Basic infrastructure Operations

Level I

NTQF

Learning Guide-32

Unit of Competence: Read and Interpret Plans, Maps and Specifications

Module Title: Reading and Interpreting Plans, Maps and Specifications

LG Code: CON BIO1M09 LO1-LG-32

TTLM Code: CON BIO1 TTLM 1019v1

LO 1: Identify types of drawings

Instruction Sheet	Learning Guide #32

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

- Identifying the Types and Functions of Plans and drawing
- Identifying Conventions of Drawing
- Understanding of Project Quality requirements
- Reading maps and sketch
- Concept of Environmental Protection
- Organizations codes and regulations

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**:

- Identify the Types and Functions of Plans and drawing used in the industry and their functions
- Identify Conventions of Drawing
- Understand Project Quality requirements of Company operations
- Read maps and sketch
- IdentifyConcept of Environmental Protectionof job plans, specifications and environmental plan
- Identify Organizations codes and regulations

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3,Sheet 4,Sheet 5 and Sheet 6”.
4. Accomplish the “Self-check 1,Self-check t 2, Self-check 3, Self-check 4, Self-check 5 and Self-check 6” **in page 20, 22, 28,34,38 and 41**respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1 and Operation Sheet 2” **in page -42.**
6. Do the “LAP test” **in page – 43** (if you are ready).

Information Sheet-1	Identifying the Types and Functions of Plans and drawing

1.1 Identifying Types of plans and drawing

Drawing is a universal language which is important to world tread. At present drawing can develop in to two; A. artistic drawing B. Technical drawing

Artistic drawing; is mainly concerned with the expression of real or imagined ideas of cultural nature. anyone can appreciate artistic drawing (even if each viewer has his own unique appreciation),

Technical drawing; is concerned with the expression of technical ideas of practical nature & is the method used in all branches of technical industries & construction works of all nature. engineering drawing requires some training to understand (like any language);

The similarity is Technical drawing shares some traits with artistic drawing in that both create pictures. Types of Technical drawings are;

- **site plans**

The single most important goal in planning a site to resist terrorism and security threats is the protection of life, property, and operations. Decision-making in support of this purpose should be based first and foremost on a comprehensive assessment of the manmade threats and hazards so that planning and design countermeasures are appropriate and effective in the reduction of vulnerability and risk. It is important to recognize that a given countermeasure can mitigate one or more vulnerabilities, but may be detrimental to other important design goals.

