weather conditions, including temperature, cloud cover, and precipitation
- Reports on any meetings held and their results
- Record of visitors to site
- Locations of construction underway during that day
- Equipment and personnel working in each activity, including subcontractors
- Descriptions of work being inspected
- Decisions made regarding approval of units of material or of work, and corrective Actions to be taken
- Description of problems or delays and resolution
- Communications with contractor staff
- Construction activities completed and/or in progress
- Progress photos, where applicable
- Signature of the report preparer

Report the following information of construction progress

1. **Concept:** All construction projects begin with planning and design
   - ✓ **Planning:** During the initial stages of the design process,
   - ✓ **Schematic Plans:** Schematic plans are the first plans of a facility and show the interrelationship between spaces and activities.

2. **Contracts and Bid Documents:** In order to solicit construction bids, the contractor must provide potential bidders with working drawings and plans for the proposed installation.
3. **Bidding:** The third stage of the construction process is bidding. Once an owner determines that a project is feasible and that construction financing is available, the owner will solicit bids or proposals from general contractors and/or specialty contractors.

The following is the sequence of events to prepare a contract bid:

- ✓ The contractor obtains a copy of the plans and specifications from the owner in order to prepare a formal estimate of the construction cost or bid (experienced construction personnel prepare the bids).
- ✓ The contractor reviews the contract plans and specifications to determine how to build the project and to consider all the limitations or conditions the owner requires for the project.
- ✓ The contractor solicits bids from subcontractors, estimates their direct material and labor costs, and evaluates the ultimate profit potential of the contract. The amount of the bid covers the estimated costs and a profit for the construction project.
- ✓ The owner evaluates all of the submitted bids and then awards the contract.
- ✓ The contract document and specs contain the project start and completion dates, the progress billing procedures, the insurance requirements, and other pertinent information.

4. **Construction:** The fourth stage of the construction process, called fieldwork, is the actual construction of the project. Fieldwork is broken down into building permits, subcontractors, scheduling subcontractors, shop drawings, project submissions, and change orders.
5. **Construction Payments:** The fifth stage of the construction process is the construction payments stage. All construction contracts extend over a period of time. The order of any business operation is to collect money as soon as work is complete. When a contractor

completes a prescribed amount of work, the owner pays the contractor for the completed work.

6. **Completion:** the final phase of the construction process is known as the completion stage, and it readies the installed sprinkler or drip for occupancy.

2.3. Following quality control method

Quality Control Activities: Quality control activities should be conducted throughout the course of the project. Calculations, estimates, etc. must be checked immediately so that errors are not perpetuated. The checker must have a similar or greater level of experience as the originator, should be a member of the project team familiar with the details of the project, and must be familiar with the type of work proposed for the project.

Quality Control Methods

- **Quality Assurance:** this method covers activities such as development, design, production, servicing, and production Quality assurance can also cover areas of management production, inspection, materials, assembly, services and other areas related to the quality of the product or service.

- **Failure Testing**: this method involves testing a product until it fails It can be placed under different stresses such as humidity, vibration, temperature, etc. This method will expose the weaknesses of the product in question.

- **Statistical Control:** almost all manufacturing companies use statistical control. This process involves randomly sampling and testing a portion of the output.

- **Company Quality:** with management leading the quality improvement process and other departments following, a successful product or service will emerge

- **Total Quality Control:** measure used in cases where sales decrease despite implementation of statistical quality control techniques or quality improvements.

Responsibility of Contractor for Quality Conformity

All material incorporated and all workmanship performed strictly in conformity with their requirements of the specifications and the contractor shall be responsible for the quality of the works in the entire construction within the contract. Materials control (including raw materials, finished products, semi-finished products, components and parts) are material conditions of construction, and material quality is one of necessary conditions to ensure construction quality.

2.4 Establishing Occupational Health and Safety (OHS) procedures, including hazard/risk management.

Contractor Employee Involvement

All contractor employees are expected to perform their duties safely and comply with all applicable laws and regulations (local, state and federal).Employees are encouraged to freely discuss their safety concerns with their immediate supervisors or the University of Rhode Island's Safety Representative. All employees are charged with personal responsibility for safe behavior. Unsafe acts will not be tolerated.

Training: Safety training is an integral part of this safety program. Contractors are expected to educate their employees on the basic elements of this manual as well as other applicable regulatory requirements.

