



Ethiopian TVET-System



Irrigation and Drainage Design and Construction Supervision Level IV

Based on February, 2017G.C. Occupational Standard

Module Title: Using Computer Aided Drafting System

TTLM Code: EIS IDDS4 TTLM 0620V1











This module includes the following Learning Guides

LG 14: Prepare for drawing

LG Code: EIS IDS4 M03 LO1-LG-14

LG 15: Perform drawing

LG Code: EIS IDS4 M03 LO2-LG-15

LG 16: Complete and report on drawing task

LG Code: EIS IDS4 M03 LO3-LG-16





sheet Learning guide 14: prepare for drawing
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This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Determining drawing task from documentation or reports and discussing with appropriate personnel.
- Obtaining Resources needed for the task accordance with enterprise procedures
- Checking correct operation and safety.
- Consulting and co-coordinating appropriate personnel to ensure the work effectively with others involving at the work site.

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:

- Determine drawing task from documentation or reports and discuss with appropriate personnel.
- Obtain Resources needed for the task accordance with enterprise procedures
- Check correct operation and safety.
- Consult and co-coordinate appropriate personnel to ensure the work effectively with others involving at the work site.

Learning instructions:

- 1. Read the specific objectives of this Learning Guide.
- 2. Follow the instructions described below
- 3. Read the information written in the "Information Sheets 1- 4". Try to understand what are being discussed.
- 4. Accomplish the "Self-checks 1, 2, 3 and 4" in each information sheets on pages 15, 33, 39 and 46".
- 5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

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- 6. If you earned a satisfactory evaluation proceed to "Operation sheets 1, on pages 48.and do the LAP Test on page 49". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
- 7. After you accomplish Operation sheets and LAP Tests, ensure you have a formative assessment and get a satisfactory result; then proceed to the next LG.





Information Sheet-1

Determining drawing task from documentation or reports and discussing with appropriate personnel.

1.1. Introduction

A drawing is a graphic representation of an object, or a part of it, and is the result of creative thought by an engineer or technician. When one person sketches a rough map in giving direction to another, this is graphic communication. Graphic communication involves using visual materials to relate ideas. Drawings, photographs, slides, transparencies, and sketches are all forms of graphic communication.

1.2. Types of construction drawing

A construction drawing or plan illustrates what you will build and what the finished product will look like when you complete it, but there are different types of construction drawings used.

1.2.1. Architectural drawings

This is one of the types of construction drawings. It provides a complete view of a building. There several design programs out there but nothing like 3-D and 2-D modelling can give architects and designers a more accurate example to articulate the end-product needed for the subcontractors to build.

An architectural drawing is a technical rendition of a building (or building project) that falls within the classification of architecture. Historically, architectural drawings were made in ink on paper or similar material, and copies require an expensive printer that needs to be expensively hand delivered. If you're still operating with a tremendous amount of paper, imagine the construction savings by shifting to a digital ecosystem.







Figure 1. AUTOCAD for 2D architectural drawing

1.2.2. Structural drawings:

This type of construction drawing provides a complete view of the structure or structures involved in the building project. Structural drawings are typically prepared by licensed structural engineers relying on input from architectural drawings. Structural drawings emphasize load-carrying members (e.g., steel beams, joists, framing materials, and so forth) of the structure.

Structural construction drawings are unique to other drawings because they do not address partition walls, plumbing, and mechanical systems, or other details like surface finishes.

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Figure.2. Structural drawing layout

1.2.3. Electrical drawings:

This type of technical drawing illustrates information about lighting, wiring, power, and circuits for communication within the commercial construction project. Electrical construction drawings are meant to illustrate the physical layout of the wires and components they connect inside the building as well as the outside power grid. Standard schema symbols in electrical drawings represent circuit breakers, transformers, capacitors, bus bars, conductors, and many other details on drawings.

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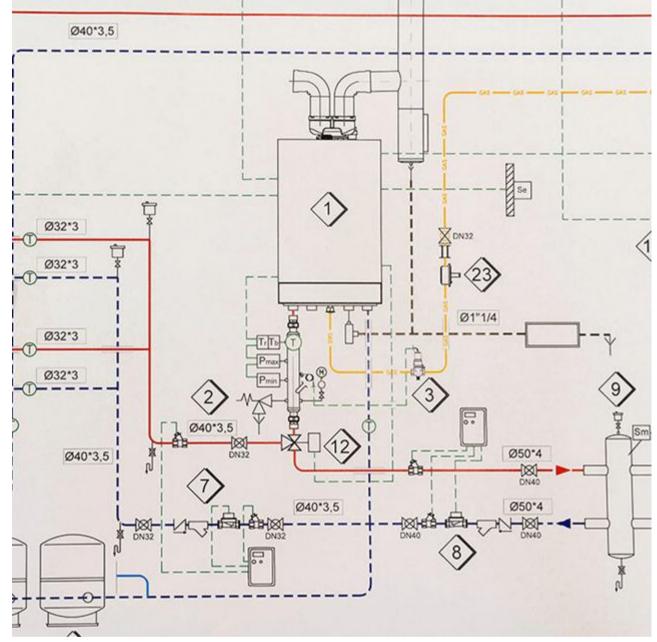


Figure 3. Electricla drawing components

1.2.4. Plumbing and sanitary drawings:

This type of technical drawing illustrates the system for pumping water in and out of the building. Equipment, pipes, pumps, and drains, the nature and size of sinks to the location of gas are carefully illustrated in a drawing. Plumbing construction drawings also indicate the position of sanitary, piping for water supply system, fixtures, and the process to connect every accessory. Read this article on how to save thousands of dollars a year with digital blueprints.

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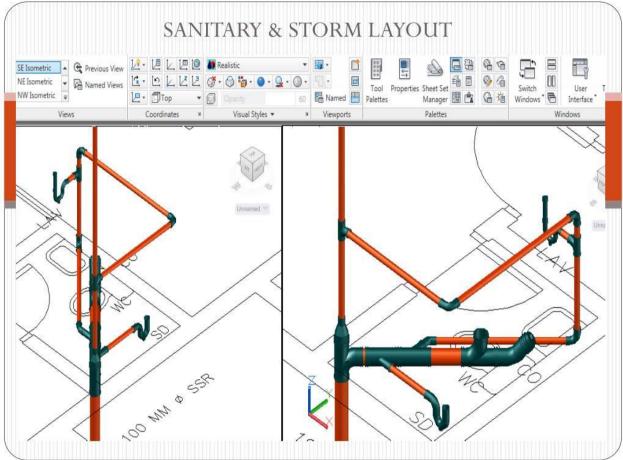


Figure 4. Plumbing and sanitary drawings

1.2.5. Finishing drawing:

This drawing illustrates the finishing details and appearance of the building. Construction Finishing drawings include every type of components of the building, such as painting colors, flooring pattern, plastering texture, elevation design, and false ceiling shapes.

1.3. Important tasks prepare for drawing

1.3.1. Complex 2D engineering drawings

2D detail drawings in engineering may be a thing of the past in a digital age, but they are still being used. Drafting has been a considerable aspect of engineering design for virtually its entire history. Before complex CAD technology, creating 2D drawings for manufacturing and production was essential to creating products. CAD has allowed us, engineers, to spend less time refining the 2D detailed drawing, but it has not eliminated the use of these drawings in the industry. The emergence of computer design did bring one influential change around drawings.

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Two-dimensional (2D) computer drawing is the representation of an object in the single-view format which shows two of the three object dimensions or the multi view format where each view reveals two dimensions.

1.3.2. Found in commercial drawing packages

Adopt illustrator cc

If you're a professional designer or illustrator, there's no beating the industry standard vector editing software. Adobe Illustrator is available as a standalone app, or as part of the Creative Cloud suite along with Photoshop, Lightroom and much more. Whether you're creating app icons or billboards, it has all the tools you need, and works seamlessly with Adobe's other software.

II. Corel painter

Corel Painter has always been a very impressive and accomplished piece of software, but the latest version's focus on performance and productivity make this a very desirable upgrade. Existing users of painter will appreciate the improved performance and refined interface. Those new to this software will welcome the many touches that make it easier to dive into Painter unaided.

III. Rebelle

Rebelle is another highly versatile drawing and painting application. Described as "one-of-a-kind paint software", it's been designed for creative working on watercolor, acrylic, wet and dry media artwork. The app uses realistic color blending, wet diffusion and drying techniques, and offers a plethora of watercolors, acrylics, inks and pastels.

1.4. Appropriate person to prepare for drawing

1.4.1. Supervisor

The term "supervisor" typically refers to one's immediate superior in the workplace, that is, the person whom you report directly to in the organization. For example, a middle manager's supervisor typically would be a top manager. A first-line manager's supervisor would be a middle manager. A worker's supervisor typically would be a first-line manager.

Supervisors typically are responsible for their direct reports' progress and productivity in the organization. Supervisors are responsible for:

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- Aligning individual performance expectations with organizational goals
- Developing performance goals collaboratively with their direct reports
- Ensuring that performance goals are clearly communicated and current
- Providing fair, constructive, and timely feedback towards performance expectations and goals
- Providing assistance, guidance, and coaching support as needed
- Ensuring that staff have professional development plans in place
- Conducting performance evaluations according to established systems and policies

1.4.2. Leading hand

Executive leadership is responsible for ensuring that a performance management system is in place and being used effectively, specifically this entails:

- Setting organizational strategy (together with the Board of Directors)
- Updating the employee handbook and communicating any changes
- Annually, in writing, communicate:
 - ✓ Current strategy and plans
 - ✓ Reminders and guidance to managers of deadlines to complete employee's annual goal setting and reviews
- Using and modeling the performance management process, practices, and tools
- Ensuring evaluations of their staff are well written and accurate by reviewing them and providing feedback and coaching as appropriate
- Reviewing evaluations of employees and providing feedback to supervisors

1.4.3. Foreman

Foreman - Formwork is responsible for reading and interpreting drawings, calculate quantity of material required for shuttering works, arrange and allocate resources, monitor shutter making and assembling process at formwork yard/site, instruct proper sequence of work, check for quality and stability of formwork as per plans, specifications, working drawings and also monitor installation and operation of Jump form system. The individual should possess sound technical knowledge, should be able to monitor and maintain safe and quality working practices.

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- Coordinating construction work according to priorities and plans
- Producing schedules and monitor attendance of crew
- Allocating general and daily responsibilities
- Coordinate tasks according to priorities and plans
- Produce schedules and monitor attendance of crew
- Allocate general and daily responsibilities
- Supervise and train workers and tradespeople
- Ensure manpower and resources are adequate
- Guarantee all safety precautions and quality standards are met
- Supervise the use of machinery and equipment
- Monitor expenditure and ensure it remains within budget
- Resolve problems when they arise
- Report on progress to managers, engineers etc.

1.4.4. Site engineer

- act as the main technical adviser on a construction site for subcontractors,
 craftspeople and operatives
- set out, level and survey the site
- check plans, drawings and quantities for accuracy of calculations
- ensure that all materials used and work performed are in accordance with the specifications
- oversee the selection and requisition of materials
- agree a price for materials and make cost-effective solutions and proposals for the intended project
- manage, monitor and interpret the contract design documents supplied by the client or architect
- liaise with any consultants, subcontractors, supervisors, planners, quantity surveyors and the general workforce involved in the project
- communicate with clients and their representatives (architects, engineers and surveyors), including attending regular meetings to keep them informed of progress

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- carry out day-to-day management of the site, including supervising and monitoring
 the site labour force and the work of any subcontractors this is site-specific and
 may not be the case on all projects
- day-to-day management of the site, including supervising and monitoring the site labour force and the work of any subcontractors
- plan the work and efficiently organise the plant and site facilities in order to meet agreed deadlines
- · oversee quality control and health and safety matters on site
- · prepare reports as required
- Resolve any unexpected technical difficulties and other problems that may arise.

1.4.5. Teacher and team member

- Planning lessons on art and art history in accordance with students' learning objectives.
- Preparing the classroom by gathering and setting up equipment.
- Developing students' drawing, coloring, and painting techniques.
- Providing instruction on the use of media such as graphite and charcoal pencils, as well as oil, acrylic, and watercolour paint.
- Teaching students about art history.
- Assigning and grading projects and examinations.
- Recording and reporting on students' progress.
- Ensuring that the classroom is clean after each lesson.
- Monitoring inventory and sourcing art supplies, as needed.
- Attending faculty and parent-teacher meetings.

1.4.6. Mentor

A mentor is a person who helps another (a mentee) to develop in their job and career. The mentor may have officially accepted that role, for example, as part of an overall mentoring program, or informally accepted the role based on a mutual relationship. The mentee sees themselves as being able to count on the mentor for help. The mentor might use a variety of methods to help the mentee ranging from advice and materials to thoughtful questions and guidelines.

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1.4.7. Trainer

The supervisor is often the first person who is considered when a new employee needs to learn the job or when an employee is struggling to improve performance in the job. Employees also often turn to the supervisor to ask about personnel policies. Progressive employees might ask about the organization's culture. The supervisor is responsible to ensure that training occurs, and might do the training themselves or arrange it through a subject matter expert. Training could be done in a variety of ways ranging from on-going on-the-job advice to participating in a formal, systematic training program.





Direction I: Choose the best answer for the following questions. Use the Answer sheet provided in the next page: Each question worth one point

- 1. One of them has type of construction drawing provides a complete view of the structure or structures involved in the building project.
 - A. Architectural Drawings
 - B. Structural Drawings
 - C. Electrical Drawings
 - D. Plumbing and Sanitary Drawings
- 2. One of them has type of construction drawing provides illustrates the finishing details and appearance of the building.
 - A. Architectural Drawings
 - B. Structural Drawings
 - C. Electrical Drawings
 - D. Finishing Drawing
- 3. One of them have Appropriate person to Prepare for drawing
 - A. Supervisor
 - B. Foreman
 - C. Site engineer
 - D. All of the above
- 4. One of them have the duties and responsibility of Supervisor
 - A. Aligning individual performance expectations with organizational goals
 - B. Developing performance goals collaboratively with their direct reports
 - C. Ensuring that performance goals are clearly communicated and current
 - D. All of the above
- 5. ---- is a person who helps another (a mentee) to develop in their job and career
 - A. Mentor
 - B. Trainer
 - C. Foreman
 - D. Site engineer

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II. Short answer part

- 1. Write and discuss at least two Important tasks Prepare for drawing?(2pts)
- 2. Write at least four responsibility of Teacher and Team member in preparing drawing?(4pts)
- 3. Write at least four responsibility of Foreman in preparing drawing?(4pts)
- 4. Write at least four responsibility of Site engineer in preparing drawing?(4pts)

Note: Satisfactory rating - 12 points Answer Sheet-1	Unsatisfactory - below 12points
Name:	Date:
Choice questions	
1	Score =
2	Rating:
3	
4	
5	
Short questions	
1	
2	
·	
3	
4	

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Information Sheet-2	Obtaining resources needed for the task accordance with
information Sneet-2	enterprise procedures

2.1. Enterprise procedures

2.1.1. The use of tools and equipment

- Wash your hands before starting, and occasionally during drawing if your hands tend to be oily.
- Always wipe dust and dirt from instruments with a soft cloth before starting to draw and frequently during use.
- Lay out all views with a hard pencil first. "Heavy-in" lines only when certain they
 are correct.
- Remove graphite dust when it collects.
- After each line is drawn, blow loose graphite from the sheet.
- Remove erasure dust with a brush, not your hands!
- Do not slide instruments across drawing!
 - ✓ Lift the drafting machine prior to moving.
- Sharpen pencils away from the drawing.
 - ✓ Maintain an orderly drawing area.
 - ✓ Keep only the tools you need on top of the desk
 - ✓ Keep unused tools off the sheet

2.2. Instructions, including job sheets, cutting lists, plans, drawings and designs 2.2.1. Job sheet instruction

A Job sheet can be defined as a document or a page that contains instructions to help an employee do his/her job in the best way possible. It has details of what would be the time taken to perform the task and also the materials needed to do so. A job sheet can help project managers, supervisors or general managers to create suitable job descriptions for the subordinate staff. A job sheet is suitable for a single or one type of job, and usually covers the task as well as the responsibilities of an employee under that job category.

To Create a Job sheet we follow the following instruction

Purpose of your sheet

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The first thing to do is to know the purpose as to why you are creating a job sheet. Once you know the purpose of your sheet, it will get easier to understand what and how you should create it.

Variables to add

There is a list of variables you need to add in a job sheet. This includes the nature of the job, training period, etc. All this should be mentioned in the sheet without fail.

• Draft your sheet

Once you have the purpose and the elements to add in mind, you should start drafting your sheet. Mention the target date, instruction sheet, employee records, etc. Also, mention the job description for each profile and the tasks for each of the posts as well. This way, your readers will have a clear view of what to do.

Review

After you are done with drafting the sheet, review it before you finalize it. As there might be a mistake in your sheet, make sure you correct them wherever necessary. Incorporate instructions when needed and wherever they are necessary. Make your sheet readable and easily understandable to the reader.





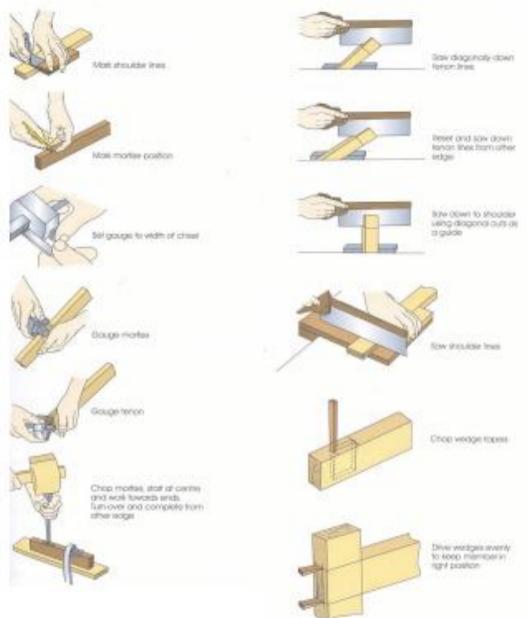


Figure 5. Cutting wood procders job sheet

2.3. Reporting and communication

In your everyday life you communicate with other people in many different ways. The race engineer might talk to someone face to face or on the phone if they are far away. This is verbal communication. They might use body language, for example gestures, facial expressions and body posture. In some cases written communication, such as text messages, email, notes or letters might be a better way of getting the message across. In other situations, graphical communications such as sketches or drawings might be more effective.

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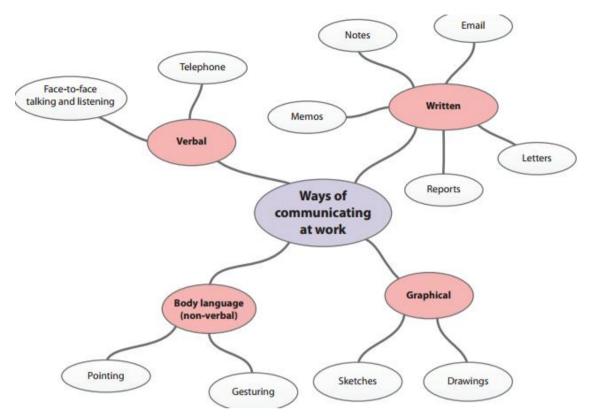


Figure 6. Ways of communication

For many engineering tasks you need information to be written down. This text is usually accompanied by charts, graphs, tables, diagrams and/or drawings. Information needs to be presented in a clear, accurate and up-to-date way.

It needs to be set out in a way that makes it is impossible to misunderstand.

Where measurements or dimensions are used these need to be clearly written – both the number and the correct unit. Where measurements are critical, for example where precision work is being carried out, the required accuracy and tolerance should also be specified. For example, if you had to produce a case for a small item of electrical equipment, as an absolute minimum you would need the:

- dimensions of the case
- material the case is to be made from
- finish to be applied to the case
- dimensions of any holes, apertures or fixings.

As an example, the information needed to construct an equipment case for a particular application might be as follows:

Dimensions: height 95 mm, width 350 mm, depth 270 mm

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- Material: mild steel thickness 1.2 mm
- Finish: paint, light grey RAL 7035
- Fixings: M4 captive nuts (4), M4 x12.7 mm screws (4)

This information is useful but it is still not enough to actually manufacture the enclosure! To be able to make it, you would need a drawing like the one shown in Figure 7. This drawing shows the dimensions of the equipment case and a very clear idea of how it will be made.

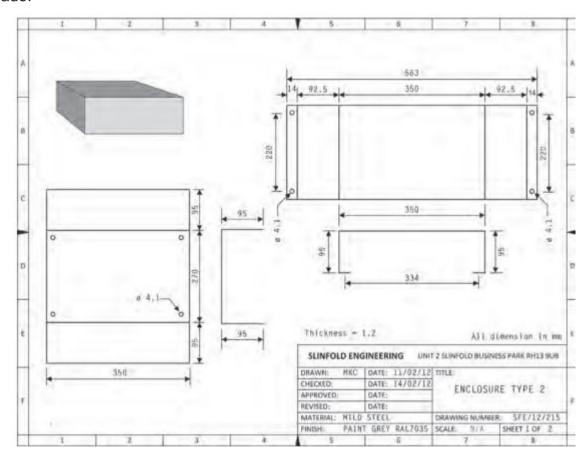


Figure 7. Dimensioned drawing of the metal equipment case

2.3.1. Written documentation

Written information is a very important part of communicating in engineering and it can take a variety of different forms.

I. Data sheets and data books

Data sheets give essential information on a particular engineering component or device. They usually provide maximum and minimum values, specifications, and information on dimensions, packaging and finish.