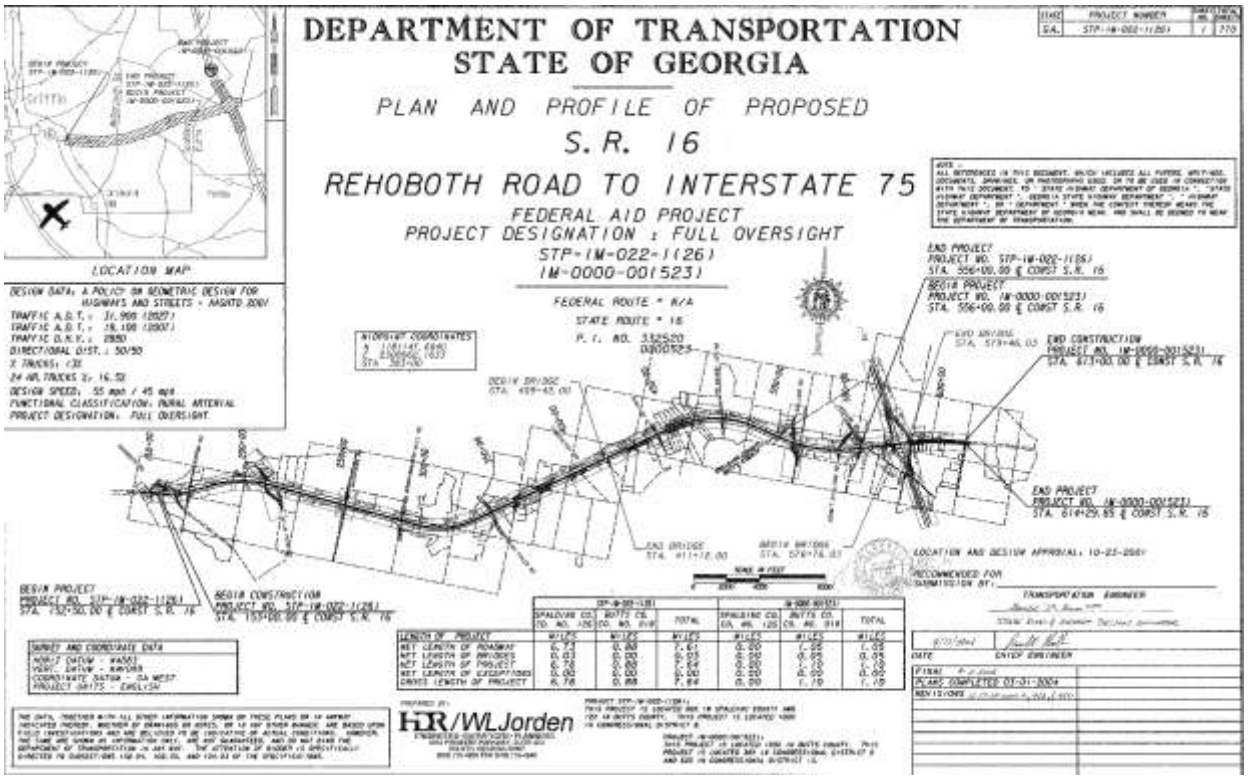


Fig1.1.Site plan.

- **locality plans**

A locality plans indicating the application site in relation to the surrounding neighborhood and road system, obtainable from the Information Centre.

fig1.2.locality plan

- **cross sectional plans**

It is a profile of proposed road including the ground along line perpendiculars to the center line of the road. a Road cross-section will normally consist of the **carriageway, shoulders or curbs, drainage features and earthwork profiles**. This type of When someone want to encourage residents to take pride in and responsibility for local concerns and improvements.

When someone wants to strengthen existing relationships and build new ones that will promote successful community development in the future.

drawings show the area of earth work involved at a given station and is helpful to determine earth work volumes.

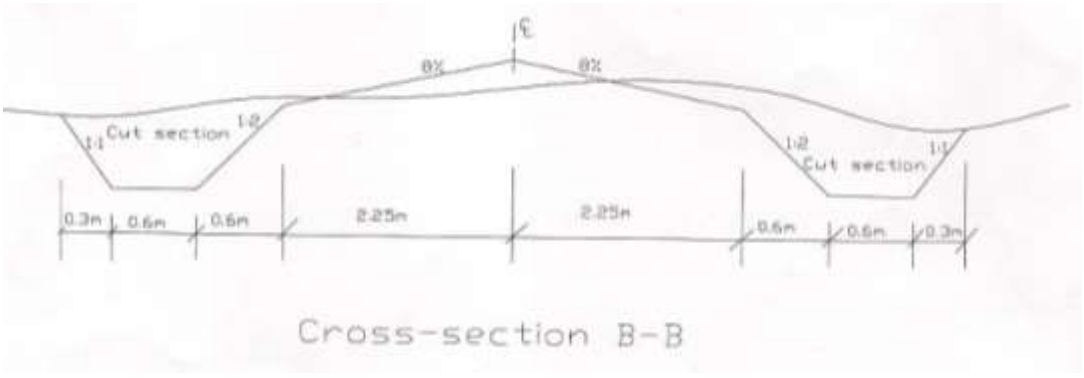


fig 1.3.cross section plan

- **longitudinal plans**

It is used to produce ground profile along the center line of road. Stakes or pages are driven into the ground along the center line at 10m,20m, or 30m interval where the slope of the ground shows very little or no variation.