Injury Management/Early Return-to-Work: All contractors/subcontractors are expected to return any injured employee to a productive Environment as soon as possible after an injury. Contractors must evaluate each lost-time injury and review the restrictions placed on each injured employee by his/her medical provider. If modified work can be found within the assigned restrictions on site, contractors/subcontractors must provide employment within those restrictions.

Safety orientation: All contractors shall ensure that their employees receive safety orientation prior to starting work. Each contractor shall maintain, and make available for inspection, records of such safety orientation and training. The orientation shall consist of the written format specified on the attachment on the next to any job specific information.

Safety Orientation: It is our intention to provide and maintain a totally safe site. Your commitment to safety is a condition for continuous employment on this project.

First Aid: All injuries are to be reported to the general contractor's representative immediately.

- Injuries requiring a doctor's care will require a drug screen and a medical authorization form from your supervisor.

- If we have an employee injured on our job we want the best medical care possible. However, if we have an injury that we suspect is fraudulent we will spare no expense investigating and prosecuting.

Protective Equipment:

Head Protection: Hardhat must be worn at all times (with the bill to the front) once entering the work area. Areas of exception are offices, equipment with fully enclosed cabs, lunch and break periods provided no work is going on in the immediate area.

Eye And Face Protection: Appropriate eye protection with side shields is required to be worn by all personnel on the construction site at all times. Prescription glasses must be approved safety glasses, approved glasses and frames, or approved eye protection.

- When grinding or buffing, a face shield with approved safety glasses will be required.
- When cutting or burning, goggles will be required.
- When welding, a welding hood and lens with an appropriate number filter.
- Chemical goggles are required to be worn when working with corrosive or toxic material.

Respiratory And Hearing Protection: Respiratory and/or hearing protection is required in designated areas and or when performing specific tasks.

· Employees must be clean-shaven prior to using a respirator.

Fall Protection/Tie-Off: A 100% tie-off policy is in effect anytime you are exposed to a potential of fall in more than 6 feet to a lower level. An approved fall arrest system will be worn when working from unprotected elevations greater than 6 feet and when working in powered man-lifts.

- Approved fall arrest system consists of a full body harness, two shock absorbing lanyards, each with double action or positive locking snap hooks**.**
- Any lifeline, safety harness, or lanyard actually subjected to fall loading shall be removed from service.

Lockout/Tag out: Lockout/Tag out the power source prior to making adjustments or Repairs to any equipment. Work is completed to supervisor's satisfaction and in accordance with Occupational Health and Safety requirements.

Why is occupational health and safety important?

- Work plays a central role in people's lives, since most workers spend at least **eight hours** a day in the workplace, whether it is on afield, in an office, factory, etc. Therefore, work environments should be safe and healthy

Some ways to identify hazards and control risks:

1. Talk with workers (including contractors) who are or will be performing any tasks to identify all potential hazards and the best ways to eliminate or reduce risk.

2. Make sure you are aware of any high risk activities, work with new machinery or new work processes before they happen.

3. Understand the hazards associated with tasks you supervise and have risk controls in place before work starts. This could mean preventing work from being done while a safety issue is being resolved.

4. Take action to resolve health and safety issues as soon as possible. This includes escalating the issue to more senior management if necessary. Once agreement is reached on how to fix a problem, implement it as soon as possible.

Identifying workplace hazards: In order to manage workplace health and safety and help prevent accidents and sickness absence, it's important to identify, monitor and reduce the risk associated with workplace hazards.

How to prevent workplace hazards: The best way to protect yourself and your employees from workplace hazards is to identify and manage them and take reasonable steps to prevent their potential to harm. In order to control workplace hazards and eliminate or reduce the risk, you should take the following steps:

- ✓ identify the hazard by carrying out a workplace risk assessment;
- ✓ determine how employees might be at risk;
- ✓ evaluate the risks

2.5.1. Establishing procedures for environmental issues

The environmental impact assessment (EIA) process makes sure that environmental issues are raised when a project or plan is first discussed and that all concerns are addressed as project gains momentum through to implementation.

The main steps in the EIA process are:-

- ➢ Screening-is the process of deciding on whether an EIA is required.