II. Application notes

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Application notes explain how something is used in a particular application or how it can solve a particular problem. They provide a lot of practical information for designers and others who may be considering using a particular component, process or technology for the first time.

III. Technical reports

Technical reports are similar to application notes but they focus more on how engineering components and devices perform. They will usually provide detailed specifications

measurements and also describe how the measurements were obtained. Technical reports are often illustrated with graphs, charts, tables and other data.

IV. Job cards and work instructions

Job cards provide information about parts and equipment and what should be done with them. They usually list the work that needs to be done and may also include the time given to each task or sub-task. Job cards are often used when equipment is sent away for service or repair. They might also relate to a particular stage in the manufacture of a product. Work instructions usually contain much more detail than job cards and often describe each of the individual stages of performing a particular task or sub-task.

V. Catalogues

Most manufacturers and suppliers provide catalogues that list the range of products they supply. These usually include part numbers, illustrations, brief specifications and prices. While catalogues are often very large documents with many hundreds or thousands of pages, short-form catalogues are usually also available.

VI. Specifications

Specifications are a precise and comprehensive description of an engineered part, product or service. Specifications should relate to the performance of the product in a way that can be measured. They also relate to what the product is going to look like. In many cases, specifications form the basis of a contract between a manufacturer or supplier and a client or customer. For example, what the purchaser requires and what the manufacturer is going to supply. There are two basic types of specification:

- **General specifications** a detailed written description of the product including its appearance, construction, and materials used.
- **Performance specification** a list of features of the product that contribute to its ability to meet the needs of the client or end user.

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VII. Manuals

Several different types of manual are used in engineering. The two most important types are:

- **User or operating manuals**:- designed to be read by the end user of the product or equipment
- Service, repair or maintenance manuals: designed to assist the repair and/or the routine maintenance of a product.

Manuals are usually produced by the company that has manufactured the product but may also be produced by third party companies that specialize in manual production.

2.3.2. Care and control of documents/drawings

I. Care documents

Engineering documents and drawings are important so they need to be used and stored correctly.

This will ensure that they are not damaged as a result of physical handling or the environment they are used in. Documents must be stored in appropriate cabinets well away from dust, dirt, oil and grease. It is vital to have a system that controls the taking and returning of documents, particularly where a number of people must have access to them. Damaged or lost drawings should always be reported to your supervisor or another responsible person. Engineering documents/drawings should always be marked with the:

- originator's name
- Issue number and/or the date of issue
- Date of any subsequent revisions or modifications. Most companies store drawings and documents electronically.

II. Controlled documents

Document control is used in all large engineering companies and the use of computerized systems has made this much easier and more effective. If a controlled document is changed, a record of the change has to be made. Equally importantly, employees should always remember to check they are using the current version of a controlled document.

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When a controlled document is changed, everyone who needs it should be made aware and should also make sure they have access to the current version. This means that versions of a document, as well as any revisions made to it, need to be clearly identified.

2.3.3. Dealing with problems

You will need to deal promptly and effectively with any problems that arise at work and are within your control. Some problems can be solved quite easily by yourself but others may require you to seek help and guidance from other people. Most engineering companies have regular team meetings and these can provide a useful forum for discussing problems and sharing ideas that can lead to a solution. More urgent problems may need to be resolved at the time they crop up. You will normally refer these to your supervisor or team leader.

2.4. Manufacturers' specifications and operational procedures

O&M manuals are required to detail the function of the asset and components, detail the equipment installed, equipment maintenance and servicing requirements and fault finding / troubleshooting references.

The O&M Manual also contains contract and WAC information required as part of the commissioning process. It does not cover requirements for:

- Work as Constructed (WAC) Drawings specified in STS 903
- Electrical Drawings specified in STS 904
- Mechanical Structural and Civil Drawings specified in STS 911

The O&M Manual is prepared in two stages:

- The first stage is provided by the Designer as part of the detailed design deliverables.
- The final stage is provided by the Contractor as part of work as constructed (WAC) deliverables.

O&M Manuals are required for assets, equipment and components that meet one or more of the following criteria:

 The item has a specific maintenance or operating regime that must be applied if regulatory (e.g. flow meter calibration), statutory (e.g. safety, environmental legislation) and/or warranty requirements are to be met.

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- The item performs a critical functional role in the treatment or transport process (i.e. if the item were not appropriately maintained/operated the process would be compromised).
- The item requires specialist training for operators and/or maintainers.
- The item requires specialist tools or spares for operation and/or maintenance Standard Operating Procedures explains:
 - What the process is and its purpose
 - Where activity is operating
 - Who is responsible for every activity
 - When activity is completed, sequential of the activities, frequency, etc.
 - How activity can be finished follow the work instruction design or other reference documents
 - Reference to the other relevant documents

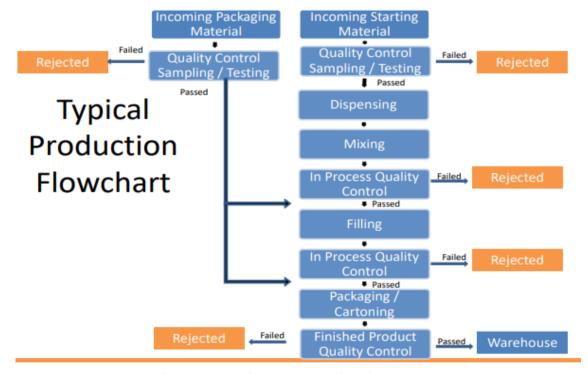


Figure 8. Typical prodection flow chart

2.4.1. Production documents – manufacturing formula

Formally authorized manufacturing formula and processing instructions should be available for each product and batch size to be manufactured and often they are combined in one document shall include:

Product name with reference code relating to its specification

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- Description of product dosage form and strength, and batch size
- List of all starting materials
 - ✓ Amount of each
 - ✓ Designated name and reference which is unique to the material
 - ✓ Substance that may disappear during processing
- Statement of expected final yield with acceptance limits.

2.4.2. Production documents - processing instructions

- Statement of processing location and equipment used
- Method/SOP (or reference to methods) for setting up equipment e.g cleaning, assembling, calibrating
- Detailed stepwise processing instruction (e.g. Checks on materials, pretreatments, sequence for adding materials etc)
- Instructions for any in-process controls with limits
- Requirements for bulk storage of products; include container, labelling, special storage conditions if applicable
- Any special precautions.
- Shall describe the different operations carried out upon crude material such as
 - ✓ Sorting
 - ✓ Cleaning
 - ✓ Drying
 - ✓ Crushing, and
 - ✓ Sifting
- Shall include drying time, temperatures, and methods used to control fragment or particle size
- Shall also describe sieving process/other methods of removing foreign materials.
- In particular, written instructions and records shall be available to ensure that each container of the product is carefully examined to detect any adulteration/substitution or presence of foreign matter, such as:
 - ✓ Metal, glass pieces, animal parts or excrement, stones, sand or rot and signs of decay.
- For product preparation, instructions shall include:
 - √ details of base or solvent

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- ✓ time and temperatures of extraction,
- √ details of any concentration stages and
- ✓ Methods used.

2.4.3. Packaging instructions

- Formally authorized Packaging Instructions should be available for each product pack size and type. Shall include:
 - ✓ Product name
 - ✓ Description of product dosage form, strength (if applicable)
 - ✓ Pack size (expressed in terms of number, weight or volume of product in final container)
 - ✓ Complete list of all packaging materials required for standard batch size
 including quantities, sizes and types with the code or reference number
 relating o the specifications of each packaging material
 - ✓ An example/ copy of relevant printed packaging materials and specimens indicating where to apply batch number references, and shelf life of the product Special precautions to be observed
- Description of packaging operation
- Details of in-process controls with instructions for sampling and acceptance limits

2.5. Important resource for preparing drawing

2.5.1. Computer software

In architectural education, developing computer technology and softwaer for visualization are creating exeting oportinities for design practice and less energy time consuming for articleral design. Parametrs 3D computer based modelling and dynamic vidualization in virtual environments enable architectural students to evaluate future capability of design and development.

2.5.2. Library files

Planning is the deliberate, preferred manner of preparing for library service in the future. It is the responsible means of fulfilling future community library needs. Construction plans should be considered in the context of the total library plan.

How library building consultant

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The consultant is usually an experienced librarian who has participated in several building projects. The cost of a building consultant can usually be saved many times over in reductions in construction and operating costs. Working with board and staff the building consultant can provide any or all of the following services:

- Survey the library's space needs
- Write the library building program
- Project a preliminary project budget
- Provide site analysis and recommendations
- Provide advice on funding options
- Provide assistance in selection of the architect
- Review all plans prepared by the architect and provide a written evaluation
- Review needs, specifications, and layout for shelving, furniture, and equipment
- Provide a final inspection of the facility Stationery

2.5.3. Drawing standards

Engineering drawing is a form of language in its own right with rules and signs. Just as it is applicable to any language, certain rules (or standards) must be followed in producing any drawing. These rules/standards define how shapes and position of object should be represented; for instance, the order of orthographic views and different line types has rules and specific position in order to fully describe such object. They also define how a part should be dimensioned or tolerance. These standards are developed by some institutions or governing agencies specifically

set up for the purpose of formulating standards globally accepted and subject to update on a 5 year basis. These organizations or governing agencies include:

- BSI British Standards Institute
- ASME-American Society of Automotive Engineers
- ANSI- American National Standards Institute
- DIN Deutsches Institut fur Normung (Germany)
- ISO International Standards Organization

2.5.4. Software reference documentation

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Software decision makers can use the data to justify modifications to established documentation processes (such as those found in to improve the creation, maintenance and approval of documentation. Using the results of our work, better documentation tools and technologies might emerge; as designers will have a better grasp of the role of documentation and under what circumstances it is, or can be, used.

2.5.5. Equipment

Many drawing tools are used for drawing, draughting and design. Drawing tools may be used for measurement and layout of drawing. They include pens, pencils, rulers, compasses, protractors and other drawing utilities.

2.5.6. Computer hardware

Computers provide accurate and precise information, manage production processes, and are extensively used by engineers, designers, architects, scientists, business executives, managers, administrators, accountants, teachers and students for its efficient outputs and flexibility to work.

Computers in industry have helped in process automation and business systems like Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) Software programs. The ability of computers has helped business organizations to store and maintain voluminous records. They have been used to store large amount of data and has led to their application in libraries, documentation centers, employment exchanges, stock exchanges, hospitals and other various establishments.

Some of the features function of computers is listed below

- **Speed:-**Computers can perform complex calculations at a very high speed. It can calculate by computing (add, subtract, divide or multiply, etc) large digits in less than a second.
- **Storage:** The storage capacity of a Computer is very high. It stores voluminous data in small storage devices like floppy, compact disc (CD), pen drives, which can be easily put in your pocket, thereby conserving space.
- Accuracy:-The accuracy of a Computer is consistently high, though errors in machinery can occur but due to incorrect inputs. A Computer does not have intelligence of its own but operates on instructions and data given by us.

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- Versatility: Computers are highly versatile. They can perform almost any task, provided with a series of logical (within the computer) steps. If you want to have repeated calculations, which are complex and involves several steps to give results, computers provide them rapidly and accurately. Computers also facilitate the process of efficient decision making. They draws and print graphs, and converse with the users through terminals.
- **Diligence:** Being a machine, a computer does not suffer from tiredness or lack of concentration. Even if a million calculations are to be made, it will perform the millionth one with exactly the same accuracy and speed as the first.

There are various components of a computer. They are broadly understood as Input, Output and the Central Processing Unit (Fig. 9).

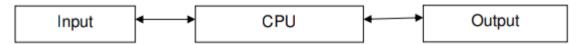


Figure 9. Process of a computer

The Input Devices are those devices by which we feed instructions to the computer. These are like Keyboard, Mouse, Scanner and Digitizer Pen. Similarly, Input CPU Output. The Output Devices are those where we take output from the Computer. These are like Monitor for Display, Printers for taking print-out. The CPU is the brain of the Computer where all instructions we feed get operated or processed to present the output.

2.5.7. Printers

Printers are output devices used to prepare permanent output of any information. The purpose of a printer is to accept typed text and graphic images from a computer and transform it into the paper.

2.5.8. Plotter

A **plotter** produces vector graphics drawings. Plotters draw lines on paper using a pen. In the past, plotters were used in applications such as computer-aided design, as they were able to produce line drawings much faster and of a higher quality than contemporary conventional printers, and small desktop plotters were often used for business graphics.

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Figure 10. Hewlett-packard a0 plotter 5785b

- Pen plotters print by moving a pen or other instrument across the surface of a
 piece of paper. This means that plotters are vector graphics devices, rather
 than raster graphics as with other printers. Pen plotters can draw complex line art,
 including text, but do so slowly because of the mechanical movement of the pens.
- An electrostatic plotter is a type of plotter that draws images on paper with an
 electrostatic process. They are most frequently used for Computer-Aided
 Engineering (CAE), producing raster images via either a liquid toner or a dry toner
 model.
- Electrostatic plotters can print in black and white or in color. Some models handle paper sizes up to six feet wide.
- Cutting plotters use knives to cut into a piece of material (such as paper, mylar film, or vinyl film) that is lying on the flat surface area of the plotter. It is achieved because the cutting plotter is connected to a computer, which is equipped with specialized cutting design or drawing computer software programs. Those computer software programs are responsible for sending the necessary cutting dimensions or designs in order to command the cutting knife to produce the correct project cutting needs.

2.5.9. Digitizer's

A digitizing tablet is a computer input device that allows one to hand-draw images and graphics, similar to the way one draws images with a pencil and paper. These tablets may also be used to capture data or handwritten signatures. A digitizer is a tablet or board-like device for converting analog electric signals of an absolute or relative position on the tablet surface to digital X, Y coordinates. This process yields vector data consisting of points, lines, and polygons that will need to be edited. By positioning a pointing device containing a magnetic coil (cursor or pen stylus) on the tablet surface

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which is embedded with a grid of wires, a signal is generated. The resolution, or density of wires in the grid, varies from 1,000 to 10,000 lines per inch. Active surface sizes vary from 12 x 12 (A size) to 48 x 72 inches (E size).

There are four main reasons why we use Digitizer Tablets:

- To have better control
- Comfortable for drawings and sketches
- Innovation and speed for work productivity
- Using a pen tablet is easy





Self-check -2	Written test
Jeli-Clieck -Z	AALIITELLI 162

- I. Choose the best answer for the following questions. Use the Answer sheet provided in the next page: each question contains 2 mark
 - **1.** A summary of the features of a particular part or component can be found in:
 - A. data sheet
 - B. technical report
 - C. service manual
 - D. an operating manual
 - E. To Create a Job sheet we follow the following instruction
 - 2. One of them has follow instruction to create a Job sheet?
 - A. Purpose of Your Sheet
 - B. Variables to add
 - C. Draft your sheet
 - D. All of the above
 - **3.** ----- is explain how something is used in a particular application or how it can solve a particular problem.
 - A. Application notes
 - B. Job cards and work instructions
 - C. Catalogues
 - D. Specifications
 - 4. One of them has components of Standard Operating Procedures explanation?
 - **A.** What the process is and its purpose
 - B. Where activity is operating
 - C. Who is responsible for every activity
 - D. All of the above
 - 5. One of them has features function of computers?
 - A. Speed
 - B. Storage
 - C. Accuracy
 - D. In versatility
 - **6.** ----- is used to accept typed text and graphic images from a computer and transform it into the paper?

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- A. Printers
- B. Plotter
- C. Computer hardware
- D. Digitizer's

II. Short answer part

- 1. Write and discuss at least four Important resource for preparing drawing?(4pts)
- 2. List and discuss at least four way written documentation?(4pts)

Note: Satisfactory rating – 10points	Unsatisfactory - below 10 points
You can ask you teacher for the copy of the	e correct answers.
Answer Sheet	
Name:	Date:
Multiple choice 13	Score =
4 6	
Short answer	
1	
2	

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Information sheet-3	Checking correct operation and safety.

3.1. Introduction

The maintenance file is a compilation of various documents and records relating to operation, maintenance, inspection, testing evaluation, and repair of the equipment. The methods selected for establishing adequate information retention and retrieval shall be determined by the equipment custodian.

3.2. Types of maintenance

3.2.1. Preventive maintenance

Preventive maintenance (PM) is the practice of maintaining equipment on a regular schedule based on elapsed time or meter readings. The intent of PM is to "prevent" maintenance problems or failures before they take place by following routine and comprehensive maintenance procedures. The goal is to achieve fewer, shorter, and more predictable outages. Some advantages of PM are:

- It is predictable, making budgeting, planning, and resource leveling possible.
- When properly practiced, it generally prevents most major problems, thus reducing forced outages, "reactive maintenance," and maintenance costs in general.
- It assures managers that equipment is being maintained.
- It is easily understood and justified.

PM does have some drawbacks:

- It is time consuming and resource intensive.
- It does not consider actual equipment condition when scheduling or performing the maintenance.
- It can cause problems in equipment in addition to solving them (e.g., damaging seals, stripping threads).

3.2.2. Condition-based maintenance

This program relies on knowing the condition of individual pieces of equipment. Some features of CBM include:

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- Monitoring equipment parameters such as temperatures, pressures, vibrations, leakage current, dissolved gas analysis, etc.
- Testing on a periodic basis and/or when problems are suspected such as double testing, vibration testing, and infrared scanning.
- Monitoring carefully operator-gathered data.
- Securing results in knowledgeable maintenance decisions which would reduce overall costs by focusing only on equipment that really needs attention.

Drawbacks to CBM include

- It being very difficult and expensive to monitor some quantities.
- It requires knowledgeable and consistent analysis to be effective; and also condition monitoring equipment and systems themselves require maintenance.

Because of these drawbacks, it is nearly impossible to have an entirely CBM program.

3.2.3. Combination of condition-based and preventive maintenance

A combination of CBM and PM is perhaps the most practical approach. Monitoring, testing, and using historical data and PM schedules may provide the best information on when equipment should be maintained. By keeping accurate records of the "as found" condition of equipment when it is torn down for maintenance, one can determine what maintenance was really necessary. In this manner, maintenance schedules can be lengthened or perhaps shortened, based on experience and monitoring.

3.3. Maintenance and test procedures

Maintenance activities fall into three general categories

 Routine maintenance: - Activities that are conducted while equipment and systems are in service. These activities are predictable and can be scheduled and budgeted. Generally, these are the activities scheduled on a time-based or meter-based schedule derived from preventive or predictive maintenance strategies. Some examples are visual inspections, cleaning, functional tests, and measurement of operating quantities, lubrication, oil tests, and governor maintenance.

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- Maintenance testing: Activities that involve using test equipment to assess condition in an offline state. These activities are predictable and can be scheduled and budgeted. They may be scheduled on a time or meter basis but may be planned to coincide with scheduled equipment outages. Since these activities are predictable, some offices consider them "routine maintenance" or "preventive maintenance." Some examples are governor alignments and balanced and unbalanced gate testing.
- Diagnostic testing: Activities that involve using test equipment to assess the
 condition of equipment after unusual events, such as equipment failure/
 repair/replacement or when equipment deterioration is suspected. These
 activities are not predictable and cannot be scheduled because they are required
 after a forced outage. Each office must budget for these events. Some examples
 are governor troubleshooting, unit balancing, and vibration testing.

Before maintenance is accomplished, where adjustments and repairs are required, the following precautions shall be taken.

- The crane shall be run to a location where it will cause the least interference and is most accessible.
- All controllers shall be checked to assure that they are in the off position.
- If the equipment is electrically powered, the main or emergency disconnect or switch shall be opened and locked in the open position. The facility specific lockout/tagout procedures shall be strictly followed. Effective isolation of the energy source shall be conducted. If the crane is hydraulic or air powered, hydraulic and air pressure shall be relieved.
- Effective warning signs, guards, and barriers shall be installed where overhead maintenance work creates a hazard or where interference with another crane or another crane's electrical conductors could occur.
- Where other cranes are operating on the same runway, rail stops or other means shall be provided to prevent interference with the idle crane or work area.
- Only trained personnel shall work on energized equipment when adjustments and test are required.
- After maintenance work is completed and before returning to service:
- ✓ Guards shall be reinstalled.

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- ✓ Safety devices shall be reactivated.
- ✓ Replaced parts, tools, rags, and debris shall be removed.
- ✓ Maintenance equipment shall be removed.
- ✓ All locks and tags shall be cleared and removed.

All hazardous conditions and discrepancies disclosed by inspection or operation shall be corrected before resuming normal operation.

3.4. Safety during maintenance

Performing maintenance on mechanical and other construction equipment can be hazardous. Electrical and mechanical energy can cause injury and death if not managed properly. All maintenance activity should be conducted in accordance with fist, hazardous energy control program (HECP) and reclamation safety and health standards. A job hazard analysis (JHA) must be conducted as well. Visitors, contractors, and others working under clearances must be trained in HECP and must follow all JHA and clearance procedures.





Self-check -3	Written test

- I. Choose the best answer for the following questions. Use the Answer sheet provided in the next page: each question contains 2 mark
 - **1.** ----- Is the practice of maintaining equipment on a regular schedule based on elapsed time or meter readings?
 - A. Preventive Maintenance
 - B. Condition-Based Maintenance
 - C. Combination of Condition-Based and Preventive Maintenance
 - D. Routine maintenance
 - 2. One of them has examples of Routine maintenance?
 - A. visual inspections
 - B. cleaning
 - C. functional tests
 - D. all of the above
 - 3. One of them has Drawbacks to Condition-Based Maintenance?
 - A. It being very difficult and expensive to monitor some quantities
 - B. It requires knowledgeable and consistent analysis to be effective
 - C. condition monitoring equipment and systems themselves require maintenance
 - D. all of the above

II. Short answer part

- 1. Write and discuss three categories fall into maintenance activities?(3pts)
- **2.** How to improve Safety during maintenance?(2pts)

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Note: Satisfactory rating – 5.5 points	s Unsatisfac	tory -	below	5.5.
Points				
You can ask you teacher for the copy of	of the correct answers.			
Answer Sheet-1			:	
Name:				
Multiple choice				
1.				
2.				
3.				
Short answer				
1				
	_			
2				

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Information Sheet-4	Consulting and co-coordinating appropriate personnel to ensure
	the work effectively with others involving at the work site.