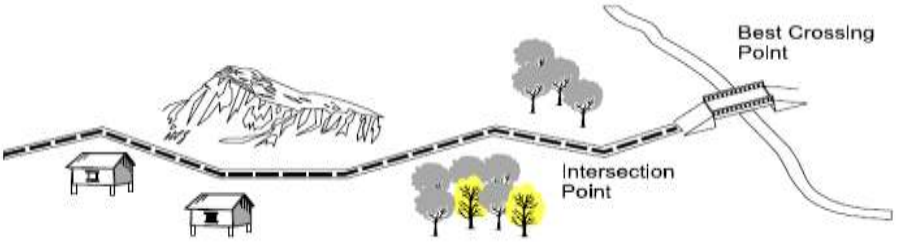


fig.1.4.1 -longitudinal plan

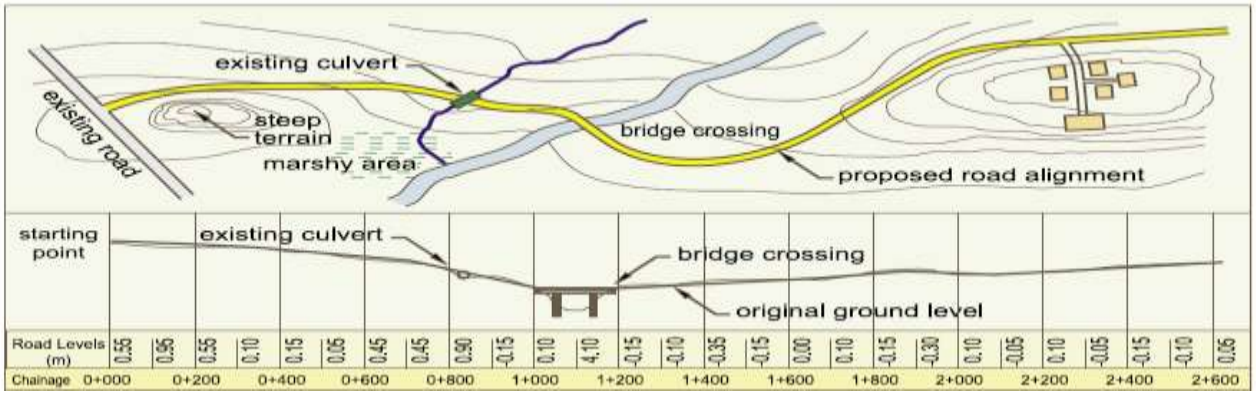


fig.1.4.2.- longitudinal plan

- **Profile View**

The profile view is a trace of a vertical plane intersecting a particular surface of the proposed road construction (Figure 2 E). It corresponds to the longitudinal centerline of the road bed in the plans. Profile grade means either elevation or gradient of the trace, depending on the context. The trace of the existing road is shown as a dashed line (Figure 2 F) and a dotted line (Figure 2 G). A vertical scale provides useful information about the profile of construction grades throughout the project. This view shows where the proposed road will be lower than the existing road (Figure 2 H) and areas where it will be higher (Figure2 I). Where the planned road is lower, material will usually be removed and used in areas needing fill. Additional information is often displayed adjacent to and locatable by the station numbers, such as volumes of excavation and embankment work, guard-rail placement, or wall placements.

