ROAD CIVIL WORKS

Level II

Learning Guide-13

Unit of Competence: -	**Produce Detailed Engineering Drawings**
Module Title:-	**Producing Detailed Engineering Drawings**
LG Code:	**CON RCW2 MO4 LO1-LG-13**
TTLM Code:	**CON RCW2 TTLM 0919v1**

LO1: Determine drawing requirement

Instruction Sheet	Learning Guide #13

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

- Introduction to drawing
- Safety requirements of equipment, OHS regulation requirements and application
- checking and interpreting Drawing requirements
- Basic concept of Drawing terminology and symbols
- sourcing Required information
- Scope of drawing
- Basic Drawing Procedures

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

- Draw requirements are checked and interpreted from work order or similar
- Require information is sourced from workshop manuals, customer specifications, product suppliers, and designers or similar.
- Scope drawing including layout, additional required information and resources is planned.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 2
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 , Sheet 4 , Sheet 4 , Sheet 6 and Sheet 7”.
4. Accomplish the “Self-check 1,Self-check t 2, Self-check 3, Self-check4 , Self-check 5, Self-check 6 and Self-check 7” **in page -11, 14, 25,33,36 and 38** respectively.

Information Sheet-1	Introduction to drawing

1.1 Drawing

A drawing is a graphic representation of an object, or a part of it, and is the recreate 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. Any medium that uses a graphic image to aid in conveying a message, instructions, or an idea is involved in graphic communication. One of the most widely used forms of graphic communication is the drawing. Technically, it can be defined as "a graphic representation of an idea, a concept or an entity which actually or potentially exists in life. Drawing is one of the oldest forms of communicating, dating back even farther than verbal communication. The drawing itself is a way of communicating all necessary information about an abstract, such as an idea or concept or a graphic representation of some real entity, Such as a machine part, house or tools. There are two basic types of drawings: *Artistic and Technical drawings*

1.1.1 Artistic Drawings

Artistic Drawings range in scope from the simplest line drawing to the most famous paintings. Regardless of their complexity, artistic drawings are used to express the feelings, beliefs, philosophies, and ideas of the artist. In order to understand an artistic drawing, it is sometimes necessary to first understand the artist. Artists often take a subtle or abstract approach in communicating through their drawings, which in turn gives rise to various interpretations.

(see figure 1.1)

Figure 1.1 Artistic drawings

(Source: Goethe, Technical drawing 3rd ed. USA: Delmar Publisher Inc., 1994)

1.1.2 Technical Drawings

The technical drawing, on the other hand, is not subtle, or abstract. It does not require an understanding of its creator, only an understanding of technical drawings. A

technical drawing is a means of clearly and concisely communicating all of the information necessary to transform an idea or a concept in to reality. Therefore, a technical drawing often contains more than just a graphic representation of its subject. It also contains dimensions, notes and specifications. (See figure 1.2)

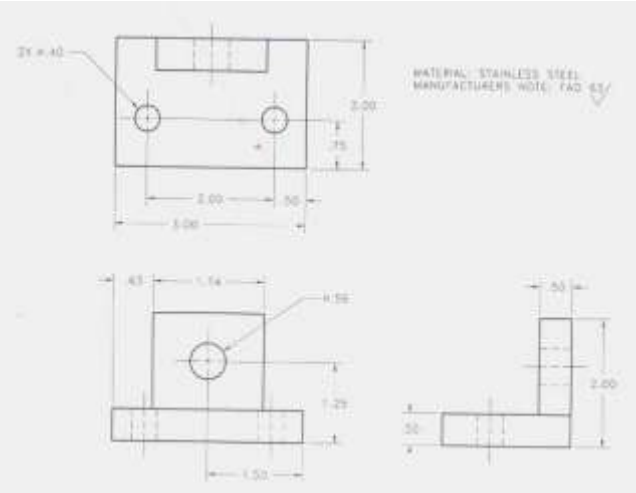


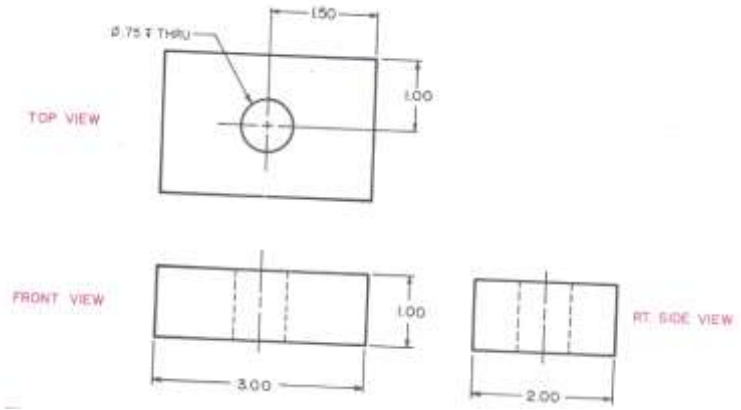
Figure 1.2 Technical Drawings

A. Types of Technical Drawings

Technical drawings are based on the fundamental principles of projections. A *projection* is a drawing or representation of an entity on an imaginary plane or planes. This projection planes serves the same purpose in technical drawing as is by the movie screen. A projection involves four components

- The actual object that the drawing or projection represents
- The eye of the viewer looking at the object
- The imaginary projection plane
- Imaginary

lines of sight called *Projectors*



The two broad types of projections, both with several sub- classifications, are parallel projection and perspective projection.

1. Parallel Projection

Parallel Projection is a type of projection where the line of sight or projectors are parallel and are perpendicular to the picture planes. It is subdivided in to the following three categories: *Orthographic, Oblique and Axonometric Projections.*

- *Orthographic projections*: are drawn as multi view drawings, which show flat representations of principal views of the subject.
- *Oblique Projections:* actually show the full size of one view.
- *Axonometric Projections:* are three-dimensional drawings, and are of three different varieties: *Isometric, Dimetric and Trimetric.*

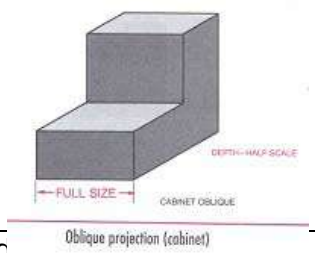


Figure 1.4 Oblique drawing

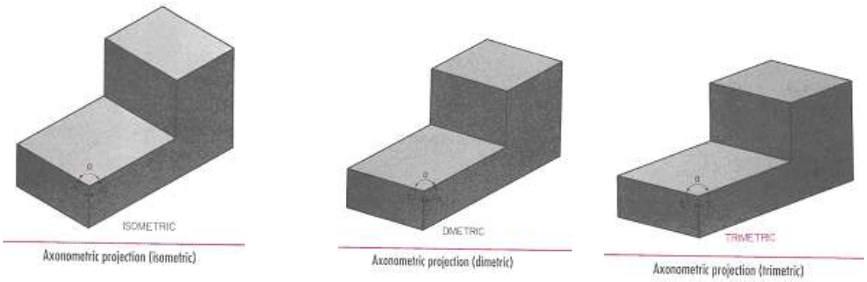


Figure 1.5 Axonometric drawing

2. Perspective Projection

Perspective projections are drawings which attempt to replicate what the human eye actually sees when it views an object. There are three types of perspective projections: *One-*

One point, Two-point and Three-point Projections.

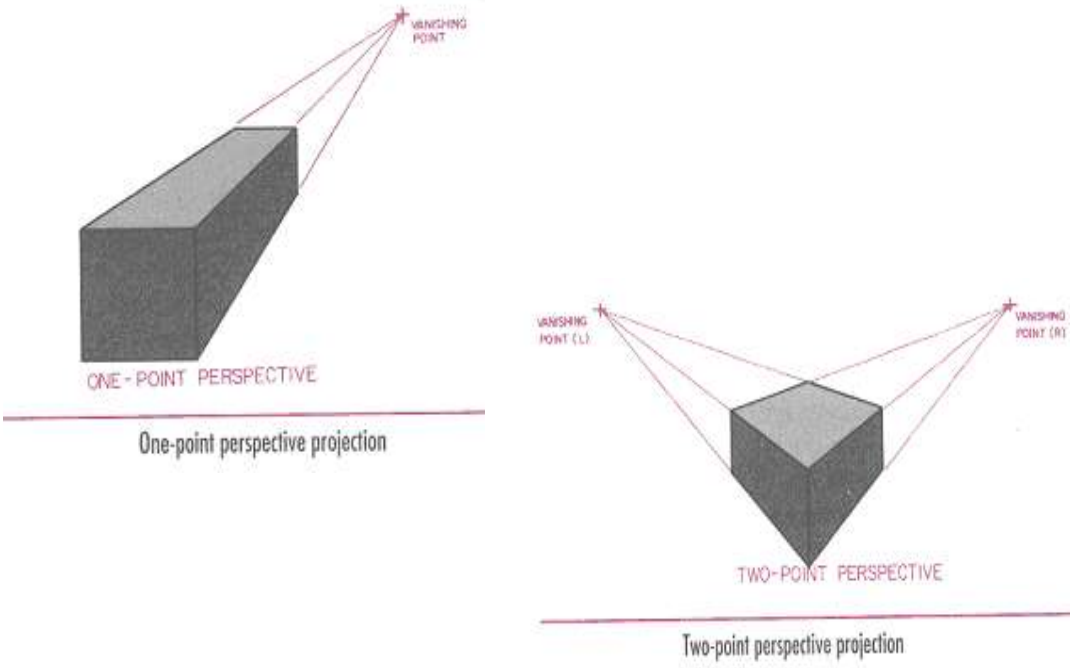


Figure 1.6 Perspective drawing

B. Purpose of Technical Drawings

To appreciate the need for technical drawings, one must understand the design process. The design process is an orderly, systematic procedure used in accomplishing needed design.

Any product that is to be manufactured, fabricated, assembled, constructed, built, or subjected to any other types of conversion process must first be designed. For example, a house must be designed before it can be built.

C. Application of Technical Drawing

Technical drawings are used in many different applications. They are needed in any setting, which involves design, and in any subsequent forms of conversion process. The most common applications of technical drawings can be found in the fields of manufacturing, engineering and construction.

For instance, Surveyors, civil engineers, sanitarians use technical drawings to document such works as the layout of a new subdivisions, or the marking of the boundaries for a piece of property. Contractors and construction personnel use technical drawings as their blue prints in converting architectural and engineering designs in to reality.

Figure 1.7 Technical drawing (architectural)

Engineering drawing is a two dimensional representation of three dimensional objects. In general, it provides necessary information about the shape, size, surface quality,

material, manufacturing process, etc., of the object. It is the graphic language from which a trained person can visualize objects.

Drawings prepared in one country may be utilized in any other country irrespective of the language spoken. Hence, engineering drawing is called the universal language of engineers. Any language to be communicative should follow certain rules so that it conveys the same meaning to everyone. Similarly, drawing practice must follow certain rules, if it is to serve as a means of communication. There are two basic types of drawings: Artistic and Technical drawings.

1 Artistic Drawings

Artistic Drawings range in scope from the simplest line drawing to the most famous paintings. Regardless of their complexity, artistic drawings are used to express the feelings, beliefs, philosophies, and ideas of the artist.

In order to understand an artistic drawing, it is sometimes necessary to first understand the artist. Artists often take a subtle or abstract approach in communicating through their Drawings, which in turn gives rise to various interpretations.

2 Technical Drawings

A technical drawing is a means of clearly and concisely communicating all of the information necessary to transform an idea or a concept in to reality. Therefore, a technical drawing often contains more than just a graphic representation of its subject. It also contains dimensions, notes and specifications.

A. Types of Technical Drawings

Technical drawings are based on the fundamental principles of projections. A projection is a drawing or representation of an entity on an imaginary plane or planes. This projection

Planes serve the same purpose in technical drawing as is served by the movie screen.

A projection involves four components.

1. The actual object that the drawing or projection represents
2. The eye of the viewer looking at the object
3. The imaginary projection plane
4. Imaginary lines of sight called Projectors

The two broad types of projections, both with several sub-classifications, are parallel projection and perspective projection.

Parallel Projection:-

Parallel Projections a type of projection where the line of sight or projectors are parallel and are perpendicular to the picture planes. It is subdivided in to the following three categories: Orthographic, Oblique and Axonometric Projections.

♦ Orthographic projections: are drawn as multi view drawings, which show flat representations of principal views of the subject.

♦ Oblique Projections: actually show the full size of one view.

♦ Axonometric Projections: are three-dimensional drawings, and are of three different varieties: Isometric, Diametric and Trimmer

Self-Check -1	**Written Test**

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

1. _____a type of projection where the line of sight or projectors are parallel and are perpendicular to the picture planes.
   A. Orthographic projections
   B. Axonometric Projections
   C. Oblique Projections
   D. Parallel Projections

2. Which one is Explain about technical drawing?

   A, are drawn as multi view drawings
   B, express the feelings, beliefs, philosophies, and ideas of the artist.
   C, contains dimensions, notes and specifications
   D, are three-dimensional drawings

Note: **Satisfactory rating – 1.5 points** **Unsatisfactory - below 1.5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Multiple Chose Test Answer

1._____

2._____

Information Sheet-2	requirements of equipment, OHS regulation requirements and application

Safety requirements of equipment, OHS regulation requirements and application
Safety Procedure

First Aid

1) Safety First is required at all times while using sharp edged instrument. Sa fety

and good precaution is a preparation for students, for the industry where they will be assigned are also requiring safety awareness.

2) Safety kit is located at the wall, use as first aid if necessary.

3) If you are allergic to dusts, lighting facilities conscious or any other m atter

encountered in drawing room, see an instructor to make alternative arrangements.

4) In case of any emergency, use the exit door.

5) Observe the location and use the fire extinguisher in case of any fire hazard.

6) Long hair must be tied back or clip properly so it doesn't obstruct during drawing work.

7) You will be working with a couple of hour, proper usage of drawing table and instruments must be observed strictly.

Cleaning

- Use clean water and soft paper to clean the drawing instruments.
- Keep the drawing instruments dried before storing.
- 5 S must be observed strictly

Self-Check -2	Written Test

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

1. Which one not list in first aide

A. Safety kit is located at the wall

B. In case of any emergency, use the exit door

C. Keep the drawing instruments dried before storing

D. use the fire extinguisher in case of any fire hazard.

Note: **Satisfactory rating – 1.5 points** **Unsatisfactory - below 1.5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Multiple Chose Test Answer

1._____

Information Sheet-3	checking and interpreting Drawing requirements

3.1 Purpose drawing

requirements

The purpose of these requirements is to ensure that plans and drawings submitted to the facilities engineer are complete and contain the required level of detail.

These requirements cover preparing plans and drawings associated with *excavation operations* and related permits and utility location requirements. They apply to persons responsible for those preparing those plans and drawings: the project manager (PM) and field construction manager (FCM) and the utility location service provider.

3.2 Requirements

An in-field survey is required to locate all utilities during the planning phase of an excavation (see Excavation Safety: Excavation Procedures). All utilities must be marked at the work location (see Excavation Safety: Utility Marking Requirements) and all utilities must be verified and/or indicated on the drawings (see Excavation Safety: Utility Location Results Form). Specific requirements for each type of plan or drawing follow. Include all applicable details as described.

2.1 As-built Underground

Utilities (Mechanical)

Do all of the following on the drawing:

□□ Identify utility

□□ Identify size and type

□□ Provide spot elevations (top/bottom of pipe)

□□ Show location of installation (dimension from closest landmark, for example, building, curb, manhole, catch basin)

□□ Show complete routing of pipes, including turn points and elbows

□□ Show tap-ins from mains, or tie-ins from existing pipes (if applicable)

□□ Show all shut-offs

□□ Identify conduit size/duct bank (top of duct) size and width

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Environment, Safety, Health, and Quality Division
Chapter

- | Drawing Requirements

- Electrical Drawing Plans

For electrical drawing plans, show all of the following:

□□ Spot elevations (depth) throughout equipment installation

□□ Installation location (dimension from closest landmark, for example, building, curb, manhole, catch basin)

□□ Complete conduit or duct routing, including turn points and elbows

□□ Pull-boxes, hand holes, shut-offs, and panel boxes associated with project

- 2.3 Piping Plan Drawings

For piping plan drawings, show all of the following:

□□ Identify pipe size/duct bank (top of duct) size and width for all site and building schematic drawings such as sanitary sewer, storm drain, hot water, chilled water, and domestic water

□□ Spot elevations (depth) throughout equipment installation

□□ Location of installation (dimension from closest landmark, for example, building, curb, manhole, catch basin)

□□ Complete pipe or duct routing, including turn points and elbows

□□ Catch basins, sanitary sewer manholes, and storm drains associated with project

- Above Ground Utility and Installation Drawings

For above ground utility and installation plan drawings, show all of the following:

□□ Identify pipe size/duct bank (top of duct) size and width for all site utility drawings such as sanitary sewer, storm drain, hot water, chilled water, and domestic water

□□ Spot elevations (depth) throughout equipment installation

□□ Installation location (dimension from closest landmark, for example, building, curb, manhole, catch basin)

□□ Complete pipe or duct routing, including turn points and elbows

□□ Catch basins, sanitary sewer manholes, and storm drains associated with project

□□ Any new installations of guardrails, bollards, speed bumps, concrete pads, foundations

□□ In addition to any new, relocated or abandoned underground utilities, the following must be marked on the drawings before submitting: new sidewalks, ramps, decks, pathways, pads, structures, stairways, berms, trailers, and new roads

✓ Forms

The following forms are required:

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The following recordkeeping requirements apply:

- ✓ Recordkeeping

To record information on paper instruments and equipment's are needed. Engineering drawing is entirely a graphic language hence instruments are essentially needed. Drawing must be clear, neat and legible in order to serve its purpose. Hence it is extremely important for engineers to have good speed, accuracy, legibility and neatness in the drawing work.

3.3 Important Drawing Equipment's

All drawings are made by means of various instruments. The quality of drawing depends to a large extent on the quality, adjustment and

care of the instruments

i. Drawing Paper

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. The use of standard size saves paper and ensures convenient storage of drawings. *Now a day, A3 and A4 are the most commonly used paper sizes.* The U.S.S.R standard establishes five preferred sizes for drawings as tabulated

bellow

Table 2.1 Description of the size of drawing paper

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

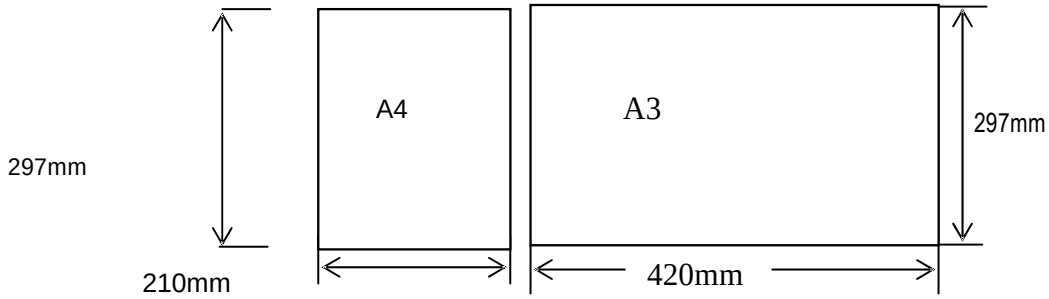
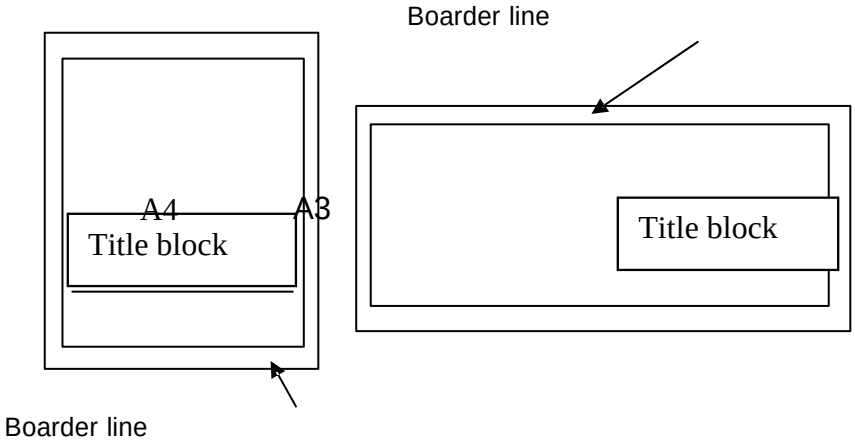


Figure 2.1 A4 and A3 standard papers

Title block is a rectangular frame that is located at the bottom of the sheet. It is recommended that space should be provided in all title blocks for such information as description of title of the drawing, dates, designer (drawer), and name of enterprise or educational institute, size (scale)



Sample for title block

TITLE	
DR.BY	
CHECK.BY	
ASSIGN. NO.	
SCALE	INSTIT. AU
DATE 02/10/2019	

Figure 2.2 Sample Title block figure

ii. Triangles (setsquares)

They are used to construct the most common angles (i.e. 30^0, 45^0, 60^0) in technical drawings. The 45^0 x 45^0 and 30^0 x 60^0 triangles are the most commonly used for ordinary work. They are shown in the fig. 2.2 below.

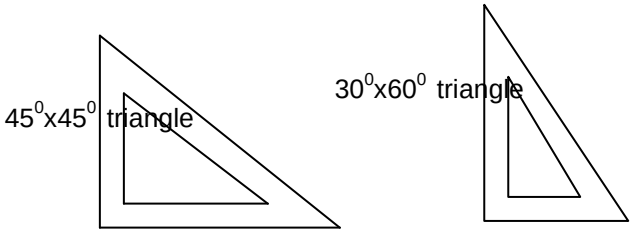


Figure 2.3 triangles or set squares

iii. T- square

It is used primarily to draw horizontal lines and for guiding the

triangles when drawing vertical and inclined lines. It is manipulated by sliding the working edge (inner face) of the head along the left edge of the board until the blade is in the required position.

T-square

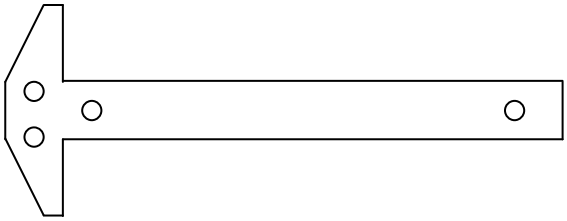
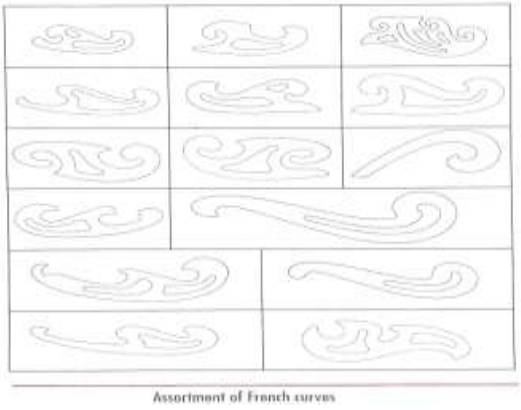


Figure 2.4 T-square

iv. French curve

It is used to draw irregular curves that are not circle arcs. The shape varies according to the shape of irregular curve



Assortment of French curves

Figure 2.5 French curves

v. Protractor

It is used for laying out and measuring angle.