- Scoping-is the process of determining which are the most critical issues to study and will involves community participation to some degree.
- Prediction and mitigation-once the scoping exercise is complete and the major impact to be identified, prediction work can start and take measures which minimize any identified impact and enhance positive impacts.
- Management and monitoring –referred as environmental action plan. The purpose of monitoring is to compare predicted and actual impact.
- Audit- it includes an analysis of the technical, procedural and decision making.

2.5.2. Identifying adverse environmental impacts of irrigation Construction

The effects of the dam on the climate and life conditions of the region, the protection of the ground water balance for agriculture (salting),

- ✓ the submergence of historical sites
- ✓ the deterioration of the natural structure of the region

One of the important factors in the selection of the dam site is the valley shape. The valley types constitute an important criterion for determining the types of dams to be built on them. The shape of a valley, the valley in opening the geological units of properties, valley opens factor (glacial, river) valley height, the stream flow system, varies depending on the grooves in the stage of the valley formed phase. According to the shape and width of the valley, some dam types are not considered at all. For example, concrete arch dam is not made on a wide valley.

Mitigation and enhancement measures

The focus of this section is to suggest appropriate measures in order to avoid and/or minimize negative and enhance positive impacts of the proposed actions. Mitigation and enhancement measures should be project specific and take in to account various issues such as cost, views of stakeholders involved in the EIA process.

The main types of mitigation and enhancement approaches which need due considerations are the following:

- Prevention or minimization of impacts,
- Elimination or reduction of adverse impacts,
- Rehabilitation or restoration of environmental damage,

2.5.3 Incorporating legislative and environmental procedures into planning

The environmental planning is the process of facilitating decision making to carry out land development with the consideration given to the natural environment, social, political, economic and governance to achieve sustainable outcomes. A major goal of environmental planning is to create sustainable communities, which aim to conserve and protect undeveloped land.

The main elements of environmental planning are:-

- social and economic development
- Urban development
- Regional development
- Natural resource management and integrated land use.

Self-Check 2	**Written Test**

Name: _____ **Date:** _____

1. ***Directions:*** **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.**
   1. What the main steps in the EIA process**?** (5pt)
   2. List the quality control system comprises? (5pt)
   3. Define project record keeping and documentation? (5PT)
   4. What are the Mitigation and enhancement measures of environmental impact**?** (5PT)

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

   You can ask your teacher for the copy of the correct answer.

Information Sheet-3	**Prepare project schedule for irrigation installation and construction**

3.1 Preparing construction operations in sequence

A project schedule: is a strategic and an important tool in a project manager's portfolio for guiding a project successfully to its target completion date. For simple projects, a project schedule is basically a timeline or calendar which lists tasks and activities with expected start and finish dates. For more complex projects, a project schedule can be layered with different details to enable project managers to direct and manage resources more smoothly, communicate more frequently and effectively with stakeholders, and identify and monitor dependencies and constraints between tasks to avert preventable delays. The project schedule can be expressed in

several display forms depending upon the purpose of the schedule, the stage of the development of the project, and the primary user of the schedule.

Types of Project Schedules

The three most common types of project schedules are the master project schedule, the milestone schedule, and the detailed schedule.

- **Master Project Schedule**

Developed in the initial phase of project planning, the master project schedule is a summary level schedule which highlights the principal activities and tasks and their estimated duration. This schedule's strength lies in its ability to aggregate individual activity schedules and display them in one convenient document. The schedule can serve as an early communication tool for building buy-in for the project with upper level management and external stakeholders. The schedule is also useful for facilitating team brainstorming during the initial phrases of the project to work out logistics. For more information on master project schedules, continue reading this article explaining how to create a master project schedule.

- **Milestone Schedule**

As an advanced schedule, a milestone schedule is often referred to throughout the project's life cycle. The milestone schedule is a summary level schedule that allows the project team leader to review and identify all of the significant and major project related milestones that may surface during the course of a project. A milestone is a significant event in the project usually marked by the completion of a major deliverable. Because of its visually-pleasing format, the milestone schedule is recommended for reporting status reports to top level management and external stakeholders. The milestone schedule is also useful during team assessments, particularly for newly-formed teams to give them an opportunity to take pride in their accomplishments, reflect upon their setbacks, and most importantly bond as a team.