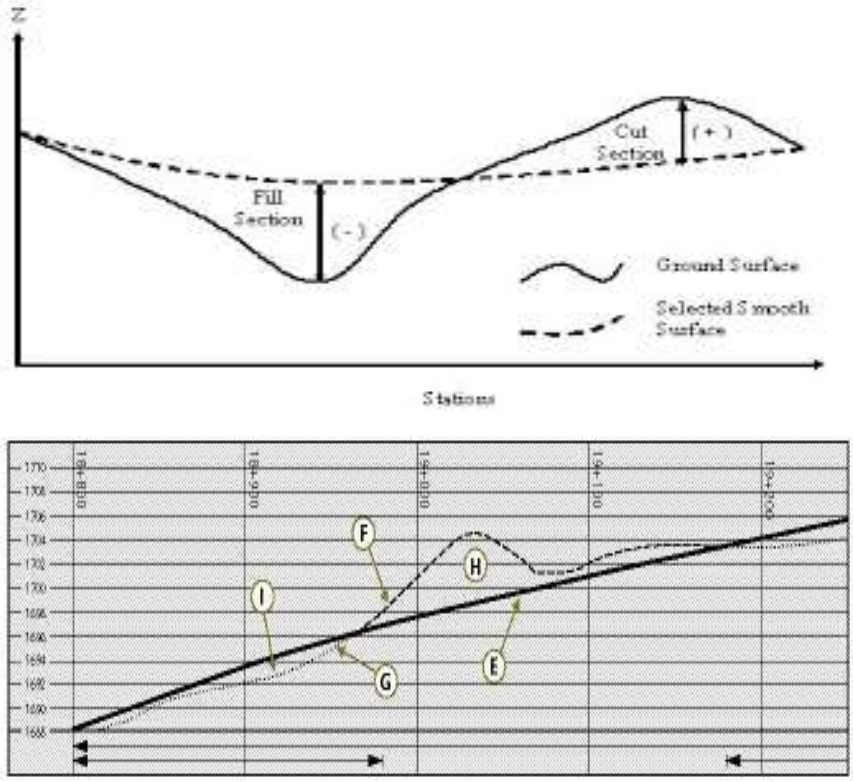


Figure 1.5 — Example profile views.

1.2 Functions of drawing

Engineering drawing is a graphical language by which engineers and technicians communicate with each other. It is usually created in accordance with standard conventions for lay out, nomenclature (naming), interpretation, size etc. It is a representation of forms or objects on a surface by means of lines.

The process or skill of producing engineering drawing is often referred to as technical drawing or drafting.

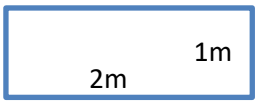
Drawing conveys or shows

- ✓ Geometry (shape and view)
- ✓ Dimension
- ✓ Tolerance (the allowable variation for each measurements)
- ✓ Material used
- ✓ Surface finish of the material in question

Technical Drawing also known as drafting, is the practice of creating accurate **representations** of objects for technical, **architectural** & **engineering** needs. A practitioner of the craft is known as a *draftsman*, and recently, "drafter". Appearance of an object. Many of the solution methods shown in this chapter are based up on pure geometry. Some of the solution to a given problem may involve mathematics and others may be solved purely by graphical methods.

Example of mathematics solutions; $1mx2m = 2m^2$

Example of Graphical solution



Geometric elements

Points (.): A point is a geometric element which has no dimension and represented by intersecting lines.

Line (——— **)**

Line is a geometric element which has one dimension. The type of a line produced depends up on the direction and type of motion followed by the point. Generally a moving point results a vertical line, horizontal line, parallel line, perpendicular line, curved line, zigzag line etc

Drawing Media - Any type of drawing material upon which an object is graphically represented.

Horizontal - Parallel to the plane of a horizon.

Example: ———————

Ink - Composed mainly of carbon in colloidal suspension (latex or solution of special shellac) and gum

(NOTE: The fine particles of carbon give the deep, dark, black appearance to the ink, and the gum makes it quick to dry and waterproof.)

Parallel - Two lines or surfaces side by side, equal distances apart at all points.

Example: ——— ——— || ——— ———

Perpendicular - At a 90° angle to a given plane or line.

Example: ⊥

Vertical - A line straight up and down, perpendicular to the horizontal plane.