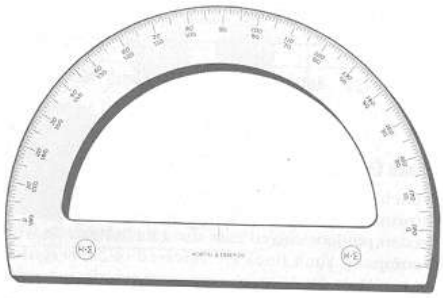
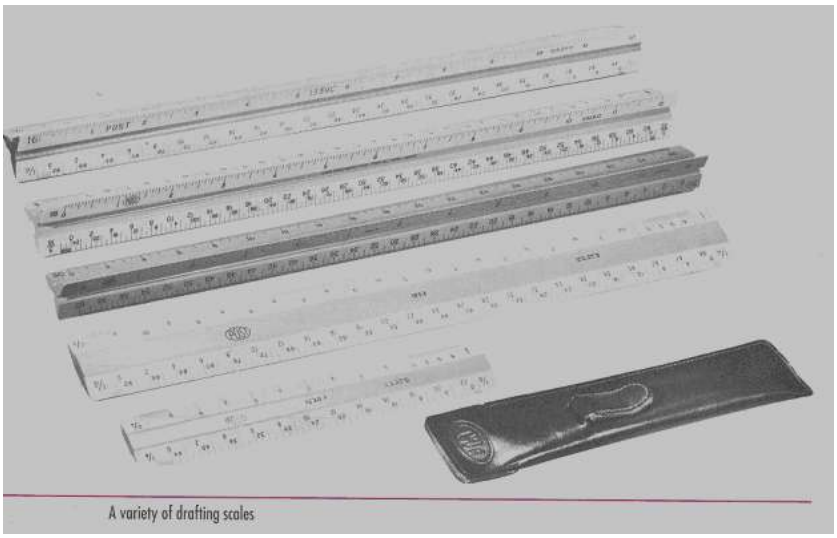


Figure 2.6 Protractor

vi. Scale (ruler)

A number of kinds of scales are available for varied types of engineering design. **Figure** fig 2**.7** Scales with beveled edges graduated in mm are usually used.



A variety of drafting scales

vii. Pencil

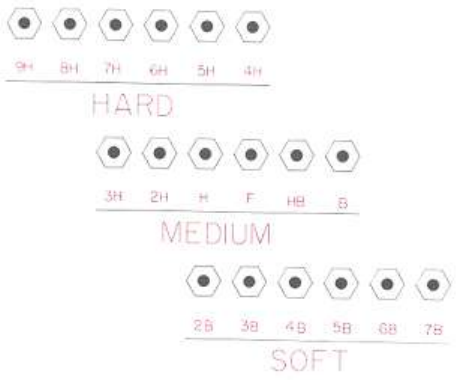
The student and professional man should be equipped with a selection of good, well-sharpened pencil with leads of various degrees of hardness such as: 9H, 8H, 7H, and 6H (hard); 5H& 4H (medium hard); 3H and 2H (medium); and H& F (medium soft). The grade of pencil to be used for various purposes depends on the type of line desired, the kind of paper employed, and the humidity, which affects the surface of the

paper. Standards for line quality usually will govern the selection. For instance,

- **6H** is used for light construction line.
- **4H** is used for re-penciling light finished lines (dimension lines, center lines, and invisible object lines)
- **2H** is used for visible object lines
- **F** and **H** are used for all lettering and freehand work.

Table 2.2. Grade of pencil (lead) and their application

TASK	LEAD
CONSTRUCTION LINES	3H , 2H
GUIDE LINES	3H , 2H
LETTERING	H, F, HB
DIMENSION LINES	2H , H
LEADERLINES	2H , H
HIDDEN LINES	2H, H
CROSSHATCHING LINES	2H, H
CENTERLINES	2H, H
PHANTOM LINES	2H, H
STITCH LINES	2H, H
LONG BREAK LINES	2H, H
VISIBLE LINES	H, F, HB
CUTTING PLANE LINES	H, F, HB
EXTENSION LINES	2H, H
FREEHAND BREAK LINES	H, F, HB



Grades of lead (left) and lead-lines chart (right)

viii. Compass

It is used to draw circles and arcs both in pencil and ink. It consists of two legs pivoted at the top. One leg is equipped with a steel needle attached with a screw, and other shorter leg is, provided with a socket for detachable inserts.

viiii. Divider

Used chiefly for transferring distances and occasionally for dividing spaces into equal parts. i.e. for dividing curved and straight lines into any number of equal parts, and for transferring measurements.

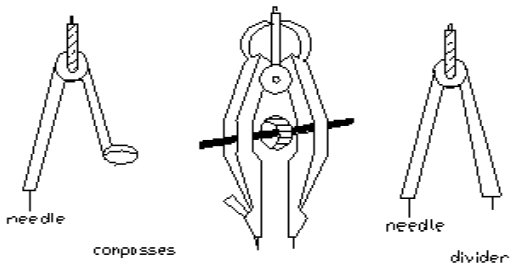


Figure 2.8 Compass and divider

X. Template

A template is a thin, flat piece of plastic containing various Cut out shapes. It is designed to speed the work of the drafter

and to make the finished drawing more accurate. Templates are available for drawing circles, ellipses, plumbing's, fixtures etc. Templates come in many sizes to fit the scale being used on the drawing. And it should be used wherever possible to increase accuracy and speed.

Drawing board is a board whose top surface is perfectly smooth and level on which the drawing paper is fastened.

Cline graph (Adjustable set square)-its two sides are fixed at 90^0 and the third side can be adjusted at any angle.

Rubber or eraser- extra lines or curves which are not required in the drawing are to be rubbed out or erased. Hence a rubber or eraser are required in the drawing work. Erasers are available in many degrees of hardness, size and shape.

Eraser shield –it is an important device to protect lines near those being erased. It is made up of thin metal plate in which gaps of different widths and lengths are cut.

Tracing paper – it is a thin transparent paper. Figures below it can be seen easily and traced out in pencil ink.

Drawing ink- it is used for making drawings in ink on tracing Paper

Self-Check -3	Written Test

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

1. Which instrument measuring angle
   A. Divider C. Protractor
   B. Compass D. Drawing ink
2. Which one Explain drawing equipment's
   A. are complete and contain the required level of detail.
   B. is an important device to protect lines
   C. finished drawing more accurate
   D. straight lines into any number of equal parts
3. _____Is a thin transparent paper. Figures below it can be seen easily and traced out in pencil ink.

A. plastic paper
B. Rubber or eraser
C. Divider
D. Tracing paper

3. Which one is the size of A3 paper
   A. 297x210
   B. 297x420
   C. 594x420
   D. 594x841

Note: **Satisfactory rating – 1.5 points** **Unsatisfactory - below 1.5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Multiple Chose Test Answer

1._____3_____
2._____4_____

Information Sheet-4	Basic concept of Drawing terminology and symbols

4.1 Terminology

Drawing Terminology

Line:

Point: A dot, usually made with the sharp tip of a drawing utensil. In geometry, a spatial point is an object with no volume, area, or length.

Line: Two dots connected. A straight curve. In geometry and in perspective, can be infinitely long or can end at two distinct points.

Contour: A method of line drawing where the eye and the hand draw in unison, looking and drawing tangentially. Contour follows the edges of a shape, which could be the shape itself or other observable edges within the shape (such as the edge of a shadow.)

Outline: A line which follows the edge of an object, distinguishing the intersection between the positive and negative space. Considered undesirable when using value.

Positive/Negative Shape or Space: The positive space is the object or subject, the negative space is the background (for example, the air the wall, etc). These negative spaces can be flattened into a shape and observed as an overall part of the composition. This is a difficult way of seeing because our brains are primarily concerned with interaction with objects: it is counterintuitive to focus on the non-subject.

Cross Contour: An intuitive form of topographical mapping. The spacing and curve of banded lines indicate the three dimensional depth of an object. May be in any direction although are typically horizontal. May be repeating parallel lines, cross hatch, or in many directions.

Gesture: In art, gesture is a type of drawing. The drawing values looseness and speed over representational accuracy, working from general to specific. Drawings typically last between several seconds and a few minutes. Although typically used as a warm up for figure drawing, this technique may be used with any subject.

Shading:

Value/Tone: Lightness or darkness. Can be full white, full black, and every kind of grey in between.

Local Value: The inherent value of an object, its "paint." For example, the local value of a ball painted white is white. The local value of steel is around middle gray. The local value of charcoal is black. When lit, the local value can be seen in the category of light known as "shadow".

Drawing Terminology Line: Point: A dot, usually made with the sharp tip of a drawing utensil. In geometry, a spatial point is an object with no volume, area, or length. Line: Two dots connected. A straight curve. In geometry and in perspective, can be infinitely long or can end at two distinct points. Contour: A method of line drawing where the eye and the hand draw in unison, looking and drawing tangentially. Contour

follows the edges of a shape, which could be the shape itself or other observable edges within the shape (such as the edge of a shadow.)Outline: A line which follows the edge of an object, distinguishing the intersection between the positive and negative space. Considered undesirable when using value. Positive/Negative Shape or Space: The positive space is the object or subject, the negative space is the background (for example, the air the wall, etc). These negative spaces can be flattened into a shape and observed as an overall part of the composition. This is a difficult way of seeing because our brains are primarily concerned with interaction with objects: it is counterintuitive to focus on the non-subject. Cross Contour: An intuitive form of topographical mapping. The spacing and curve of banded lines indicate the three dimensional depth of an object. May be in any direction although are typically horizontal. May be repeating parallel lines, cross hatch, or in many directions. Gesture: In art, gesture is a type of drawing. The drawing values looseness and speed over representational accuracy, working from general to specific. Drawings typically last between several seconds and a few minutes. Although typically used as a warm up for figure drawing, this technique may be used with any subject. Shading: Value/Tone: Lightness or darkness. Can be full white, full black, and every kind of grey in between. Local Value: The inherent value of an object, its "paint." For example, the local value of a ball painted white is white. The local value of steel is around middle gray. The local value of charcoal is black. When lit, the local value can be seen in the category of light known as "shadow

Illusionistic Value: The value of an object when under different lighting conditions. For example, the illusionistic value of a white ball in a room with no light is black. Highlights and shadows on an object fall under the category of illusionistic value. Categories of light: Highlight, light, shadow, core of the shadow, reflected light, cast shadow. The highlight is the part of the form which is opposite from the light source. The cast shadow is the space where the light is blocked by the object. Penumbra: Where multiple light sources cause multiple layering cast shadows. Sfumato: Gradual value transitions with soft edges. "Like smoke." Famously used by Leonardo Da Vinci to create Mona Lisa's mysterious smile. Chiaroscuro: An artwork employing a full range of value with full white, full black, and all the range of values in between. Related to the art movement known as Tenebrous which uses dramatic illumination. The artist Caravaggio used this technique. Key: An artwork which stays within a particular range of value, described as High Key, Middle Key, or Low Key. High key is primarily in the top third of the value scale, lacking dark shadows. Middle key is primarily in the middle, lacking light highlights and dark shadows. Low key is primarily on the bottom third, having lots of darks but lacking bright lights. Often used to create a mood, for example high key lighting is often employed in comedy sitcoms. Hatching: A means of creating value through the use of repetitive lines. Lines may be parallel hatch, cross hatch, cross contour cross hatch, or scribbled lines. Lines which are farther apart with lots of light space behind them appear as lighter values, lines that are closer together with little space between them appear as darker values. Typically

used with pencil or ink drawings, and frequently employed in printmaking, for example, on paper money. Stippling: A means of creating value through the use of repetitive dots. Related to pointillism. Used to great effect by the artist Georges Seurat. Optical Grey: When using hatching or stippling or other similar methods, this is our perception of the resulting value. The small movements of our eyes mix the white and black lines into the perception of a particular value or tone. Edge Quality: The hardness or softness with which one edge meets another. Often spoken of as sharp or soft. Blending an edge makes it soft. Texture: In art, this refers to literal or perceived texture. The pattern on a blanket, a polka dot dress, a woven basket, and the hair on someone's head all have texture. The texture passes through the overall range of value on an object while also having its own value (or hue) variations within. Texture is themost apparent in the category of light known as shadow, where the light is parallel to the object. Silhouette: Where an outline and its interior are represented as a flat shape. Often used in profile portraiture. Can be created with a strong backlight with no front lights, or as the shadow on a vertical screen. Perspective: Overlap: The most basic form of perspective, where one object blocks the view of another object, indicating position in space. Vertical/Diagonal Perspective: A form of perspective in which the objects closer to the bottom of the page are perceived as being closer than those at the top or middle of that page. Frequently employed in the middle ages and in historical Asian landscape prints and is used by the artist Hokusai in his woodblock prints. Atmospheric Perspective: The tendency for objects which are farther away to appear blurrier, more blue, and having lower contrast, and typically being lighter in value than those which are close to the viewer. The makeup of the air obscures our view like fog over a great distance. Horizon line: The eye level. Where the earth turns out of view (the perceived edge of the world.) The axis around which linear perspective drawing is structured. Vanishing Point(s): The point or points to which orthogonal recede. In one and two point perspective, the vanishing point or points are located on the horizon line. In three point, vanishing points may be above or below the horizon. Orthogonal: Receding diagonals. All lines which are geometrically parallel appear to recede to a common point when represented in two dimensional spaces. Cone of Vision: The viewing plane a person sees without turning their head. Extending out sixty degrees in all directions from the eyes. You can notice this by looking straight ahead and moving your hands in and out of your cone of vision. In two point linear perspective, this is a circle which includes the two vanishing points outside of which the illusion of depth falls apart. One Point Perspective: Typically occurs when facing a wall. Where the horizontals and verticals are at straight 90 degree angles and are parallel to the picture plane (paper). Only the depth appears to recede to a single vanishing

Two Point Perspective: Typically occurs when facing a corner. Where the Verticals are at straight 90 degree angles. The lines of width vanish to one point and the lines of depth vanish to a second point, usually with one on the right and one on the left sides of the horizon line, with these points occurring off of the edges of the paper.

Three Point Perspective: Typically occurs when looking up at a skyscraper or down from a helicopter. Where, in combination with one or two point, the verticals are no longer parallel to the picture plane and recede to their own separate point above or below the horizon line. Foreshortening: The illusion created when the part of an object which is close appears larger than the part of an object which is far away. Typically used to describe the figure in perspective. Color: Pigment and Dye: The raw form of subtractive color. Pigment is powdered, dye is wet. All colored media contain these in combination with some kind of binder. These come from a wide variety of sources, from the toxic (mercury, cadmium) to the natural (cow dung, beetle wings) to those made in a lab (the beautiful Quinapril dons). They come in different strengths and are often chemically manipulated to change their effects. Many have undertones and do not perfectly correspond to pure theoretical color –there are no true primaries with subtractive color. There are a limited number of source pigments and dyes. When purchasing colored media, items with strange names tend to be made with pure pigments or dyes, and those with romantic sounding titles tend to be mixtures of pigments or dyes. For example, “Alizarin Crimson and Dopamine Violet” are pure. “Cotton candy pink” is a mixture. Color Wheel: Although many historical color systems exist, the one we use today is derived from the studies of Albert Man sell. The color wheel is arranged practically for use in mixing subtractive color such as paint (additive color is light, which works differently.) Note: I find it useful to remember ROY G. BIV from Biology and then eliminate the I because we don’t use Indigo on the color wheel. Local Color: The inherent color of an object, its “paint.” For example, the local color of a ball painted orange is orange. The local color of a granny smith apple is yellow-green. When lit, the local color can be seen in the category of light known as “shadow”. Value: In color, the value of an object is the same as it would be in a black and white drawing, except while remaining in color. Imagine taking a black and white photograph of a colored vase. The vase has a range of value, even though it is red. This is referred to in terms of the lightness or darkness of an area of color. Some colors have an inherently lighter value than others. For example, yellow is lighter in value than violet.

Hue: The name of the area of color you are perceiving. The hue of an orange is orange. The hue of a granny smith apple is yellow-green. You may have specific variations of hue within the same object, for example a red hued glass vase may have a blue hued reflection in it. Chroma: Sometimes referred to as the intensity or brightness of a color, measured in terms of high or low. A neon sign has a very high Chroma, whereas a gray feather has a low Chroma. Some colors have inherently higher chromes than others. For example, cadmium red has a higher Chroma than burnt sienna. Mixing colors together lowers their Chroma. Monochromatic Color: Use of color that remains in the same hue with a variety of values. Ex: Dark red, red, pink, white. Analogous Color: A color scheme which uses colors that are neighbors on the color wheel. For example, yellow/orange/red, and yellow-green/green/blue. Complementary Color: Colors that are opposite from each other on the color wheel.

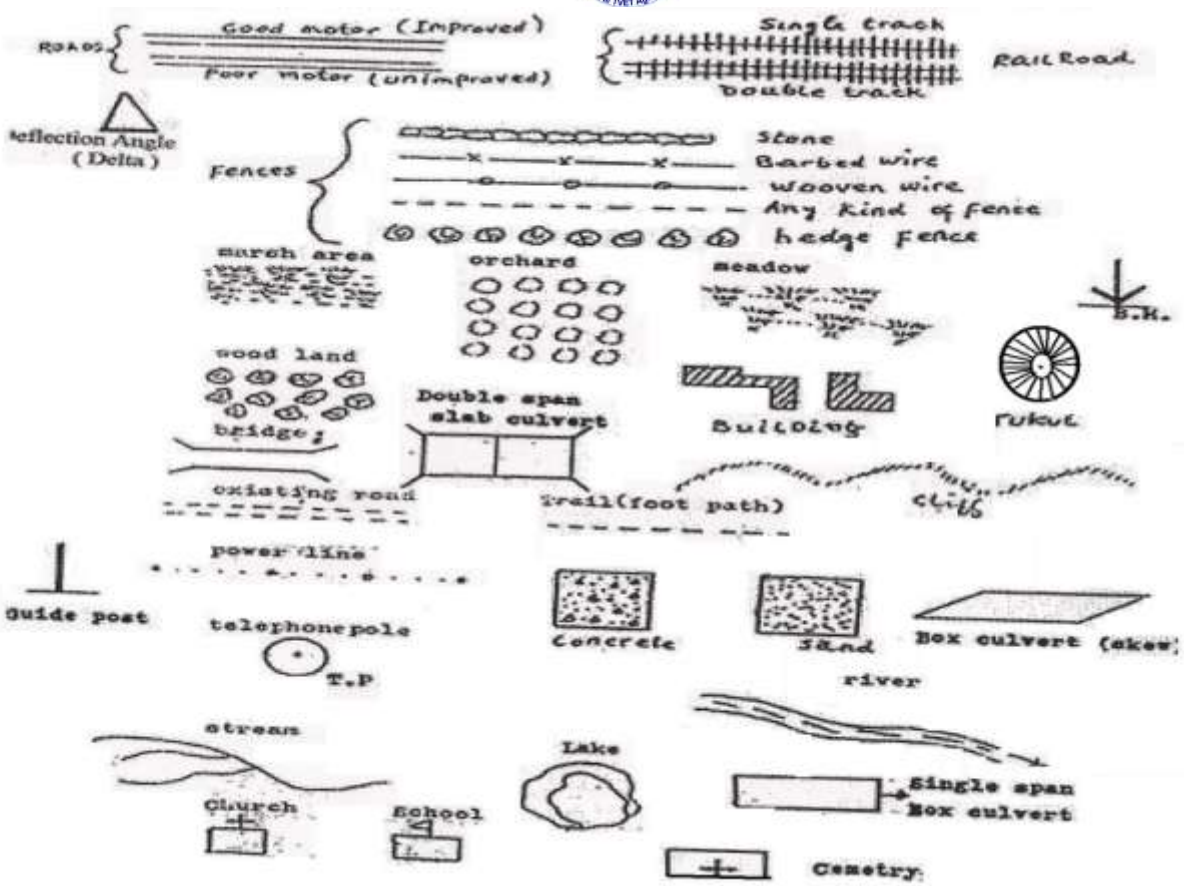
For example, some opposites are: red and green, yellow and violet, orange and blue, yellow-green and red-violet. When placed next to each other they can cause optical strain and the illusion of shimmering (this can be seen in the artist Bridget Riley's work.) When mixed together, complementary colors lower each other's Chroma. Chromatic Grey: A grey that is the result of mixing colors together without the use of a true black or true grey pigment. Can be achieved by mixing across the color wheel, such as with complementary colors. The colors Alizarin crimson and Viridian green are often mixed to make a chromatic grey. Triadic Color Scheme: Colors which are equidistantly spaced on the color wheel, in the shape of a triangle. For example: red/yellow/ blue, orange/green/violet, Yellow-orange /blue-green /red-violet. Simultaneous Contrast: The way that two different colors affect each other. For example, the same violet appears slightly different when placed next to green than when placed next to red. . Broken Color: Varying a color's hue, value, and/or Chroma to give it a more complex shimmering appearance, not flat color. This technique was frequently employed by artists in the impressionist movement. For example, to use broken color with the color blue, you might weave in blue-green and blue-violet. Tint: Adding color to white. Note: I remember my grandma getting her white hair tinted with blue. Shade: Adding black to a color

4.2 Basic concept of civil construction terminology, Symbols and Abbreviations

Topographic symbols

Standard symbols are used to represent special topographic features, thereby making it possible to show many details on a single sheet.

Considerable practice is required to draw these symbol will a suitable scale. Before placing symbols on map such as things buildings, roads and boundary lines are first plotted and inked. The symbols are then drawn or out from standard sheets having an adhesive on the back and pasted on the map. A fully detailed map with coloring and shading is a work of art.