4.1. Introduction

The management of construction projects requires knowledge of modern management as well as an understanding of the design and construction process. Construction projects have a specific set of objectives and constraints such as a required time frame for completion.

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, and quality and participation satisfaction.

4.2. Factors to consider coordinating and consorting

Several organizational factors are indicators of successful worker safety programs. These factors include:

- Strong management commitment to safety, as defined by various actions reflecting management's support and involvement in safety activities.
- Close contact and interaction among workers, supervisors, and management enabling open communication on safety as well as other job-related matters.
- A high level of housekeeping, orderly workplace conditions, and effective environmental quality control.
- Well-developed selection, job placement, and advancement procedures plus other employee support services.
- Training practices emphasizing early indoctrination and follow-up instruction in job safety procedures.
- Added features or variations in conventional safety practices that enhance the effectiveness of those practices.
- Effective disciplinary plan to encourage employees to adhere to safety practices.

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4.3. Concerting and coordinating appropriate person

Overall, the most effective industrial safety programs are successful in dealing with "people" variables. Open communication among workers, supervisors, and management concerning worksite safety is essential. The effective management of response actions at hazardous waste sites requires a commitment to the health and safety of the general public as well as to the onsite personnel. Prevention and containment of contaminant release into the surrounding community should be addressed in the planning stages of a project. Not only must the public be protected, they must also be made aware of the health and safety program and have confidence in it. To accomplish these goals, the project team leader, or Public Information Officer under the supervision of the Project Team Leader, should establish community liaison well before any response action is begun, and should be in continuous contact with community leaders.

4.3.1. Work plan

The following steps should be taken in formulating a comprehensive Work Plan: .

- Review available information, including:
 - √ Site records
 - ✓ Waste inventories
 - √ Generator and transporter manifests
 - ✓ Previous sampling and monitoring data
 - ✓ Site photos
 - ✓ State and local environmental and health agency records ·
- Define work objectives.
- Determine methods for accomplishing the objectives, e.g., sampling plan, inventory, disposal techniques.
- Determine personnel requirements.
- Determine the need for additional training of personnel.
- Evaluate their current knowledge/skill level against the tasks they will perform and situations they may encounter.
- Determine equipment requirements. Evaluate the need for special equipment or services, such as drilling equipment or heavy equipment and operators.

Preparation of the Work Plan requires a multidisciplinary approach, and may therefore require input from all levels of onsite and offsite management.

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4.3.2. Site safety plan

The Site Safety Plan must provide measures to minimize accidents and injuries that may occur during normal daily activities or during adverse conditions such as hot or cold weather.

At a minimum, the plan should: .

- Name key personnel and alternates responsible for site safety. •
- Describe the risks associated with each operation conducted. •
- Confirm that personnel are adequately trained to perform their job responsibilities and to handle the specific hazardous situations they may encounter.
- Describe the protective clothing and equipment to be worn by personnel during various site operations.
- Describe any site-specific medical surveillance requirements.
- Describe the program for periodic air monitoring, personnel monitoring, and environmental sampling, if needed.
- Describe the actions to be taken to mitigate existing hazards (e.g., containment of contaminated materials) to make the work environment less hazardous.
- Define site control measures and include a site map.
- Establish decontamination procedures for personnel and equipment. •
- Set forth the site's Standard Operating Procedures (SOPs). SOPs are those
 activities that can be standardized (such as decontamination and respirator fit
 testing), and where a checklist can be used. These procedures should be
 - ✓ Prepared in advance.
 - ✓ Based on the best available information, operational principles, and technical guidance.
 - ✓ Field-tested by qualified health and safety professionals, and revised as appropriate.
 - ✓ Appropriate to the types of risk at that site. Formulated to be easy to understand and practice.
 - ✓ Provided in writing to all site personnel, who should be briefed on their use.
 Included in training programs for site personnel.
- Set forth a Contingency Plan for safe and effective response to emergencies.

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4.3.3. Safety meetings and inspections

To ensure that the Site safety plan is being followed, the Site Safety Officer should conduct a safety meeting prior to initiating any site activity and before and after each work day.

The purpose of these safety meetings is to: ·

- Describe the assigned tasks and their potential hazards.
- Coordinate activities.
- Identify methods and precautions to prevent injuries.
- Plan for emergencies. Describe any changes in the Site Safety Plan.
- Gets worker feedback on conditions affecting safety and health? •
- Get worker feedback on how well the Site Safety Plan is working.

The site safety officer should also conduct frequent inspections of site conditions, facilities, equipment, and activities to determine whether the Site Safety Plan is adequate and being followed. At a hazardous waste site, risks to workers can change quickly and dramatically when there are changes in:

- Work and other site activities.
- State of degradation of containers and containment structures.
- State of equipment maintenance.
- · Weather conditions.

In order to make safety inspections effective, the following guidelines should be observed:

- Develop a checklist for each site, listing the items that should be inspected. •
- Review the results of these inspections with supervisors and workers.
- Re inspect any identified problems to ensure that they have been corrected.
- Document all inspections and subsequent follow-up actions. Retain these records
 until site activities are completed and as long as required by regulatory agencies.

The minimum frequency at which inspections should occur varies with the characteristics of the site and the equipment used on site. Factors that need to be considered are:

- The severity of risk on site.
- Regulatory requirements.
- Operation and maintenance requirements.
- The expected effective lifetime of clothing, equipment, vehicles, and other items.

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 Recommendations based on professional judgment, laboratory test results, and field experience.

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Self-check -4	Written test

- I. Choose the best answer for the following questions. Use the Answer sheet provided in the next page: each question contains 2 mark
 - 1. One of them is not components of work plan?
 - A. Review available information
 - B. Define work objectives
 - C. Determine personnel requirements
 - D. Determine routine maintenance
 - 2. One of them has factors to consider coordinating and consorting?
 - A. Strong management commitment to safety
 - B. Close contact and interaction among workers
 - C. A high level of housekeeping
 - D. All of the above
 - 3. One of them has factors that need to inspections be considered
 - A. The severity of risk on site
 - B. Regulatory requirements
 - C. Operation and maintenance requirements
 - D. All of the above

II. Short answer part

- 1. Write at least three purpose of safety meetings?(3pts)
- 2. Write and discuss at least four minimum, contents when the Site Safety Plan contains ?(4pts)
- 3. Write and discuss at least four guidelines when safety inspections applied?(4pts)

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<i>Note:</i> Satisfactory rating – 8.5 points	Unsatisfactory - below 8.5.	
Points		
You can ask you teacher for the copy of the cor	rect answers.	
Answer Sheet-1	Score =	
Name:	Date:	_
Multiple choice		
1		
2		
3		
Short answer		
1		
2		
3		

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Operation Sheet 1	Obtaining resources needed for the task

Procedures for Use personal computer to access and use CAD software

- **Step 1**. Wear appropriate PPE
- Step 2. Select all tools and equipment used for computer use
- Step 3. install all power of computer in the power divider
- Step 4. power on the computer power
- Step 5. install all power of computer in the power divider
- **Step 6.** power on the computer power
- **Step 7**. start the computer by using mouse and go to starting point
- Step 8. go to all programs
- Step 9. draw the line on your working area
- Step 10. go to the top of your computer and save the drawing line
- Step 11. give the folder name as practice of simple drawing by computer
- Step 12. Save the folder your folder on D drive
- **Step 13**. Shutdown your computer
- Step 14. Clean all tools and equipment used on these practice





Lap test	Practical demonstration	
Name:	Date:	
Time started:	Time finished:	

Instructions: Giving the necessary equipment's and PPEs you are required to perform the following tasks within 5 hours.

Task1. Open the computer and draw a simple drawing line and saved by your name on D drive





Instruction sheet Learning guide #15: perform drawing	
---	--

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

- · Caring out Drawing task standards and Procedure
- Selecting Methods for dealing with unexpected situations
- Showing Procedure for simple Computer aided Drawings
- Applying application of CAD software in irrigation System

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

- · Carry out Drawing task standards and Procedure
- Select Methods for dealing with unexpected situations
- Show Procedure for simple Computer aided Drawings
- Apply application of CAD software in irrigation System drawings

Learning instructions:

- 1. Read the specific objectives of this Learning Guide.
- 2. Follow the instructions described below
- 3. Read the information written in the "Information Sheets 1- 4". Try to understand what are being discussed.
- 4. Accomplish the "Self-checks 1, 2, 3, and 4" in each information sheets on pages 64, 69, 84 and 144.
- Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
- 6. If you earned a satisfactory evaluation proceed to "Operation sheets 1 on pages 146.and do the LAP Test on page 147". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
- 7. After you accomplish Operation sheets and LAP Tests, ensure you have a formative assessment and get a satisfactory result; then proceed to the next LG.

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Information sheet-1	Caring out drawing task standards and procedure
---------------------	---

1.1. Introduction

Technical drawing is essential for communicating ideas in industry and engineering. To make the drawings easier to understand, people use familiar symbols, perspectives, units of measurement, notation systems, visual styles, and page layout.

The lines, circles, arcs, and curves are created within the software. It is down to the technical drawing skill of the user to produce the drawing.

1.2. The use of tools and equipment

- Most important drawing tools
 - ✓ Drawing paper
 - ✓ Drafting board
 - ✓ Drafting machine
 - ✓ French Curves
 - ✓ Rulers
 - ✓ Compass
 - ✓ Templates
 - ✓ Perspective machines
- Drawing materials
 - ✓ Drafting paper
 - ✓ Thick draft paper
 - ✓ Cloth
 - ✓ Tracing paper
 - ✓ Tracing tube
 - ✓ Inks
 - ✓ Dry transfer

Drafting tools may be used for measurement and layout of drawings, or to improve the consistency and speed of creation of standard drawing elements. Tools such as

• **Drawing paper:** - is the paper, on which drawing is to be made. All engineering drawings are made on sheets of paper of strictly defined sizes, which are set forth in the U.S.S.R standards.

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Table 1.1. Description of the size of drawing paper

Size designation	11	12	22	24	44
Sheet dimensions	297x210	297x420	594x420	594x841	1,189x841
in mm					
Corresponding					
designation of	A4	A3	A2	A1	A0
paper sheets					
according to the					
U.S.S.R Standard					
(for references)					

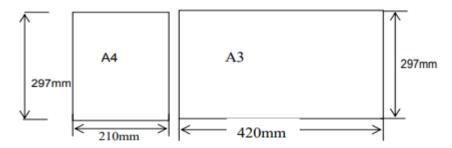


Figure 11. A4 and A3 standard papers

- Pens and pencils mark the drawing medium.
- Straight edges assist the operator in drawing straight lines.
- Divider the dividers consists of two legs hinged at the upper end has steel
 points at both the lower ends. The dividers, as the name implies, are used for
 dividing distances into a number of equal parts. They are used also for
 transferring distances or for setting off a series of equal distances.

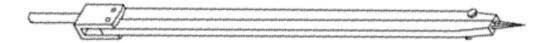


Figure 12. Commonly used of diveder

Scales - are measuring sticks made of plastic, wood, steel and celluloid. There
are different types of scales used in engineering practice. Scales are used for
preparing drawings to full size, reduced size or enlarged size.



Figure 13. Commonly types of scale

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• **Protractor** - is used for measuring or setting off angles other than those obtainable with the set square.

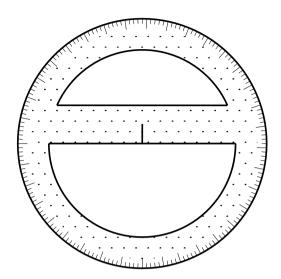


Figure 14. Commonly used types of protractors

• The compass is used to draw arcs and circles.



Figure 15. Compas

 A drawing board was used to hold the drawing media in place. Drawing work is carried out by fixing the drawing sheet on the drawing board. The drawing board is made of soft wood. There is perfectly straight projecting edge on one side of the board known as working edge, which it is use full when T-square is used in the drawing.

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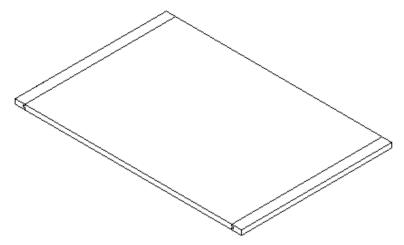


Figure 16. Drawing boards

- Later boards included drafting machines that sped the layout of straight lines and angles.
- French curve (irregular curves) is required to draw mechanical curves other
 than circle or circular arcs. Many different forms and sizes of curves are
 manufactured. The curves are composed of largely of successive segments of
 the geometric curves, such as ellipse, parabola, hyperbola, and involutes.

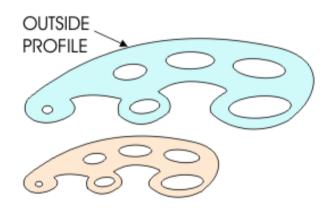


Figure 17. Commonly used types of french curv

- Tools such as templates and lettering guides assisted in the drawing of repetitive elements such as circles, ellipses, schematic symbols and text.
- Other auxiliary tools were used for special drawing purposes or for functions related to the preparation and revision of drawings.
- A drafting machine is a device which is mounted to the drawing board. It has rulers whose angles can be precisely adjusted with a controlling mechanism. There are two main types of apparatus:
 - ✓ An arm-type parallelogram apparatus based on a hinged arm; and

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✓ A track-type apparatus which moves on a rail mounted to the top of the drawing board. The accuracy of the arm type apparatus is better in the middle of the board, decreasing towards the edges, whereas a track machine has a constant accuracy over the whole board. The drawing head of a track-type drafting machine slides on bearings in a vertical rail, which in turn is moved along a horizontal, top-mounted rail. Both apparatus types have an adjustable drawing-head with rules attached to a protractor scale so that the angle of the rules may be adjusted.

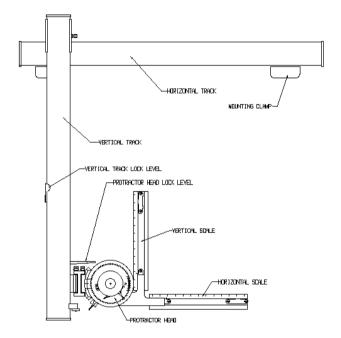


Figure 18. Drafting machine

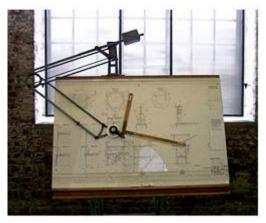
A drafting machine allows easy drawing of parallel lines over the paper. The adjustable angle between the rulers allows the lines to be drawn in varying accurate angles. Rulers may also be used as a support for separate special rulers and letter templates. The rules are replaceable and they can be for example scale-rules.

- Rulers used in technical drawing are usually made of polystyrene. It is used for
 drawing lines and connecting points. Rulers come in two types according to the
 design of their edge. A ruler with a straight edge can be used with lead pencils
 and felt pens, whereas when a technical pen is used the edge must be grooved
 to prevent the spread of the ink
- A T-square is a straightedge which uses the edge of the drawing board as a support. It is used with the drafting board to draw horizontal lines and to align other drawing instruments.

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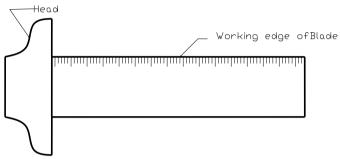
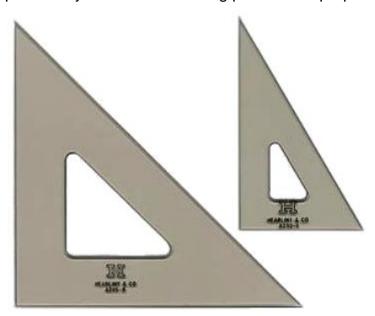


Figure 19. Right-handed parallelogram machine with ballast and T-square

- **Setsquares** The setsquares commonly employed in drawing are 45° and $30^{\circ} \times 60^{\circ}$ triangles.
- ✓ A pair of setsquares may be used for drawing vertical lines with the help of T-square.
- ✓ A pair of setsquares may be used for drawing angles of 15° , 30° , 45° , 60° , 75° , 90° , 105° , 120° , 135° , 150° and 180° .
- ✓ A pair of setsquares may be used for drawing parallel and perpendicular lines.



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Figure 20. Paires of setsquare

The tools used for manual technical drawing have been displaced by the advent of computer-aided drawing, draughting and design (CADD).

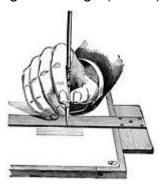


Figure 21. Holding a ruling-pen

1.3. Reporting and communication of design documentation

The design drawings and technical specifications should include the following information.

- Design drawings these set out design information and procedures which are required to be used on the works.
- **Bill of quantities** this itemizes the quantity of materials to enable a tenderer to accurately cost the work for which they are bidding.
- Material specifications such as diameter, type and grade of material for pipes (e.g. polyethylene pipes or UPVC), joining methods (e.g. electro-fused or compression fittings etc./), or 28- day compressive strength of concrete.
- Requirements for material testing e.g. testing required for earthworks (i.e. minimum required compaction and moisture range to be achieved), frequency of testing (e.g. one soil density test per 1,000 m3 of bulk earthworks) or the number of tests per 1,000 m2 of area for hydraulic conductivity tests in sedimentation ponds.
- Construction and installation methods.
- Development approval conditions that have to be complied with throughout the construction.

1.3.1. Design documents relate to the design, construction and commissioning of the project works.

Typically, the documents should include

I. Design drawings: -

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Design drawings for construction contain all the information necessary for the construction contractor to bid on and build a particular project. Typically, the preparation of design drawings provides a detailed record of the design and structural requirements of the works. A contract or tender document often references design drawings.

Design drawings should show details on layout, measurements, plan, cross-sectional and vertical profiles. This information is prepared as scale drawings of the works to be constructed. Design drawings should be presented in such a way that

- The project can easily be understood
- They visually communicate the concept to the lot feeder and the construction contractor.
- They are legible
- They include all information from previous revisions and updates.

The design drawings should include the following aspects

- Site layout and the location of the works to be constructed
- Plan views
- detailed designs and cross-sectional profiles of the works
- dimensions and units gradients
- titles and scales that meet the required standards and units
- adequate labeling
- elevations that are referenced to meters Australian Height Datum (m AHD)
- be dated and signed by the designer

Computational devices and computer aided drafting and design (CADD) packages have made the creation of project design information in digital form common place.

II. Construction/technical specifications

A contract or tender document often references technical specifications about the specific requirements and construction standards for various elements of a project. This includes

- How the work will be done.
- The quality of workmanship and
- Methods of testing.

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Typically, construction projects require construction of various elements and use of various materials. More than one technical specification may be required for the whole project. For example, a construction project may require individual technical specifications for

- ✓ Earthworks
- ✓ Erosion and sediment controls
- ✓ Concrete works
- √ Fencing
- ✓ Building works
- ✓ Roads
- ✓ Electrical systems
- ✓ Water reticulation systems.

For small projects, the material and construction specifications may be documented in the form of notes on the design drawings. For larger projects, a separate specification document is more practical. Designers will usually have suitable standard technical specification documents. However, as a guide a specification might include

- Descriptive title, number, identifier etc. Of the specification
- Date of last effective revision and revision designation
- A logo or trademark to indicate the document copyright, ownership and origin
- Table of contents (toc) if the document is long
- Person or office responsible for questions on the specification, updates and deviations
- The significance, scope or importance of the specification and its intended use
- Terminology, definitions and abbreviations to clarify the meanings of the specification
- References and standards used or to be complied with
- Test methods for measuring all specified characteristics
- Material requirements: physical, mechanical, electrical, chemical targets and tolerances
- Acceptance testing, including performance testing requirements and tolerances
- Workmanship
- Certifications required
- Safety considerations and requirements

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- Environmental considerations and requirements
- Approval authority considerations and requirements
- Quality control requirements, acceptance sampling, inspections, acceptance criteria
- Person or office responsible for enforcement of the specification
- Completion and delivery
- Provisions for rejection, re inspection, rehearing, corrective measures





Self-check -1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Choose the best answer (Each question worth 2 points)

- 1. One of them has components most important drawing tools
 - A. Drawing paper
 - B. Drafting board
 - C. French Curves
 - D. All of the above
- **2.** ------ls the quantity of materials to enable a tenderer to accurately cost the work for which they are bidding?
 - A. Design drawings
 - B. Bill of quantities
 - C. Material specifications
 - D. Construction and installation methods
- 3. Design drawings should be presented in one of them
 - A. The project can easily be understood
 - B. They are legible
 - C. include all information from previous revisions and updates
 - D. All of the above

Matching part each question worth 2 points

	Α		В
1	used for measuring or setting off angles other	Α	T-square
	than those obtainable with the set square		
2	mark the drawing medium	В	French curve (Irregular Curves)
3	used to draw arcs and circles	С	compass
4	Draw mechanical curves other than circle or	D	Protractor
	circular arcs.		
5	Straightedge which uses the edge of the	Ε	Pens and pencils
	drawing board as a support.		
		F	Drawing Paper

Note: Satisfactory rating – 8 and above points Unsatisfactory - below 8points

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

	1 2						
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Answer Sheet-1

Name:	Date:
Part I:-Choose answer	
1	
2	
3	
Part II:-Matching	
1	
2	
3	
4	
5	





Inform	ation	Chast	2
Inform	iation	Sneet	-2

Selecting methods for dealing with unexpected situations

2.1. Introduction

Unexpected situation in life can come anytime in anyone's life. The important thing is how you dealt with them. Life is full of hurdles, ups, and downs. You cannot expect to go everything smoothly and adequately all the time.