- **Detailed Project Schedule**

Detailed schedules are operational schedules intended to help front line managers in directing hourly, daily, or weekly project work. The detailed schedule is considered the execution playbook for the project. Analogous to a football playbook that can be broken down into activities (passes and runs) for the two sides of the game (offense and defense), the detailed project schedule playbook can be broken down into chapters to show the detailed schedule for each activity or each phase of the project as it unfolds.

Ways to Display Project Schedules

One aspect of project planning and project management that is often overlooked is effectively communicating the project schedule to the various project stakeholders. Although presenting a one page schedule list to the core team may be sufficient, the use of visual representations of the schedule is highly recommended when presenting the schedule to upper level management and external stakeholders. The most common display options for presenting a project schedule are the summary table, Gantt chart, and network diagram.

A summary table in its most basic form is an action list of the tasks and completion dates.

A Gantt chart is the most common form for representing a project schedule. A Gantt chart can show a wealth of information and is often used to visually compare actual progress against estimated or baseline completion dates. For more information on how to create Gantt charts, continue reading these articles on creating Gantt charts in Excel 2007 and Microsoft Project 2007.

A network diagram is another type of graphical representation that uses nodes and arrows to show interrelationships between events and activities and predecessor/successor indicators to show resource constraints. The network diagram is superior in highlighting the critical path of a project and to show the project's logic flow from start to finish. For more information, this article on examples of network diagrams provides more detail on the two main types of network diagrams.

To compare the different display options for the same project schedule, click on the images below to see each illustration of a five task project that includes critical path information, a milestone marker, and slack time. You can also download, print, and modify these charts and diagrams from an Excel document located here in the Media Gallery.

Sequence of construction operations

Site Preparation

Initial clearing and grading work on a site requires attention to a fairly common set of general goals:

- Minimize site disturbance to preserve and maintain existing vegetative cover
- Limit the number of access points to the site to control off-site mud tracking
- Phase and sequence construction activities by dividing the project into logical work zones
- Locate temporary and permanent soil disposal areas, haul roads, and construction staging areas
- To minimize erosion, sediment transport, and disturbance to existing vegetation
- Install sediment barriers and controls before land clearing and grading wherever possible

- Get to final grade, seed and mulch as soon as you can Construction site work includes clearing, grading, and preparing the site for built features like roads, utilities, buildings, parking lots, and the site drainage system.

This section covers a broad range of site preparation tasks including land grading, installation of the construction exit, topsoil storage, identifying buffer zones around drainage features, and initial preparation of soil surfaces by roughening. For more information about designing construction projects that cost less and minimize water resource impacts, see the

The normal sequence for basic site preparation work begins with the installation of controls before clearing and excavation work and ends with all bare areas covered with grass, gravel, or built surfaces, and stable ditches with functioning storm water systems.

Planning the clearing, grubbing, and site preparation work is necessary, especially for larger sites. Written plans—even very basic ones—help to ensure that everyone understands where the active work zones are, various activity phases, and the schedule. Contractors and equipment operators should understand erosion control plans developed by engineers and be prepared to adapt the controls as the job progresses. Key control points are areas of concentrated runoff and sheet runoff Construction Activity

- **Scheduling Considerations**

Identify work zones and construction phases by analyzing proposed cut/fill work, location of proposed structures, site conditions, and site resources Construction phase and work zone identification will ensure that land clearing and grading exposes a minimum amount of soil at any one time. Identify and flag off areas to be protected, such as buffer zones near creeks or

Sinkholes, drainage features, vegetated filter strips, mature trees, and so on.

All areas should be flagged and posted before land clearing and grading begins. Install construction entrance/exit and designate vehicle parking areas First land disturbing activity. Use geo textile liner under rock to maintain effectiveness; stabilize bare areas as soon as Possible. Install up gradient diversion swales or berms.

Entering operations into a manually prepared schedule or computer based software package

- **Project Management Software**

There are many software options available to assist in the management of a project or program of work. A key point in making a selection is ease of use-some programs are designed to handle very complex situations while others are more straightforward and user-friendly. Keeping in mind the end-user and information required to be generated will help in selecting a system that is scaled

appropriately for the project at hand. Generally, all will require a Work Breakdown Structure (WBS) to be created within the system, breaking down the entire project or program into manageable pieces. The WBS can be customized to suit the agency's needs, and should be consistent across budgeting, scheduling and construction management. Links to software tools available are provided in the Resources section below.