Road construction Terminologies and Symbols, Legend and Plan Abbreviations

marginal information:

1. the outer edges of a map contain information, which is used to interpret the map.
2. a legend of symbols and abbreviations is not included in the plans.
3. certain symbols and abbreviations are common to a set of highway plans.
4. it is often necessary to abbreviate words on plan sheets.
5. the following marginal information are contained in a map:

a. sheet name -

b. sheet number
c. series name and scale
d. bar scales
e. index to adjoining sheets
f. index to boundaries
g. legend
h. declination diagram
i. contour interval
j. protractor scale

4.3 Some standard abbreviations, symbols, legend

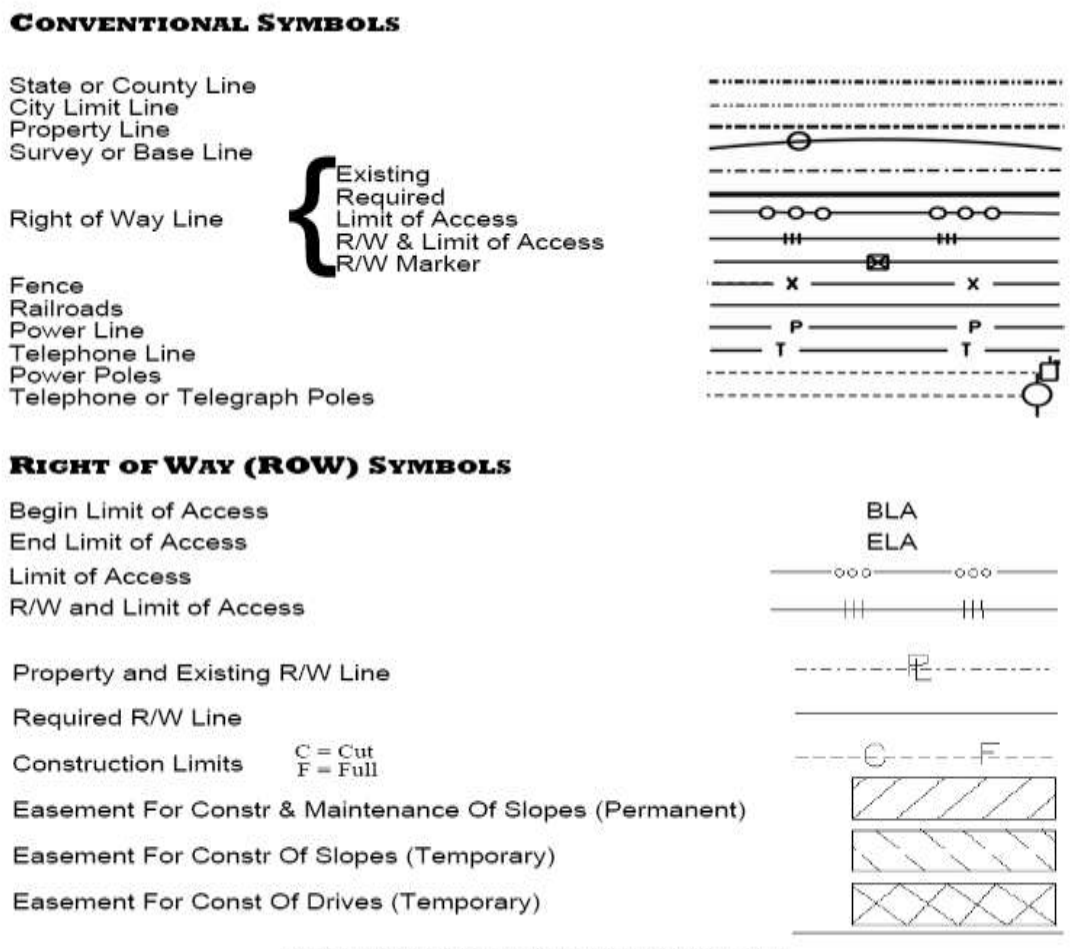


Figure 6-7. Conventional and Right of Way (ROW) Symbols

Self-Check -4	Written Test

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

1. Select drawing Terminology is not?
   A. **A dot usually made with the sharp tip of a drawing utensil.**
   B. following marginal information
   C. to represent special topographic features
   D. . give it a more complex shimmering appearance

2. Among the given alternative which one is drawing symbol?
A. ___ _ ____ _ _____
B. WC
C. HWB
D. BLA

Note: **Satisfactory rating – 1.5 points** **Unsatisfactory - below 1.5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____
Multiple Chose Test Answer

1._____
2._____

Information Sheet-5	sourcing Required information

5.1 sourcing

The actual act of sourcing for candidates is performed by either a recruiter (be it an internal corporate recruiter or agency recruiter) or a dedicated recruiter just focused on the sourcing function. The definition of sourcing needs to be clearly defined by what it is, as much as what it is not. Candidate sourcing activity typically ends once the name, job title, job function and contact information for the potential candidate is determined by the candidate source. To further develop a list of names that were sourced some companies have a second person then reach out to the names on the list to initiate a dialogue with them with the intention of pre-screening the candidate against the job requirements and gauging the interest level in hearing about new job opportunities. This activity is called "candidate profiling" or "candidate pre-screening". The term candidate sourcing should not be confused with candidate research.
In some situations a person that "sources" candidates can and will perform both 'primary' and 'secondary' sourcing techniques to identify candidates as well as the candidate profiling to further pre-screen candidates but there is a growing market for experts solely focused on "telephone sourcing", "internet sourcing/researching" and candidate profiling. The actual act to source candidates can usually be split out into two clearly defined techniques: primary sourcing and secondary sourcing.

Source Control Drawings are mainly used for single source items. You should consider making a Vendor Item Control Drawing instead, where you can have multiple sources.

You should list the Supplier information (name, address, part number) of the part you are sourcing, including Quality Requirements, Performance Data, and interchangeability of the part.

You need "Source Control Drawing" printed on the drawing, . tall.

You need 2 general notes:

- Only the item described on this drawing when procured from the vendor listed hereon is approved by (your company) for use in the application specified heropn. A substitute item shall not be used without prior approval by (your company).

- Identification of the approved source hereon is not to be construed as a guarantee of present or continued availability as a source of supply for the items described onthe drawing.

Try to get a hold of ASME Y14.24M for further information.

This information is misleading. See Drawing Types.
Before you quote the spec, READ the spec.

The Spec is very clear on this.
Source Control Drawings are only used for Vendor Items IF THERE IS A SPECIFIC QUALIFICATION TEST required.
If there is No Specific Qualification Test, then it is a VENDOR ITEM DRAWING.
Any number of vendors can provide their component for a Source Control Drawing if they have their Vendor Item Product TESTED AND APPROVED. If approved, the vendor is added to the vendor table just like any Vendor Item Drawing.

So many people think that they can just say "Source Control Drawing" and it locks them in as the only vendor. This is NOT what

- ✓ Vendor Item Control Drawing

NOTE: A vendor item control drawing was formerly called a specification control drawing or vendor item drawing.

- ✓ Description. A vendor item control drawing provides an engineering description and acceptance, criteria for commercial items or vendor-developed items that are procurable from a specialized segment of industry.

- ✓ Source Control Drawing
- ✓ Description. A source control drawing provides an engineering description, qualification requirements, and acceptance criteria for commercial items or vendor-developed items procurable from a specialized segment of industry, that provide the performance, installation, interchangeability, or other characteristics required for critical applications. The drawing provides a list of approved sources of supply and the vendor’s item identification for the item(s) that have been qualified and approved for use in the critical application(s).

Self-Check -5	Written Test

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

1. Among the given alternative which one is Source Control Drawings?
   A. are only used for Vendor Items
   B. Drawings are mainly used for single source items
   C. activity typically ends once the name, job title, job function
   D. ALL

Note: **Satisfactory rating – 1.5 points** **Unsatisfactory - below 1.5 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

Multiple Chose Test Answer

1._____

Information Sheet-6	Scope of drawing

6.1Understanding the scope of drawing

is an excellent guide that will help you to improve your technique in any setting.

Not a rendering of some proposed architectural wonder, but the steel, glass and wood structure that finally materializes after years of planning, fundraising and construction.

Menial Drawing Institute makes a case for it at virtually every turn: with long stretches of slanted steel awnings that define courtyards, with the grain of the dark-gray Port Offord cedar under those gables, with soffit lighting that streaks between the ceiling and walls of the linear living room, even with the veining of the Vermont marble that lines restroom walls and punctuates three serene courtyards in different ways.

Only the front portion of the building's interior is open to the public, but much of what can be seen in the architecture, the landscaping and the art on view aims to address questions about what; drawing; means today. Bernice Rose, the founding chief curator, was among the first visitors. She has described the enterprise as honoring that very specific moment when drawing ceases to become a step towards painting and becomes an independent action of its own.

For centuries, the definition was simple: A drawing was a work of art executed on paper. Though a drawing can still be a work on paper, and often is, that paper may be monumental. Or it may be Mylar. Or some less porous material one might associate with sculpture. A drawing can be made in air, or in the ground. Here are a few of the eye-opener

6.1.1. Living-room are

Two artworks in the living room represent the polar spectrum of drawing. The late Ruth Asana made this hanging sculpture of oxidized copper and brass wire in about 1956. The shape references basket weaving, but not basket weaving for the simple-minded. Curators call the untitled piece Hanging six-lobed, discontinuous surface with an interlocked top section. an American, learned to draw when she was incarcerated as a teenager during World War II in Japanese internment camps. She had the talent and good fortune to land at the legendary, experimental Black Mountain College, where Josef Albers and Buckminster Fuller became her mentors

Across the room,; End Sampler looks more accidental, like a stretch of drywall the building's painters forgot to cover after the construction. actually the result of a meticulous process of gathering handwritten idioms by about 300 people, in their own handwriting, and silk-screening each piece of text individually in a unique configuration that makes the piece site-specific. A visitor could spend hours reading it if for no other reason than to count the seemingly endless number of cliché in the English language; stick to my guns; lose my head beating a dead horse; and on and on. Next year, the MDI will present Horn's solo show; When I Breathe, I Draw; filling the building's gallery with more defined, large-scale works

6.1.2. Outdoor sculpture

Curve the slice of white metal near this west entrance, is the last public commission that Ellsworth Kelly completed before his death at the end. The Menial owns a number of the great Minimalist's works, including many drawings; the curve is among his iconic shapes. The sculpture's reflective quality contrasts with the matte finish of the wall behind it, a relationship that changes with the daylight. View it from the sidewalk on West Main, and the piece almost disappears, becoming simply a above the grass.

Self-Check -6	Written Test

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

1. What scope of drawing?
   A. is an excellent guide that will help you to improve your technique in any setting.
   B. Steep
   C. Flow
   D. all

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ **Date:** _____

Multiple Chose Test Answer

1._____

Information Sheet-7	Basic Drawing Procedures

How to begin your drawing?

A. Clean the drawing board and all the drawing
B. instruments using duster.
C. Fix the drawing sheet on the drawing board.
D. Fix the mini-drafter in a convenient position.
E. Draw border lines using HB pencil..
F. Complete the title box using HB pencil .
G. Plan spacing of drawings b/n two problems/views beforehand.
H. Print the problem number on the left top and then
I. commence the drawing work**.**

A student's success in this course is directly related to his or her ability to understand how to proceed in traditional and non-traditional
class settings. It is imperative for students to:
1. Read all material carefully. Reread the material several times for total understanding. DO NOT SKIM.
2. Understand the concept of an activity before you start the process of typing commands on the keyboard.
3. The information you will type is presented in numbered sequence. Follow the steps carefully, watching the screen as you proceed.
4. Read the concepts again if you are having difficulty understanding a particular item.
5. Repeat the steps of an exercise over and over to develop mastery. Mastery means you are able to complete
an exercise without looking at the book, and understand why you performed that particular function.
6. Ask questions if you do not understand or if you are having difficulty with the key strokes.

Self-Check -7	Written Test

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

1. WHICH ONE IS Drawing Procedures?

A. Clean the drawing board and all the drawing
B. instruments using duster.
C. Fix the drawing sheet on the drawing board.
D. All

Multiple Chose Test Answer

Note: **Satisfactory rating – 1 points** **Unsatisfactory - below 1 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ **Date:** _____

Short Answer Questions

1._____

Reference

1. engineering drawing by N.D BHATT
2. engineering drawing{GEAMETRICAL DRAWING} BY P S GILL
3. ATEXTBOOK OF engineering drawing BY ROOP LAI .RAMAKANT RANA
4. FUNDAMENTALS engineering drawing{FOR POLY TECHICS}BYS. CHAND

ROAD CIVIL WORKS

Level II

Learning Guide-14

Unit of Competence: - **Produce Detailed Engineering Drawings**

Module Title: - **Producing Detailed Engineering Drawings**

LG Code: **CON RCW2 MO1 LO1-LG-14**

TTLM Code: **C OCON RCW2 TTLM 0919v1**

LO 2 Produce detail drawings

Instruction Sheet	Learning Guide #14

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

- detail drawing and Assembly drawing
- Dimensioning
- ***Geometric tolerances*** and general tolerance
- ***Simple components or layouts*** in angle projection
- Auxiliary view
- Showing ***parts***
- producing Detaille drawing

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**:

- Drawing details including assembly and components are completed.
- Dimensions of various components are determined and inserted where required.
- Appropriate symbols for limits and fits, surface texture and geometric tolerances are included.
- Simple components or layouts are drawn in third angle projection.
- An auxiliary view is drawn of a component, given two views.
- Correct convention for parts is shown.
- Detailed drawing is produced in third angle projection, including auxiliary views, sections and assemblies **Learning Instructions:**

3. Read the specific objectives of this Learning Guide.
4. Follow the instructions described below 41.
5. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 Sheet 4 Sheet 5 Sheet 6 and Sheet 7”.

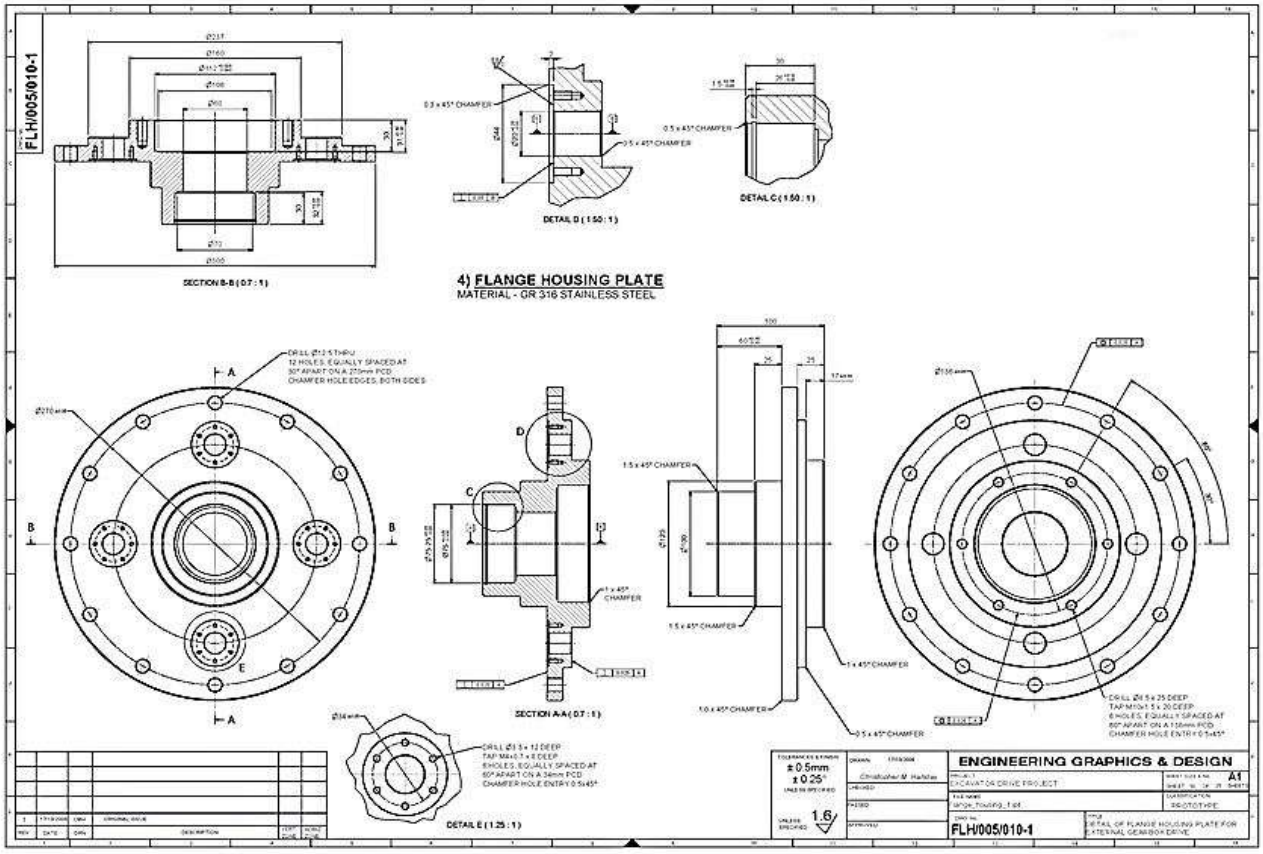
6. Accomplish the “Self-check 1,Self-check t 2, Self-check 3 Self-check 4 Self-check 5 Self-check 6 and Self-check 7” **in page 48, 61, 71,83,90,97 and 100** respectively.
7. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -50,51,63,and 85**
8. Do the “LAP test” **in page – 102** (if you are ready).

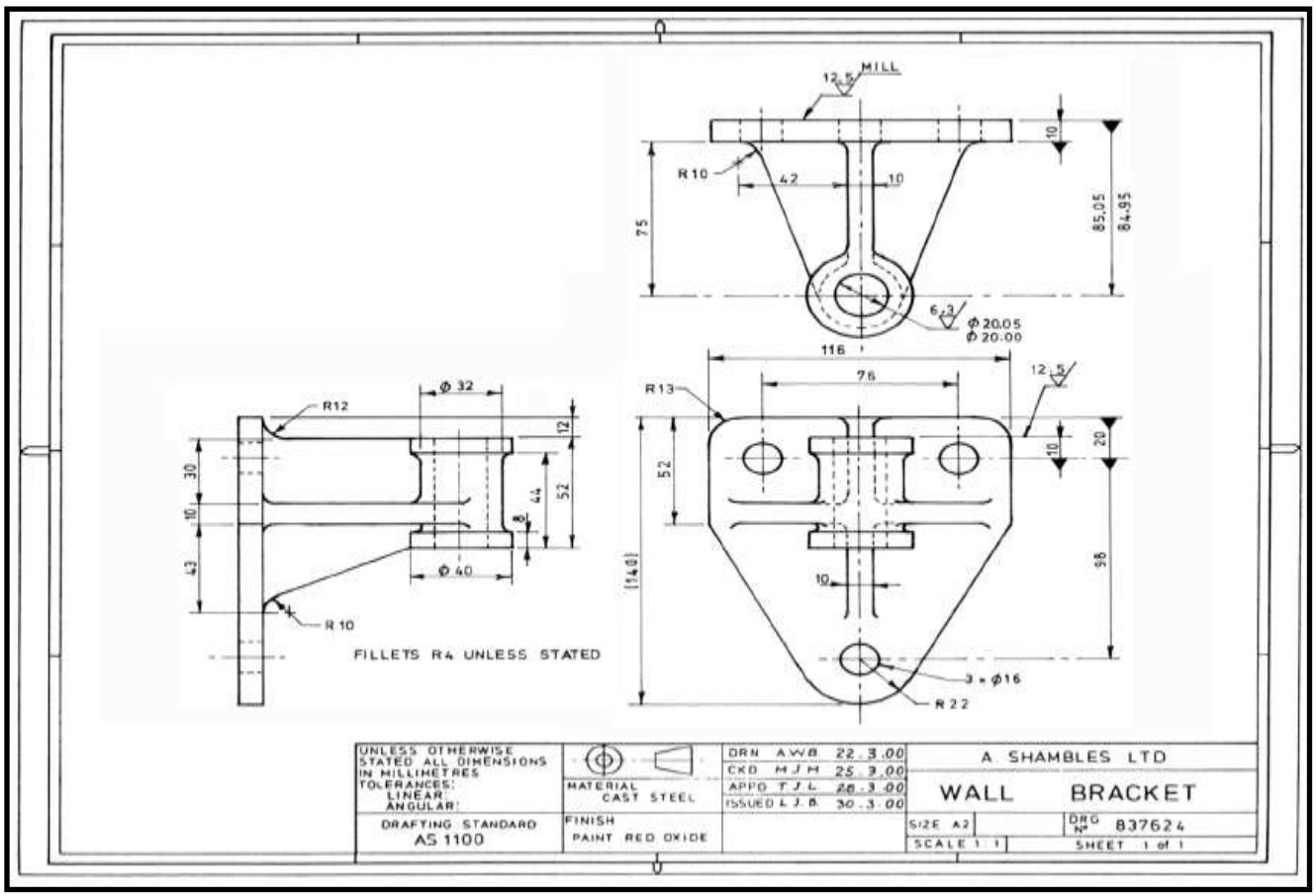
Information Sheet-1	Detail drawing and Assembly drawing

What is a Detail Drawing?

Detail drawings provide a detailed description of the geometric form of a part of an object such as a building, bridge, tunnel, machine, plant, and so on. They tend to be large-scale drawings that show in detail parts that may be included in less detail on general arrangement drawing

An Engineering Detail Drawing contains the key points to enable the manufacture or design to other interested parties.




MILL
12.5
R10
42
10
75
85.05
84.95
6.3
Φ20.05
Φ20.00
116
76
12.5
R13
52
10
20
98
140
10
3 × Φ16
R22
Φ32
R12
12
30
10
43
44
8
52
Φ40
R10
FILLETS R4 UNLESS STATED
UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETRES
TOLERANCES: LINEAR: ANGULAR:
DRAFTING STANDARD AS 1100
MATERIAL CAST STEEL
FINISH PAINT RED OXIDE
DRN A.W.B 22.3.00
CKD M.J.H 25.3.00
APPD T.J.L 28.3.00
ISSUED L.J.B 30.3.00
A SHAMBLES LTD
WALL BRACKET
SIZE A2
DRG Nº 837624
SCALE 1:1
SHEET 1 of 1

6.1.1manufacture a part.

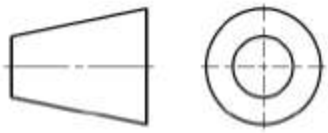
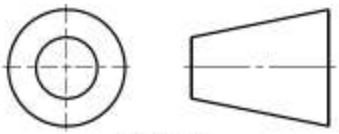
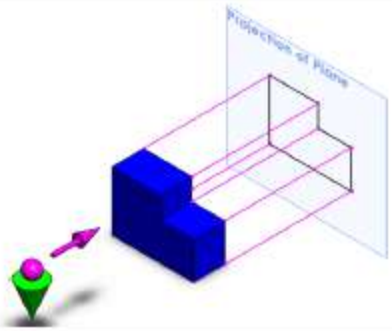
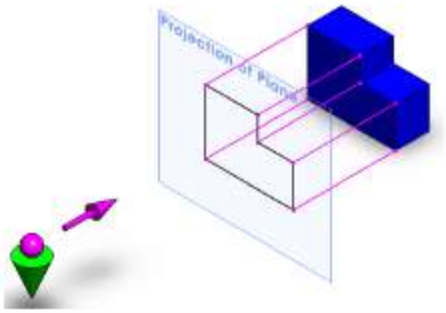
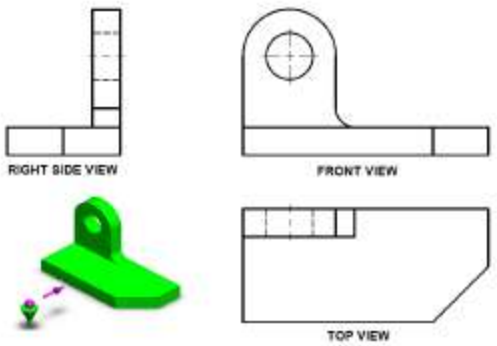
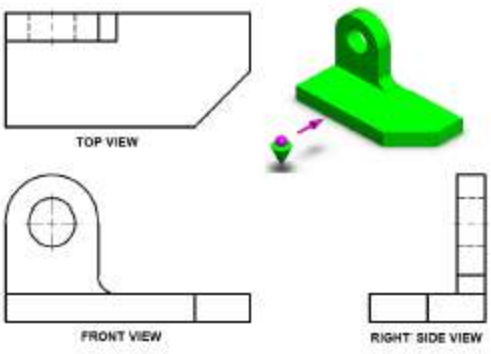
- Enough orthogonal views : enough views to adequate describe the component.
- Dimensions : Must be evenly distributed, structured and not duplicated.
- Scale : Drawing must state the scale used to fit the component onto the drawing sheet.
- The type of projection : Third Angle Projection is mandatory in ENGG1960.
- Drafting Standard (AS1100) : This is effectively covered in prescribed texts.
- The name or title of drawing : What is the name of the component ?
- The drawing number : What is the number (in-house system) of the component ?
- Dimensional units used : mm, m, inches, feet etc.
- Tolerances : What are the manufacturing tolerances for each part of the component.
- Surface texture (or roughness) : How smooth/rough each part of the component has to be.
- Treatments (coatings, tempers etc.) : Does the component need protective coatings ?
- Reference to assembly drawing : What does my component fit into ?
- Material : What material is the component manufactured from ?
- Drafter (who drew it), Checker (who checked it), Approver (who approved it) and dates
- Zones : Where on the drawing are you referring to ?
- Revision : What has been revised and why and what revision is this drawing ?
- Sheet Size : A4, A3, A2, A1 or A0

6.2 Assembly drawing

Assembly of various links or parts. It is necessary to understand the relation between the various parts of the unit for the purpose of design and production.