You should be prepared about unexpected circumstances and know very well that how to handle them without being panic. Remember that with panic, the problems won't get resolved but may be increased.

The fact must be kept in view that in life you have to face such situations. Sometimes, these situations can be life-shaking or a source of much stress. Still, you have to be patient and choose to handle the unexpected situation gracefully. People who have excellent skills in dealing with such events in life are the strongest one.

2.2. Examples of unexpected events include:

- Causes an unscheduled change in water operations
- Damage to equipment associated with power generation, power transmission, or water operations
- Forced outages
- Relay operations with the unit on or offline
- Events that have an impact to the bulk electric system
- Additional events not listed but as determined by the individual region

2.3. Common solving methods for unexpected situations

I. Keep Calm and Patience

It is the most essential and beneficial attitude you could keep when you face any unexpected situation in life. No matter how much the big problem is, you should stay calm to manage the things properly. Believe me, when you become stressful or panic, the mess or problems will increase very much.

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Because of this, you start doing even the right things in the wrong way. Either you face unexpected events in your work, educational, or personal life, you should learn to handle and manage things properly with patience, calmness, and confidence.

II. Develop acceptance in you

Life is full of surprises where not everything can go as you want to. It is a fact which one should accept quickly to face the situations effectively. If you start to complain and deny taking changes or variations in your life, you can't handle the things gracefully.

When you admit and agree that you cannot avoid unfavourable events, they become less troubling for you. This acceptance will lead you to an act of courage and contentment in a significant way. The sooner you develop the recognition in you; the positive your attitude will become towards life.

III. Try to make wise strategies

You cannot avoid problems in life but can handle them accurately with proper planning and strategy. Instead of being tensed and confused, you need to be mentally active when some unexpected situation comes. Consider why this happens and now what should you do to make the things better rather than making them more chaotic.

Everything has a solution you need to pay proper attention and make the right strategies which can take you out from problems or help to face them in the right way. The panic and stress will give you nothing, but your productive thought or strategies can do a lot.

IV. Control over yourself

You cannot fully control yourself until or unless you have strong inner self and foundations. If you are weak from inside and do not possess the courage to handle unexpected life events, the problems will increase.

The inner strength is an excellent source of firmness and confidence, which allow you to face unfavourable things accurately. You can control the situations and your actions very well if you have an energetic inner self.

V. Be optimistic and positive

Well, the optimism and its impacts on anyone's life are numerous. It can help a lot to manage things and yourself in the right way when you pass through any unexpected situation. If you start thinking negatively, the troubles will increase both outsides and within you. Stay positive and courageous and remember all those events when you were in bad situations and resolved everything suitably.

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This though will give you a boost to take right steps which can take you out from an unfavourable state of affairs. With optimism and positive attitude, you can face anything efficiently and productively.

You can beat the negative impacts of unfavourable conditions very well with your inner strength, power, and stability. If you learn to manage yourself in difficult circumstances, they will start losing their adverse effects on you.

With the exception of equipment or systems undergoing commissioning or undergoing testing, an unexpected event is an unanticipated action involving components or systems. The interruption of power transmission related to power generation or water delivery.





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Self-check -2	Written test	

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

I. Choose the best answer

- 1. One of them is Examples of unexpected events
 - A. Causes an unscheduled change in water operations
 - B. Relay operations with the unit on or offline
 - C. Events that have an impact to the bulk electric system
 - D. All of the above
- 2. One of them has **not** Common solving methods for unexpected situations
 - A. Keep Calm and Patience
 - B. Develop not acceptance in you
 - C. Try to make wise strategies
 - D. Control over yourself

I. Short answer

1. Write and discus at list four Common solving methods for unexpected situations?(4pts)

Note: Satisfactory rating – 4 points Unsatisfactory - below 4 points

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

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Answer Shee	et-1		
Name:		_ Date	e:
Choose answ	wer		
1.			Score =
2.			Rating:
Short answe	r		
1			
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Information sheet-3	Showing procedure for simple computer aided drawings

3.1. Drawing format and setup

Standard 22"x34" (full-size) and 11"x17" (half-size) Forest Service drawings sheets are used for design and construction drawings.

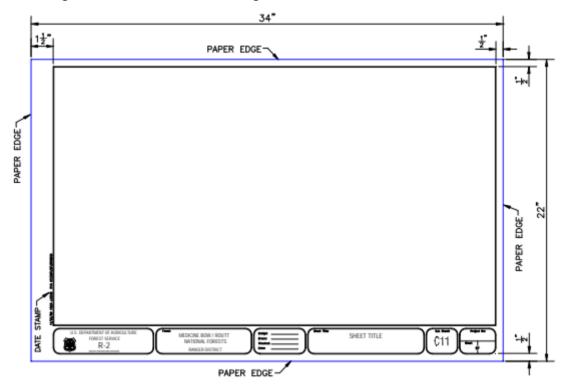


Figure 22. Standard sheet border

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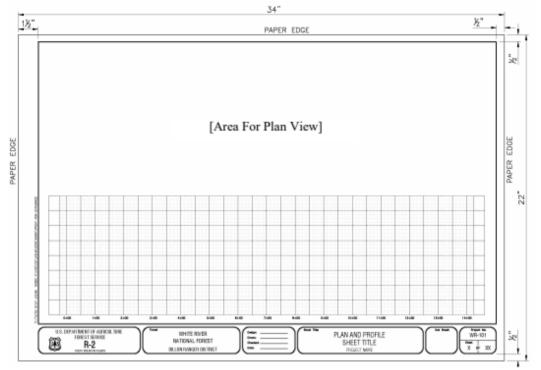


Figure 23. Standard plan and profile sheet border

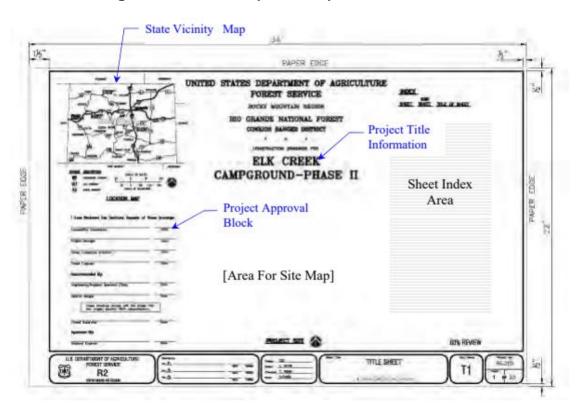


Figure 24. Typical cover sheet configuration

3.2. Title blocks

The title blocks on a standard sheet (rectangular bubbles located on the bottom of the border sheet) include the following information:

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- Drawing title;
- project name;
- project number;
- · Ranger district;
- designer,
- Drafter, and reviewer's name;
- date;
- Sub-sheet number as well as sheet number and total sheets.

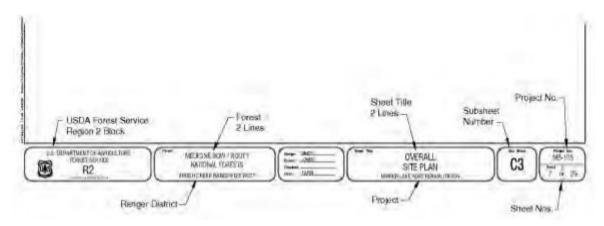


Figure 25. Standard border sheet title block

3.3. Approval and revision blocks

• **Approval blocks** – The project approval block is located on the cover sheet of all design and construction drawing sets.

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I Have Reviewed the Technical Aspects of Thesi	e Drawings:
Accessibility Coordinator	Date
Project Manager	Date
Forest Landscape Architect	Date
Forest Engineer	Date
Recommended By:	
Engineering/Regional Specialist (Insert Title)	Dote
District Ranger	Date
These drawings comply with the Forest Plan and project specific NEPA documentation.	
Forest Supervisor	Date
Approved By:	
Regional Engineer	Date

Figure 26. Example of the approval block to be used on the cover sheet of all construction-drawing sets.

 Revision block - A revision block is required when changes are made to construction drawings, which have been issued for bid and therefore are official contract documents.

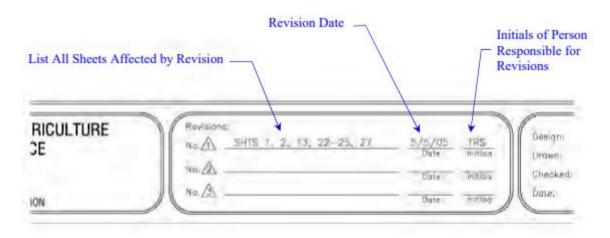


Figure 27. Completed revision block

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3.4. Date stamp

Each drawing needs to contain a date stamp that includes the latest date and time drawing was last modified, name of drafter, AutoCAD release number, and the drawing pathname with the drawing filename (including any external references). It is to be located vertically, on the left side of the border sheet, outside the border. This date stamp is written into the customization of our border sheet drawings and when using our 2nd sheet borders, the date stamp will automatically be updated each time the drawing is saved. To insert this date stamp on existing drawings, you can access the "auto stamp" icon from the icon menu.

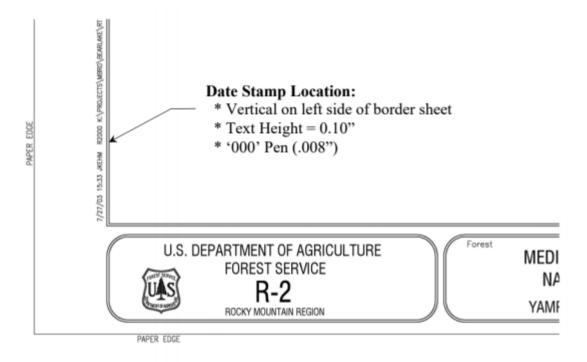


Figure 28. Automatic date stamp location

3.5. Drawing setup guide

The following is a quick guide to setting up your drawings.

All the standard sheets referenced in this chapter are accessible from the general toolbar available on the FS AutoCAD customization disk. Additional symbols are also available from this toolbar such as scale bars and north arrows.

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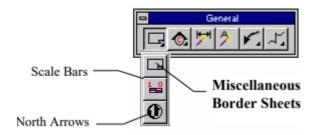


Figure 29. General toolbar

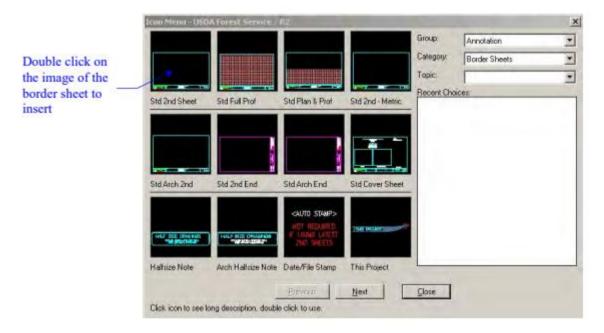


Figure 30. Fs icon menu

3.5.1. Insert border sheet

Insert a FS border (second sheet) into the drawing in paper space at (0, 0, and 0) and scale factor 1 (both x and y)...the border is full size 22"x34":

The FS border sheet is setup with attributes that allow the drafter to fill in all the appropriate title block information, and the dialog box immediately pops up once inserted.

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Figigure 31. Inserted border sheet into paper space

3.5.2. Setting up viewports

Before creating any viewport, be sure to create a new layer for them in the layer dialog box to better manage the display and printing options of the viewports. If you don't want the frame of the viewport to print, be sure to set the print option to no plot for your newly created viewport layer or set the pen color to 254 (no plot pen).

Another option is to create the viewport on the def points layer, which automatically does not plot. To create a viewport(s) simply type '**mview**' in the command line and create your viewport by clicking in the lower left of the border working area, stretching your rectangular box and clicking on the upper right. Once the viewport is created, you will immediately see the model space environment appear within your viewport window. The next step is to scale and/or rotate the model space view to accurately fit the border sheet.

3.5.3. To scale:

Type in 'mvsetup' in the command line and select the Scale viewports option by typing 's'.

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- Select the viewport by clicking on the viewport box (the lines should dash after selecting) and hitting the enter key to complete the selection.
- 2. The command line will prompt you for the paperspace units (default = 1.0)...hit enter.
- 3. Next the command line prompts you for the modelspace units (again default = 1.0), but here type in the scale desired for the drawing. For a drawing that is 1"=40'...type in 40, for 1"=100'...type in 100, for ½"=1'-0"...type in 24, etc.

Note: Scale Factors will depend on what units (inches or feet) the drawing is set to. If the desired area disappears from the screen, you may need to pan or zoom in through the model space window to the area prior to starting these steps.

Another alternative to scaling a viewport is to simply click on the paper button just below the command line, which initiates the floating modelspace option (you will see the button now reads model, and your cross hairs operate within the viewport only and not the entire screen. Type in 'z' for the zoom command and 's' for scale, or click the zoom scale icon under the zoom fly out menu.

Follow the scale input in step number three above, and enter 1 over your scale factor with 'xp' immediately following the number. (i.e 1/40xp for 40 scale, 1/100xp for 100 scale, 1/24xp for ½" scale, etc.) Both methods will provide an accurate viewport scale.

3.5.4. To rotate

Again type 'mvsetup' in the command line and select the Align option by typing 'a', and then select the rotate view option by typing in 'r'.

- **1.** Type in 0, 0 as the viewport base point and hit enter.
- 2. Determine the specified viewport angle by typing in the desired angle relative to 0 being straight up. For a 30-degree rotation counterclockwise, type in 30. For a 45 degree rotation clockwise, type in -45. All angles ccw(counter cloacae) are positive and cw(cloacae) are negative, see Figure 32.

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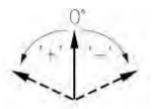


Figure 32. Viewport angle rotation orientation

After setting a rotation in the selected viewport, you will note that your crosshairs are no longer horizontal and vertical in the floating model space window, but rather angled to match the rotation. If you click the model space tab you will discover that the actual 'real world' model space is still the same orientation it has always been, it is just the view in paper space that has been rotated to accommodate the border sheet space. Despite the viewport rotation, the horizontal/vertical orientation or coordinate system has not been changed in the actual model space.

3.5.5. Text input on rotated viewport

As you work through the newly rotated viewport window you discover that any text or ortho line work that you attempt to put is subject to the rotation angle established by the rotated viewport. You want text that is horizontal on the drawing but is coming in angled since the crosshairs are angled.



Figure 33. Viewport with actual model space orientation

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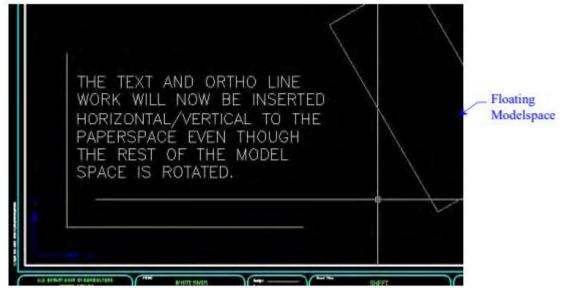


Figure 34. Viewport with corrected crosshairs - changed with UCS

3.5.6. Xrefs

All xrefs should be inserted at (0,0) as 'overlays' rather than 'attached'. Select relative Path in the Path type box. By selecting this option, the drawing tag on the left side of your border sheet simply identifies the name of the xrefs rather than the entire path and name of the xrefs. (This will keep your drawing tag from shooting up off the page on the left side of your border sheet). Another option is to select 'No Path' this allows users from other districts/forests to share drawings from another server in an entirely different office. The xref manager will look to the user's local drives to load the xref drawing rather than trying to directly access a foreign drive that is hard coded into the attachment

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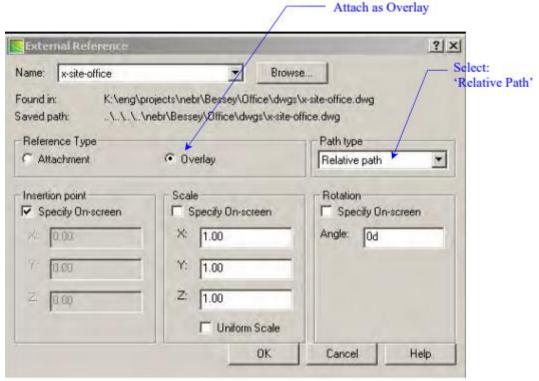


Figure 35. Xref manager attachment box

As good practice: It is recommended that a new layer called xref be created and set current prior to inserting xref dwgs. This allows the cad user working in that particular drawing to turn off or freeze the entire xref by selecting the newly created xref layer...rather than freezing/turning off each individual layer associated with a particular xref. If several xrefs are inserted, layer names can have identifiers added such as: xrefsite.... xref-utility.....xref-topo, etc

3.5.7. Important setting in AutoCAD when working with XREFs

Navigate to the 'Tools' pull-down menu and click on 'Options' at the bottom of the menu. The 'Options' dialog box should pop on the screen and after clicking on the 'Open and Save' tab, the user should see the box shown in Figure 36. Under the External References section in this box, be sure to change the demand load Xrefs option by clicking on the right arrow and selecting 'enable with Copy'. By doing this, other users will be able to successfully load project drawings that have also xrefed in the same base drawing. If you don't select this option, you lock any xref drawings that load along with your AutoCAD file, and other users will not load or even view those drawings while you are in that particular file.

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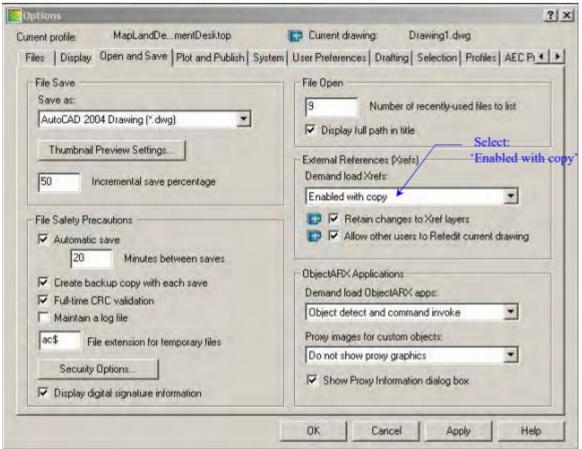


Figure 36. Options dialog box - opens and save tab





Self-check -3	Written test
Directions: Answer all the	ne questions listed below. Use the Answer sheet provided in the
next page:	
I. Choose the best answ	rer
1. One of them has in	cluding in Date stamp
A. latest date a	nd time drawing was last modified,
B. name of dra	fter,
C. AutoCAD re	lease number,
D. the drawing	pathname with the drawing filename
2. One of them has c	omponents of the title blocks on a standard sheet
A. Drawing title	;
B. project name	e;
C. project num	per;
D. all of the abo	ove
3 is requir	ed when changes are made to construction drawings, whic
have been issued	for bid and therefore are official contract documents?
A. Revision Blo	ock
B. Approval blo	ocks
C. Title Blocks	
D. Setting up V	Tiewports
ote: Satisfactory rating -	- 3 points Unsatisfactory - below 3 points
ou can ask you teacher fo	the copy of the correct answers.
Answer Sheet-2	
Name:	Date:
Multiple choose	
1	
2	Score =
3	Rating:

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Applying application of CAD software in irrigation system

4.1. Introduction

The future of irrigation design is in software, with highly-specialized CAD tools that dramatically speed the process of producing irrigation plans. The first, and most crucial element of irrigation design software, is the equipment database: all the varied manufacturers, with new and updated models, and wildly varying performance specifications. Further, all these pieces of equipment have to be matched with appropriate symbols to represent them on the plan.

There needs to be tools to rapidly and easily place sprinklers and equipment, calculate their flow and pressure needs, indicate how they are to be piped, generate a legend, and most importantly, perform the flow hydraulics calculations to determine their sizes of pipes required. Some irrigation designers claim that they can produce a design quicker by hand than with software. While this may or may not be true, the indisputable gains from using software are in areas such as error-checking, revisions, redesigning the system for differing requirements or equipment, all done nearly instantly and perfectly accurate. CAD, or Computer-aided design is the use of computer technology for irrigation design structure and design documentation.

4.2. Use of CAD software used in irrigation design

Autocad is an abbreviation standing for Automated Computer Aided Design which is application software that Designers (Engineers and Architects) use in their daily design activities and it by far, helps in reducing the bulk of work to be done, had the design been with ruler and pencil.

AutoCAD command and options allow you to draw objects of any size or shape. Use AutoCAD to prepare two-dimensional (2D) drawings, three-dimensional (3D) models, and dimensional and animations.

AutoCAD is a universal CADD software program that applies to any drafting, design, or Engineering discipline. For example, use AutoCAD to design and document mechanical

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parts and assembles, architectural building, civil and structural engineering projects and electronics.

In this information you will how learn how to start with AutoCAD2016 and how to use different buttons & hot keys to draw and design structures.

4.2.1. 2D drawings:-

2D Drawings display object length and width, width and height, or height and length in a flat. (2D) drawings are the established design and drafting format and are common in all engineering and architectural industrial and related disciplines. A complete 2D drawing typically includes dimensions, notes, and symbols that describe view features and information. This practice results in a document used AutoCAD provides commands and options to accurately create 2D drawing for building design and construction.