3.2 Entering operations into a manually prepared schedule or computer based software package

Irrigation scheduling, or irrigation water management, ensures that water is applied according to crop requirements and is consistently available to the plant. Proper irrigation scheduling will improve profitability by:

- Maximizing crop yield and quality
- Decreasing water lost through deep percolation and runoff
- Optimizing pumping costs and
- Improving water use efficiency

To effectively schedule irrigation operations/applications, four key pieces of information need to be known:

- Soil texture;
- Water holding capacity of the soil;
- Soil moisture content; and
- Crop water use at the specific development stage.

Another factor that should be considered within a scheduling program is the allowable moisture depletion for the specific crop. This is the percentage of available water that can be utilized prior to stressing the crop. The capacity of your irrigation system should also be considered. For scheduling purposes it is important to know how much water your system can apply in a given duration of time.

3.3 Adjusting time frame

In any irrigation construction work or operation before carrying out any construction irrigating activity we are expected to prepare an appropriate time frame for the work/task that we are going to undertake**.** Irrigation scheme is among the largest downstream control flows regulation devices that adjust inflow and outflow to feed programmable and to supply water during specific time slot.

Time delays during construction phase

From the study of related documents submitted in Project Implementation Unit (PIU) as evidences of construction delay, following reasons have been found significantly cited by the contractors and A/E Consultant for the extension of construction time period; these are also pertinent to all construction projects in Nepal in one or other way.

Delay factors beyond the Contractor's control

Following are the some delay factors, which was considered as out of the control of the contractors. Most of these delay factors are excusable for time extension but non-compensable and/or excusable with compensation in contract documents.

- Unavailability of local skilled workers (masons, carpenters, bar benders etc.)
- Seasonal unavailability of unskilled workers (during cropping and harvesting.)
- Unavailability of construction material (especially cement).
- Excess quantity of retaining wall construction.
- New design and construction method (different than traditionally carrying out work).
- Scope and master plan of the project changed, so extra work carried out.
- Lack of water and power supply.
- Severe cold/hot climate and monsoon rain (Cement related work/outdoor work not possible).
- Local community obstructions.
- Earthwork in excavation difficult due to soil nature.

Delay factors related to project participants acts

These types of delay factors are emerged, when the acts of project participants goes against the progress of the project. If the Owner's or Consultant's act retards the progress of construction work then, it could be excusable for time extension or compensable or both. But, at the same time, if it is the act of contractor results the retardation of work progress, then the contractor will be subjected to penalty for the liquidated damages. The delay factors due to participants' act are:

Self-Check 1	**Written Test**

Name: _____ Date: _____

Directions: Answer all the questions listed below.

1. What does irrigation project schedule mean, what is its purpose? (5pts)
2. List the main systems of irrigation construction operations and explain?(5pts)
3. How can we prepare an irrigation schedule which can improve profitability?(5pts)
4. What is the objective of adjusting time frame for any irrigation work?(5pts)

Note: Satisfactory rating – 10 points and above Unsatisfactory - below 10 points you can ask you teacher for the copy of the correct answers

Information Sheet-4	**Determine all the required resources for project**

What are resources in a project?

In project management terminology, resources are required to carry out the project tasks. They can be people, equipment, facilities, funding, or anything else capable of definition (usually other than labor) required for the completion of a project activity.

What is a resource management plan?

In organizational studies, resource management is the efficient and effective development of an organization's resources when they are needed. Such resources may include financial resources, inventory, human skills, production resources, or information technology (IT). Why is Resource Management important? In organizational studies, resource management is the efficient and effective deployment of an organization's resources when they are needed. Such resources may include financial resources, inventory, human skills, production resources, or information

Types of Essential Resources for Your Project

When you start your project you need to consider what resources are required to get it done.

The three types of essential resource that you should be considering for your project.

Projects can't start without…

- **People**

Human resources are required to get the project done. Normally a project team is a group of people and you won't be working alone. The team management part is often the hardest part of the project, especially if you haven't had to lead a team in the past. Managing their workload can be tricky too, as most of your project team members won't work solely on your project. They will have day jobs and may be involved in other projects at the same time. When you know what individuals you need it becomes a lot easier to do your resource planning, which should help you

balance those peaks and troughs of availability in the team. Spend some time thinking through the different skill sets that you need and the kind of tasks that are required on the project.