An assembly drawing is one which represents various parts of a machine in their working
position. These drawings are classified as design assembly drawings, working assembly drawings,
sub-assembly drawings, installation assembly drawings, etc. An assembly drawing made at the
design stage while developing a machine is known as design assembly drawing. It is made to a
larger scale so that the required changes or modifications may be thought of by the designer,
keeping in view both the functional requirement and aesthetic appearance. Working assembly
drawings are normally made for simple machines, comprising small number of parts. Each part
is completely dimensioned to facilitate easy fabrication. A sub-assembly drawing is an assembly
drawing of a group of related parts which form a part of a complicated machine. Thus, a number
of such sub-assembly drawings are needed to make a complete unit. An installation assembly
drawing reveals the relation between different units of a machine, giving location and dimensions
of few important parts.
The final assembly drawings are prepared from design assembly drawings or from the
working drawings (component drawings). The class-room exercises are designed to train the
students to master fundamentals of machine drawing, such as principles of drawing, orthographic
projections, etc. In addition, the student will understand the relation between the different parts
of the components and working principles of the assembled unit. The following steps may be made
use of to make an assembly drawing from component drawings:
1. Understand the purpose, principle of operation and field of application of the given
machine. This will help in understanding the functional requirements of individual parts and
their location.
2. Examine thoroughly, the external and internal features of the individual parts.
3. Choose a proper scale for the assembly drawing.
4. Estimate the overall dimensions of the views of the assembly drawing and make the

outline blocks for each of the required view, leaving enough space between them, for indicating
dimensions and adding required notes.
5. Draw the axes of symmetry for all the views of the assembly drawing.
6. Begin with the view from the front, by drawing first, the main parts of the machine and
then adding the rest of the parts, in the sequence of assembly.
7. Project the other required views from the view from the front and complete the views.
8. Mark the location and overall dimensions and add the part numbers on the drawing.

First Angle Projection	Third Angle Projection
The object is imagined to be in first quadrant.	The object is imagined to be in third quadrant.
The object is lies between the observer and plane of projection.	The plane of projection lies between the observer and object.
The plane of projection is assumed to be non transparent.	The plane of projection is assumed to be transparent.
When view are drawn in their relative position Top view comes below Front view, Right side view drawn to the left side of elevation.	When view are drawn in their relative position Top view comes above Front view, Right side view drawn to the right side of elevation.
 SYMBOL	 SYMBOL
	
 RIGHT SIDE VIEW FRONT VIEW TOP VIEW	 TOP VIEW FRONT VIEW RIGHT SIDE VIEW
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Self-Check 1	Written Test

Short Answer Questions

1. Engineering Detail Drawing must have following essential features:
   A. description of the geometric
   B. Examine thoroughly, the external and internal features
   C. Choose a proper scale for the assembly drawing.
   D. Estimate the overall dimensions
2. In general Assembly drawing address issue such as:
   A. Various links or parts.
   B. space between them, for indicating
   C. component need protective
   D. All

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Multiple Chose Test Answer

Score = _____
Rating: _____

Name: _____ Date: _____

Short Answer

. 1_____
2._____

Operation Sheet 1	Detail drawing

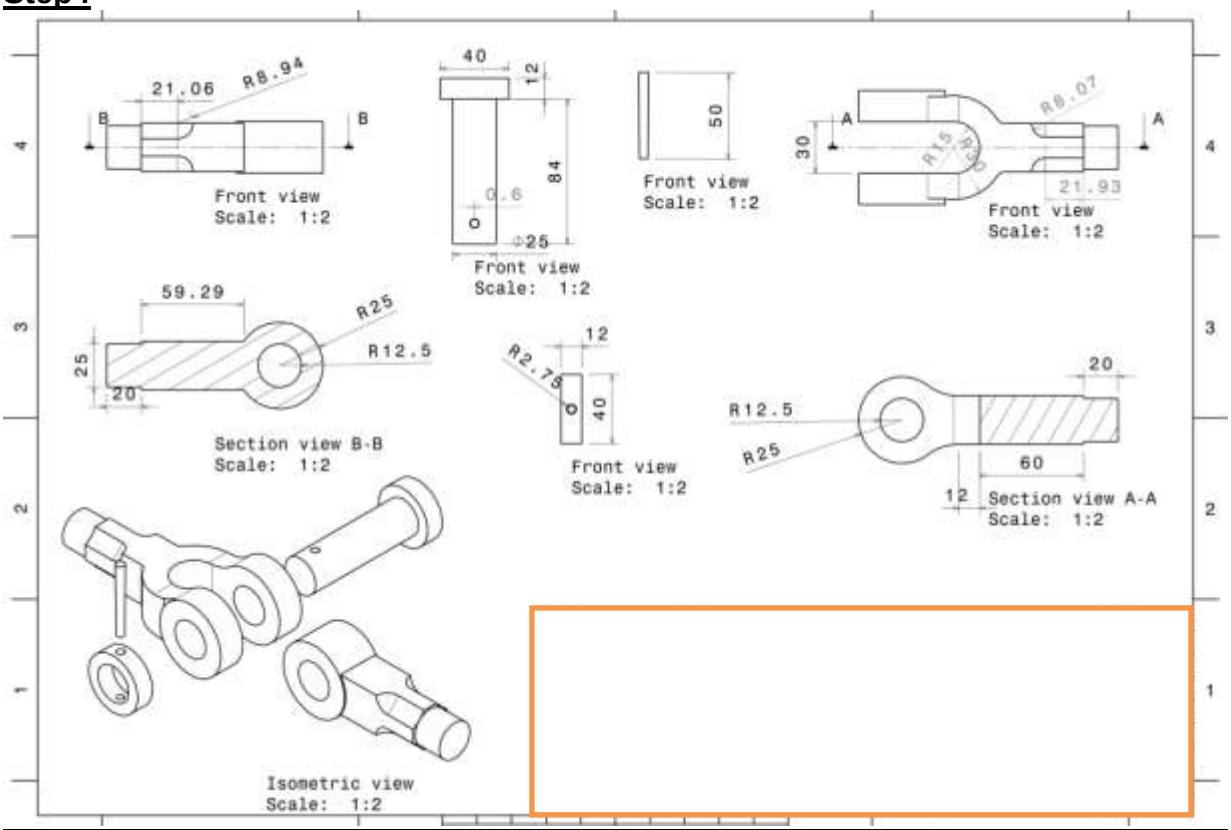
Procedures for ----------

Step 1- proper usage of drawing table and instruments .

Step 2- draw border line and title block

Step3 draw the detail drawing of the give drawing by following the procedure

Step4



Operation Sheet-2	Assembly drawing

Techniques for----------:

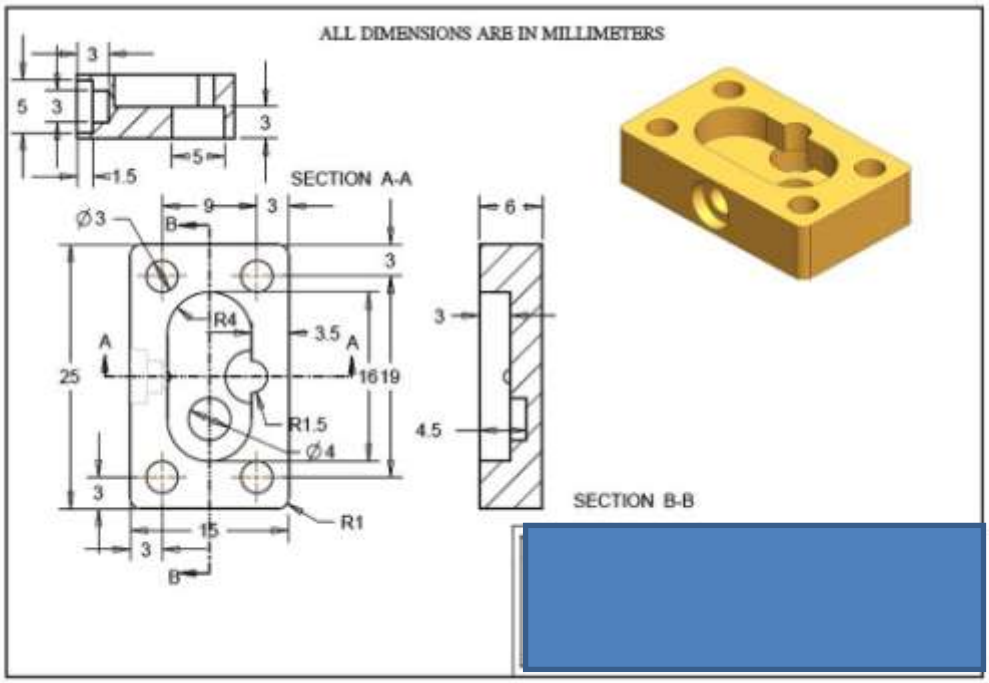
Step 1- proper usage of drawing table and instruments .

Step 2- draw border line and title block

Step3 draw the detail drawing of the give drawing by following the procedure

Step

.



Information Sheet-2	Dimensioning

DIMENSIONING

Objectives:

At the end of this Information Sheet the students should be able to:

- Discuss the purposes of dimensioning
- Explain the differences between dimension line, extension line, leaders etc.
- Draw the dimension of technical drawings as per the standard

8.1 Introduction

The purpose of dimensioning is to provide a clear and complete description of an object. A complete set of dimensions will permit only one interpretation needed to construct the part. Dimensioning should follow these guidelines.

1. Accuracy: correct values must be given.
2. Clearness: dimensions must be placed in appropriate positions.
3. Completeness: nothing must be left out, and nothing duplicated.
4. Readability: the appropriate line quality must be used for legibility.

8.2 Definitions

- **Dimension line** is a thin line, broken in the middle to

allow the placement of the dimension value, with arrowheads at each end (figure 8.1).

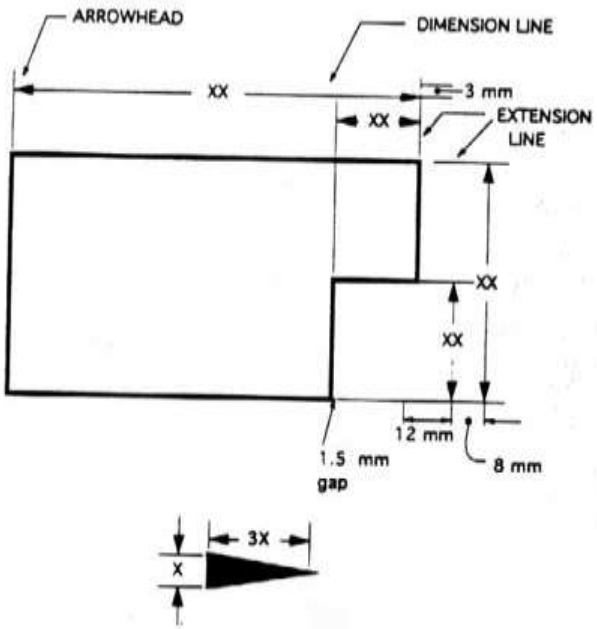


Figure 8.1 Dimensioning Drawing

- An **arrowhead** is approximately 3 mm long and 1 mm wide. That is, the length is roughly three times the width.
- An **extension line** extends a line on the object to the dimension line. The first dimension line should be approximately 12 mm (0.6 in) from the object. Extension lines begin 1.5 mm from the object and extend 3 mm from the last dimension line.
- A leader is a thin line used to connect a dimension with a particular area (figure 8.2).

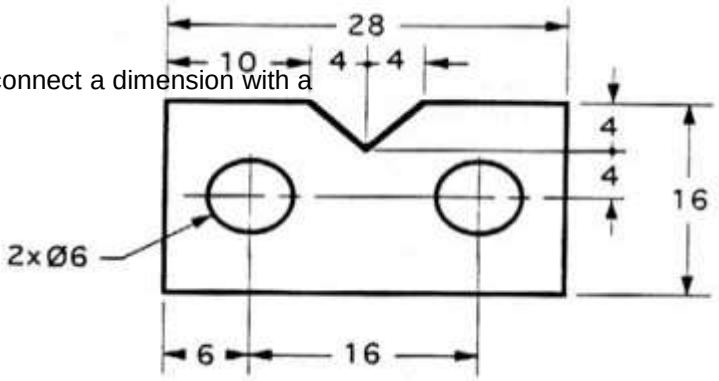


Figure 8.2 Example drawing with a leader

A leader may also be used to indicate a note or comment about a specific area. When there is limited space, a heavy black dot may be substituted for the arrows, as in figure 8.1. Also in this drawing, two holes are identical, allowing the "2x" notation to be used and the dimension to point to only one of the circles.

8.3 Steps in Dimensioning

There are two basic steps in dimensioning objects, regardless of the type of object.

STEP 1: Apply the size dimensions. These are dimensions, which indicate the overall sizes of the object and the various features, which make up the object.

STEP 2: Apply the location dimensions. Location dimensions are dimensions, which locate various features of an object from some specified datum or surface.

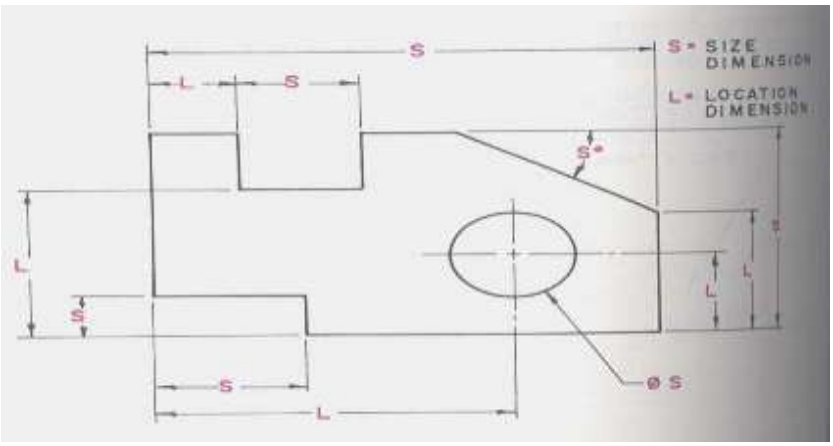


Figure 8.3 Dimensioning

8.4 Where to Put Dimensions

The dimensions should be placed on the face that describes the feature most clearly. Examples of appropriate and inappropriate placing of dimensions are shown in figure 9.4.

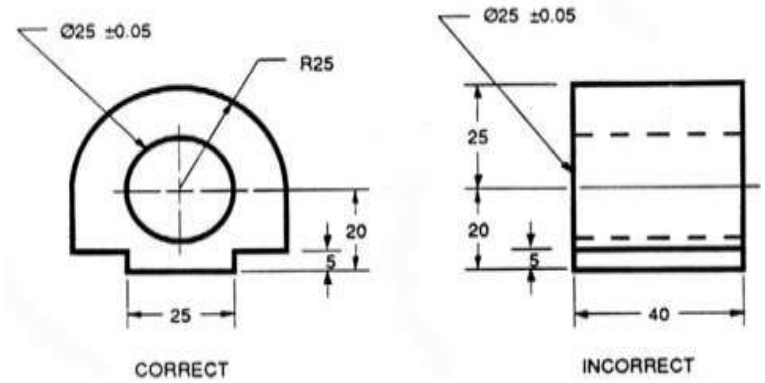


Figure 8.4 Example of appropriate and inappropriate dimensioning

In order to get the feel of what dimensioning is all about, we can start with a simple rectangular block. With this simple object, only three dimensions are needed to describe it completely (figure 8.5). There is little choice on where to put its dimensions.

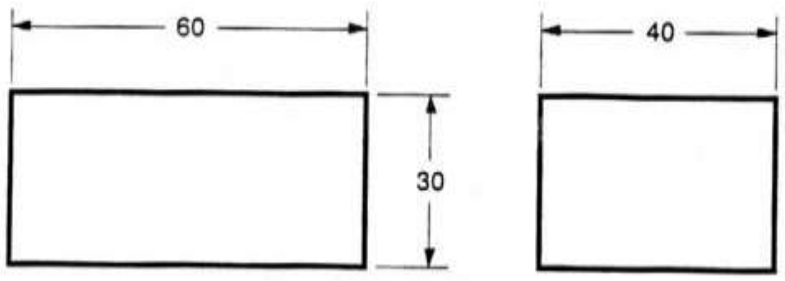


Figure 8.5 Simple object

We have to make some choices when we dimension a block with a notch or cutout (figure 9.6). It is usually best to dimension from a common line or surface. This can be called *the datum line of surface*. This eliminates the addition of measurement or machining inaccuracies that would come from "chain" or "series" dimensioning. Notice how the dimensions originate on the datum surfaces. We chose one datum surface in figure 9.6, and another in figure 9.7. As long as we are consistent, it makes no difference. (We are just showing the top view).

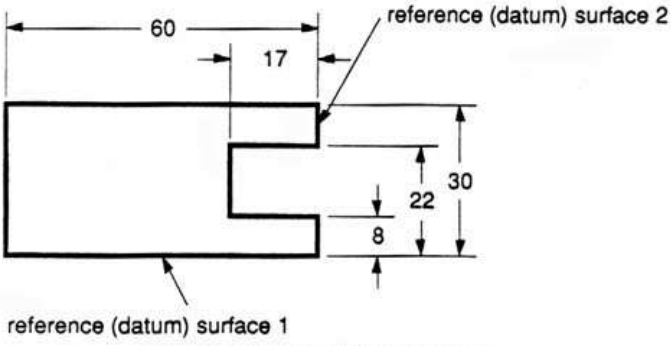


Figure 8.6 Surface datum example

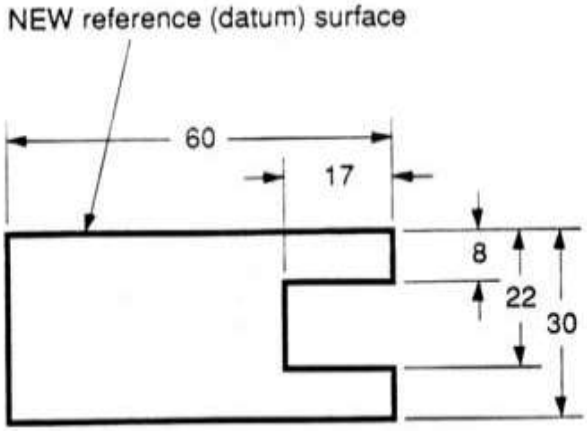


Figure 8.7 Surface datum examples

In figure 9.8 we have shown a hole that we have chosen to dimension on the left side of the object. The Ø stands for "diameter".

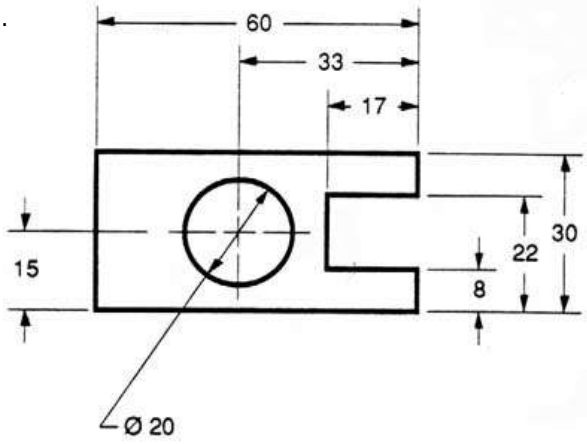


Figure 8.8 Examples of a dimensioned hole

When the left side of the block is "radiuses" as in figure 9.9, we break our rule that we should not duplicate dimensions. The total length is known because the radius of the curve on the left side is given. Then, for clarity, we add the overall length of 60 and we note that it is a reference (REF) dimension. This means that it is not really required.

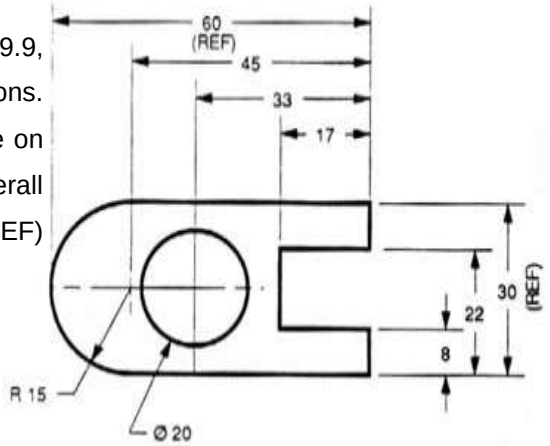


Figure 8.9 Examples of a directly dimensioned hole

Somewhere on the paper, usually the bottom there should be placed information on what measuring system is being used (e.g. inches and millimeters) and also the scale of the drawing.

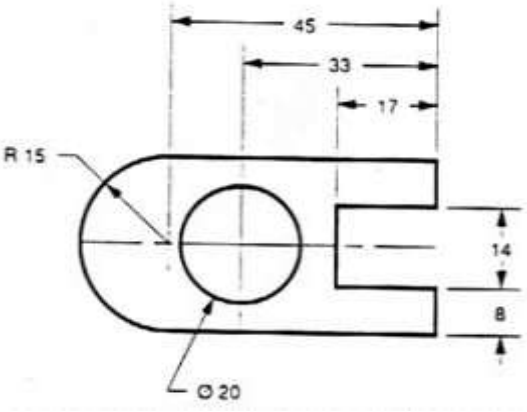


Figure 8.10 Example of a directly dimensioned hole

This drawing is symmetric about the horizontal centerline. Centerlines (chain-dotted) are used for symmetric objects,

and also for the center of circles and holes. We can dimension directly to the centerline, as in figure 9.10. In some cases this method can be clearer than just dimensioning between surfaces.