- CAD systems Consists the following components
- i. CAD user (Human): knowledge
- ii. CAD Hardware: use of digital computer such as:
 - CPU
 - Memory
 - Storage
 - Input devices
 - ✓ Keyboard,
 - ✓ Mouse,
 - ✓ Optical pen,
 - ✓ Tablet,
 - ✓ Scanner,
 - ✓ Modem,
 - ✓ Digitizer
 - Output devices
 - ✓ Computer screen (monitor) Printer

iii. CAD software:

- System Software
- Application Software

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4.3. Manuals or producers for cad use software

4.3.1. Starting Up AutoCAD 2016

Select the AutoCAD 2013 option on the Program menu or select the AutoCAD Civil 3D 2016 metric icon on the Desktop. Click Start Drawing to start a new drawing. We have the following components.



Figure 37. Start drawing displays on desktop view

A. Setting up the workspace

Before you start the tutorials, you must set the appropriate workspace. Workspaces are sets of commands that are grouped and organized so that you can work in a custom, task-oriented drawing environment. When you choose a workspace, only the ribbon tabs, toolbars, and secondary windows specified in that workspace are shown in the interface. To access other commands not shown in the ribbon, enter their command names on the command line.

To set up the workspace: **General->workspace->3D** Or

- 1. On the command line, enter workspace.
- 2. At the workspace option prompt, enter C.
- 3. When prompted to enter the name of the workspace, enter civil 3D.

B. Understanding the civil 3D user interface and tools

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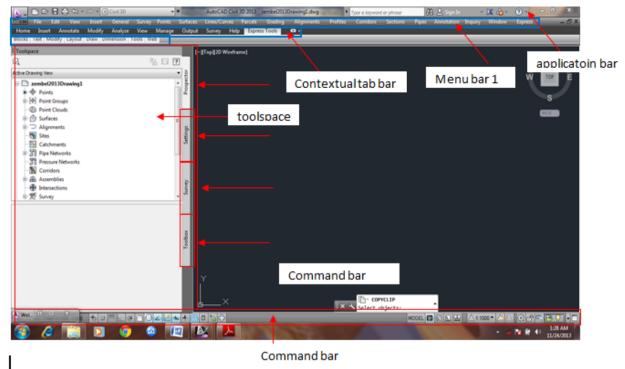


Figure 38. basic details of menu bar buttons

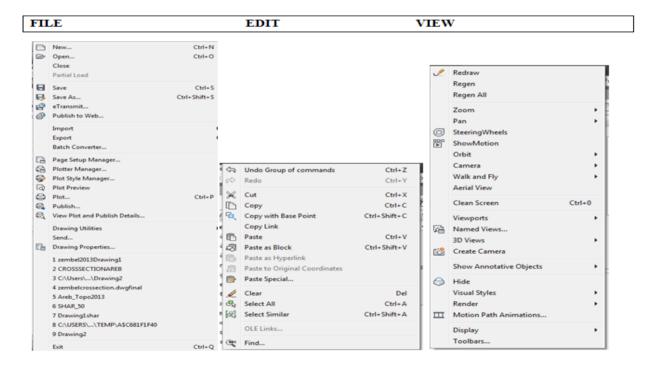


Figure 39. Components of file, edit and view

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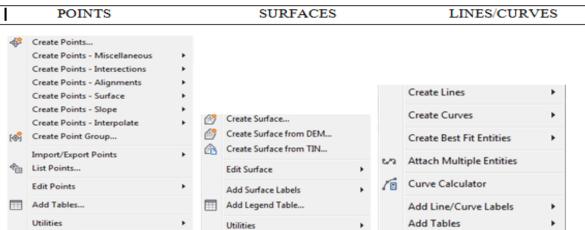


Figure 40. Components of point, surface and lines/curve

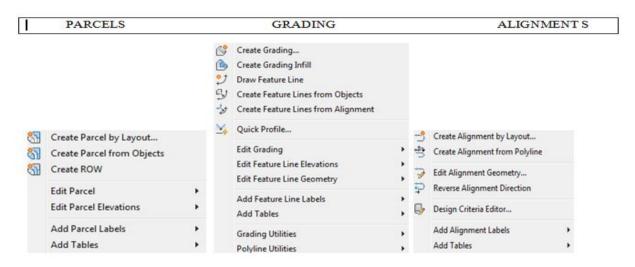


Figure 41. Components of parceles, grading and allignment

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Figure 42. Components profile, corridors and sections

C. Using the ribbon

The ribbon is located at the top of your screen and is the launching pad for most of your civil 3D commands. The commands that it contains are organized into groups through the use of tabs and panels. The ribbon itself is divided into a series of tabs that include Home, Insert, Annotate, and so on. Tabs arrange large numbers of similar civil 3D commands into groups. Each tab is divided into *panels*. For instance, the Home tab includes the Palettes, Create Ground Data, Create Design, and Profile & Section Views panels.

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Because Civil 3D groups the commands in this way, you never have to choose from more than a handful of commands once you've taken your best guess at the correct tab and panel. Also, you'll find that the more you use civil 3D, the better you will be at knowing where the commands are. It's not so much memorizing their locations as it is learning how civil 3D "thinks"—that is, the way in which it relates commands to one another and categorizes them into tabs and panels.

One other thing you should know is that most panels expand downward to show you the less frequently used commands in that particular category. You'll know they expand when you see a downward-pointing black triangle next to their name.

CONTEXTUAL TAB BAR

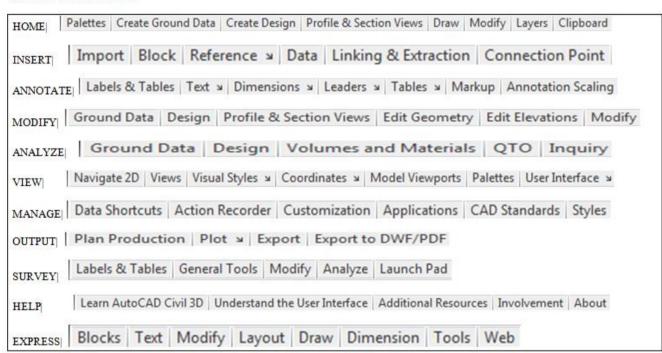


Figure 43. Contextual tab bar

4.3.1. Getting started with basic tab usage

Components under these part

Using the tool space

You can open the Toolspace by clicking the Toolspace icon on the Home tab of the ribbon. Think of the Toolspace as the civil 3D "command center" where all civil 3D data and settings are laid out in a nice, orderly arrangement.

To open and display the toospace, follow the following sequence.

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Home->Palette->toolspace. When you want to display. Click it and when don't want it to be shown again click it. If the prospector tab is not visible, click the Home tab of the ribbon, and then click the prospector icon on the palettes panel.

Toolspace has several main functions that are represented by the different tabs. Altogether, the Toolspace can house four tabs:

- √ Prospector,
- ✓ Settings,
- ✓ Survey, and
- ✓ Toolbox. We will see each tab functions one by one.

I. Prospector

Prospector is the most important part of the civil 3D user interface. As you build your design, prospector arranges the different components of your design in a tree structure. Another way to think about Prospector is that it arranges your design categorically rather than spatially. In other words, in your drawing area, you see canal centerlines crossing through parcels, which cross through contours, which cross through survey points. Everything is in the right place spatially, but from an organizational standpoint, it's kind of a mess. Prospector sorts out this mess and puts all the points in one place, all the parcels in one place, and so on.

Prospector also knows exactly where those objects are in the drawing. You can rightclick an object in prospector and use the select command or zoom to command to locate that object within the drawing.

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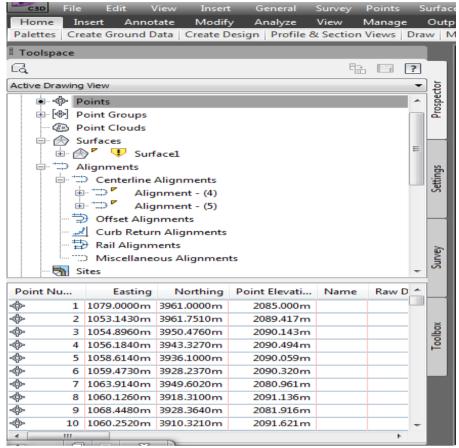


Figure 44. Prospector tab showing drawing points

If the Toolspace is not already open, click Toolspace on the Home tab of the ribbon.

- 1. Click the prospector tab of toolspace to bring it to the forefront.
- **2.** Explore the tree structure of prospector by clicking the plus signs to expand the different branches.
- **3.** Expand alignments centerline alignments a main canal A a profiles. This hierarchical arrangement provides effective organization and suggests a relationship between the alignment and its profiles.
- **4.** Right-click side canal B and select zoom to. Notice how Prospector knows where the alignment named Side Canal B is, even if you don't.

It's important to point out that prospector isn't just a place for viewing your design; it's also a place where you can change the appearance of your design, create new components for your design, and edit your design, and so on. These types of functions are accessed through contextual menus such as the one used in step 5 of the previous exercise. A good rule of thumb when using Prospector is, When in doubt, right-click it.

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II. Settings tab

Civil 3D has a lot of settings that control nearly every aspect of how the software behaves. In fact, one of the things that make civil 3D so powerful is that you can customize its settings to accommodate nearly any type of design, company standard, or any other factor that defines the environment within which you use it. The settings tab is where these settings are managed; however, you won't be spending much time here for the early part of your civil 3D career. This area is more often the territory of a CAD manager.

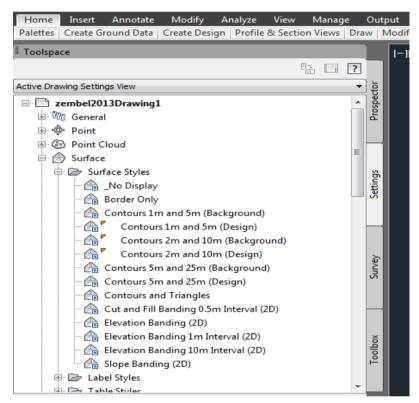


Figure 45. Setting r tab showing drawing points

To explore the Settings tab, follow these steps

- **1.** Click the settings tab of the Toolspace.
- 2. Expand surface a surface styles and take note of the list of styles shown there. These styles control the appearance of models that represent the shape of the ground.
- 3. Expand surface a label styles a contour and take note of the list of styles shown there. These styles control a certain type of label that is used to annotate surface models.
- **4.** Keep this drawing open for the next exercise.

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Note: If the settings tab is not visible, click the home tab of the rib- bon, and then click the settings icon on the palettes panel.

III. Survey tab

The Survey tab is specifically for working with survey data. It displays survey data in a tree structure, and it allows you to launch commands through contextual menus.

Toolbox tab

As if civil 3D didn't have enough stuff packed into it already, the toolbox is a place where other add-ons can be plugged in. Your company may have some custom programming that is designed to run in civil 3D or some add-on modules pro- vided by Autodesk®. This is the place where you can load and run these additional enhancements to civil 3D.

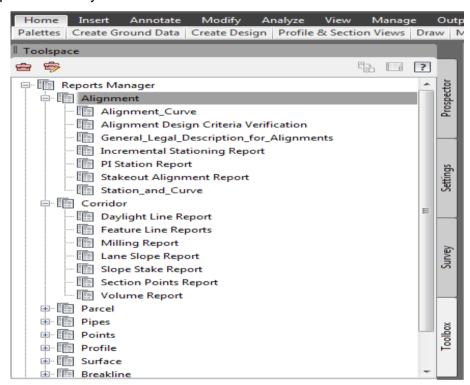


Figure 46. Features of toolbox

· Using the command line

Think of the command line as a chat window where you talk with civil 3D. Nearly everything you do is reported on the command line along with civil 3D's response to it. A response can be a request for more information, reporting of a result, or notification of a problem. It's good to get into the habit of always watching the command line, because it often tells you what to do next. You can also launch commands from the command line, but you will likely find it much easier to use the visual interface provided by the ribbon and other tools.

Visual reference

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The method we just used to create the freehand sketch is known as the interactive method, where we use the cursor to specify locations on the screen. This method is perhaps the fastest way to specify locations on the screen. However, it is rather difficult to try to create a line of a specific length by watching the displayed coordinates. It would be helpful to know what one inch or one meter looks like on the screen while we are creating entities. AutoCAD 2016 provides us with many tools to aid the construction of our designs. For example, the GRID and SNAP mode options can be used to get a visual reference as to the size of objects and learn to restrict the movement of the cursor to a set increment on the screen. The GRID and SNAP mode options can be turned on or off through the status bar. The Status bar area is located at the bottom left of the AutoCAD drawing screen, next to the cursor coordinates.

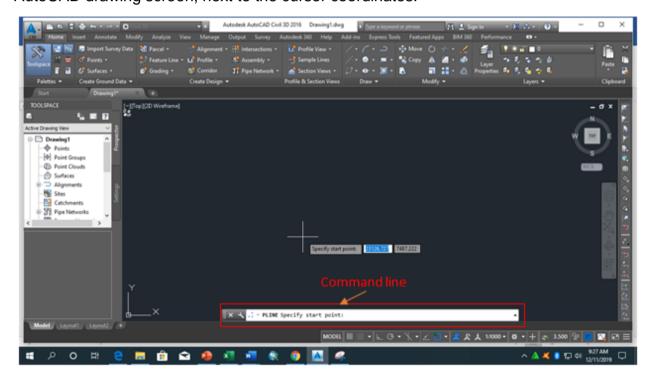


Figure 47. Freehand sketching area

https://www.youtube.com/watch?v=Ess0dmJB2lo

Using option buttons

There are many icons to be used when drawing an object.

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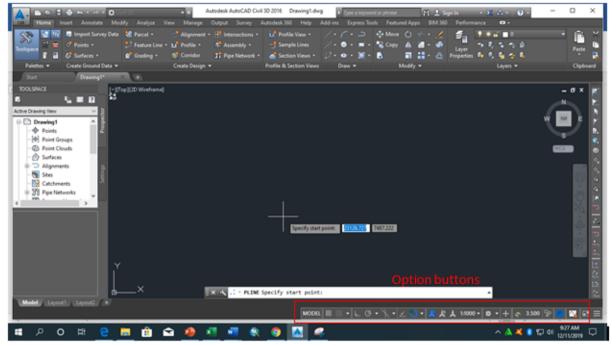


Figure 48. Option bottum display point

Snap Mode: snaps to increments of the spacing that you specify. (I.e. if you set it to 2 in both x,y direction, it will snap on 2,2:2,4:10,8 etc.)

Grid Display: displays grids with the spacing that you specify

Ortho Mode: restricts movements to horizontal and vertical directions.

Object Snap: snaps to existing objects on the screen. You can also activate specific Object Snap during drawing/inquiry operations by right clicking and selecting snap overrides.

Object Snap: snaps to existing objects on the screen. You can also activate specific Object Snap during drawing/inquiry operations by right clicking and selecting snap overrides.

Show/Hide Line weight: turns on/off the line width on display. It does not affect the line widths on plot.

Quick Properties: displays the properties of selected object(s). Another way to show properties: After select a object/objects, right click and select "Quick Properties". You can change the object(s) properties here (layers, color

Figure 49. Option buttom components and its function

4.3.4. Drawing objects

Components under these part

https://www.youtube.com/watch?v=dii9qzv1J3U

Drawing with lines

Draws a line/curve with multiple control points.

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Pay attention to the command line while using polyline tool; it will show you variety of options for the next move you can take. Following are some of the examples.

- ✓ If you hit "Esc" while drawing a polyline, the line terminates at the last point you clicked.
- ✓ If you type "cl" while drawing a polyline, it draws a segment that connects the starting point and the last point you clicked (the line becomes a closed shape).
- ✓ You can also draw an object with arcs using polyline tool. If you type "a" while
 drawing a polyline, your next segment will be an arc. It will continue to draw arc
 segments with tangent to the previous arc.

If you type "s" while drawing an arc segment, you can define an arc angle by specifying three points that the arc goes through.

If you type "r" while drawing an arc segment, you can define an arc radius.

- 1. Move the graphics cursor to the icon in the Draw panel. This icon is the Line icon.

 Note that a brief description of the Line command appears next to the cursor.
- 2. Select the icon by clicking once with the left mouse-button, which will activate the Line command.

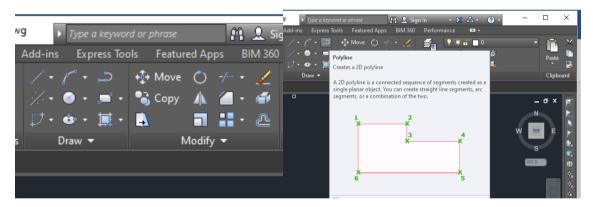


Figure 50. Poly line function and its components

3. In the command prompt area, near the bottom of the AutoCAD drawing screen, the message "_line Specify first point:" is displayed. AutoCAD expects us to identify the starting location of a straight line.

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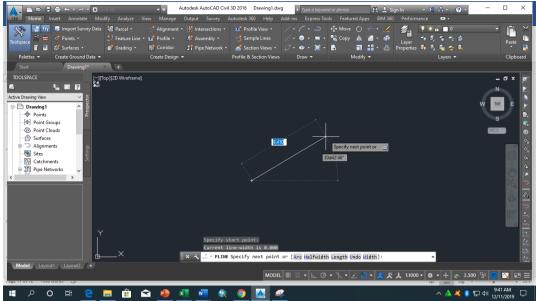


Figure 51. Starting location of a straight line

• Drawing with rectangles,

- Move the graphics cursor to the icon in the draw panel. This icon is the rectangle icon. Note that a brief description of the rectangle command appears next to the cursor.
- 2. Select the icon by clicking once with the left mouse-button, which will activate the rectangle command.
- 3. In the command prompt area, near the bottom of the AutoCAD drawing screen, the message "_line Specify first point:" is displayed. AutoCAD expects us to identify the starting location of a straight line.
- 4. You can also draw a rectangle using lines and at the end press C for "close" the drawing.
- 5. Press enter when finished.
- 6. Draws a rectangle by defining two corners. Click on the point where you want to place the first corner of a rectangle or type in x,y coordination for precise input.
- 7. If you type "@" after defining the first corner, you can specify the second corner by x,y coordination. For example, type @36, 24 for 36" x 24" box.
- 8. If you type "d" after the first corner, you can specify the second corner by the x and y distance from the first corner. For example, type "d" > space > 36 > space > 24 for 36" x 24" box

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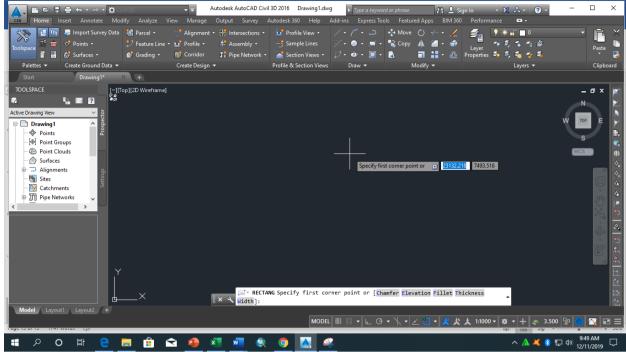


Figure 52. Rectangular drawing line

Drawing with circles,

- Move the graphics cursor to the icon in the draw panel. This icon is the circle icon.
 Note that a brief description of the circle command appears next to the cursor.
 Select the way of drawing circles.
- 2. Select the icon by clicking once with the left mouse-button, which will activate the circle command.
- In the command prompt area, near the bottom of the AutoCAD drawing screen, the message "_line Specify the radius, diameters etc. of the circle and press enter
- 4. Notice the different options available under the circle submenu:
 - Center, Radius: Draws a circle based on a center point and a radius.
 - Center, Diameter: Draws a circle based on a center point and a diameter.
 - 2 Points: Draws a circle based on two endpoints of the diameter.
 - 3 Points: Draws a circle based on three points on the circumference.
 - TTR-Tangent, Tangent, and Radius: Draws a circle with a specified radius tangent to two objects.
 - TTT-Tangent, Tangent, and Tangent: Draws a circle tangent to three objects.

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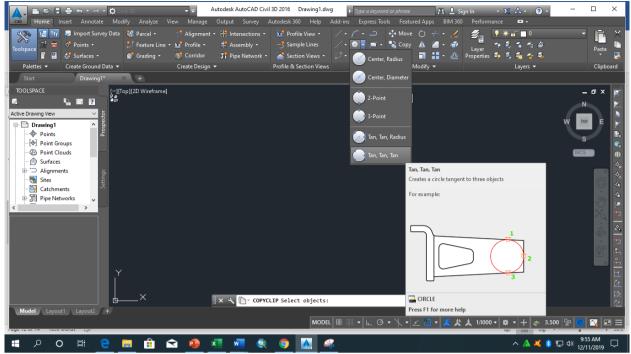


Figure 53. Polyline of atucad 3d

4.3.5. Using modify tools

https://www.youtube.com/watch?v=PlvLiKHrxuo

A. Modify

There are three ways to modify

- 1. Type full or short name in command line(increase efficiency)
- 2. Icon:home/modify
- 3. From dropdown



Figure 54. Modification display

- Erase:-Erases the selected objects. You can get the same effect by selecting objects.
- Copy(copy):- copies the selected objects from one place to another
 - ✓ Select objects click/type the base point and the second point that you want to copy objects to

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- ✓ You can also copy +past objects by selecting objects and right click on them. It will save objects in clipboard and allows you to copy things from one file to another.
- ✓ Select copy with base point to copy things between files at precise location.
- Mirror(Mi):-mirrors objects at along the line that define.

It will ask you wtethre you want to keep the original object or not after you defining the mirror line type V for yes n for no.