Example: |||

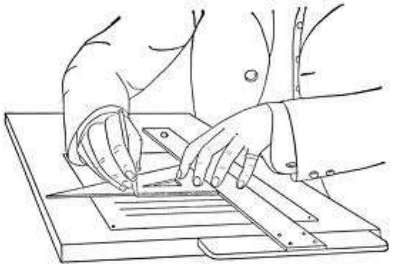
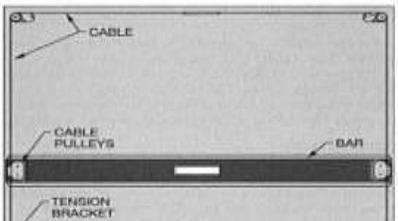
Working Surface - Any surface such as a drafting board or desk used to secure drawing media.

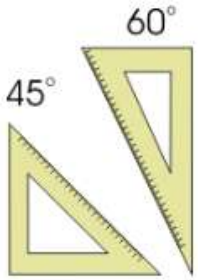
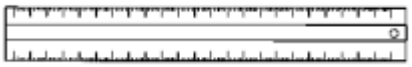
1.3 Description of Drawing Instruments and Materials

Technical drawing instruments allow drafters to produce precise drawings. Technical drawing instruments are the tools used by professional and student drafters to render the precision graphics needed to manufacture a product or structure.

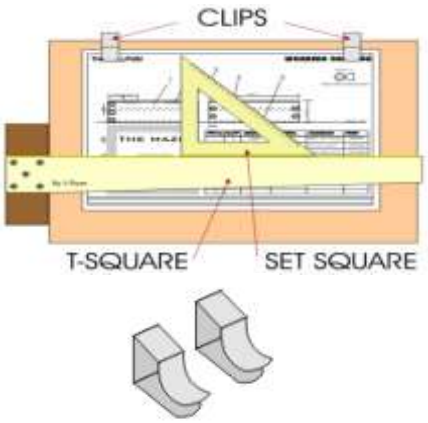
These instruments take many forms because of the variety of lines and graphics needed for designs. Some instruments are manual, while others are computer-based. All professional quality drafting instruments are manufactured with precision because the drawings they're used to make must be precise.

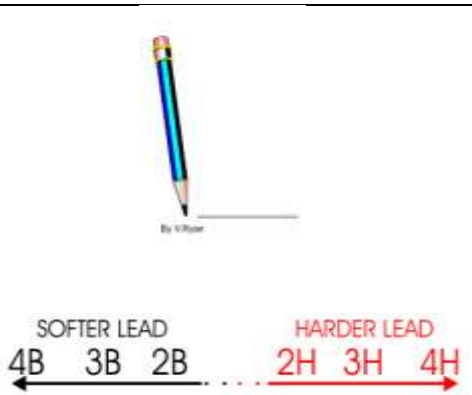
The following information assumes a right-handed drafter. Wherever "left" or "right" is written, the opposite direction may be substituted to apply to a left-handed drafter.

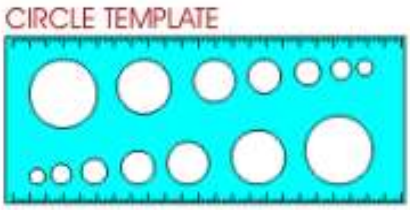
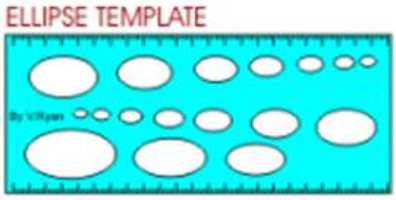
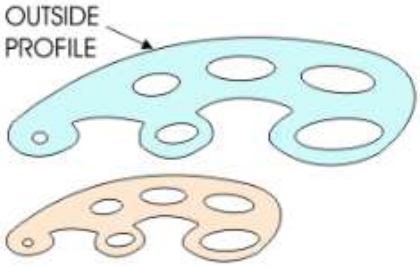
Name of drawing instrument	Picture	Description
Drawing Table/Board		This has different dimensions that depends on the needs of a drafter. This should be a perfectly smooth flat board of soft wood or metal are made in such a way that it cannot warp or split. All angles should be perfectly true and smooth. The drawing board should be smooth and free from any hard particle.
T-Square		are especially useful when constructing accurate orthographic drawings or architectural drawings. A T-Square is normally used with a drawing board, set squares and clips. The common parts of a T-square are the head and the blade. The common materials to produce T-square are wood, plastic and metal. The substitute of a T-square is a slider which is shown on the figure upper right.
Parallel bar		this bar will slides up and down the board to allow you to draw horizontal lines. Vertical lines and angles are made with triangles in conjunction with