Self-Check 2	Written Test

Short Answer Questions

1. which one is the Steps in Dimensioning
   A. The dimensions should be placed on the face
   B. placed information on what measuring system
   C. **Apply the size dimensions.**
   D. All

2. Dimensioning should follow these guidelines except .
   A. Accuracy: correct values must be given.
   B. Clearness: dimensions must be placed in appropriate positions.
   C. Completeness: nothing must be left out, and nothing duplicated.
   D. all

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Score = _____
Rating: _____

Multiple Chose Test Answer

Name: _____ Date: _____

Short Answer

1._____
2_____

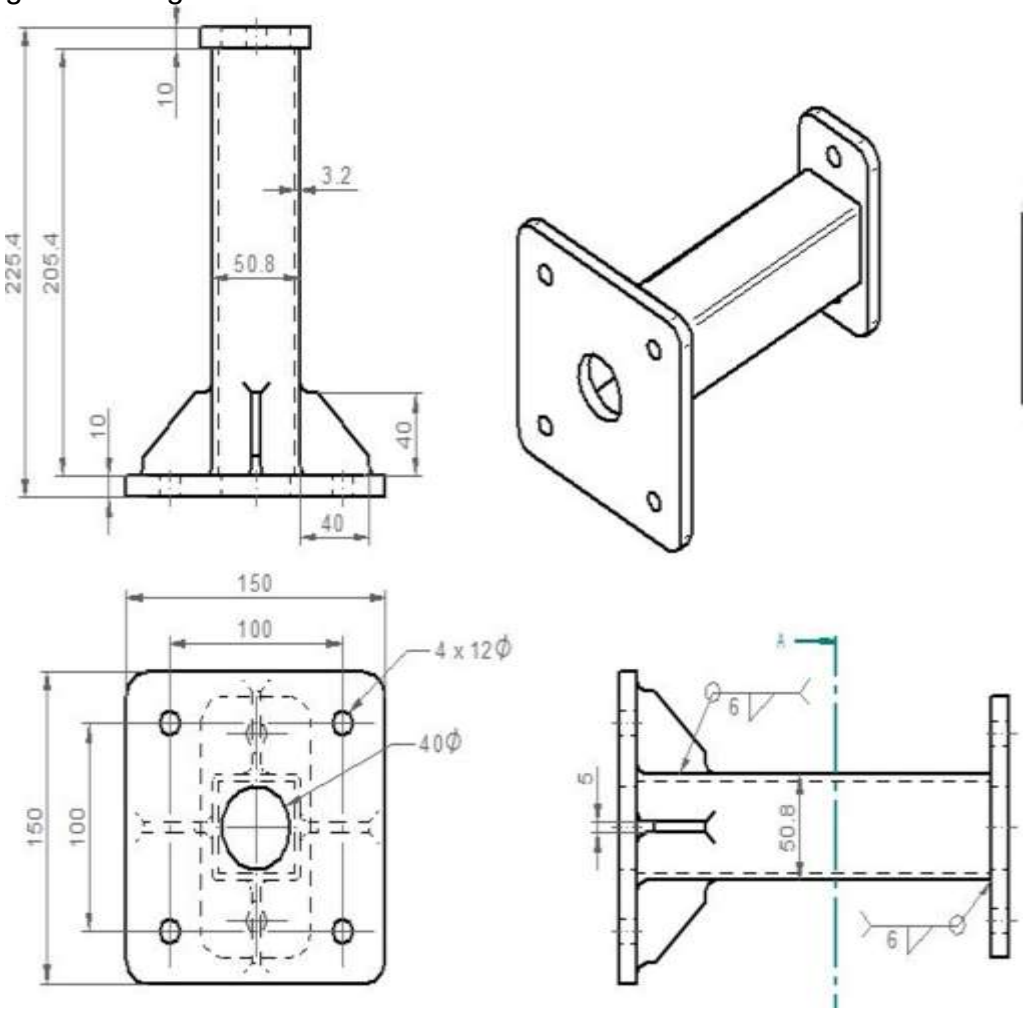
Operation Sheet-3	Dimensioning

Step 1- draw the given drawing

Step 2-: Apply the size dimensions

Step 3- Apply the location dimensions.

Step 4put the Dimension line, A leader, An extension and An arrowhead of the give drawing



Information Sheet-3	*Geometric tolerances* and general tolerance

3.1GEOMETRIC TOLERANCING

Geometric dimensioning and tolerancing (GD&T) is a symbolic language used on engineering drawings and computer generated three-dimensional solid models for explicitly

describing nominal geometry and its allowable variation.

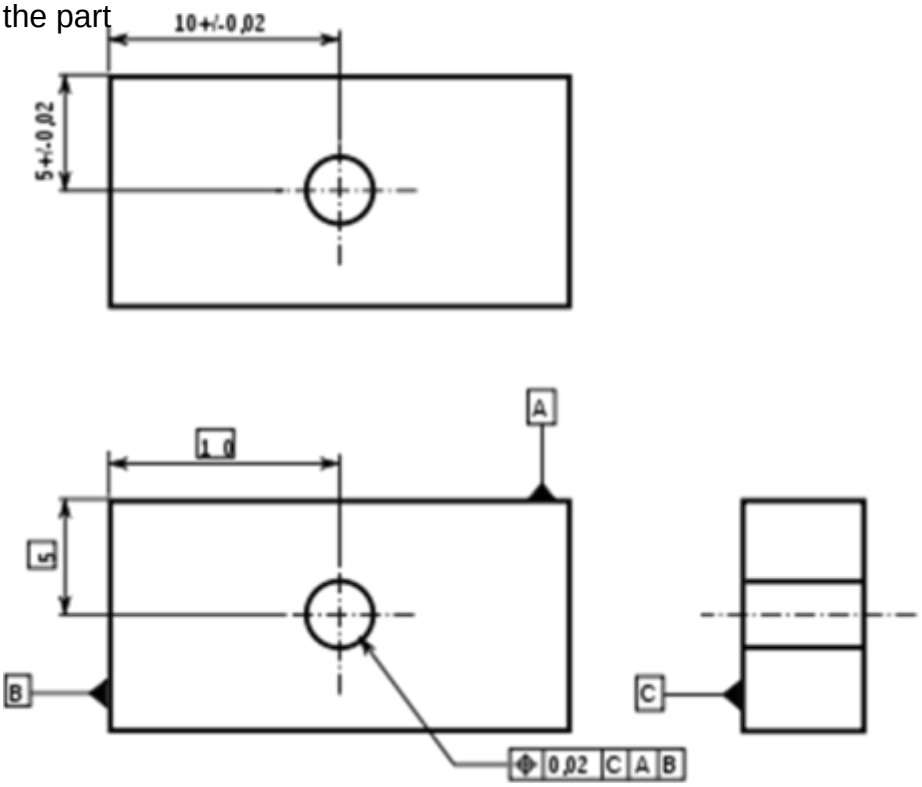
3.2TYPES OF CONTROL NEEDED FOR PARTS

POSITION OF FEATURES WITHIN PARTS

(linear dimensions and diameters)

Such as holes

FORM or SHAPE of FEATURES
Such as straightness, angularity
or parallelism of spesific portions
of the part



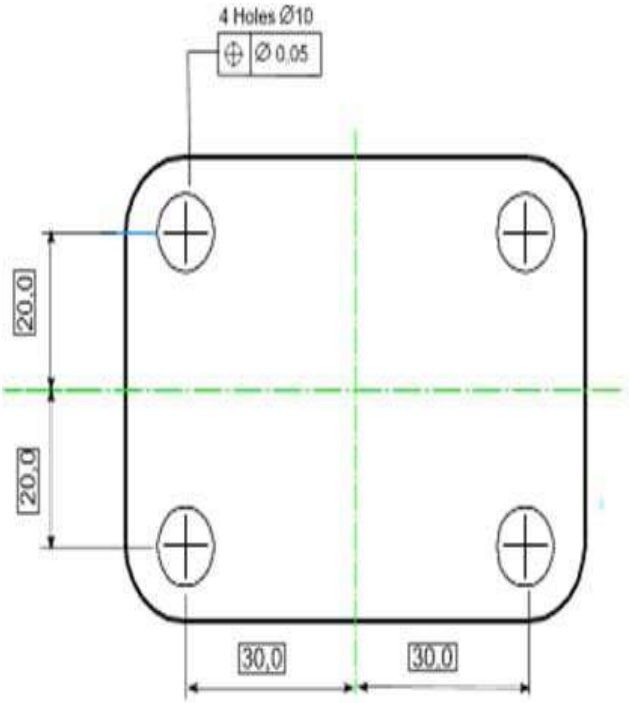
A datum is a feature of a part that acts as a master

reference used to locate other features of the part.

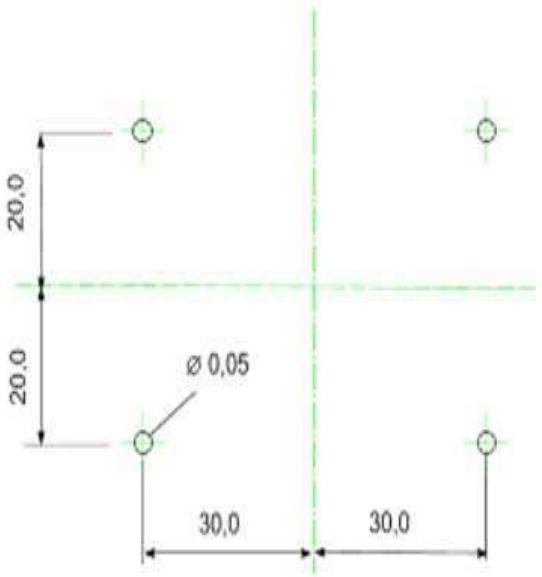
A datum can be a point, a line, or a plane

Theoretically exact dimensions

The dimension determining the theoretically exact form, orientation or position respectively must not be toleranced. The corresponding actual dimensions may only vary by the tolerances of form, orientation or position specified within the tolerance frame. This is illustrated in the figure below



Dimension



Requirement - The axes of the four holes to be contained within the cylinderical tolerance zones each 0,05mm dia.

Type of tolerance characteristics	Symbol
Form Straightness	
Form Flatness	Tolerances are given
Form Circularity	
Form Cylindricity	along with modifiers
Profile Profile of a line	
Profile Profile of a surface	
Orientation Perpendicularity	
Orientation Angularity	
Orientation Parallelism	
Location Symmetry	
Location Positional tolerance	
Location Concentricity	
Runout Circular runout	
Runout Total runout	

Symbol	Modifier
	Free state
	Least material condition (LMC)
	Maximum material condition (MMC)
	Projected tolerance zone

3.3 LIMITS, TOLERANCES, AND FITS

3.3.1 INTRODUCTION

The manufacture of interchangeable parts require precision. Precision is the degree of accuracy to ensure the functioning of a part as intended. However, experience shows that it is impossible to make parts economically to the exact dimensions. This may be due to,

(*i*) inaccuracies of machines and tools,
(*ii*) inaccuracies in setting the work to the tool, and
(*iii*) error in measurement, etc.

The workman, therefore, has to be given some allowable margin so that he can produce a part, the dimensions of which will lie between two acceptable limits, a maximum and a minimum.

The system in which a variation is accepted is called the limit system and the allowable deviations are called tolerances. The relationships between the mating parts are called fits.

The study of limits, tolerances and fits is a must for technologists involved in production.
The same must be reflected on production drawing, for guiding the craftsman on the shop
floor.

3.3.2 LIMIT SYSTEM

Following are some of the terms used in the limit system :

3.3.2.1 Tolerance

The permissible variation of a size is called tolerance. It is the difference between the maximum
and minimum permissible limits of the given size. If the variation is provided on one side of
the basic size, it is termed as unilateral tolerance. Similarly, if the variation is provided on
both sides of the basic size, it is known as bilateral tolerance.

3.3.2.2 Limits

The two extreme permissible sizes between which the actual size is contained are called limits.
The maximum size is called the upper limit and the minimum size is called the lower limit.

3.3.2.3 Deviation

It is the algebraic difference between a size (actual, maximum, etc.) and the corresponding
basic size.

3.3.2.4 Actual Deviation

It is the algebraic difference between the actual size and the corresponding basic size.

3.3.2.5 Upper Deviation

It is the algebraic difference between the maximum limit of the size and the corresponding
basic siz
Limits, Tolerances, and Fits

3.3.2.6 Lower Deviation

It is the algebraic difference between the minimum limit of the size and the corresponding
basic size.

3.3.2.7 Allowance

It is the dimensional difference between the maximum material limits of the mating parts,
intentionally provided to obtain the desired class of fit. If the allowance is positive, it will
result in minimum clearance between the mating parts and if the

allowance is negative, it will
result in maximum interference.

3.3.2.8 Basic Size

It is determined solely from design calculations. If the strength and stiffness requirements

need a 50mm diameter shaft, then 50mm is the basic shaft size. If it has to fit into a hole, then
50 mm is the basic size of the hole. Figure 15.1 illustrates the basic size, deviations and
tolerances.
Here, the two limit dimensions of the shaft are deviating in the negative direction with
respect to the basic size and those of the hole in the positive direction. The line corresponding
to the basic size is called the zero line or line of zero deviation

3.3.2.9 Design Size

It is that size, from which the limits of size are derived by the application of tolerances. If there
is no allowance, the design size is the same as the basic size. If an allowance of 0.05 mm for
clearance is applied, say to a shaft of 50 mm diameter, then its design size is (50 – 0.05) = 49.95
mm. A tolerance is then applied to this dimension.

3.3.2.10 Actual Size

It is the size obtained after manufacture.

3.3.3 TOLERANCES

Great care and judgement must be exercised in deciding the tolerances which may be applied
on various dimensions of a component. If tolerances are to be minimum, that is, if the accuracy
requirements are severe, the cost of production increases. In fact, the actual specified tolerances
dictate the method of manufacture. Hence, maximum possible tolerances must be recommended

3.4Drawing tollerance

Dimensioning and Tolerance

- Every engineering drawing must include
  - A. Dimensions
  - B. Tolerances
  - C. Materials from which products will be made
  - D. Finished surfaces marked
  - E. Other notes such as part numbers
- Two concepts when specifying dimensions
  - A. Size
  - B. Location
- Basic dimensioning practice
  - A. *Dimension lines*

- Provide information on the size of the object

B. *Extension lines*
   - Lines that extend from the points to which the dimension or location is to be specified
   - Lines are drawn parallel to each other with dimension line placed between them

C. *Leaders*
   - Arrows that point to a circle or a fillet for the purpose of specifying their sizes

D. *Fillet*
   - Rounded edges of an object
   - Size, radius of roundness must be specified

E. *Information box* contains
   - Name of person who prepared the drawing
   - Title of the drawing
   - Date
   - Scale
   - Sheet number and drawing number

Tolerance

- Engineered products generally consist of many parts
  - ❖ Would everything fit correctly if the actual dimension of machine part is off from the specified value?
- Must specify a tolerance on your drawing regarding the machine part dimension
  - ❖ For example, 2.50 cm +/- 0.01 cm

Self-Check 3	Written Test

Short Answer Questions

- 1. Every engineering drawing must include
  - A. Dimensions
  - B. Tolerances
  - C. Materials from which products will be made
  - D. All

2. Discuss the purpose of TOLERANCES

  - A. inaccuracies of machines and tools,
  - B. inaccuracies in setting the work to the tool, and
  - C. error in measurement
  - D. The permissible variation of a size

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

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

Answer Sheet

Score = _____

Rating: _____

Answer Sheet

Name: _____ Date: _____

Multiple Chose Test Answer

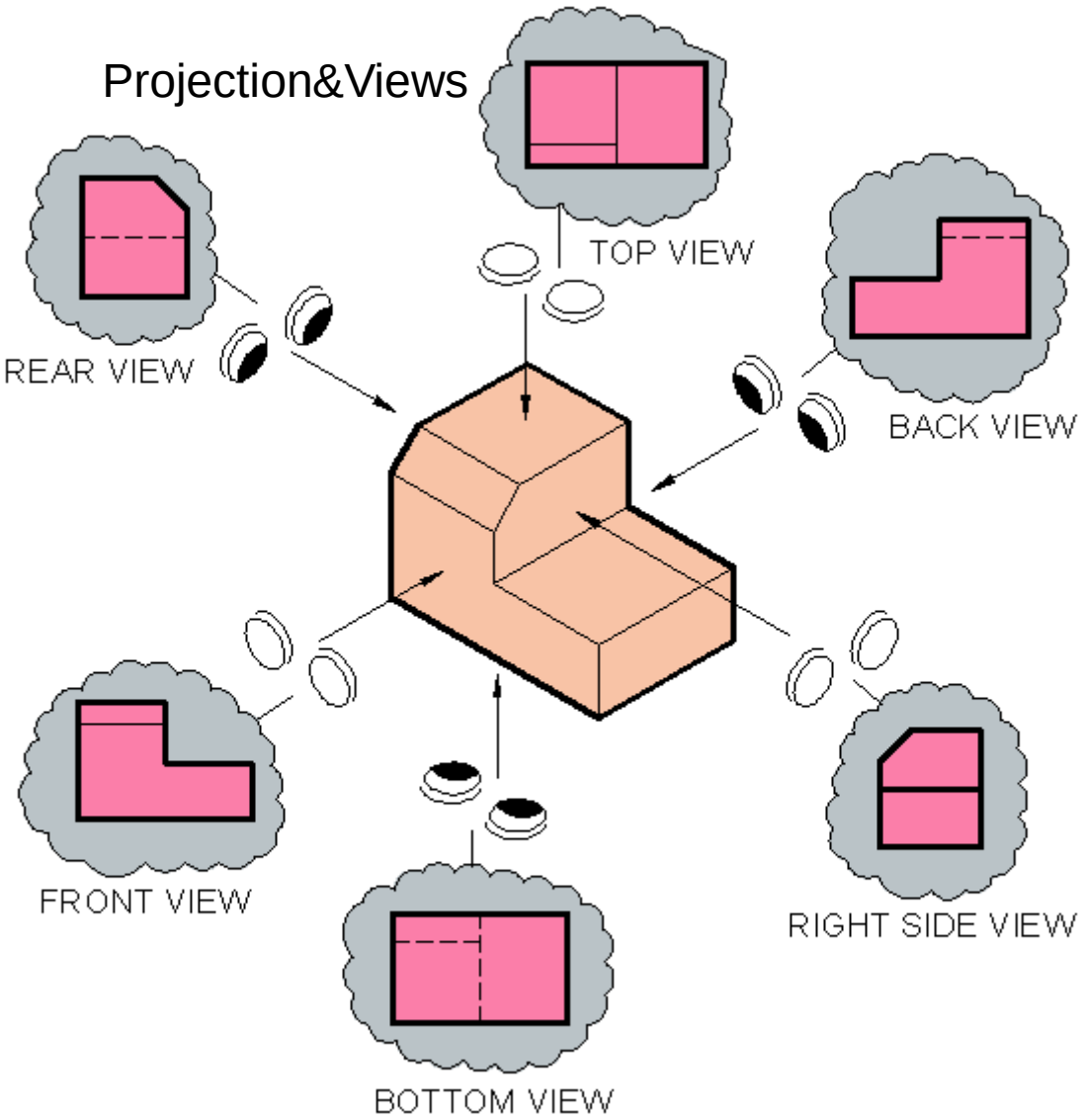
1._____

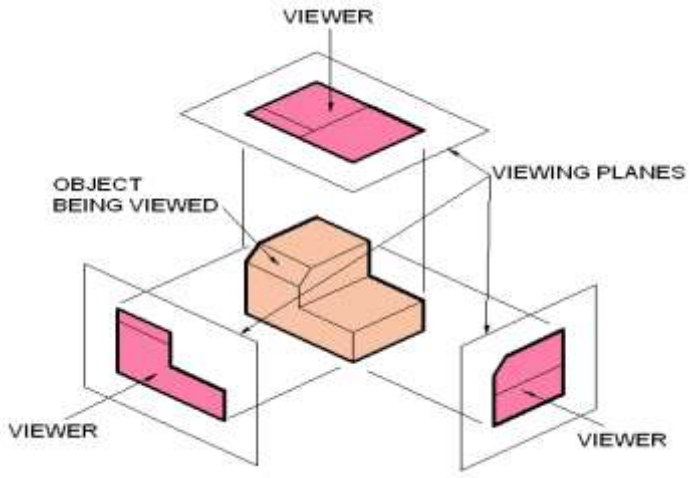
2._____

Information Sheet-4	Simple components or layouts in angle projection

Understanding

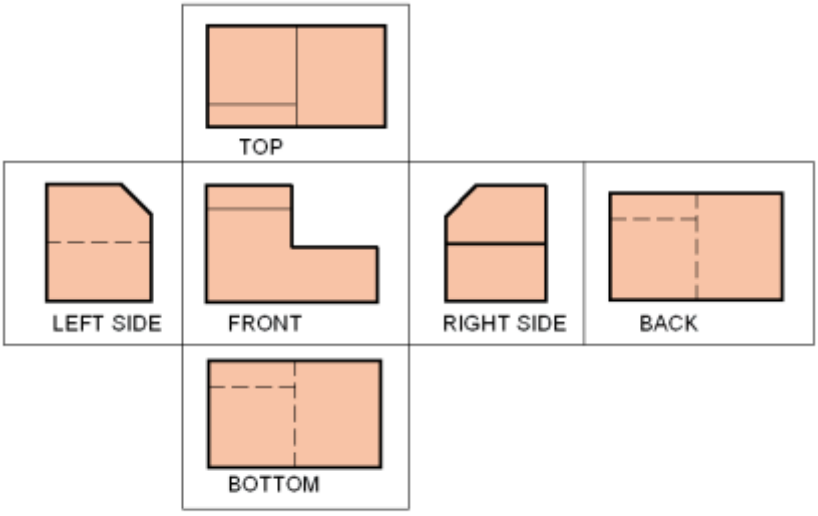
Projection&Views

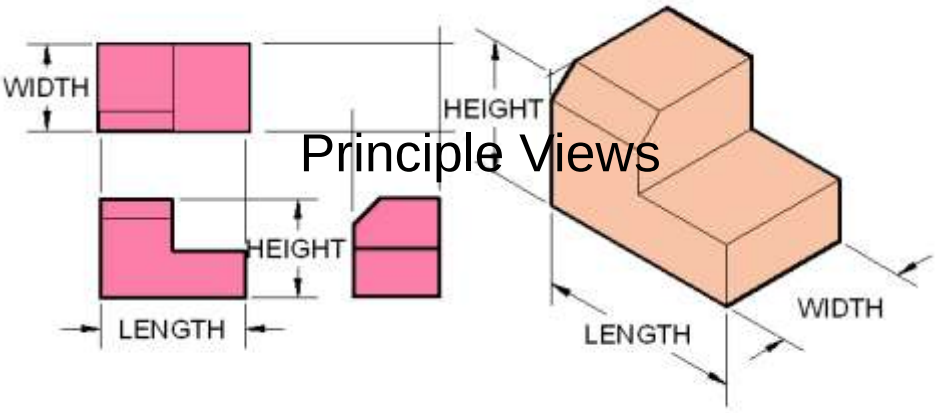




OrthographicProjection

Orthographic Projection is a way of visualizing different views of an object from there different sides such as a top view, front view, side view, the object is rotated so that theviewer viewing the object can see each individual side as the part is rotated.These Views are then drawn on a sheet of paper, enough views are drawn of the object to Help the person manufacturing the part to get a good visualization of what the part looks Like.The most common views drawn of an object in an orthographic drawings are the front view, top view, and right side view.After the views have been drawn on a sheet of paper notes and dimensions are then added.