- Offset(O):offset objects to the distance you specify
 - ✓ It will ask you the distance to offset object first. You can specify it by typing the distance in or clicking two points on screen.
 - ✓ After entering the distance, grab an object to Offset and click on the side that you want to offset it to.
 - ✓ You can offset an object multiple times in the same distance by repeating click.
- Move(m):moves the selected objects from one place to another.
 - ✓ Select objects, click/type a base point and the second point that you want to move objects to.
- Select/deselect: you can select the objects by clicking on an object or drawing a window around it
 - ✓ Drawing a window from left to right selects everything that the windows crosses
 - ✓ Drawing a window from right to left select everything that the window containes.
 - ✓ Deselect objects by doing the same operation while holding down shift key, or deselect everything by hitting Esc key.

Using the ERASE command

✓ One of the advantages using a CAD system is the ability to remove entities without leaving any marks. We will erase two of the lines using the ERASE command.

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✓ Pitch ERASE in the modify toolbar.(the icon is a picture of an ERASER at the end of a pencil. The message "select objects" is displayed in the command prompt area and AUTOCAD awaits us to select the objects to ERASE.

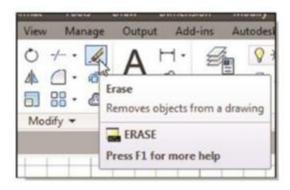


Figure 54. Removing non use objects by using erase

• Scale(sc): scale objects by the ratio you specify. You can also scale objects by the relative distance using reference point

Click scale →Select object →click enter →click base point → specify scale factor



- Trim(Tr): trim objects along specified object.
 - ✓ Creat objects that you want to use as trim edge
 - ✓ Clik on trim tool select the trim edge and hit enter, clik on the objects to trim on the side that you want to ERASE.
 - ✓ You can trim multiple objects at once by using selection window or Fence tool.
 - ✓ To use selection window, draw a window after selecting trim edge instead
 of directly clicing on objects to trim.
 - ✓ To use fence type 'f' after selecting trim edges and draw a line. It will trim
 everything that the line crosses.



- extend(ex):extend objects to reach specified objects.
 - ✓ Basic operation is similar to trim
 - ✓ Select objects that you want to use extend edeges nad hit enter, click on the objects that you want to extend

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✓ You can also extened multipe objects at onese by using selection window or 'fence'tool. For direction, please see trim section.





- Explode(x): break selected complex objects such as blocks and polylines down to lines and arcs.
- Filler: conects two objects with an ark that is tangent to the objects and has a specified radius.
 - ✓ Click on fillet
 - ✓ Select first objects type in R and press enter. This is to set the fillet radius.
 - ✓ Specify the fillet radius type in two and press enter.
 - ✓ Select first objects, select the horizontal line some where near the end point close to the vertical line/ do not click on the end point it selef/ with the pick box.
 - ✓ Select the second object select the vertical line some where near the end point close to the horizontal line / do not click on the end point it selef/ with the pick box.
 - ✓ If you don't enter a number the two lines will extend to join each other.
- chamfer: connect with a sraight line using distance
 - ✓ Click on chamfer
 - ✓ Select first objects type in d and press enter. This is to set the chamfer distance.
 - ✓ Specify the chamfer distance type in 2 and press enter.
 - ✓ Select first objects, select the horizontal line some where near the end point close to the vertical line/ do not click on the end point it selef/ with the pick box.

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- ✓ Select the second object select the vertical line some where near the end point close to the horizontal line / do not click on the end point it selef/ with the pick box.
- ✓ If you don't enter a number the two lines will extend to join each other.

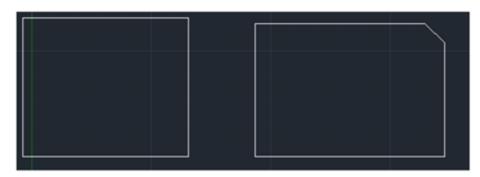


Figure 54. Chanege of vertical line in to incliened line

- Hach(H):
 - ✓ Filles an enclosed area or selected objects with a hach patern or fills.
 - ✓ Type useally predefinied
 - ✓ Pattern: choose the patern from list(pull down)or clicking either of these.
 - ✓ The winwow below pops up. ISO has basic paterns, other predefined tab shows commonly used patterns such as brick, earth, gravel, concrate and sand.

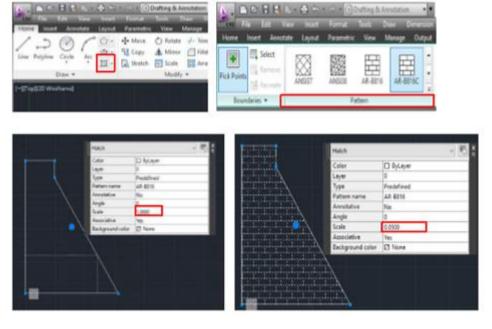


Figure 55. Modification of angles and scales by using hach

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- ✓ You can modify the angle and scale of patern
- ✓ You can also modify the property after you complet the command.

 Doubleclick the hach and the property window will popup. Simply make changes.

4.3.6. Making layers

https://www.youtube.com/watch?v=QAtOPeN4KpY

AutoCAD uses layer systems like photo shop and sketch up to organize a drawing layer palette shows your current layer name and state.

✓ To access layer manager, click on the highlighted icon or type 'layer' on the command.

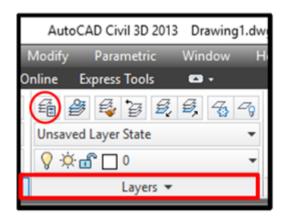


Figure 56. Layer formation





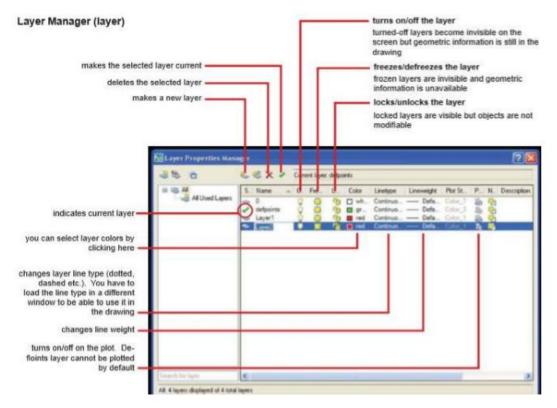


Figure 57. Components of layer manager

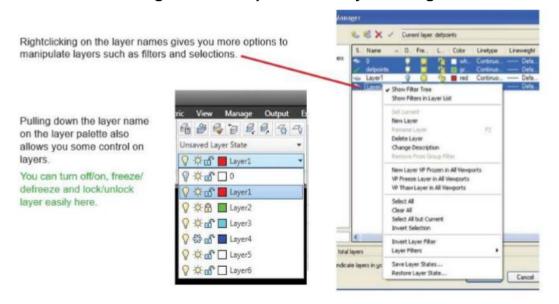


Figure 58. Use to filter and selection

4.3.7. Annotation and dimension style manager

https://www.youtube.com/watch?v=MqGEfiHPvo0

dimension style manager

First, setup a new dimension style in dimension style manager by clicking on the dimension manager.

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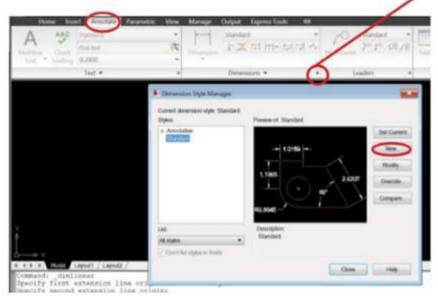


Figure 59. Dimentional style manager

- √ Choose new and set up a new style
- ✓ Choose continue and then you can modify the setting. The most important ones
 are shown below the figure.

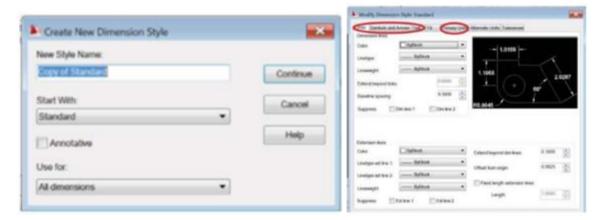


Figure 60. Setting modification in dimentional manager

Set a new layer for dimension, and then use the following tools.

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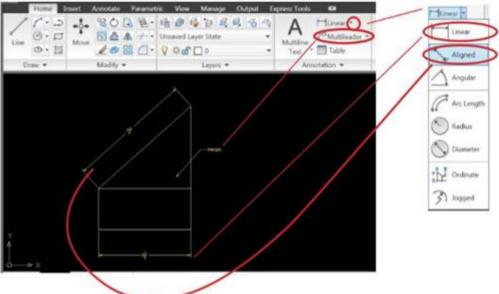


Figure 61. Insert unit in the dimension

4.3.8. Making layouts and plotting

https://www.youtube.com/watch?v=ppRjgAWhmYU

- Importing from template
- Editing attributes
- Blocking the drawings
- Using layout tools
- Scaling the drawing
- Using models and paper styles
- Plotting to pdf or printer

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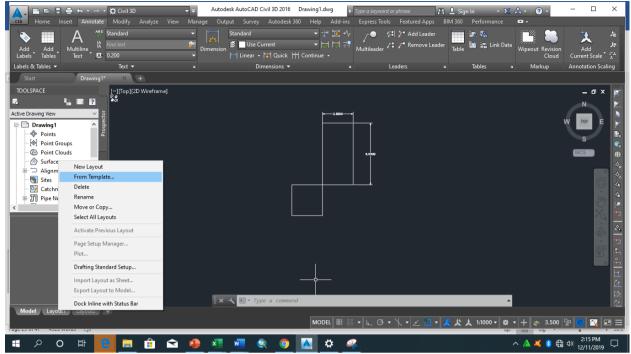


Figure 62. Making layout and ploting

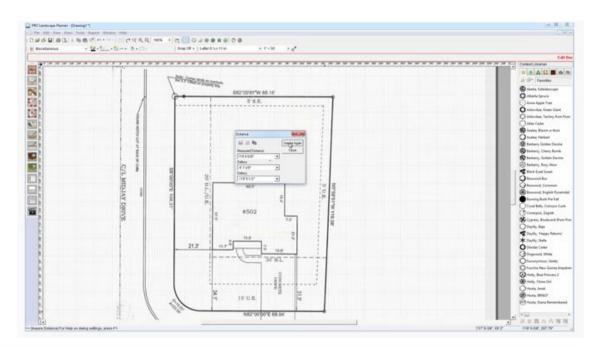


Figure 63. Easy-to-Use CAD for landscape design with PRO landscape

https://www.youtube.com/watch?v=thaeC99H8FE

4.4. AutoCAD civil 3d functions

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4.4.1. Managing points

https://www.youtube.com/watch?v=yWPpU kXqM0

In AutoCAD Civil 3D, you can create, work with, and manage points using a variety of commands and tools. Points can be managed based on the 1st menu bar button" points". You can import and export points in text format in to or out of the civil 3D interface environment. You can browse all functions in point's button.

Managing points in tool space ribbon

The points created by AutoCAD Civil 3D are called Coordinate Geometry (COGO) points, which are very different from AutoCAD point nodes.

AutoCAD point nodes have only coordinated data (XYZ values) associated with them. However, COGO points, in addition to coordinate data, have a variety of properties associated with them, including point number, point name, raw (field) description, and full (expanded) description.

Unlike AutoCAD point nodes, which exist in a single drawing, COGO points can be stored in a project outside a drawing and referenced by multiple users. In AutoCAD Civil 3D, the term point refers to a COGO point, not to an AutoCAD point node.

Points can be imported from a text file or a Microsoft Access database. Data created in Autodesk land desktop can be migrated to AutoCAD Civil 3D by importing points directly from a project database.

You can create a large point set and organize it later. However, it is usually more efficient to classify points into several groups as they are being created. Save as space delimited point format

- 1. In toolspace, on the prospector tab, right-click points. click create.
- In the Create Points dialog box, click[™]. Expand the default layer parameter, and then change the value to V-NODE.
- 3. In the create points dialog box, click \$\frac{1}{2}\$ import points.
- 4. In the format list, select external project Point Database.
- 5. Click and then Browse.
- 6. In the import points dialog box, clear the advanced options check boxes.
- 7. Click OK.
- 8. The points are imported.

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In Toolspace, on the prospector tab, right-click the _All points point group. Click Zoom To.

The points are displayed both in the drawing and in tabular form in the tool space list view. In the drawing window, if you move the cursor over a point, a tooltip displays basic data about the point. Notice that the two storm water point groups appear to be empty.

• Creating point groups

- 1. In toolspace, on the prospector tab, right-click the goups collection. Click New.
- 2. In the point group properties dialog box, on the information tab, in the name field, enter the name. Optionally, enter a short description in the description field.
- 3. On the raw desc matching tab, select **name** *. Click Apply.
- 4. This option specifies that all points with the POND* raw description is added to the detention pond point group.
- 5. Click OK.
- 6. Create another point group by repeating Steps 1 through 4, but use the following parameters:

• Change the point group label style

- 1. In Toolspace, on the prospector tab, expand the point group's collection.
- 2. Right-click the All Points collection. Click properties.
- 3. In the point group properties dialog box, on the information tab, change the point label style to **standard**.
- 4. Click ok to close the point group properties dialog box.

Create a TIN surface in a new drawing

- Click Home tab ➤ Create Ground Data panel ➤ Surfaces drop-down ➤ Create Surface.
- 2. In the Create Surface dialog box, for Type, select **TIN surface.**

Note

By default, a new surface layer will be created named C-TOPO- followed by the name you enter in the name cell. You can also click \$\mathref{\sigma}\$ to specify an existing layer for the surface.

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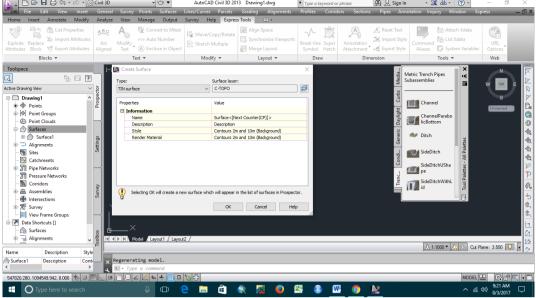


Figure 64. Create a TIN surface in a new drawing

- In the Properties table, specify the following parameters:
 - ✓ Name: any name you like
 - ✓ Description: existing ground surface from imported point data
 - ✓ Style: points and border

Tip: To select the style, click the Value cell, and then click to display the Select Surface Style dialog box.

- ✓ Render Material: by layer
- Click OK.
- In Toolspace, on the Prospector tab, expand the surfaces collection.

The new surface name is displayed in the surfaces collection in Toolspace on the prospector tab, but this surface does not contain any data.

- Import point data into the current drawing
- 1. Click Modify tab ➤ Ground Data panel ➤ ⊕Surface ➤ ⊕Add Data ➤ ⊕Point Files.
- 2. In the add point file dialog box, under format, select ENZ (Space Delimited).
- 3. Under source File, click
- 4. In the select source file dialog box, browse to the file, ENZ (space delimited).txt. Click Open.
- 5. In the add point file dialog box, click OK.
- 6. At the command line, enter **ZE**.

The surface, which contains the imported point data, is displayed in the drawing

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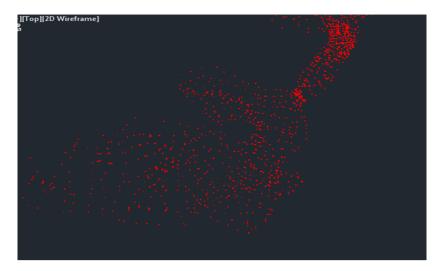


Figure 65. Point data displied in the drawing

• Adding contour data to a surface and contour labelling

To add contour data to a surface

1. In Toolspace, on the prospector tab, expand the surface definition collection, right-click point groups and select A-points click ok.

The contour data is created and added to the surface contours collection in the prospector tree.

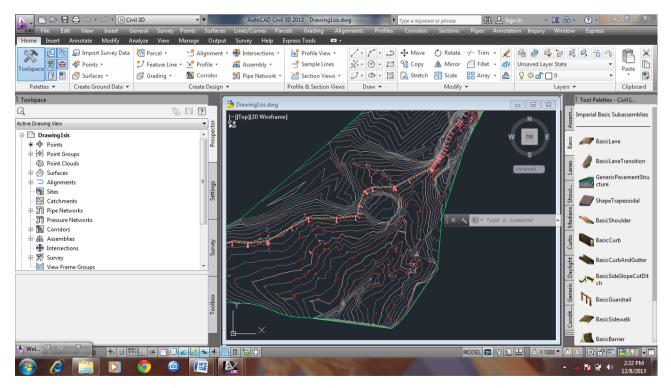


Figure 66. Contour data to a surface and contour labeling

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You can also extract the block surface counters in to single by selecting the contour and clicking extract tab

Deleting extended lines

1. Right click on the surface and select surface properties then click information menu and then change surface style to contours and triangles

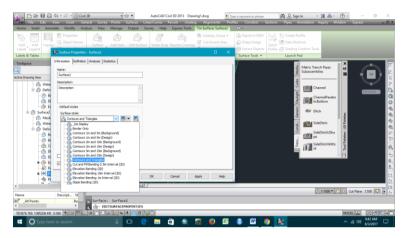


Figure 67. Deleting extened linesetup

2. Click surface menu----go to edit surcase--- go to delete line----click it----- then select unneeded lines and right click anywhere

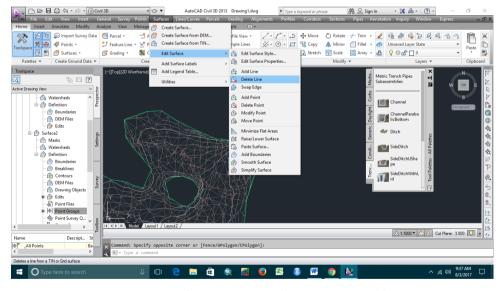


Fig 4.34. Deleting extened line

3. Change the surface style to 1 in 5m contours

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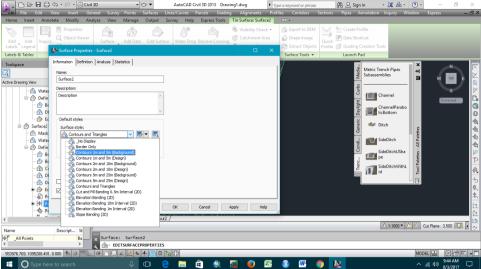


Figure 68. Changing the surface style

4.4.2. Creating alignments

You begin creating an alignment by marking the location of tangents and points of intersection for a canal centerline alignment.

- Creating an alignment with the alignment layout tools
- 1. Draw a feature line 1st for which you wanted to know its alignment.
- 2. Click home tab ➤ Create design panel ➤ Alignment drop-down ➤ Alignment Creation Tools:

 ...
- 3. In the Create Alignment Layout dialog box, for Name, enter main canal.
- 4. On the general tab, select the following settings:
 - ✓ Site: <none>
 - ✓ Alignment style: canal layout
 - ✓ Alignment layer: c-canal
 - ✓ Alignment label set: major minor and geometry points

Setting the site to <None> prevents the alignment from interacting with other objects in the drawing. The <None> selection is helpful when you do not want parcels to be created when either intersecting alignments form closed regions or an alignment crosses an existing parcel.

5. Click the design criteria tab.

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The starting design speed value specifies the default design speed at the alignment starting station. Design speeds can be specified at other stations along the alignment. If no other design speeds are specified, the starting design speed is applied to the entire alignment. Accept the default starting design speed value for this exercise.

6. Click OK.

The alignment layout tools toolbar is displayed. It includes the controls required to create and edit alignments.

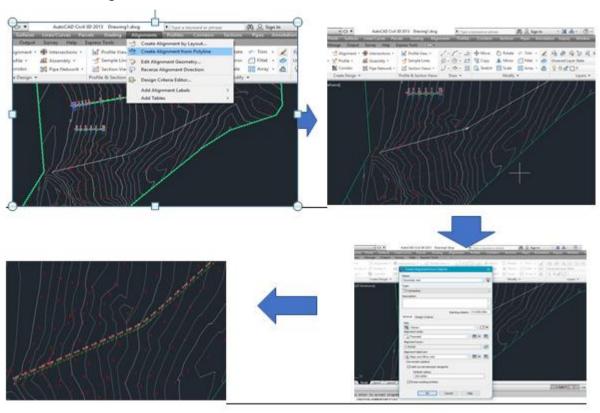


Figure 69. The alignment layout tools toolbar

Information from alignment

- Copy and take it to excel





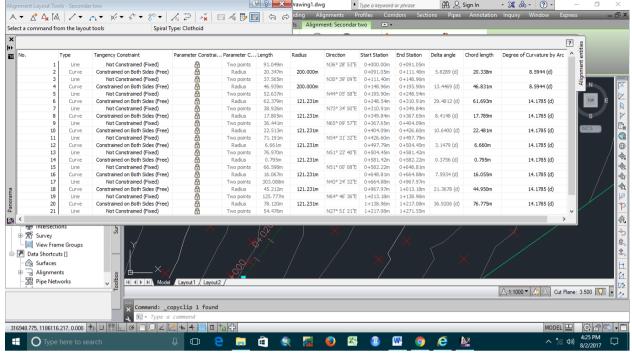


Figure 70.Data displiend in the working autocad

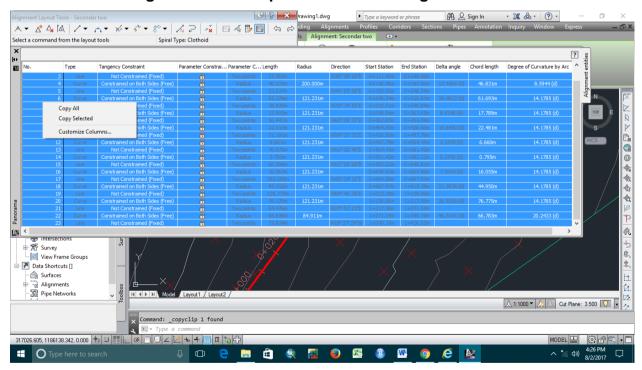


Figure 71. Selection and copy of displied data

• Designing simple profiles

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An existing ground profile is extracted from a surface and shows the changes in elevation along a horizontal alignment. A layout profile is a designed object that shows the proposed grade and elevations to be constructed. Profiles are displayed on an annotated grid called a profile view.