- **Capital**

Your project needs money, because it will need to pay for things, even if that is only your salary (let's assume that you aren't working on this project for free, although I know that does happen as people often volunteer to put their project management skills to good use for charities.

Generally, though, you'll be managing a budget on your project and this is one of the core skills for a project manager. You need to be confident handling the numbers, even if you never get your hands on any real cash!

Talk to your sponsor about their expectations for the money that needs to be spent. It's important that they have a realistic idea about how much the project will cost, and you can help them do that once you have undertaken some of the planning.

- **Material Goods**

Projects also use up assets. Assets, or goods, vary from project to project but it's highly likely that your project will need some kind of tangible resource. It's normally what you use the project budget to buy.

Examples include:

- Software licenses
- Hardware like technical infrastructure such as cabling or switches for the IT equipment
- Equipment or machinery (which you might hire for the life of the project or buy)

Resources of all types are important to get you project off the ground and successfully moving in the right direction. The more effort you put into thinking through the types of project resources you need and requesting them far enough in advance to ensure that they are ready for you when you need them, the easier it will be for you to complete your project on time, on budget and to the required specifications.

4.1 Determining temporary services and site

Temporary work or temporary employment refers to an employment situation where the working arrangement is limited to a certain period of time based on the needs of the employing organization. Temporary employees are sometimes called "contractual", "seasonal", "interim",

"casual staff", "outsourcing", "freelance"; or the word may be shortened to "temps". In some instances, temporary, highly skilled professionals (particularly in the white-collar worker fields, such as law, engineering, and accounting) refer to themselves as consultants.

Temporary workers may work full-time or part-time depending on the individual situation. In some instances, temporary workers receive benefits (such as health insurance), but usually benefits are only given to permanent employees as a cost-cutting measure by the employer to save money. Not all temporary employees find jobs through a temporary employment agency. With the rise of the Internet and 'gig economy' (a labor market characterized by the prevalence of short-term contracts or freelance work as opposed to permanent jobs), many workers are now finding short-term jobs through freelance marketplaces: a situation that brings into being a global market for work.

The non-productive activities associated with a project may or may not be paid by the owner, but they nevertheless take up potential labor resources which can otherwise be directed to the project. The non-productive activities include among other factors:

- Indirect labor required to maintain the progress of the project
- Rework for correcting unsatisfactory work
- Temporary work stoppage due to inclement weather or material shortage
- Time off for union activities
- Absentee time, including late start and early quits
- Non-working holidays

4.2. Input requirements and dates are selected and accessed.

Identifying the Required Resources

Once you have listed all the tasks required to undertake the project, you need to identify the resources required to complete each task, as shown in the table below:

Task Title	Resource	Effort
Enter the title of each Task in the project.	Enter details of the project team responsible for the completion of the Task.	Quantify the approximate amount of effort (days, weeks and months) required to complete the Task.

You now need to construct a Resource Plan, identifying all the resources needed to complete the project, eg: labor, equipment and materials. You should also produce a schedule indicating when

each resource will be used and note any assumptions and constraints made during the resource planning process. Many of the resources required should already be listed in the Business Case, Terms of Reference and Project Plan. For a small project it is sufficient to take each activity listed in the Project Plan and assign a resource to it. For larger or more complex projects a full Resource Plan may be needed to ensure that the type and amount of resources, and the schedules for their use are accurately identified.

- **The next section describes the creation of a Resource Plan in greater detail.**

Creating a Resource Plan: The first step is to produce a detailed list of all the individual resources needed to complete the project. Start by listing each of the major resource groups (eg: Labor, Equipment and Materials), then list the individual components of each group.

Labor: identify all the roles responsible for or involved with the completion of any activity specified in the Project Plan. Remember to include any external or contract staff that will be brought in for specific tasks.

Equipment: identify all the equipment which will be needed to complete the project, eg: office equipment (PCs, photocopiers, mobile phones etc.), telecommunications equipment (cabling, switches etc.) and machinery (heavy and light machinery).

Materials: consumables (eg: photocopy paper, stationery, ink cartridges) are often needed to complete project activities. Other materials (eg: wood, steel and concrete) may be needed to produce physical deliverables. Draw up a detailed list of all the materials required to complete the project. This should be as accurate as possible, since it will be used to produce the Resource Schedule and Expense Schedule.