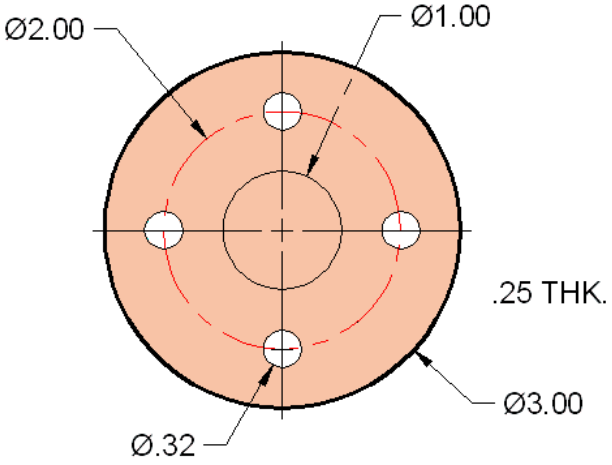


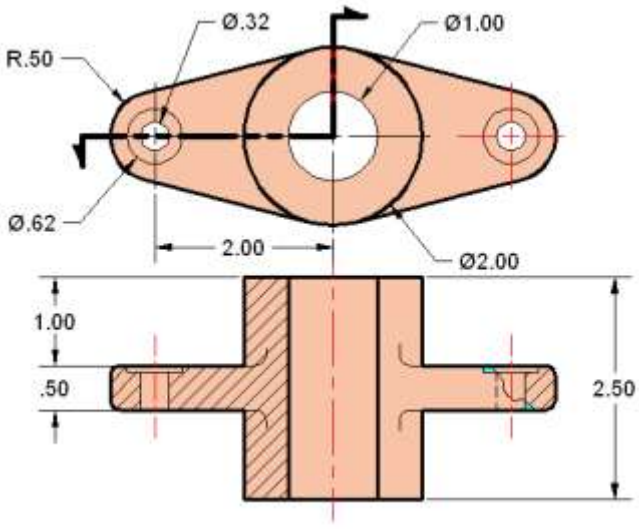
Principle Views

In orthographic projection there are 6 principleviews of an object, front, top, L side, R side, rear, and back views.The three most commonly views drawn on a technical drawing are the front, back, and side views most other views are not needed.Other views may be needed in order for the person who is creating the Part, to better visualize it in order to properly manufacture it.A wellviewed

ShapeDescription

Most objects in the world today are created in 3 dimensions, they display height, width, and length hence
the term 3D (Three dimensional).Most Orthographic drawings are drawn showing these three dimensions





Multiview Drawings

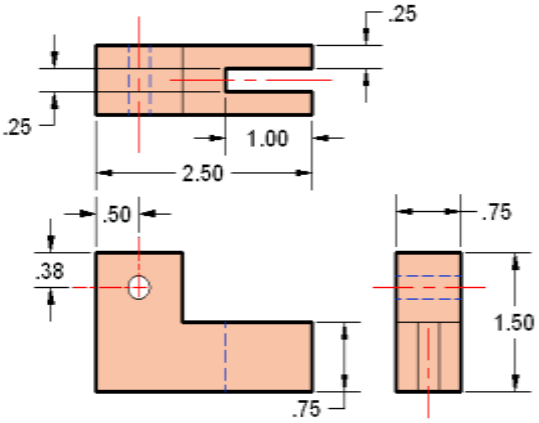
Most prints today are often created in the form of multiview

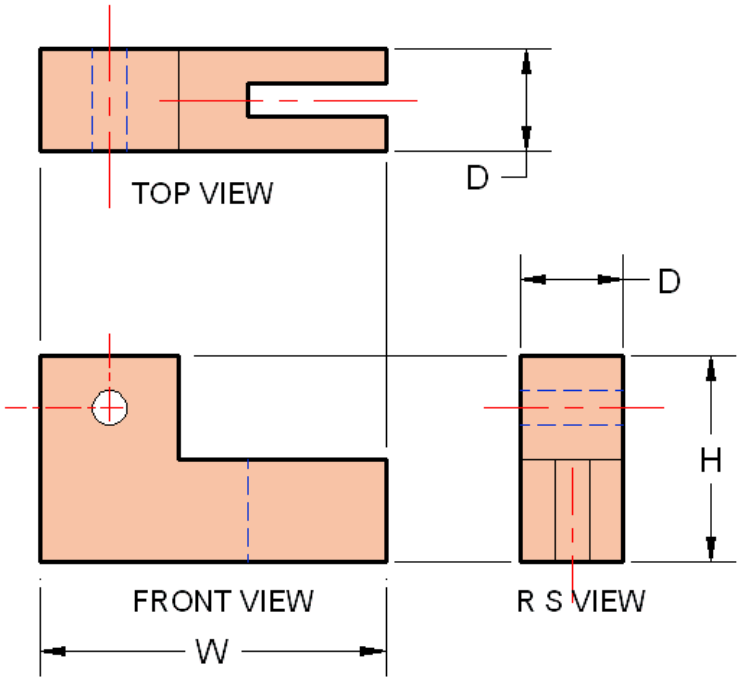
drawings.A multiview drawings is usually required when more than one view of the object being drawn is needed to accurately describe the shape of the object to the person responsible for creating it.

One View Drawing- Parts that may need only one view draw of it are simple cylindrical part.

Two View Drawings -Parts that may need 2 views draw of it maybe rectangular or square in shape withno irregular surfaces.

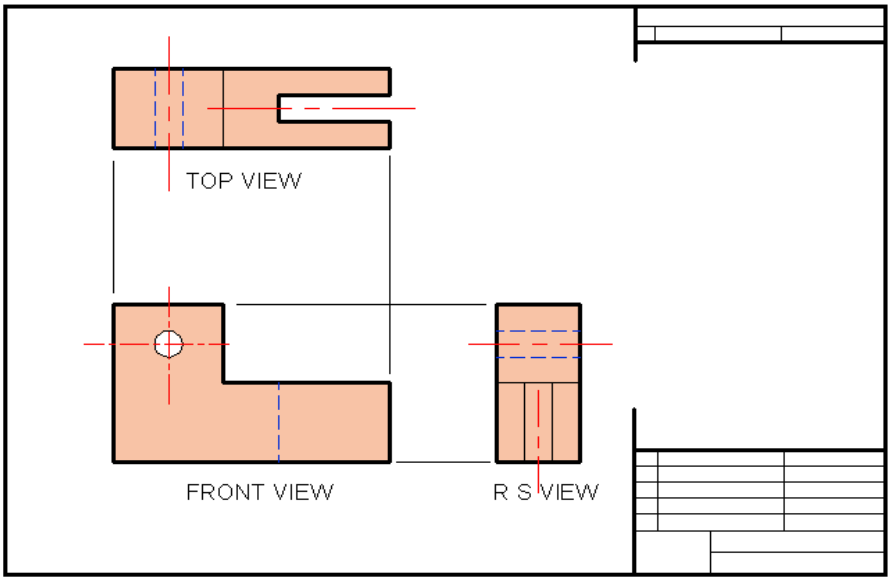
Three View Drawings - In orthographic drawing the most commonly used arrangement of views drawn is the threeview drawing.

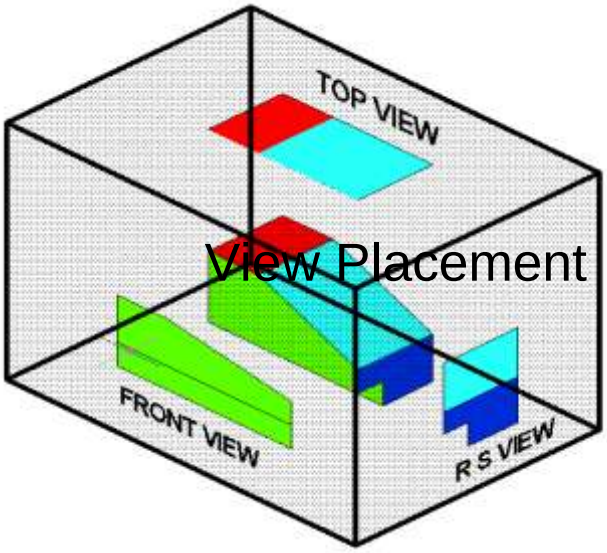




Arrangement Of Views

The image to the right shows the standard arrangement of a three view drawing.The front view is usually established first then the top and side view are projected from the frontview.The top view is projected directly over the front view and the side is projected directly to the right of the frontview.Using this standard orientation of views on a drawing you shouldbe able to determine the height, width, and depth of the object



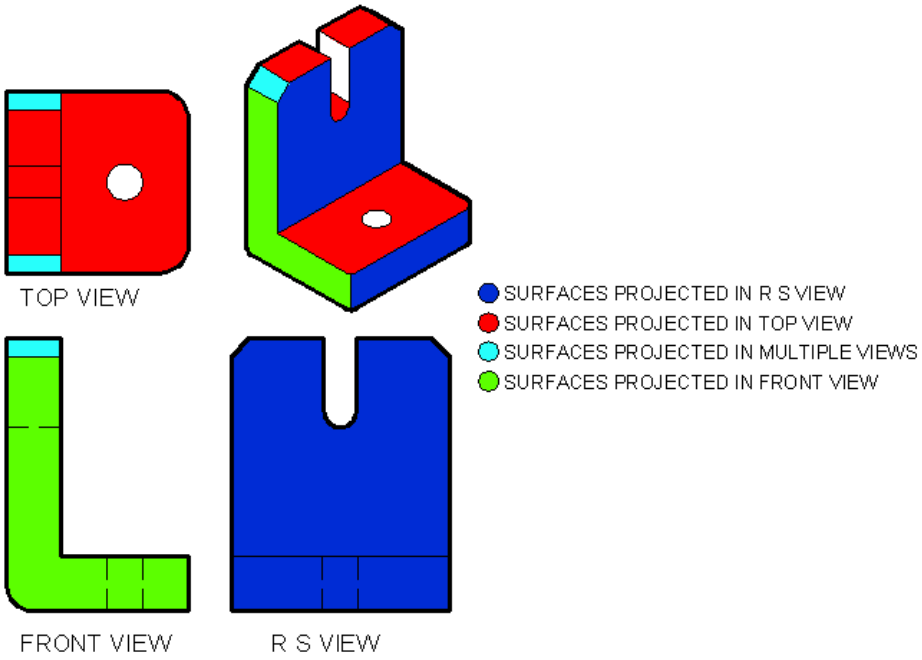


View Placement

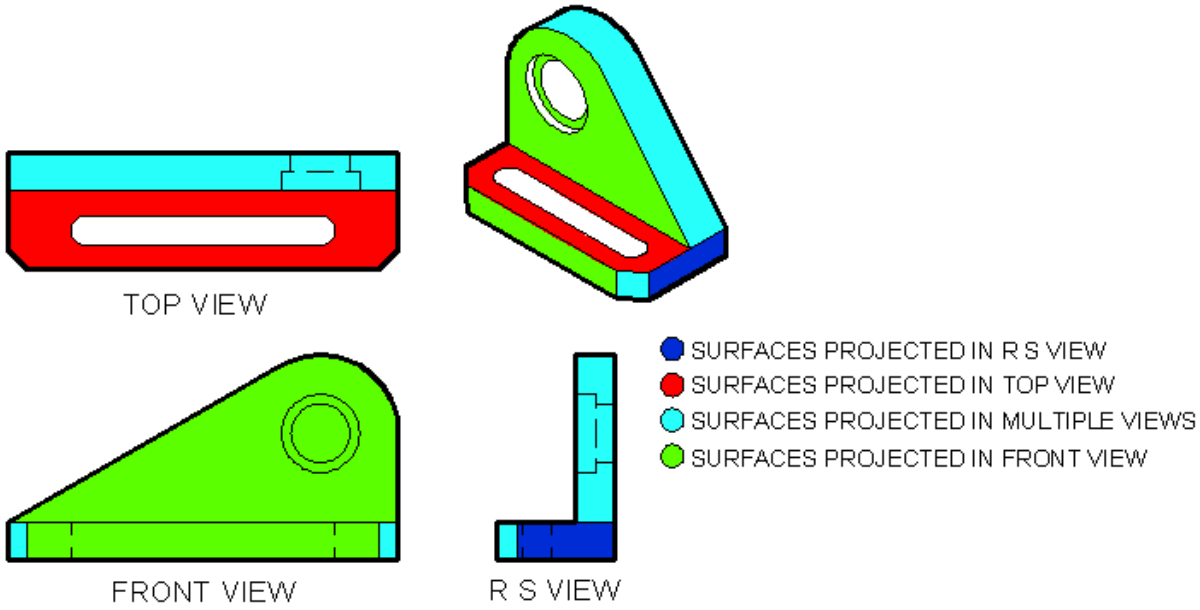
In a standard multiviewdrawing views are placed on a drawing similar to the image below.Firstthe front view is established then the top view then the right side view.The views are usually to the left of the titleblock or where room permits.The views are usually space a distance apart in order to place dimensions and notes between them.

GlassBox

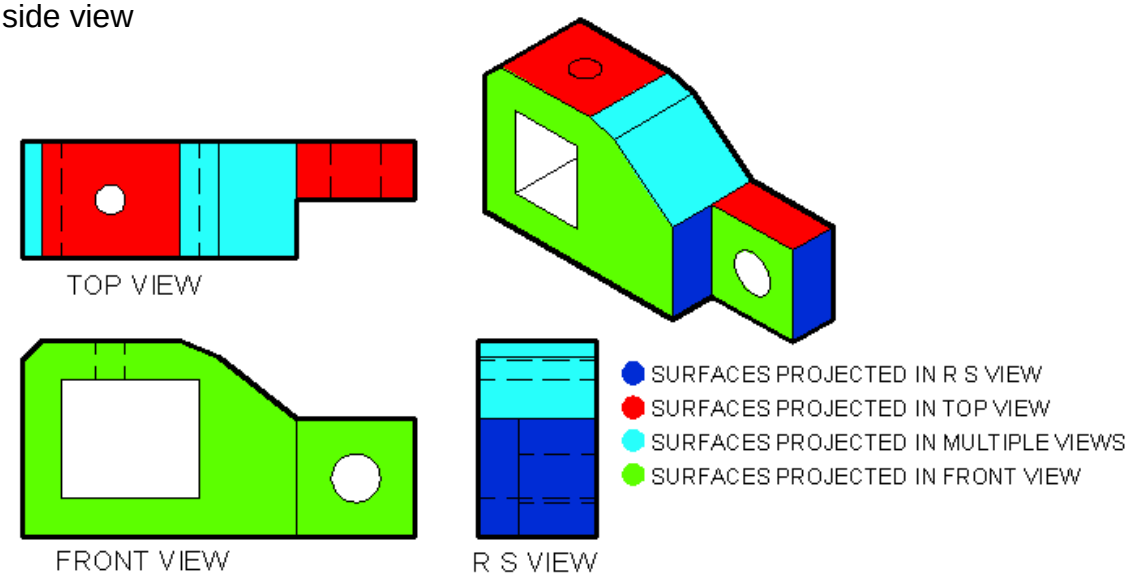
When obtaining an orthographic projection, the object is usually placed inside of an imaginary glass box. The side of the box are a representation of the six principle planes.Views of the objected are projected onto the sides of the box to create the six principle views.In the image to the right only three views are projected for clarity.The sides of the glass box can also be expressed as the "viewing plane"or "projection plane" in which the views are projected onto.



take time and try to visualize the views of the 3D object as they are projected into the top, front , and right side view.



take time and try to visualize the views of the 3D object as they are projected into the top, front , and
right side view



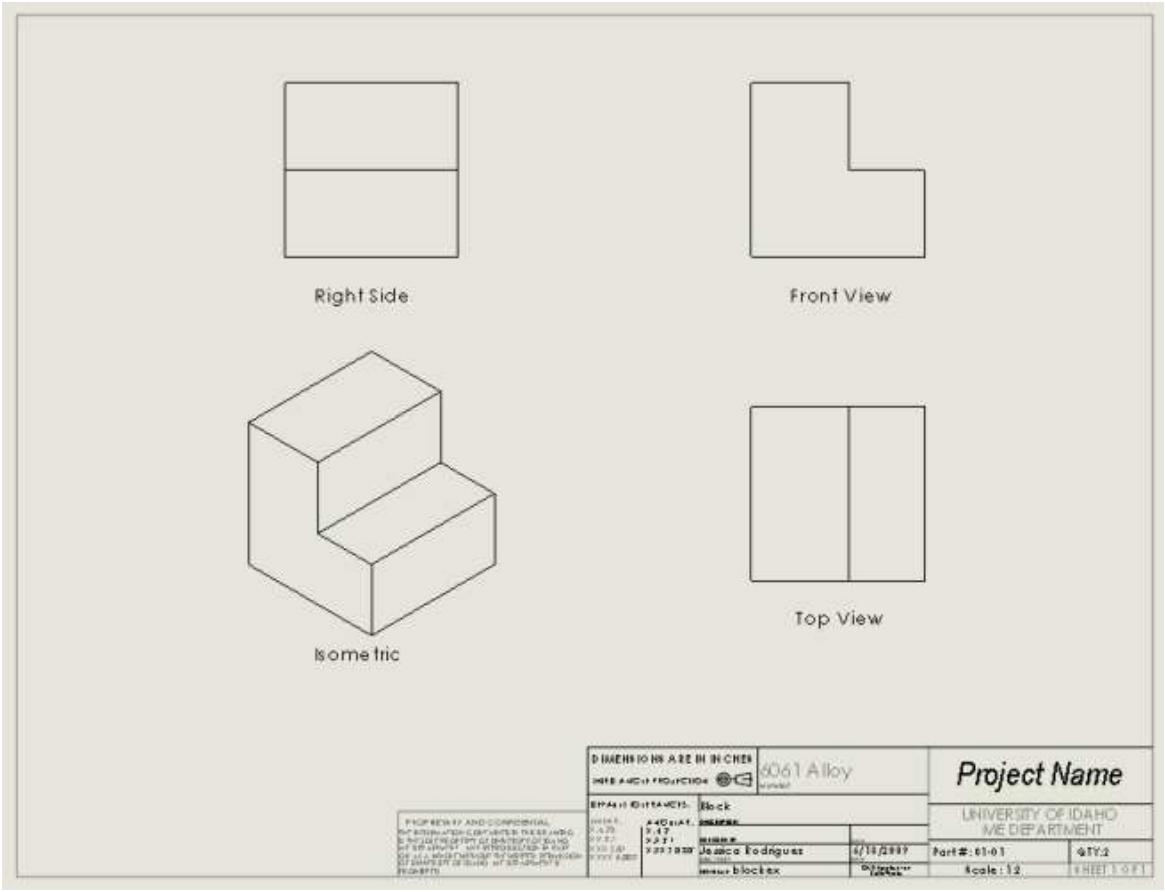
take time and try to visualize the views of the 3D object as they are projected into the top, front , and right
side view.

Third Angle VS First Angle

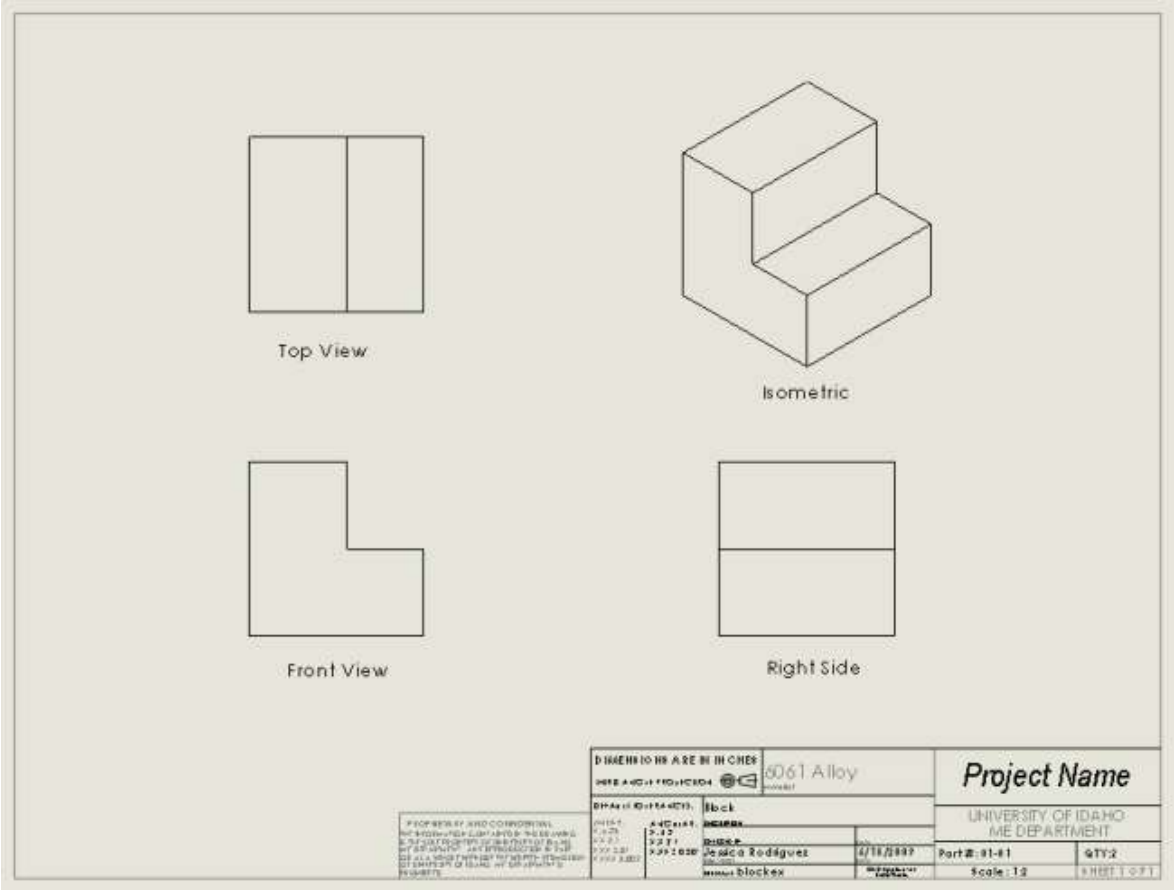
Description: Both third angle and first angle projection display the standard three orthographic
views of a part or assembly. The key difference between third angle and first angle is the layout
of the part on the sheet.

Note: Changing the projection in the sheet properties will not update already inserted model
views. Ensure that a drawing and or drawing package is in the standard projection format as
mislabeling the drawing as third angle in the title block and putting the part in first angle can
lead to a misunderstanding and or confusion on design intent.