A. Creating and displaying surface profiles with offsets

After creating the profile and several off sets, you will create a profile view to display the profiles. You can create surface profiles to show surface elevations along an alignment. You can create a surface profile either from a horizontal alignment on a surface or from a surface profile file.

Quick profile

Profile->quick profile->select line

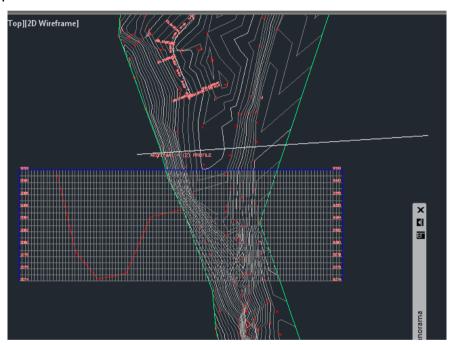


Figure 71. line selection on quik profile

B. Creating profiles from a surface

- Click Home tab ➤ Create design panel ➤ Profile drop-down ➤ Create surface profile ...
- 2. In the Create profile from surface dialog box, in the Alignment list, select the horizontal alignment to use for the profile.
- 3. Ensure that the surface you want to use is listed in the select surfaces list. If multiple surfaces are listed, use Ctrl + click to select one or more of them from which to create profiles.

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- 4. Optionally, in the station range area, specify start and end stations if you want the profile to cover a distance less than the entire length of the horizontal alignment.
- 5. Click add to add the centerline profile to the profile list
- 6. Right offsets and negative numbers for left offsets. Use commas to separate the values.
- 7. Optionally, click Add to add the offset profiles to the Profile List.
- 8. In the table, review the data for each profile line and m.
- 9. Optionally, select the Sample Offsets check box. Enter the offset distances in the field if you want the profile to include one or more offsets from the centerline of the horizontal alignment. Use positive numbers to specify ake corrections as required. Optionally, add or delete profiles in the Profile list.

10. Do one of the following:

- If you want to draw the profile in a profile view, click draw in profile view, and then go to the create profile view procedure.
- Click OK. The profiles you created are saved. If the alignment has one or more profile views associated with it, the profiles you created are added to the views.



Figure 72. Created profile view

C. Create centerline and offset surface profiles

- Click Home tab ➤ Create Design panel ➤ Profile drop-down ➤ Create Surface
 Profile.
- 2. In the Create Profile from Surface dialog box, under Alignment, select any alignment name.
- 3. Click Add.
- 4. Select the sample offsets check box. in the field next to the check box, enter **25,- 25** (including comma).

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This field enables you to specify that profiles be created on either side of the centerline. The left offset (-25) will mark the approximate location of the power line. If you wanted more offsets, you could enter a series of them here. Use positive numbers for right offsets and negative numbers for left offsets, with values separated by commas.

- Click Add.
- 6. In the profile list, in the Description column, enter the following descriptions:
 - ✓ EG Surface: Centerline
 - ✓ EG Surface 25.000: Right Offset
 - ✓ EG Surface -25.000: Left Offset
- 7. In the profile list, in the update mode column, for the left offset, change the value to static.

This option specifies that the left offset reflects the surface elevations at the time of its creation. It will not update to reflect future changes in the surface.

8. Click OK.

A message that indicates profiles have been created is displayed in the Event Viewer.

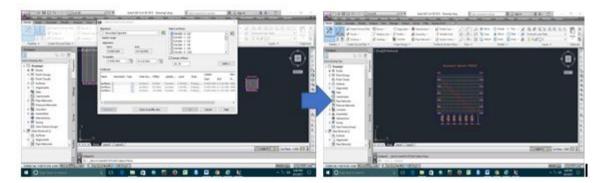


Figure 73. Displied message on created profile

- D. Display the surface profiles in a profile view
- Click Home tab ➤ Profile & Section Views panel ➤ Profile View drop-down
 Create Profile View.
- 2. The Create Profile View wizard is displayed, where you can configure the display of the profile. The wizard contains the many controls for displaying profiles in a profile view. You can use either the Back or Next buttons at the bottom or the links along the left side to navigate through the pages. You can click Create Profile View at any time to accept the settings and create the profile view in the drawing.

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- In the create profile view wizard, on the general page, under select alignment, select ridge canal.
- 4. Click profile display options.
- 5. The table on the profile display options page shows the existing profiles for ridge canal. By default, they are all checked in the draw column, indicating that they will appear in the profile view.
- 6. In the specify profile display options table, in the style column, double-click the cell for the left offset.
- 7. In the pick profile style dialog box, change the style to **existing ground**. Click ok.
- 8. In the specify profile display options table, in the labels column, double-click the cell for the left offset.
- 9. In the pick profile label set dialog box, change the style to <none>. Click ok.
- 10. You will not create labels for the existing ground profiles. You will specify a label set when you create a layout profile in the using layout profiles tutorial.
- 11. Repeat steps 6 and 7 for the other two profiles.
- 12. Click creates profile view.
- 13.In the drawing, pan and zoom to a blank area at the lower right of the surface.

 Click at a suitable location for the lower left corner of the profile view grid.
- 14. The profile view is drawn, with a grid, axes, title, and two data bands along the x axis, one above the grid and another below it. Because of its style, the left offset line is red.

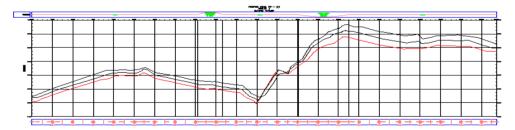


Figure 74.The profile view is drawn, with a grid, axes, title, and two data bands along the x axis

4.4.3. Creating parcels from AutoCAD objects

Parcel layout tools are available to create and edit parcels with precision. They are very important in irrigation block design and quantifying the area.

1. Open drawing Parcel

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This drawing contains an existing ground surface, alignments that represent intersecting road centerlines and AutoCAD lines and arcs that represent property boundaries. In the following steps, you will create AutoCAD Civil 3D parcel objects from the existing lines and arcs.

- Click home tab ➤ Create design panel ➤ Parcel drop-down ➤ Create parcel from object object.
- 3. Select the lines and the polyline border at the east side of the site, north of the first canal alignment. Press enter.

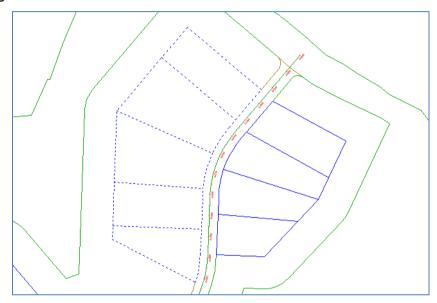


Figure 75. Creating parcels from AutoCAD Objects

- 4. In the Create Parcels From objects dialog box, specify the following parameters:
 - Site: Site 1
 - Parcel Style: Single-family
 - Area label style: Parcel Number and area

Note: Parcels must have area labels, but segment labels are optional.

- Automatically add segment labels: selected
- Erase existing entities: selected
- 5. Click OK.

The parcels are created and labeled. The labels annotate the overall parcel area, as well as the bearing and distance of each line and curve segment. These labels are automatically updated if any line or curve segments are edited or deleted.

The numbers with a circular border are automatically generated parcel numbers. You will change these numbers to use a more desirable numbering convention.

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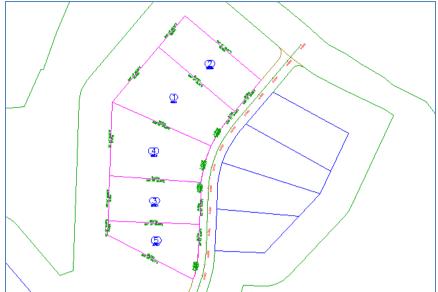


Figure 76. Annotate of the overall parcel area, the bearing and distance of each line and curve segment.

A. Changing the parcel numbering

- Click a parcel number to select it. Click parcel tab ➤ Modify panel
 ➤ Renumber/Rename
- 2. In the renumber/rename parcels dialog box, specify the following parameters:
- 3. Renumber: Selected
- 4. Starting Number: 101
- 5. Increment Value: 1
- 6. Click ok.
- 7. To specify a start point, click to top-most parcel.
- 8. To specify an end point, click the bottom-most parcel.
- 9. Press enter twice.

The parcel area labels are now numbered in ascending order, with three digits.

B. Editing parcel data

An attached lot line is a parcel segment that was created with the slide angle, slide direction, and swing line precise sizing tools on the parcel layout tools toolbar. You can use the slide angle, slide direction, and swing line precise editing tools to edit only attached lot lines. In this tutorial, you will learn how to use two precise editing tools:

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- The slide angle Edit tool slides a lot line at a specified angle through a selected parcel until a target area is enclosed.
- The swing line Edit tool swings a lot line from a specified point through a selected parcel until a target area is enclosed.

If a lot line is created either from other AutoCAD Civil 3D objects or the fixed line and curve tools on the Parcel layout tools toolbar, it is not attached. You can use grips and the feature line editing tools to change the geometry of these lot lines. Sliding a parcel lot line.

C. Parcel data generation

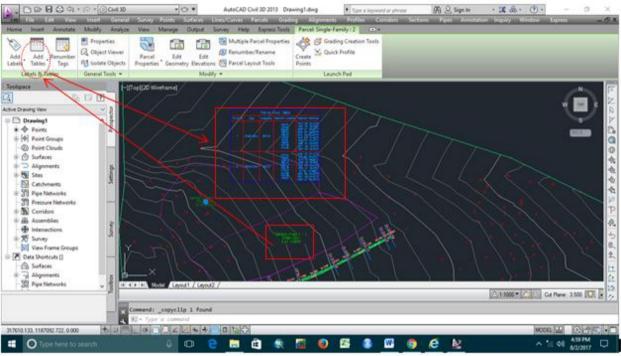


Figure 77. Parcle data generation

4.4.4. Functionalities of analyze contextual tab

The Analyze tab contains many important tools which are common in civil 3D design. There are about six ribbons such as ground data, design, volumes and materials, QTO and Inquiry. We shall discuss the most important and useful ones in detail.

A. Storage calculation

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Before you go to the storage reservoir calculation, copy the drawing and save with drawing for storage calculation and then, extract the object and then remove the surface Cut the contours across your dam axis

Use this: Analyze->design->storage ->define basin from entity-> click insert ->define basin from polylines->define->select the storage contours->ok

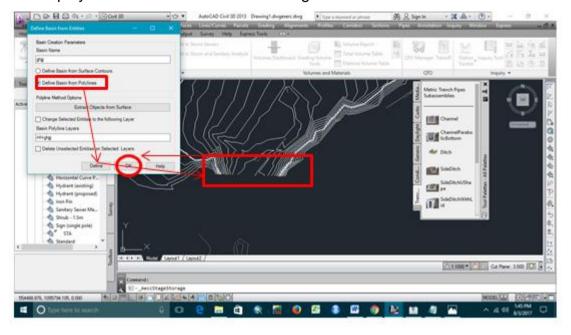


Figure 78. Copies the drawing and saves with drawing for storage calculation

The following reservoir is selected and the result is obtained

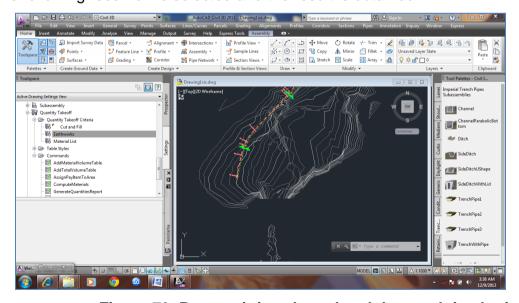


Figure 79. Reservoir is selected and the result is obtained

Result can be inserted in the drawing, saved or loaded as text file.

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The following is data inserted in the drawing



Figure 80. Stage storage table

The following is data saved or loaded to a file.

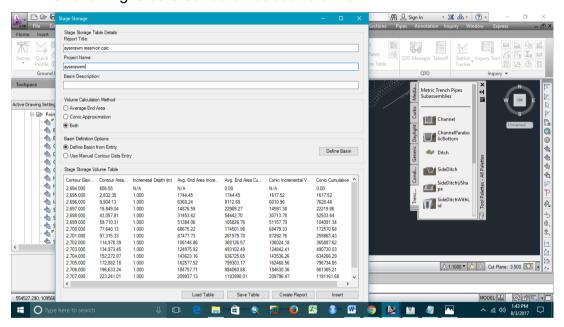


Figure 81. Ways how to data saved or loaded to a file

Finally by using the above data we can create report

4.5. Geometric construction methods

Strict interpretation of geometric construction allows use of only the compass and an instrument for drawing straight lines, and with these, the geometer, following mathematical theory, accomplishes his solutions.

4.5.1. Geometric nomenclature

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Points in space:-

A point is an exact location in space or on a drawing surface. A point is actually represented on the drawing by a crisscross at its exact location. The exact point in space is where the two lines of the crisscross intersect. When a point is located on an existing line, a light, short dashed line or cross bar is placed on the line at the location of the exact point. Never represent a point on a drawing by a dot; except for sketching locations.

Line

Lines are straight elements that have no width, but are infinite in length (magnitude), and they can be located by two points which are not on the same spot but fall along the line. Lines may be straight lines or curved lines.

✓ A straight line is the shortest distance between two points. It can be drawn in any direction. If a line is indefinite, and the ends are not fixed in length, the actual length is a matter of convenience. If the end points of a line are important, they must be marked by means of small, mechanically drawn crossbars, as described by a pint in space. Straight lines and curved lines are considered parallel if the shortest distance between them remains constant. The symbol used for parallel line is //. Lines, which are tangent and at 90° are considered perpendicular. The symbol for perpendicular line is ⊥.

Angle

An angle is formed by the intersection of two lines. There are three major kinds of angles:

- ✓ Right angels,
- ✓ Acute angles and
- ✓ Obtuse angles.

The right angle is an angle of 90°, an acute angle is an angle less than 90°, and an obtuse angle is an angle more than 90°. A straight line is 180°.

Quadrilateral

It is a plane figure bounded by four straight sides. When opposite sides are parallel, the quadrilateral is also considered to be a parallelogram.

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Figure 82. Steps to create a qquadrilaterals

Circle

A circle is a closed curve with all points on the circle at the same distance from the center point. The major components of a circle are the diameter, the radius and circumference.

- ✓ The diameter of the circle is the straight distance from one outside curved surface
 through the center point to the opposite outside curved surface.
- ✓ The radius of a circle is the distance from the center point to the outside curved surface. The radius is half the diameter, and is used to set the compass when drawing a diameter.
- ✓ A central angle: is an angle formed by two radial lines from the center of the circle.
- ✓ A sector: is the area of a circle lying between two radial lines and the circumference.
- ✓ A quadrant: is a sector with a central angle of 90° and usually with one of the radial lines oriented horizontally.
- ✓ A chord: is any straight line whose opposite ends terminate on the circumference
 of the circle.
- ✓ A segment: is the smaller portion of a circle separated by a chord.
- ✓ Concentric circles are two or more circles with a common center point.
- ✓ Eccentric circles are two or more circles without a common center point.

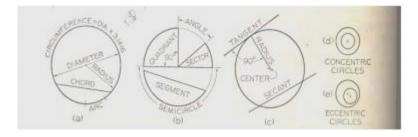


Figure 83. Steps to create a Circle

Solids

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They are geometric figures bounded by plane surfaces. The surfaces are called faces, and if these are equal regular polygons, the solids are regular polyhedral.

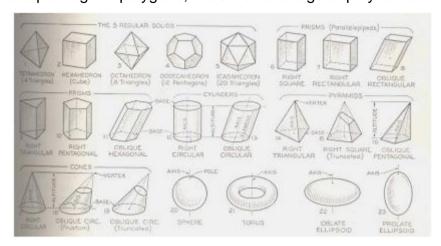


Figure 84. Different Solids

4.5.2. Techniques of geometric constructions

To construct the above mentioned geometric figures, we have to know some principles and procedures of geometric construction.

How to bisect a line or an arc

To bisect a line means to divide it in half or to find its center point. In the given process, a line will also be constructed at the exact center point at exactly 90°. **Given: Line A-B Step 1:** Set the compass approximately two-thirds of the length of line A-B and swing an arc from point A.

- **Step 2:** Using the exact same compass setting, swing an arc from point B.
- Step 3: At the two intersections of these arcs, locate points D and E
- **Step 4:** Draw a straight-line connecting point D with point E. Where this line intersects line A-B, it bisects line A-B. Line D-E is also perpendicular to line A-B at the exact center point.

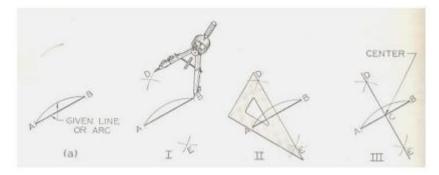


Figure 85. Example on how to bisect a line or arc

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How to divide a line in to number of equal parts

Given: Line A-B

Step 1: Draw a construction line AC that starts at end A of given line AB. This new line is longer than the given line and makes an angle of not more than 300 with it.

Step 2: Find a scale that will approximately divide the line AB in to the number of parts needed (11 in the example below), and mark these divisions on the line AC. There are now 'n' equal divisions from A to D that lie on the line AC (11 in this example).

Step 3: Set the adjustable triangle to draw a construction line from point D to point B. Then draw construction lines through each of the remaining 'n-1' divisions parallel to the first line BD by sliding the triangle along the straight edge. The original line AB will now be accurately divided.

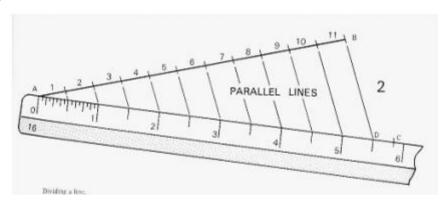


Figure 86. Example on how to divide a line in to a number of equal parts

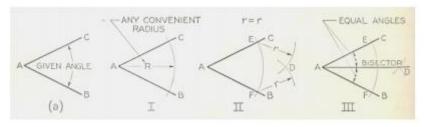
· How to bisect an angle

To bisect an angle means to divide it in half or to cut it in to two equal angles. Given: Angle **BAC**

Step 1: Set the compass at any convenient radius and swing an arc from point A

Step 2: Locate points E and F on the legs of the angle, and swing two arcs of the same identical length from points E and F, respectively.

Step 3: Where these arcs intersect, locate point D. Draw a straight line from A to D. This line will bisect angle BAC and establish two equal angles: CAD and BAD.



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Figure 87. Example on how to bisect an angle

• How to draw an arc or circle (radius) through three given points Given:

Three points in space at random: A, B and C.

- Step 1: With straight line, lightly connect points A to B, and B to C,
- Step 2: Using the method outlined for bisecting a line, bisect lines A-B and B-C
- **Step 3:** Locate point X where the two extended bisectors meet. Point X is the exact center of the arc or circle.
- **Step 4:** Place the point of the compass on point X and adjust the lead to any of the points A, B, or C (they are the same distance), and swing the circle. If all work is done correctly, the arc or circle should pass through each point.

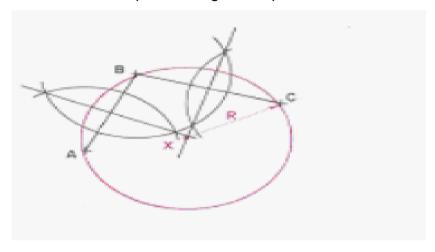


Figure 88. Example on how to draw an arc or circle

• How to draw a perpendicular lines to a line at a point

Line A-B with point P on the same line.

Step 1: Using P as a center, make two arcs of equal radius or more continuous arc (R1) to intercept line A-B on either side of point P, at points S and T.

Step 2: Swing larger but equal arcs (R2) from each of points S and T to cross each other at point U.

Step 3: A line from P to U is perpendicular to line A-B at point P

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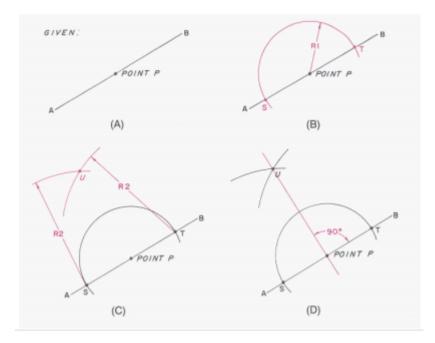


Figure 89. Example on how to draw a perpendicular line, to a point outside the line

How to draw a triangle with known lengths of sides

Given: lengths 1, 2, and 3.

Step 1: Draw the longest length line, in this example length 3, with ends A and B. Swing an arc (R1) from point A whose radius is either length 1 or length 2; in this example length 1.

Step 2: using the radius length not used in step 1, swing an arc (R2) from point B to intercept the arc swung from point A at point

Step 3: Connect A to C and B to C to complete the triangle

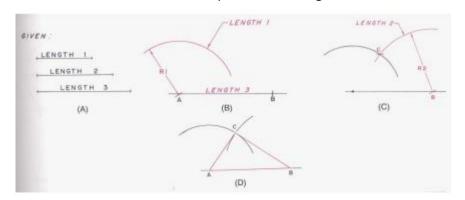


Figure 90. Example on how to draw triangles with given sides

How to draw A pentagon (5 Sides)

Given: The locations of the pentagon center and the diameter that will circumscribe the pentagon.