Quantifying the Resource Requirements

Labor: Using the following table, list all the roles required to undertake the project. Identify the number of people required to fulfill each role. Describe the responsibilities and skills needed to undertake each role successfully. Also specify the timeframe during which the role will exist.

Role	Number	Responsibilities	Skills	Start Date	End Date
List each project role.	Identify the number of people required for each role.	Summarize the responsibilities for each role.	summarize the skills required to fulfill each role	Enter the start date for the role.	Enter the end date for the role.

Equipment: Use the following table to list each item of equipment required to complete the project. Quantify the amount of each item needed. Describe the purpose and specifications of each item and specify the timeframe for which the equipment will be required.

Item	Amount	Purpose	Specification	Start Date	End Date
List each item of equipment required.	Identify the amount of each item of equipment required.	Describe the purpose of each item.	Describe the specifications of each item.	List the date by which the equipment is needed.	List the date when the equipment can be released.

Material: Use the following table to list each item of material required to complete the project. Quantify the amount of each item needed and specify the timeframe during which the materials will be required.

Item	Amount	Start Date	End Date
List each item of material.	Quantify the amount of each item of material needed.	List the date by which the material item is needed.	List the date upon which the use of the material ends.

Constructing a Resource Schedule

You have now collected all the information required to build a detailed Resource Schedule. The next step is to list the labor, equipment, materials and any other resources needed to undertake the project, then identify the amount (ie: value) of each resource required during the periods it will be needed, in the following Resource Schedule.

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
labor													
labor Type													
Equipment													
Equipment Type													

Materials													
Material Type													

A detailed Resource Schedule enables a Project Manager to identify the total quantity of each type of resource needed on a daily, weekly and monthly basis.

Assumptions

List any assumptions made during this resource planning process, eg:

- The scope of the project will not change."
- Identified resources will be available upon request."
- Approved funding will be available upon request."

Constraints

List any constraints identified during this resource planning process. For example:

- ✓ The project team must create all of the physical deliverables within the allocated budget."
- ✓ All work must be undertaken within normal working hours."

Constructing a Project Schedule: You can now create a detailed Project schedule by listing all the phases, activities and tasks required completing the project, along with the dependencies, sequencing and resources involved. The example below treats the construction of a Project Plan as a project in its own right:

Other Resources: For larger projects, or where greater project management effort is justified, the following resources can also be used.

1. **Organizational/Administration.** The portion of the organization's administration cost that the project must pay for.
2. **Subcontractors.** These can be tracked as a fixed cost item within a task.
3. **Facilities.** The purchase or rental of buildings to perform the work.
4. **Financing costs.** The interest cost for loans required to carry out the project.
5. **Contingencies.** Where the complexity of the project justifies contingencies as separate resource items, they can be tracked separately.
6. **Overtime pay.** This applies to people as well as to equipment where the rate increase after a certain point in time.

4.3 Determining on site labor requirements

- Accountants divide labor into three categories:

✓ **Direct.** Work that results in production units. The hourly unit rate of a laborer, or a salary divided into the number of days or hours they work on the project. It must also include benefits, retirement contributions, bonuses, and any other expense associated with the employee.

✓ **Indirect.** Work that is required to produce deliverables but doesn't directly translate into production. This includes things like quality control, production supervision, and yes, project management. This type of labor needs to be included in estimates to give an accurate project cost. It needs to be divided into each task and allocated as much as practical.

✓ **Overhead.** Organizational administration costs like CEO's salaries are not attributable to the project but, depending on the organizational structure, sometimes must be paid for by all projects. Normally the organizational administration (non-project) expense is calculated yearly and divided among the number of employees to arrive at a unit rate which is added to the direct labor rate. Usually an established labor cost will be known to the company. If not, start with the direct labor and make the necessary allocations for indirect costs.

Man-Hour Estimates

Estimates of total man-hour requirements are a combination of data derived by two different procedures. For the on-site activities, where labor input can be identified as relating to a specific project, direct primary data are available. For all other activities, however, such as the manufacture of construction equipment and materials, which are in their nature diffuse and nonspecific with respect to a particular project, an estimating procedure was used. These two methods are described below.

On-Site Man-Hours

With minor exceptions, all construction under contracts awarded by a Federal agency is subject to the Davis-Bacon Act. To check compliance with this law, an administrative regulation requires that each contractor on Federal construction file a copy of his weekly project payroll with the supervising agency. These payrolls are thus a primary source of data on production man-hours worked and wages paid on a project. In the current study, the payroll files for the sample projects were made available for data transcription through the cooperation of the Corps of Engineers and its Division and District offices. Controlling labor cost presents significant financial challenges in construction works.