First angle



Third Angle


Top View
Isometric
Front View
Right Side
6061 Alloy
Project Name
UNIVERSITY OF IDAHO
ME DEPARTMENT
Jessica Rodriguez
Part#: 01-01
QTY:2
Scale: 1:2

Self-Check 4	Written Test

Short Answer Questions

1. _____ is a way of visualizing different views of an object from there different sides
   A. Orthographic Projection
   B. Third Angle
   C. First angle
   D. All

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Multiple Chose Test Answer

Self-Check 4	Written Test

Name: _____ Date: _____

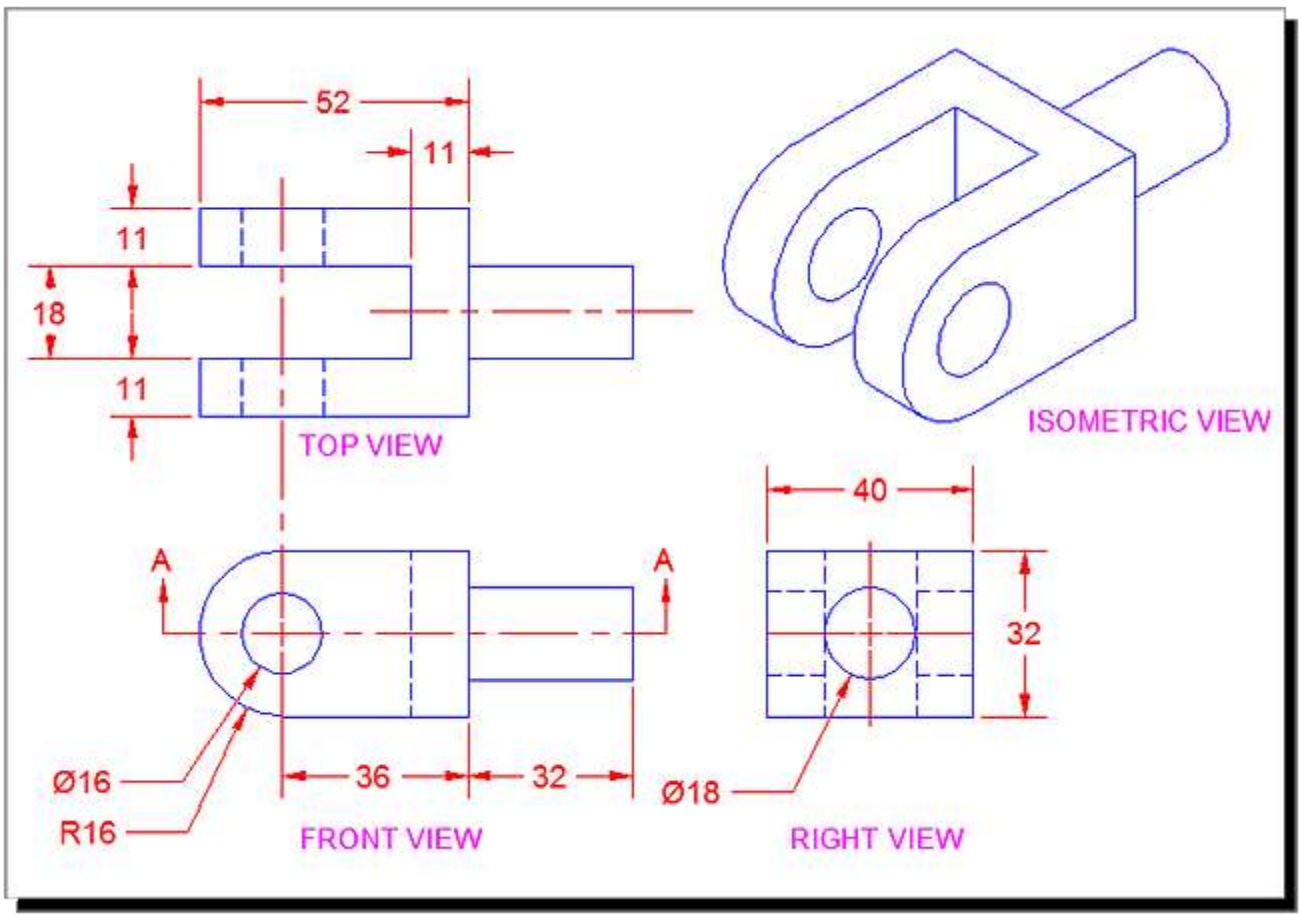
Short Answer

1._____

Operation Sheet-4	Dimensioning

Techniques for----------:

Step 1- check the instrument
Step 2-: draw top view than front and side view
Step 3- draw the given drawing
Step 4 draw title block and write on it

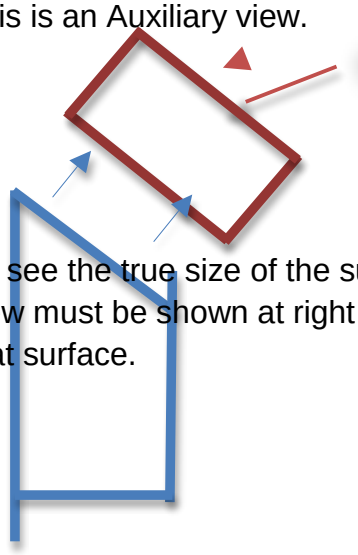


Information Sheet-5	Auxiliary view

Auxiliary view:

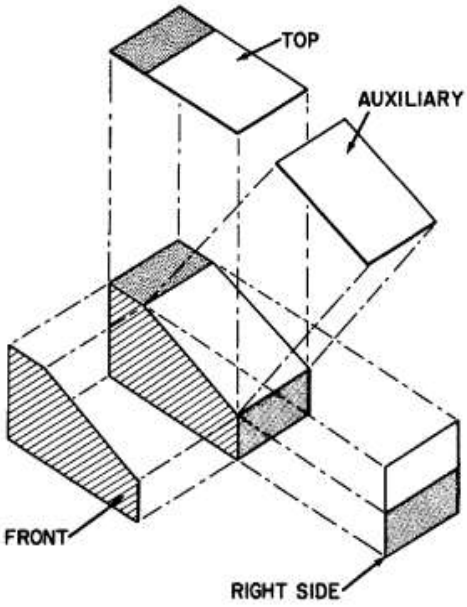
This is when a view is projected on a plane that is parallel to the surface of the principal view.

This is an Auxiliary view.



To see the true size of the surface the view must be shown at right angles to that surface.

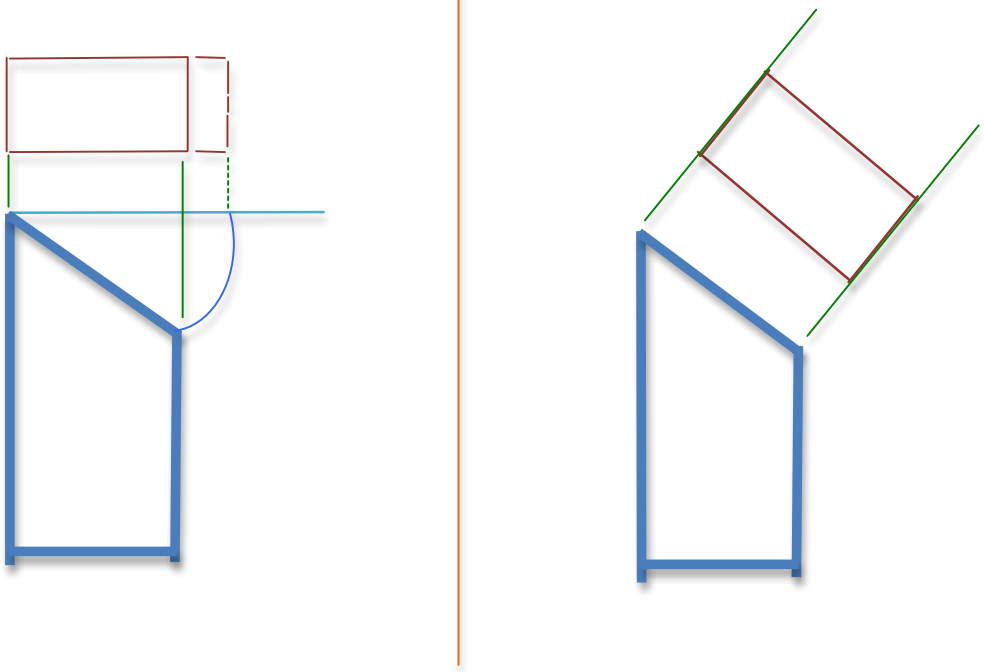
Auxiliary views are often used to show the inclined surfaces true size. Inclined surfaces do not show their true size using standard orthographic drawing procedures.



Drawing auxiliary views:

There are many ways of drawing an auxiliary view of an object. In this class you will learn how to draw these views using the following two methods:

Auxiliary views through rotation: Auxiliary views through Projection:



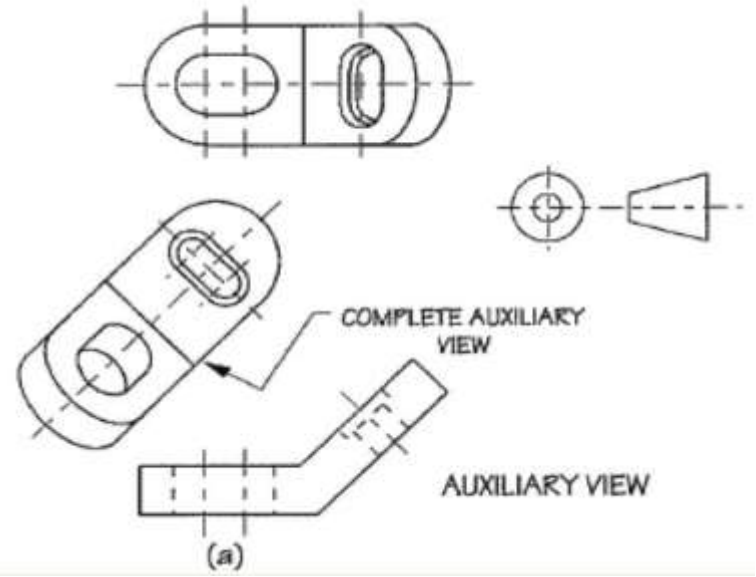
More on auxiliary views:

Regardless of the fact that auxiliary views are projected on a plane that is parallel to the surface of the principal view *"meaning the view is drawn from an inclined surface of the drawing*" auxiliary views are still classified as an orthographic view.

When creating an auxiliary view the drafter have to take into account how the drawing will be used, this will determine how the drawing will be viewed.

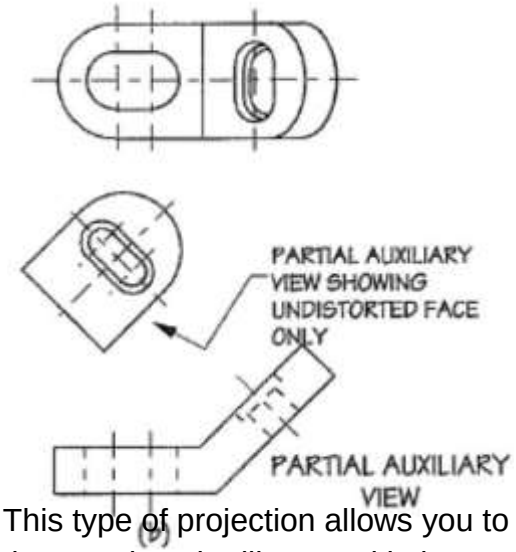
There are two ways of viewing an auxiliary view:

1. The complete auxiliary view:



This type of view allows you to see the entire side of that drawing as projected from that auxiliary plane.
With this projection many of the other surfaces will appear foreshortened which can make the drawing difficult to read.

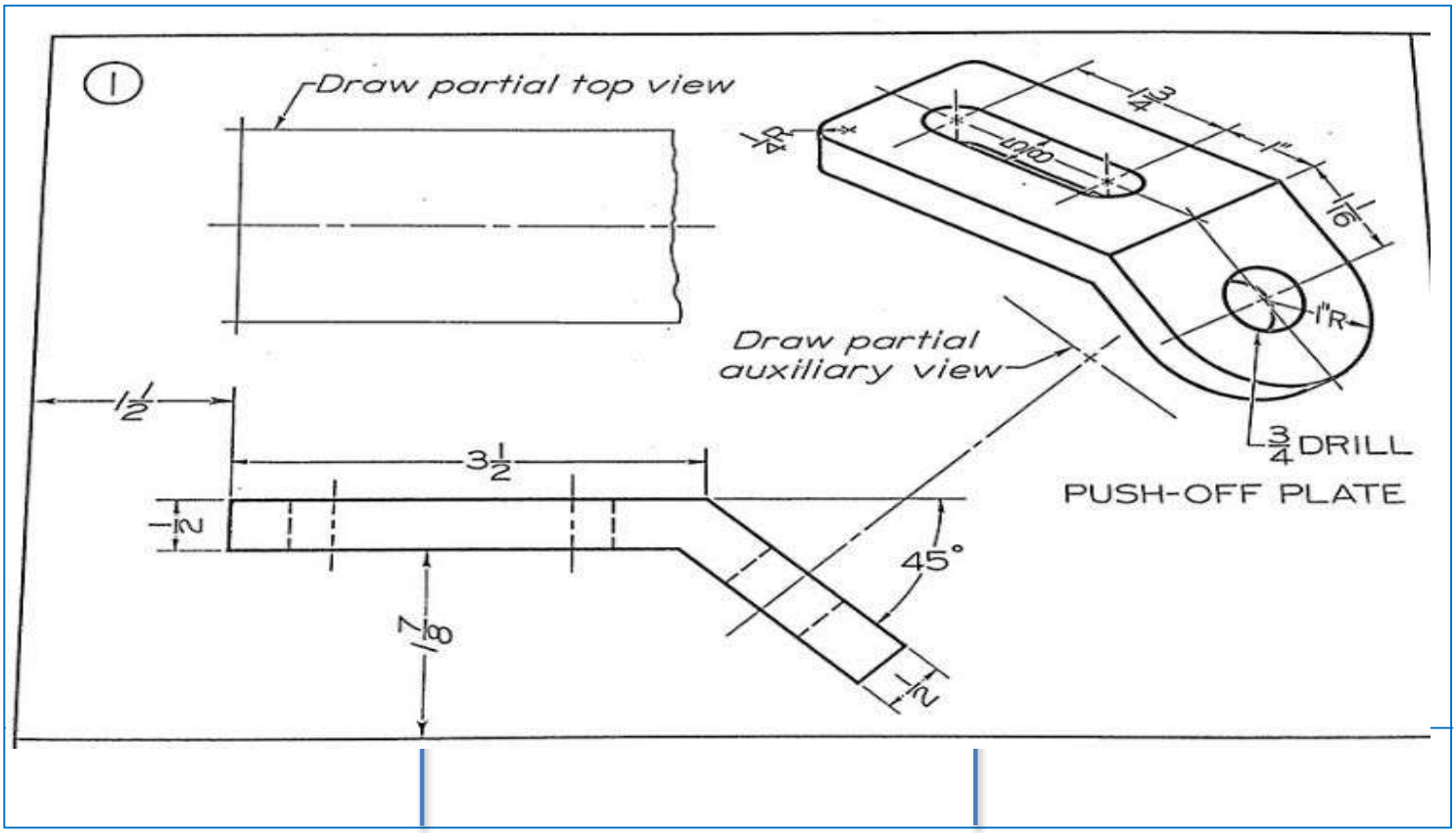
2. Partial auxiliary view:



This type of projection allows you to see only that part of the drawing that needs to be illustrated in its true undistorted surface.

Plate 5:

In this project you are required to create a partial auxiliary view of the PUSH-OFF plate:



You are required to draw the following views:

1. The partial top view.
2. The front view.
3. The Partial auxiliary view.

Self-Check 5	Written Test

Short Answer Questions

1. select the best Explain of Auxiliary view:
   A. **is parallel to the surface of the principal view.**
   B. is parallel to the The partial top view.
   C. is parallel to the The front view
   D. All

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Multiple Chose Test Answer

Name: _____ Date: _____

Short Answer

1._____

Information Sheet-6	*Showing parts*

A machine element or joining two or more parts of a machine or structure is known as a fastener. The process of joining the parts is called fastening. The fasteners are of two types : permanent and removable (temporary). Riveting and welding processes are used for fastening permanently. Screwed fasteners such as bolts, studs and nuts in combination, machine screws, set screws, etc., and keys, cotters, couplings, etc., are used for fastening components that require frequent assembly and dissembly.

Screwed fasteners occupy the most prominent place among the removable fasteners. In general, screwed fasteners are used : (*i*) to hold parts together, (*ii*) to adjust parts with reference to each other and (*iii*) to transmit power.

SCREW THREAD NOMENCLATURE

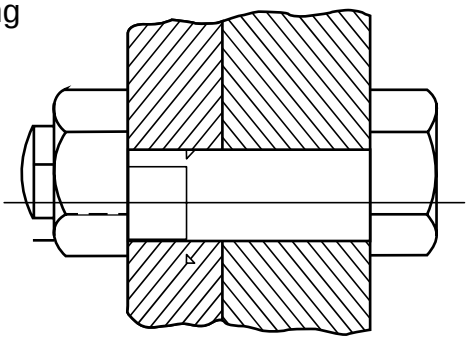
A screw thread is obtained by cutting a continuous helical groove on a cylindrical surface (external thread). The threaded portion engages with a corresponding threaded hole (internal thread); forming a screwed fastener

Coupler-nut

A coupler-nut or turnbuckle is an example of a machine element, in which both right hand and left hand thread forms are used. The length of a tie rod, may be adjusted by this device. Referring the Fig. 5.6*a* ; out of the two rods operating inside the nut (a long double nut), one will have a right hand thread at its end and the other, a left hand one. The nut is usually hexagonal at its outer surface, with a clearance provided at the centre. By turning the nut, the two rods in it may move either closer together, or away from each other. Figure 5.6*b* shows a coupler used for railway coaches. They are also used for fixing guy wires, etc

BOLT

A bolt and nut in combination (Fig. 5.11) is a fastening device used to hold two parts together. The body of the bolt, called shank is cylindrical in form, the head; square or hexagonal in shape, is formed by forging. Screw threads are cut on the other end of the shank. Nuts in general are square or hexagonal in shape. The nuts with internal threads engage with the corresponding size of the external threads of the

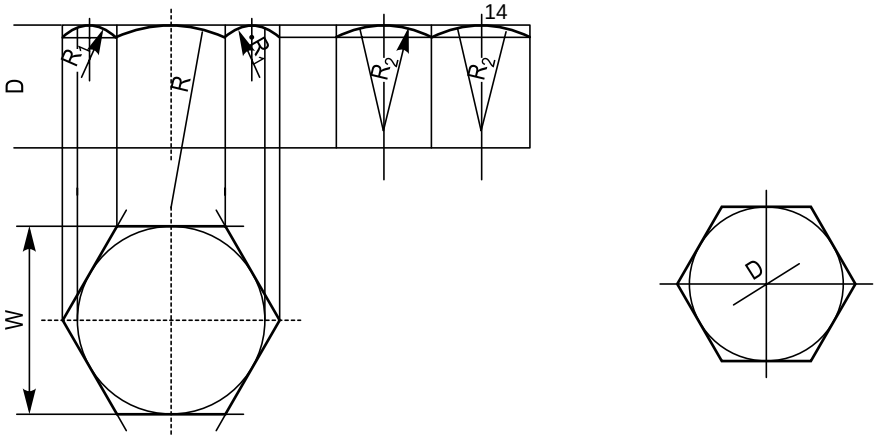


bolt. However, there are other forms of nuts used to suit specific requirements.

For nuts, hexagonal shape is preferred to the square one, as it is easy to tighten even in a limited space. This is because, with only one-sixth of a turn, the spanner can be re-introduced in the same position. However, square nuts are used when frequent loosening and tightening is required, for example on job holding devices like vices, tool posts in machines, etc.

The sharp corners on the head of bolts and nuts are removed by chamfering.

Fig. 5.11 Bolted joint



Methods of Drawing Hexagonal (Bolt Head) Nut

Drawing hexagonal bolt head or nut, to the exact dimensions is labourious and time consuming. Moreover, as standard bolts and nuts are used, it is not necessary to draw them accurately. The following approximate methods are used to save the draughting time :

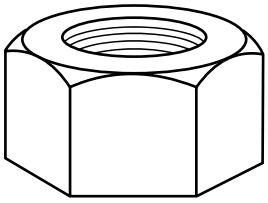
Empirical relations :

Major or nominal diameter of bolt = D

Thickness of nut, T = D

Width of nut across flat surfaces, W = 1.5D + 3 mm

Radius of chamfer, R = 1.5D



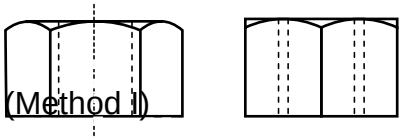


Fig. 5.12 Method of drawing views of a hexagonal nut (Method 1)

PROCEDURE

1. Draw the view from above by drawing a circle of diameter, W and describe a regular hexagon on it, by keeping any two parallel sides of the hexagon, horizontal.
2. Project the view from the front, and the view from side, and mark the height equal to D.
3. With radius R, draw the chamfer arc 2-1-3 passing through the point 1 in the front face.
4. Mark points 4 and 5, lying in-line with 2 and 3.
5. Locate points 8,9 on the top surface, by projecting from the view from above.
6. Draw the chamfers 4–8 and 5–9.
7. Locate points 6 and 7, lying at the middle of the outer two faces.
8. Draw circular arcs passing through the points 4, 6, 2 and 3, 7, 5, after determining the radius R_1 geometrically.
9. Project the view from the side and locate points 10, 11 and 12.
10. Mark points 13 and 14, lying at the middle of the two faces (view from the side).
11. Draw circular arcs passing through the points 10, 13, 11 and 11, 14, 12, after determining the radius R_2 geometrically.

It may be noted that in the view from the front, the upper outer corners appear chamfered. In the view from the side, where only two faces are seen, the corners appear square.

Washers

A washer is a cylindrical piece of metal with a hole to receive the bolt. It is used to give a perfect seating for the nut and to distribute the tightening force uniformly to the parts under the joint. It also prevents the nut from damaging the metal surface under the joint.

Cap screws and machine screws are similar in shape, differing only in their relative sizes. Machine screws are usually smaller in size, compared to cap screws. These are used for fastening two parts, one with clearance hole and the other with tapped hole. The clearance of the unthreaded hole need not be shown on the drawing as its presence is obvious.

Keys are machine elements used to prevent relative rotational movement between a shaft and the parts mounted on it, such as pulleys, gears, wheels, couplings, etc. Figure 6.1 shows the parts of a keyed joint and its assembly. For making the joint, grooves or keyways are cut on the surface of the shaft and in the hub of the part to be mounted. After positioning the part on the shaft such that, both the keyways are properly aligned, the key is driven from the end, resulting in a firm joint. For mounting a part at anyintermediate location on the shaft, first the key is firmly placed in the keyway of the shaft and then the part to be mounted is slid from one end of the shaft, till it is fully engaged with the key. Keys are classified into three types, viz., saddle keys, sunk keys and round keys.