Step 1: Bisect radius OD at C.

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Step 2: With C as center, and CA as radius, strike arc AE. With A as center, and AE as radius, strike arc EB.

Step 3: Draw line AB, then set off distances AB around the circumference of the circle, and draw the sides through these points.

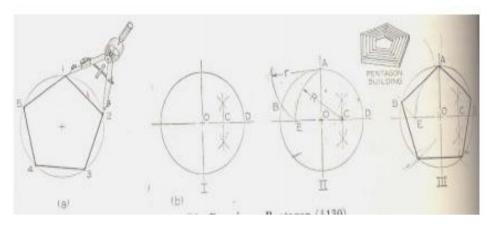


Figure 91. Example on how to draw pentagon with a given side

4.6. Radiations in three dimensions using total stations and/or theodolite and EDM/Data recorder

A **total station** (**TS**) or **total station theodolite** (**TST**) is an electronic/optical instrument used for surveying and building construction. It is an electronic transit theodolite integrated with electronic distance measurement (EDM) to measure both vertical and horizontal angles and the slope distance from the instrument to a particular point, and an on-board computer to collect data and perform triangulation calculations.

Robotic or motorized total stations allow the operator to control the instrument from a distance via remote control. This eliminates the need for an assistant staff member as the operator holds the retroreflector and controls the total station from the observed point. These motorized total stations can also be used in automated setups knows as Automated Motorized Total Station (AMTS).

4.6.1. Function of A total station (TS) or total station theodolite (TST)

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- Angle measurement: Most total station instruments measure angles by means of
 electro-optical scanning of extremely precise digital bar-codes etched on rotating
 glass cylinders or discs within the instrument. The best quality total stations are
 capable of measuring angles to 0.5 arc-second. Inexpensive "construction grade"
 total stations can generally measure angles to 5 or 10 arc-seconds.
- Distance measurement: Measurement of distance is accomplished with a modulated infrared carrier signal, generated by a small solid-state emitter within the instrument's optical path, and reflected by a prism reflector or the object under survey. The modulation pattern in the returning signal is read and interpreted by the computer in the total station. The distance is determined by emitting and receiving multiple frequencies, and determining the integer number of wavelengths to the target Most each frequency. total stations use purpose-built glass prism (surveying) reflectors for the EDM signal. A typical total station can measure distances up to 1,500 meters (4,900 ft) with an accuracy of about 1.5 millimeters $(0.059 \text{ in}) \pm 2 \text{ parts per million.}$
- Coordinate measurement: The coordinates of an unknown point relative to a known coordinate can be determined using the total station as long as a direct line of sight can be established between the two points. Angles and distances are measured from the total station to points under survey, and the coordinates (X, Y, and Z; or easting, northing, and elevation) of surveyed points relative to the total station position are calculated using trigonometry and triangulation.

To determine an absolute location, a total station requires line of sight observations and can be set up over a known point or with line of sight to 2 or more points with known location, called free stationing

For this reason, some total stations also have a Global Navigation Satellite System receiver and do not require a direct line of sight to determine coordinates. However, GNSS measurements may require longer occupation periods and offer relatively poor accuracy in the vertical axis

 Data processing: - When data is downloaded from a total station onto a computer, application software can be used to compute results and generate a map of the surveyed area. The newest generation of total stations can also show the map on the touch-screen of the instrument immediately after measuring the points.

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4.6.2. Applications A total station (TS) or total station theodolite (TST)

Total stations are mainly used by land surveyors and civil engineers, either to record features as in topographic surveying or to set out features (such as roads, houses or boundaries). They are also used by archaeologists to record excavations and by police, crime scene investigators, private accident deconstructionists and insurance companies to take measurements of scenes.

4.7. CAD software functions including simple drawing production, methodology for drawing variables and creating layers

The advantages of using CADD systems are listed as follow: •

- constant quality drawing the quality of lines, dimensions, symbols, notes, etc., are independent of the individual skill of the draughtsman;
- creation of database, which is the collection of useful information that may be retrieved by draughtsman and accessed by other processors;
- creation of library of commonly used electrical, hydraulic, welding, etc., symbols standard components such as nuts, bolts, screws, bearings, etc., projection symbols, parts of drawings, etc., can be stored in the memory and recalled when needed and additionally they can be positioned anywhere on the screen and redrawn to any scale and angle of inclination.
- use of layers the drawings may be drawn on any one of a number of available layers, which may be considered as a stack of transparent sheets and any separate sheet can be selected for drawing construction lines, grids, dimensions, notes, hatching, etc., but to make up together a complete drawing when required
- saving on repetition repetitive work on similar features or drawings and the
 resulting tiredness and boredom is replaced by automatic redrawing, hence
 attention and interest are maintained with the consequent marked increase in
 speed and productivity;
- greater accuracy due to computer mathematical accuracy, a high level of dimensional control is obtained with reduction in the number of mistakes resulting in accurate material and cost estimates;

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- multicolor drawings visualization of drawings relates directly to the projection used, pictorial projections are easier to understand than orthographic projection and the different colors obtainable by computers enhance the understanding even further;
- editing functions the powerful editing functions of correcting mistakes, deleting and inserting new features, copying, moving, translating and rotating features, scaling, etc., is only made possible with the use of computers.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

- I. Choose the best answer each question contains 2 point
 - **1.** ----- is display object length and width, width and height, or height and length in a flat?
 - A. 2D Drawings
 - B. 3D Drawings
 - C. CAD Hardware
 - D. CAD Software
 - 2. One of them has **not** components of Input devices
 - A. Keyboard,
 - B. Mouse,
 - C. Optical pen,

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- D. Storage
- **3.** One of them has **not** Function of Function of A total station (TS) or total station theodolite (TST)?
 - A. Angle measurement
 - B. Distance measurement
 - C. Coordinate measurement
 - D. Cost calculation
- 4. The points created by AutoCAD Civil 3D are called
 - A. Coordinate Geometry (COGO) points,
 - B. AutoCAD point nodes.
 - C. Single coordinate point
 - D. Parallel line point

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Matching part each question contains 2 point

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	A.		B.
1.	CAD user (Human)	A.	Computer screen (monitor) Printer
2.	Output devices	В.	Draws a line/curve with multiple control points
3.	Input devices	C.	knowledge
4.	CAD Software	D.	System Software
5.	Drawing with lines	E.	Keyboard
		F.	Connect with straight line using distance
Note:	Satisfactory rating – 9 po	oints	Unsatisfactory - below 9 points
You ca	in ask you teacher for the	сору о	of the correct answers.
Answe	r Sheet		
Name:			Date:
Multipl	e choose questions		
1			
2			
3			
4			
Matchi	ng		

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1	١.			

2. _____

3. _____

4. _____

5. _____

Operation Sheet 1	Applying application of CAD software in irrigation System





Procedures of interpret advanced drawings by use CAD software

- **Step 1-** Wear necessary personal protective safety
- Step 2- Thoroughly clean the work apparatus
- Step 3- Select necessary tools and equipment
- Step 4- Opens your computer /laptop in start point
- Step 5- Open AutoCAD civil 3D 2016
- Step 6- Click on start drawing to start a new drawing
- Step 7- Selecting up the work space
- **Step 8-** Open the tool space.
- **Step 9-** Selects the drawing object
- **Step 10-** Draw the drawing on the given dimension/specification
- Step 11- Modify the colure and dimension on modification tool



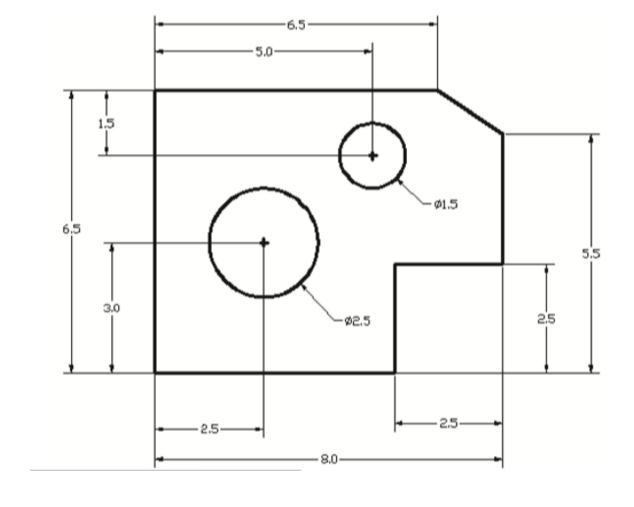


Practical demonstration	
	Practical demonstration

Name:	Date:
Time started:	Time finished:

Instructions: Giving the necessary equipment's and PPEs you are required to perform the following tasks within 3 hours.

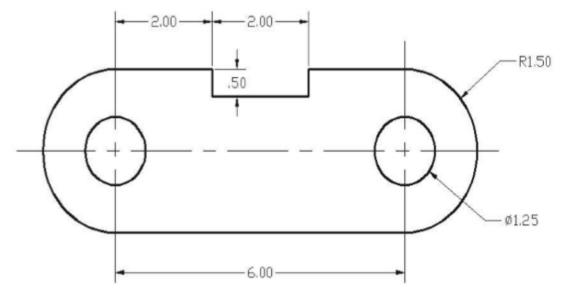
Task1. Draw the following drawings based on the given dimension and shade circles in red colour



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Instruction sheet

Learning guide #16: complete and report on drawing task

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

- Shut down equipment according to enterprise procedures.
- Documenting Drawing task and notifying appropriate personnel

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**:

- Shut down equipment according to enterprise procedures.
- Document drawing task and notifying appropriate personnel

Learning instructions:

- 1. Read the specific objectives of this Learning Guide.
- 2. Follow the instructions described below
- 3. Read the information written in the "Information Sheets 1 and 2". Try to understand what are being discussed.
- 4. Accomplish the "self-checks 1, and 2" in each information sheets on pages 155 and 160.
- 5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
- 6. After you accomplish self-check ensure you have a formative assessment and get a satisfactory result; then proceed to the next LG.





Information sheet-1	Shut down equipment according to enterprise procedures.
---------------------	---

1.1. Introduction

Work Safe BC regulations require that all powered machinery or equipment shut down for maintenance or repair must be secured against the possibility of the equipment being accidentally turned on while being worked on. To safeguard the person working on such equipment, lock-out procedures must be posted near the equipment, and the procedures listed must be followed before repairs or maintenance can start.

1.2. Shutdown machine and equipment

Locking out a machine usually means the power feeding the machine is disconnected either by pulling a plug, placing a switch in the off position, or turning a circuit breaker to the off position. The disconnected circuit is then secured in the inoperative position by the use of a padlock. The person doing the maintenance or repair keeps the key to this lock until the work on the machine has been completed. The worker then removes the lock and the machine is again operable.

Depending on the situation, the lock might be used to secure the power switch of the machine or it might be used to lock shut the door to a circuit breaker panel where the thrown breaker is located.

If the machine is not wired into its own power circuit but simply plugs into the wall, the lock-out procedure may require that the machine be turned off with its power switch and unplugged from the power receptacle. The plug end of the machine must be kept in plain view of the repair person so no one can inadvertently restore power without the repair person's knowledge.

Kitchen machines that must be locked out before repairs or maintenance can commence include, but are not limited to, meat saws, dough mixers, meat grinders, garbage disposal systems and meat slicers.

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You must be aware of the lock-out procedures that are to be followed before repairing or cleaning any machine. Lock-out procedures must be clearly posted by management near each machine.

1.3. Procedures for equipment

- Never use any machine you have not been trained to use.
- Pull plug or throw switch to off position before cleaning or adjusting any machine.
 Keep fingers, hands, spoons, etc., away from moving parts. Wait until machine stops before moving food.
 - Check all switches to see that they are off before plugging into the outlet.
- Particular care must be taken when cleaning the slicing machine.
- First pull the plug.
- Turn the gauge to zero in order to cover the edge of the blade
- Do not touch the edge of the blade
- Clean the blade from the centre out.
- Clean the inside edge of the blade with a stick that has a cloth wrapped around one end.
- Do not start a mixer until the bowl is locked in place and the attachments are securely fastened.
- When using a mixer, turn off motor before you scrape down the sides of the bowl.
- Use a wooden or plastic plunger rather than your hands or spoons to push meat down into a meat grinder.
- Keep your hands to the front of the revolving bowl when operating the food cutter.
 This is one of the most dangerous pieces of equipment in the commercial kitchen.
- Never start a machine until you are sure all parts are in their proper places. If it is a
 machine that operates with gears, check the gear position.
- You must be aware of the lock-out procedures that are to be followed before repairing or cleaning any machine. Lock-out procedures must be clearly posted by management near each machine.
- When using electrical power equipment, always follow the manufacturer's instructions and recommendations. Do not wear rings, a wristwatch, or a tie when operating electrical power equipment.

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1.4. Personal protective equipment

In addition to being aware of the mechanical hazards in the kitchen, it is important that you use the correct protective clothing and equipment. Wearing personal protective equipment (PPE) can prevent accidents from happening. As a worker, you are responsible for the following:

- · Making sure your uniform is well fitted.
- Keeping all uniforms clean and in good condition, not frayed or badly worn.
- Making sure sleeves are kept buttoned at the wrist, cuffs on overalls and trousers are be eliminated, and trouser legs are long enough to hang outside boots.
- Wearing specific personal safety equipment such as goggles, hearing protection, gloves, and aprons when required.

To ensure that you are protecting yourself, your personal protective equipment (PPE) list should include the following items.

I. Clothing

This includes well-fitted pants and jackets with all buttons fastened. Sleeves should be close fitting because sleeves that are loose and flowing are potential fire hazards when working over open gas burners.

II. Footwear

The OHS Regulation requires that approved footwear must be worn by employees in all industrial occupations. Ensure your footwear is sturdy and provides enough back support to not cause future back problems. Footwear suitable for commercial foodservice establishments must have a non-slip sole and a closed toe and closed back.

Your footwear should be sturdy and comfortable, and if the environment you work requires steeled toes, such footwear should be worn. High leather tops on shoes are a good idea as they will protect your feet from hot grease or liquids.

III. Hand protection

The most common type of gloves used in food service establishments are natural rubber latex gloves, synthetic rubber gloves, and vinyl gloves. As it is impossible to distinguish between natural and synthetic rubber gloves simply by looking at them, you should read the label on the box to determine what they are made of. Some people may have an allergic reaction (known as dermatitis) or a more serious reaction known as anaphylaxis to the natural latex glove, and for this reason natural latex gloves are not recommended for use when preparing food.

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IV. Eye protection

Eye protection in the form of safety goggles or masks should be worn whenever there is a chance of eye injury. Particles flying through the air can easily land in your eye and possibly do permanent damage. Eye protection is important, for example, when working with the band saw cutting through bone or when working with corrosive cleansers that could splash into your face.

V. Hearing protection

Approved hearing protection must be worn when high-level noise conditions exist. These conditions are not common in commercial kitchens but may be present in food manufacturing operations.

VI. Respirators

Respirators should be used to protect you from inhaling harmful fumes or vapours such as those that often come from concentrated kitchen cleaning liquids. The respirator unit should be properly fitted to provide the best protection. Check the components to ensure they are not broken, cracked, or torn and that they do not have holes. Replace faulty components before use. Each unit will have a filter that should be checked regularly and replaced before the expiration date.

1.5. Equipment safety

Extreme care should be taken when operating equipment. Before you attempt to operate any tool or piece of equipment, you must be fully trained by an experienced operator. Make sure that all guards are in place and function properly and that all electrical connections are properly made. You should observe the following precautions when using equipment:

- Understand the correct operating procedures and safety precautions before operating a piece of equipment.
- Ensure that all guards are in place and functioning before any machine is started.
- Report defective or unsafe equipment to a responsible individual to prevent serious injury.
- Do not distract or interfere with the equipment operator.

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- Make sure that the cords to electrically powered tools are in good condition, with no frayed parts or bare wires showing and make sure that the tools are properly grounded.
- Keep edge-cutting tools properly sharpened so that they do the job well and do
 not have to be forced because of dull edges.
- Use tools only for their intended use and make sure the size of the tool is right for the job.
- Report to your immediate supervisor any tool or piece of equipment that is broken or does not function properly.





Self-check -1	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

I Choose the best answer (Each question worth 2 points)

- 1. One of them has precautions when using equipment:
 - A. Understand the correct operating procedures
 - B. Ensure that all guards are in place and functioning before any machine is started
 - C. Do not distract or interfere with the equipment operator
 - D. All of the above
- 2. One of them has not Procedures for equipment
 - A. Never use any machine you have not been trained to use
 - B. Check all switches to see that they are off before plugging into the outlet
 - C. Particular care must be taken when cleaning the slicing machine
 - D. Do touch the edge of the blade
- 3. As a worker one of them has **not** responsible task:
 - A. Making sure your uniform is well fitted.
 - B. Keeping all uniforms dirty and in poor condition
 - C. Making sure sleeves are kept buttoned at the wrist,
 - D. Wearing specific personal safety equipment
 - E. Such as goggles, hearing protection, gloves, and aprons when required.

II. Matching part (Each question worth 2 points)

	А	В
1.	Footwear	1. gloves
2.	Clothing	2. safety goggles or masks
3.	Hand protection	3. High leather tops on shoes
		4. well-fitted pants and jackets

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Note: Satisfactory rating – 6 points Unsatisfactory - below 6 points

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

Name:	Date:
Choose Questions	
1	
2	Score =
3	Rating:
Matching	
1	
2	
3	
4	





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Documenting drawing task and notifying appropriate personnel

2.1. Introduction

Design documentation is prepared to a level that allows the works to be constructed accurately. The design documentation includes design drawings, bill of quantities and technical specifications. Design drawings are developed to a level of detail necessary to prepare a clear, coordinated visual depiction of all aspects of the works. Major project elements including overall layout, earthworks equipment, mechanical, electrical, structural, and water supply systems are designed and depicted through coordinated scale drawings and detailed elevations and plans. The lot feeder may engage consultants to ensure well-coordinated drawings and bill of quantities are prepared.

2.2. How to create a gantt chart

- Define the project settings, such as its start date, end date and scheduling mode.
 The most common scheduling mode is forwards from the project start date. In this mode the default is for tasks to start as soon as possible, which means that the whole project finishes at the earliest possible date.
- Define the project calendar. This sets the number of working days in the week, the number of working hours in the day, and so on.
- Enter or edit task names and durations.
- Set up a global resources list and assign resources to tasks. Although you can
 often define the resources as you need them, it is usually quicker to start by
 setting up a global resources list from which you can then select resources to
 assign to the various project tasks. See Including resources in a Gantt chart.
- Create links to specify the dependencies between the project tasks. See Linking tasks in a Gantt chart.
- Set constraints on the tasks as necessary. See Adding constraints to a Gantt chart.
- Make final adjustments to the project plan. See Enhancing a Gantt chart.
- Once the project has actually started, inspect it at regular intervals to detect potential problems or scheduling conflicts and make any corrections required. See reviewing a project using a Gantt chart.

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2.3. Prepare estimates to complete for each task.

Prepare estimates to complete for each task in the work breakdown structure. Tasks differ based on which aspect of the task is fixed and which aspects are variable. There are three types of tasks:

- Fixed Units means that the resources remain constant even if the volume of work changes. Hence, the changed work alters the duration of the task;
- Fixed Work means that the work effort assigned to the task remain fixed when additional resources are assigned to that task, while the duration of the task is changing; and
- Fixed duration means that the duration assigned to the task remains fixed whether the resources assigned to the task are increased or decreased. As a result, the change in resources will change the task's work effort requirement. The selection of the appropriate category depends upon whether the duration of the task can be shortened by assigning more resource to it. For example, the time for concrete to dry is an example of a fixed duration task, whereas a task such as data entry may be resource driven, given no other system or facilities constraints.

Duration is defined as the total span of working time required to complete a task. To estimate project length, the approximate elapsed time for each task is calculated using the formula:

Work = Duration / Units

If units are fixed, then duration will extend. If work is fixed and units are decreased,

2.4. Document estimating assumptions.

Document all estimating assumptions including number of productive hours per day, number of people working on each task, holidays) are recorded to provide consistency in plan development. Duration is the elapsed time required to complete a task.

Factors affecting the estimate of duration may include:

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- Geographic diversity of the project team;
- Equipment availability;
- · Vacation, holidays and sick leave;
- Meetings;
- Equipment downtime;
- Relevant experience more experience should increase productivity;
- Decreases in productivity due to excessive overtime;
- Turnover of personnel;
- Impact of teaching or mentoring on productivity;
- Difficulties caused by multi-tasking; and
- Impact of team-size on productivity.





Self-check -2	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

I. Choose the best answer each question contains 2pts)

- **1.** One of the following is **not** include in design documentation?
 - A. bill of quantities
 - B. technical specifications
 - C. Design drawing
 - D. Assumption of the task
- 2. One of them will include in design drawings?
 - A. overall layout
 - B. earthworks equipment
 - C. mechanical and electrical, structural
 - D. all of the above
- 3. one of them have **not** included in Create a Gantt chart
 - A. Define the project settings
 - B. Define the project calendar
 - C. Enter or edit task names and durations
 - D. Discipline of the supervisor

II. Short answer part

- 1. Define the meaning of Duration in work task concept?(1pts)
- 2. Write and discuss the types of task during Prepare estimates to complete for each task?(3pts)
- 3. Write at least four factors that affect the estimate of duration?(4pts)

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

Answer Sheet	Score =
Name:	Date:
1.	
2.	
3.	
Short Answer Questions 1	
3	

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