There must be enough employees scheduled to serve customers and complete the construction works.

To determine the total labor hours on a project, you need to adjust the estimated labor hours based on each particular job you undertakes. Then, you add additional labor not included in the takeoff.

The first step in determining the total labor hours of the job is to transfer the labor hours from your price/ labor worksheets to your estimated-summary worksheet. Then you must adjust the labor- hour values for the working condition based on a percentage of total man-hour or fixed man-hours for specific condition.

Self-Check 4	**Written Test**

Name: _____ Date: _____

Directions: Answer all the questions listed below.

1. What are resources? Explain the major types of resources in irrigation construction(8pts)
2. What does mean by a resource management plan, explain? (5pts)
3. How can we determine temporary service and site , explain?(5pts)
4. How can we select and asses input requirements and data's?(5pts)
5. What is the objective of adjusting time frame for any irrigation work?(5pts)

Note: Satisfactory rating – 14 points and above Unsatisfactory - below 14 points you can ask you teacher for the copy of the correct answers

Information Sheet-5	**LO 5.** Prepare Completion And Dilapidation Report

A. dilapidation: report or condition inspection report is a specialized building inspection that identifies any pre-existing issues such as cracking, subsidence, damage to surrounding and adjacent properties prior to new construction commence on residential building site. This is so that any problems or claim that may arise after construction are able to be compared to the pre-existing condition report.

5.1 Making records of the condition of completed and dilapidated structures

Documentation and Record Keeping

In documentation and record keeping the following documents and records need unique accentuates:

- ***Contract (amendments):*** This is about when the contract started, when and why amendments are done, intended completion date.
- ***Cost:*** Contract price, Advance and interim payments
- ***Time*** (extension)
- ***Claim/Dispute:*** When the parties are in disagreement in interpretation of contract, deliverables, payment approved.
- ***Quality:*** This is about the quality in attaining the TOR, responsibility, staff quality, logistics as mentioned in the contract.
- ***Report:*** Contract management reports are mandatory; whether there is a significant issue or not Contract management report should be issued every month with the project progress report.

5.2 Submitting copies of reports to supervisor

REPORTS

A. Daily Construction Reports:

Prepare a daily construction report recording the following information concerning events at Project site:

- ✓ List of subcontractors at Project site.
- ✓ List of separate contractors at Project site.
- ✓ Approximate count of personnel at Project site.
- ✓ Equipment at Project site.
- ✓ Material deliveries.
- ✓ High and low temperatures and general weather conditions, including presence of rain.
- ✓ Accidents.
- ✓ Meetings and significant decisions.

- ✓ Unusual events.
- ✓ Stoppages, delays, shortages, and losses.
- ✓ Meter readings and similar recordings.
- ✓ Emergency procedures.
- ✓ Orders and requests of authorities having jurisdiction.
- ✓ Change Orders received and implemented.
- ✓ Construction Change Directives received and implemented.
- ✓ Services connected and disconnected.
- ✓ Equipment or system tests and startups.
- ✓ Partial completions and occupancies.
- ✓ Substantial Completions authorized.

B. Monthly Statement for Progress Payments

The Contractor shall submit to the Engineer after the end of each month, statements signed by the Contractor showing:-

- ✓ The quantities and value of the permanent work executed on Site.
- ✓ The value of materials on Site intended to form part of the permanent work together with supporting invoices.
- ✓ The value of temporary work, as included in the Bill of Quantities and completed on Site.
- ✓ Amount reflecting any changes in cost pursuant to Clause 70 hereunder.
- ✓ Amounts approved in respect of day works executed up to the end of the month in question.
- ✓ The monthly statements shall be in an approved form and shall comprise an original and one copy, each duty signed by the contractor.

Self-Check 5	Written Test

Name: _____ Date: _____

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

1. Define the word dilapidation? (5pts)
2. What type of document we record during irrigation structure construction?(5pts)
3. What type of report we prepare in daily activities?(5pts)
4. What type of report we prepare in monthly activities?(5pts)

Note: satisfactory Rating: 10 and above pts. Unsatisfactory rating: below 10 pts

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

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