Self-Check 6	Written Test

Short Answer Questions

1.which of the following is not parts of a machine

A. Washers
B. Keys
C**.** column
D. Cap screws

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

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

Answer Sheet

Score = _____

Rating: _____

Answer Sheet

Name: _____ Date: _____

Multiple Chose Test Answer

1._____

Information Sheet-7	*producing Detaille drawing*

Detail drawings

Detail drawings contain all the information required to manufacture the item or items represented. This information will include all dimensions, tolerances, surface finish specifications, and material specifications. There are two different types of detail drawing

Self-Check 7	Written Test

Short Answer Questions

1._____contain all the information required to manufacture the item

A**.** Detail draw
B. Specification
C. bill of materiel
d. All

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Multiple Chose Test Answer

Self-Check 4	Written Test

Name: _____ Date: _____

Multiple Chose Test Answer

1._____

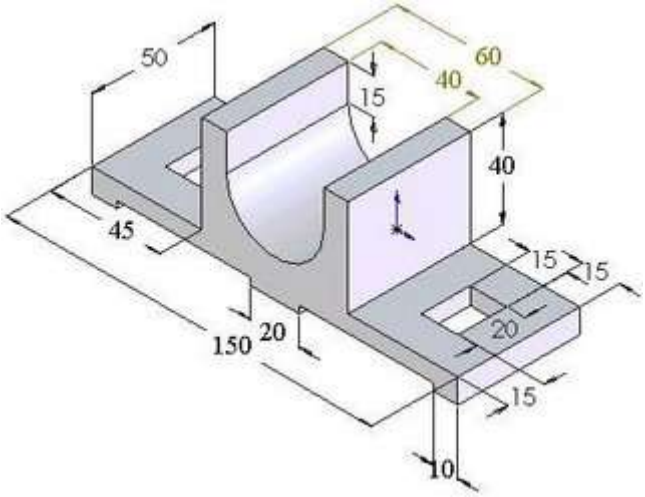
LAP Test	Practical Demonstration

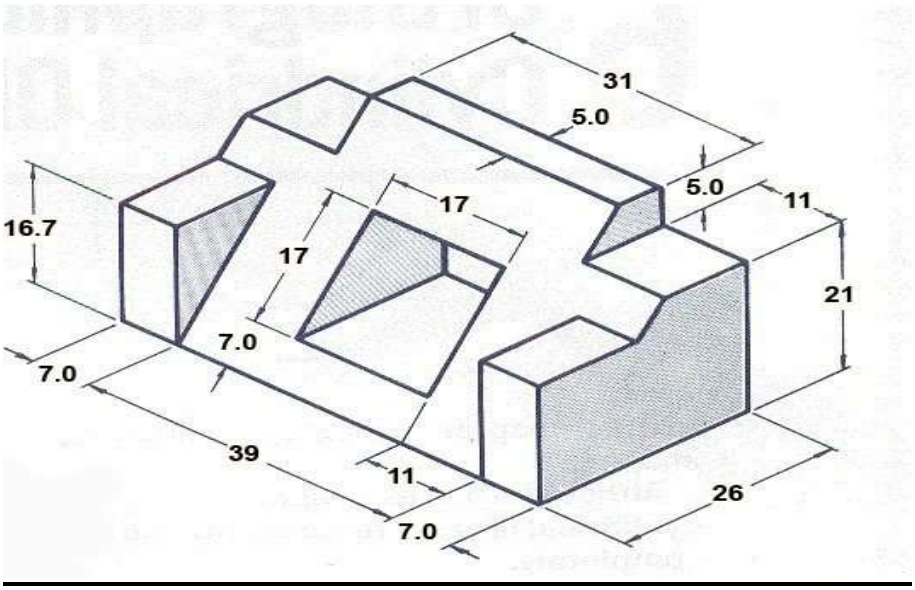
Name: _____ Date: _____

Time started: _____ Time finished: _____

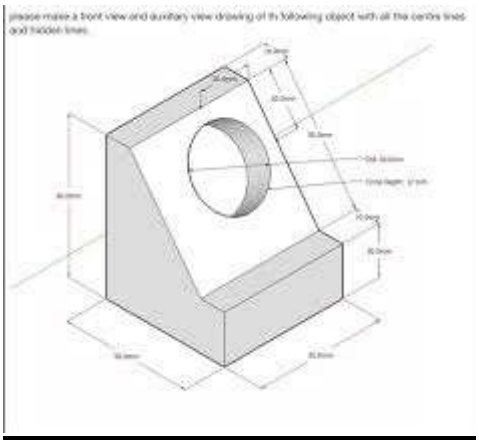
Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

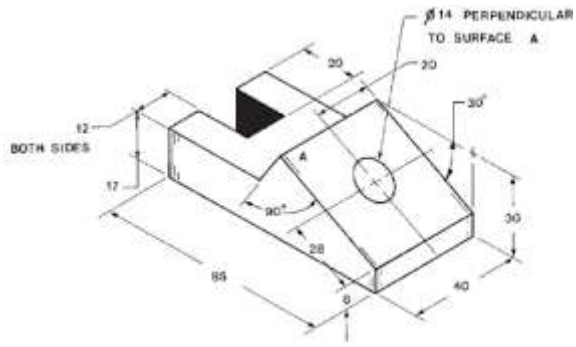
Task 1.- draw the detail drawing of the give drawing in first and third angle projection with dimension





Task 2. Draw auxiliary drawing





Reference

5. engineering drawing by N.D BHATT
6. engineering drawing{GEAMETRICAL DRAWING} BY P S GILL
7. ATEXTBOOK OF engineering drawing BY ROOP LAI .RAMAKANT RANA
8. FUNDAMENTALS engineering drawing{FOR POLY TECHICS}BYS. CHAND

ROAD CIVIL WORKS

Level II

NTQF

Learning Guide-15

Unit of Competence: - **Produce Detailed Engineering Drawings**

Module Title: **Producing Detailed Engineering Drawings**

LG Code: - **CON RCW2 MO1 LO1-LG-14**

TTLM Code:- **CON RCW2 TTLM 0919v1**

LO3: Issue and/or file drawing

Instruction Sheet	Learning direct #1

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

- labelling and sorting Drawings
- issuing Drawing
- Documenting and arrangement

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**:

- Drawings are labeled and sorted in accordance with organization procedures and format
- Drawing is issued and/or filed according to workplace procedures.

Learning Instructions:

1, Read the specific objectives of this Learning Guide.

2, Follow the instructions described below 3 to 6.

3, Read the information written in the information “Sheet 1, Sheet 2, and Sheet 3

4, Accomplish the “Self-check 1,Self-check t 2, Self-check 3 and Self-check 4” **in page 11, 16, and 20** respectively.

Information Sheet-1	labelling and sorting Drawings

1.1Labelling

Definition: Labelling is a part of branding and enables product identification. It is a printed information that is bonded to the product for recognition and provides detailed information about the product. Customers make the decision easily at the point of purchase seeing the labelling of the product.

Labels must comply with the legal obligations. A company's label needs to adhere to the Competition and Consumer Act 2010. According to The Food and Drug Administration (FDA), packaged and processed food items must have nutritional labelling. The Federal Trade Commission Act (FTC) states that cheating of labels and graphics is an offence and comprise unjust competition.

The Fair Packaging and Labeling Act establishes compulsory labelling conditions, boosts independent packaging standards and grants federal companies to establish packaging regulations in certain industries.

Types of Labelling

There are different types of labels:

Brand label: It plays an important role in labelling as it gives information about the brand. It can be removable or non-removable.

Descriptive label: It specifies product usage.

Grade label: It describes the aspect and features of the product.

Functions of Labelling

The different functions of labelling are as follows:

Defines the product and its contents: A label is informative about the product's usage and caution to be taken while using the product. Example, Red Label Natural Care tea mentions five ingredients in its label that provide immunity.

Recognition of product: Labeling assists in the identification of the product. Example, the brand name of a chocolate will help one choose from the rest of the confectionery items available.

Assorting of products: It means classification or grading of products according to different categories in the market. Example, shampoos are categorized as dry hair, normal hair and oily hair types and cater to consumers in the market with the dry, normal and oily scalp, respectively.

Assists promotion of products: It gives the customer the reason to purchase the product. Example, it attracts the attention of the consumer by displaying messages such as '20% free' or 'save rupees 15' message in potato chips packet.

In compliance with the law: Labels should strictly abide by the law. Example, for tobacco, the label should mention 'Tobacco is injurious to health'. Cigarettes also should have 'Smoking is injurious to health' as the statutory warning on its package.

Importance of labelling

Labelling is significant as it fetches customers' attention to purchase the product because of visual appeal.

It promotes the sale of the product as it can make or break the sale of a product.

Labelling is an important factor in the sale of a product. It helps in grading and provides information required by the law.

Technical Drawing section, but as usual I'm previewing it as a post mainly so that I can tag the contents.

Breaking the line i.e. if a structure or distance needs to be shown condensed (because the whole can't be fitted on the paper, or space needs to be saved). Shown with a wavy or jagged break line.. or two, spaced a little apart. Obviously this is only an option if no information is lost by doing this i.e. for a completely plain wall or a regular pattern. What's most important is that the true length of the wall should always be clearly indicated with a written measurement.

CODING

'Coding' is a recognized term used in technical drawing to describe the cross-referencing of parts of a drawing, either within the same sheet (i.e. relating an elevation to its place on the ground-plan) or from one sheet to another, often when details of a structure in an elevation need to be drawn in a bigger scale on a separate sheet. One could just call this 'labelling' in normal language, but as the name implies shorthand letter codes are used rather than words

and it relies on everyone understanding how to read them. Using just letters and numerals rather than descriptive words has proven more effective in practice .. they take much less time to write, and they are more easily found and recognized!

For example, the simplest method when cross-referencing parts on the same sheet would be to label or 'code' a drawn view of a wall as 'Elevation A' and place the same 'A' beside its representation on the ground-plan. Both the style and the symbols do vary. In whatever case though, it must be made clear not only the direction seen from but also the 'point' in space seen from (especially with sections).

'Coding' when it means referencing a part of a drawing within a number of separate sheets of drawings must include both the view title i.e. 'Elevation A' or 'Elevation A-A' and the sheet number where the corresponding drawing can be found. Often this information is conveyed with a small circle cut in half with for example the elevation letter written in the top half and the sheet number below it. Connected (often surrounding the circle) is an arrow pointing towards what this relates to.

Obviously one definite common sense 'rule' is that the letter 'A' or 'A-A' (describing the extent of the view) should only be used once on the same sheet, but it can be used for something else on a separate numbered sheet.

In addition to whole views, smaller elements are sometimes easier to label with a letter, for example if a specific door is labelled 'Door C' on ground plan and elevation rather than having to write 'the upstage door on the stage-left side of the fireplace …'

Construction drawings Technical drawings are not, strictly speaking, construction drawings! They show what is to be constructed, but not how. In theatre/film/television it is generally understood that the designer's responsibility extends only so far as to describe the visible form and not necessarily define how it will be constructed .. though it is certainly appreciated if the designer has some knowledge of construction methods, especially an awareness of what's possible or reasonable!

Sorting a Dimension by Two Values At Once

I recently got a question via email about how to sort a view by two different criteria at the same time. Here's an Excel table of opportunities where for each month and Opportunity ID there's a forecast of size of opportunity:

The goal here is to sort the opportunities within each account type by the nearest (by month) and biggest opportunities (by Forecast size) first, so it looks more like this in Tableau:

Now with that data in Excel arranged in a tabular form I can sort on December, then November, then October, and so on, and get the desired sort:

But in Tableau I can't do that, if I try to work with the data in that "wide" format with a column for each month it just won't work. If I use Tableau's pivot feature to make the data "tall" with a record for each Opportunity ID and Month then I still run into problems. I want to sort the opportunities by each month and by Forecast but when I try to sort the Opportunity ID dimension I can't get it to work, it only sorts by a single month's values, so in the view below Opportunity ID 864280 should be the first new one for August since:

The Excel way isn't good because each month I have to manually re-sort the data. And in Tableau it just seems impossible to get the right sort because it looks like we need to sort in two different directions at once (get the earliest non-zero month for each opportunity, and then sort up and down the opportunities in each account type), and Tableau only lets us sort on one thing at a time. However, it is possible – read on for how to get this kind of sort in Tableau and maybe learn a few math tricks!

Part of how this kind of problem can be more challenging is the way the problem (and data) is initially presented to us. When we see the data in the crosstab form in Tableau the *appearance* is that we need to sort in two different directions. In fact, we really only need to sort in one direction based on the forecast value in the first month for each opportunity, so in the view below we'd want Opportunity Each opportunity row in the view needs to be sorted within the account type by the first (earliest) month where there is a non-zero forecast and then by the value of Forecast in descending order for that month.

The key to sorting headers and panes in Tableau is that it's done using the discrete (blue) pills on Rows or Columns from left to right. So the left-most discrete (blue) pill headers are sorted, then the 2nd discrete pill's headers are sorted, and so on. For discrete dimensions from a

primary source we can sort by a measure, use the default alphanumeric sort, or a manually, otherwise any discrete pills are by default alphanumerically sorted or manually sorted.

Therefore in this case I knew I needed to either return a measure that could sort some dimension (like the Opportunity ID) or return a discrete dimension value that with the default alphanumerical sort would work right. Note that filtering wouldn't work here because the goal is to show a sorted crosstab.

The next part of working out the solution is how to structure this value for sorting. I've done some multi-level sorting in the past where I needed a nested sort of single dimension by two different criteria, and a common construct is a number of the form X.Y where the integer portion X is from one criteria and the decimal portion N is from the other criteria. So with the default alphanumerical sort 1.2 comes before 1.3 comes before 2.1 etc.

So for the integer part of the sort I need to convert the date for each opportunity into a number where the Forecast is greater than 0. The Date Number (temp) calc has the formula:

This convers the date into an integer, in this case the number of days since 1/1/1900. To get the first (earliest) month for each opportunity then all I need to do is aggregate it with MIN() at the le

Self-Check 1	Written Test

Short Answer Questions

1. which of the following Explain purpose sorting Drawings

A. a part of branding and enables product identification.

B**.** the opportunities within each account type by the nearest and biggest opportunities

C. They show what is to be constructed

D. default alphanumerically sorted or manually sorted.

2. Which of the following the purpose of labelling

A. a part of branding and enables product identification.

B. opportunity into a number where the Forecast

C. return a measure that could

D. All

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Multiple Chose Test Answer

Name: _____ Date: _____

Short Answer

1._____

2._____

Information Sheet-2	issuing Drawing

2.1Issuing Drawing

The Project Managers and/or Job Captains should insist that the Owner and/or Contractor keep them up to date with respect to tendering. It is imperative that we know which drawings or specifications are being used for tender.

As many projects are tendered “sequentially”, documents that are incomplete in many respects are, in fact, contract documents with respect to certain trades. This is particularly true with respect to excavation, forming and the exterior envelope.

All drawings and specifications must be identified by a revision number and description in the revision column on the drawing title block or by a revision number or new date in the specification header. In addition, unless the client or his project manager specify otherwise every drawing or specification revision should be issued under the authority of an appropriate change document. Unless each new issue of the drawings is clearly identified, it is impossible to properly administer the construction contracts. We have seen many instances of this particularly when reviewing shop drawings or construction quality.

For example, when reviewing shop drawings for miscellaneous metal, it was noted that the contractor was specifying prime paint whereas the Architectural drawings showed galvanized. The shop drawings were duly marked up and returned with the requirement that the steel be galvanized. The contractor claimed an extra because his “contract drawings” had no mention of galvanizing. Our drawings with the same date and revision numbers did include the note. Someone in our office had added the notation with respect to galvanizing without any other indication on the drawing that it constituted a change and without issuing an instruction. This is not just embarrassing for the Architect but it can lead to significantly higher costs for the client and/or the omission of important elements or features. It frequently means that construction administration staff members have to spend considerable time “clearing up the confusion”.
To summarize, do not issue drawings or specification revised after the first tender without clear indication of the changes on the documents and without an attached instruction or change notice

it is! Getting a place set up for your drawing comfort is just as important as the getting your drawing materials ready before you start drawing. Surely some prefer to draw outdoors or in coffee shops, but some of these places are not accessible all the time. Having a workplace(or some refer to as a “mini studio”) allows you to relax, draw and experiment with your favorite comic artist works all at the comfort of your home.

There is a lot of factors that contribute to you being at your best while you draw. For example; having a comfortable chair can help you avoid putting strain on your back and allows you to relax while you draw or having the proper lighting is essential to avoid stressing out your eyes. Setting up a studio or a workplace doesn't mean you need to have a large space or rent out an office or a shop lot.It can be as small as your storeroom or a section of your bedroom. You only need a space just enough for a table, a chair as well as a side table(note that this setup does not include the usage of computer and scanner for scanning). Here are some of the thing that you may want to understand before setting up your very own workplace or "mini studio".

The Best Area – Getting The Right Environment

Almost every comic artist has their own drawing space and each one has his or her own preferences. But in order to find just the right environment, one need to experiment in different type of places. For example; try taking your sketchbook to a library to draw. Are you comfortable with the quiet and calm atmosphere around you or you just cannot get yourself to concentrate when thing are "too silent"? If the latter is the case, try a coffee shop next and see if the environment fits you. If it does , the other things that you must take into account is the space that the place have. Do you have a place to put your materials? – Is the coffee that you ordered limiting your drawing space? – Is there a chance that the coffee might spill and affect your whole workplace? – Maybe having a side table might help with either the coffee or your drawing materials?

The idea is to find out what is needed to have a workplace that can mimic the same atmosphere you want (example: coffee shop) but at the same time making the necessary adjustment and adding up the required equipment that you probably cannot have in a coffee shop (example: side table).

Time Of The Day

Although this does not entirely affect the set up of your workplace or mini studio, it goes to show how often you access workplace and how long will you be spending your time when you are in your workplace to draw. When some like to spend like to spend one or two hours at a time and occasionally comes back later to spend a couple more hours to draw, others may prefer to spend three to several hours at one time. Often doing sketches and finishing up their drawing before calling it a day. If you are one to spend straight hours a day rather than taking breaks in between, be sure to proper ventilation for your workplace as not having the place aired-out or ventilated enough can make you tire and stressed out easily at the same time affecting your mood to draw altogether.

The other factor to consider is how well or efficient you draw during the specific time of the day. Are you focused and more productive in the morning or are you a lot more hyped-up in the afternoon? If you function better in the evening for example, then you should organize your schedule so that you do most of your drawing later in the day.

Adequate Lighting

Having proper lighting is crucial when you are drawing. You can always depend on the light from your room but having an additional table lamp or a clip-on lamp can really help. When you are drawing, try to avoid working under dimly lit conditions as it can result to being harmful and can stress out your eyes.

Choosing A Drawing Table

To assume all tables are suitable for drawing is a mistake commonly made by beginners. Most flat surface tables are fine if you are drawing for a short period of time. But if you like to spend several hours drawing, flat surface tables can put pressure to your back making you tire easily. Drawing this way also makes your illustration look distorted.

Drawing at an angle helps keep your posture allowing you to be more productive, focused and more comfortable at the same time eliminating any strain on your back. A drafting table is by far the best option, but not everyone has them and drafting tables can be a bit “pricey”. If you do not have the budget to buy a drafting table just yet, you can always find cheaper adjustable tables as substitute. Try to avoid drawing on flat surface and at best, try to get a regular board or large clipboard and position it at about a 45o angle to avoid distortion in your artwork.

Self-Check 2	Written Test

Short Answer Questions

1. Which one more Explain Issuing Drawing
   a. Contractor keep them up to date with respect to tendering
   b. suitable for drawing is a mistake commonly made by beginners
   c. allowing you to be more productive
   d. all

2. which one is the purpose of l Issuing Drawing
   a. everyone has them and drafting tables can be a bit
   b. Getting a place set up for your drawing comfort
   c. Having proper lighting is crucial when you are drawing
   d. none

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____
Rating: _____

Multiple Chose Test Answer

Self-Check 2	Written Test

Name: _____ Date: _____

Short Answer

1._____
2._____

Information Sheet-3	Documenting and arrangement

Document drawing

Architects, designers, engineers, contractors, suppliers and manufacturers require effective methods for working with a large number of documents that often consist of hundreds of different file types, including Office and PDF documents, CAD drawings, and image files. They require a simple way to manage the often complex relationships between engineering drawings and related documents within their existing business processes and to make these documents available whenever they are required.

Approximately 7.5% of all the documents get lost. Furthermore, 90% of these documents are shuffled, which leads to lost time. Interestingly, professionals spend 50% of their time looking for files but only 5% to 15% of their time reading the required information. Project information is frequently stored in a wide variety of dispersed systems and, often a considerable amount, in hard copy format. These storage systems are not linked or synchronized which causes considerable loss in productivity and introduces significant organizational risks.

Engineering document management software provides quick access so users can find what they need when they need it, saving them time to do real work.

Engineering Drawing management

Drawings represent a significant portion of an organization’s intellectual property. Drawings contain essential information used to design, construct, operate and maintain large fixed assets. Maintaining the integrity of this information is critical. Drawing management have to be thought of and organized to better optimize document management within a project.

Engineering drawings are inherently more complex than other business documents because they are created using specialized computer-aided design (CAD) authoring tools and often consist of compound documents that include numerous linked files and layers of information

arrangement drawings (GA’s) present the overall composition of an object such as a building. Depending on the complexity of the building, this is likely to require a number of different projections, such as plans, sections and elevations, and may be spread across several different drawings.

They may be referred to as 'location drawings' as they show the location of various components and assemblies within the overall design, but this can be confused with location drawings indicating the geographical location of the building.

General arrangement drawings are likely to be prepared at each stage of development of a building design, showing the overall relationship between the main elements and key dimensions. The level of detail will increase as the project progresses and they may need to be supplemented by more detailed drawings, showing specific elements and assemblies. On very simple projects

these may be included on the general arrangement drawings themselves, but generally, separate drawings will be required.

General arrangement drawings may include references to additional information, such as specifications and detail drawings, however they should not duplicate information included elsewhere as this can become contradictory and may cause confusion.

They may also include notation and symbols. It is important that these are consistent with industry standards so that their precise meaning is clear and can be understood

The scale at which drawings are prepared should reflect the level of detail of the information they are required to convey. Different line thicknesses can be used to provide greater clarity for certain elements. They may be drawn to scale by hand, or prepared using Computer Aided Design (CAD) software. However, increasingly, building information modelling (BIM) is being used to create 3 dimensional representations of buildings and their components.

Self-Check 3	Written Test

Short Answer Questions

1 what Document drawing

a. require effective methods for working with a large number of documents

b. drawn to scale by hand

c. this can become contradictory

d. all

3. write the purpose of arrangement drawings

a. Engineering document management software

b. overall composition of an object such as a building

c. variety of dispersed systems

d. none

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**
You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

Answer Sheet

Multiple Chose Test Answer

Self-Check 4	Written Test

Name: _____ Date: _____

Short Answer

1._____

2._____

Reference

1. engineering drawing by N.D BHATT
2. engineering drawing{GEAMETRICAL DRAWING} BY P S GILL
3. ATEXTBOOK OF engineering drawing BY ROOP LAI .RAMAKANT RANA
4. FUNDAMENTALS engineering drawing{FOR POLY TECHICS}BYS. CHAND

Answer key for self chucks

Lo. 1 self chick 1

1. c
2. a

self chick 2

1. c

self chick 3

1. c
2. a
3. d
4. b

self chick 4

1. a
2. a

self chick 5

1. d

self chick 6

1. a

self chick

1. d

Answer key for self chucks

Lo. 2 self chick 1

1. a
2. a

self chick 2

1. c
2. d

self chick 3

1. d
2. d

self chick 4

1. a

self chick 5

1. a

self chick 6

1. c

self chick 7

1. a

Answer key for self chucks

Lo. 2 self chick 1

1. b
2. a

self chick 2

1. a
2. b

self chick 3

1. a
2. d

The trainers (who developed the LEARNING GIDE)

No	Name	Qualification level	TVET College
1	ABRHAM GEREMEW	B	(BAHIR DAR Polly Technique College)
2	TEMESGEN DESSE	B	(HARAR Polly Technique College)
3	HABTAMUSHIMELS	B	(NIFAS SILK Polly Technique College)
4	HABIB SURUR	B	(HAWASA Polly Technique College)

The facilitator (who approved the LEARNING GIDE)

No	Name	Qualification level	TVET Bureau
1	AYELE ESHETE	A	(ADIS ABABA TVET Bureau)