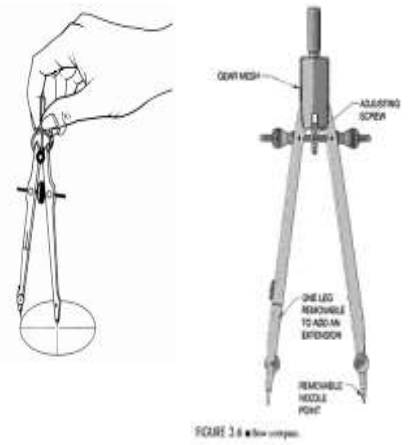
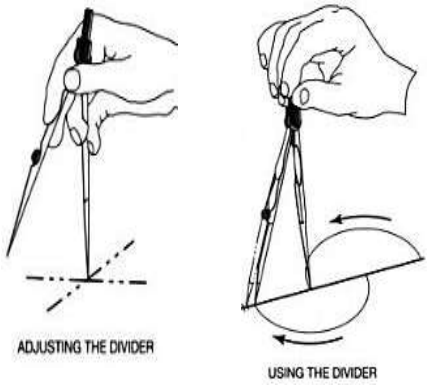
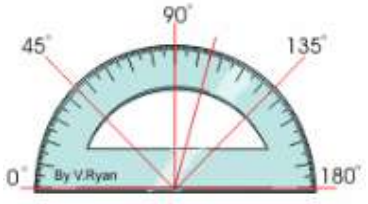
		the parallel bar. The parallel bar is commonly found in architectural drafting offices because architectural drawings are frequently very large. Architects often need to draw straight lines the full length of their boards and the parallel bar is ideal for such lines.
Set Squares		The most common are 45 by 45 degrees and 60 by 30 degrees. When using set squares they should always used along with a T-Square. The Set-square rest on the straight edge of the T-Square and this ensures when the angle is drawn that it is accurate. Please see figure above.
Scale		The architectural draftsman's scale is made in various lengths, but 12 -inch triangular scale will be found best for student use. This has in one face the normal full size division of the foot. to show in the drawing.
A **ruler**		is possibly one of the most important pieces of drawing equipment. Be remembered that the edge of a ruler is not guaranteed to have a perfectly straight edge unlike a good T-Square or set square. The recommended material for a ruler is a plastic but for cutting purpose, it is advisable to use a metal ruler. Recommended maximum dimension of a ruler is 12 inches and it is commonly known as one foot ruler.
Paper sizes		The rolls vary in width from 36 to 54 inches and contain a measurement from 10 to 50 yards. A 36 inch roll may be cut without waste into sheets 36 by

SIZE (MILLIMETERS)			LETTER SIZE
WIDTH		LENGTH	
210	x	297	A4
297	x	420	A3
420	x	594	A2
594	x	841	A1
841	x	1189	A0

		26, 26 by 18, 18 by 13, 13 by 9 by 6 1/2 inches.
Tracing paper		is a thin white transparent paper for general use where one drawing is to be made over another. But if ink was applied then you cannot use again. These material is recommended to use in preparation of plans and specifications.
Board clips		They simply clip on to the board holding the paper firmly against the drawing board. You can choose either plastic or metal clips. Figure below shows the importance of a board clips.
Pencil sharpener		is an essential for sharpening pencils. Accurate drawings cannot be produced unless they are sharp. However, when shading a blunt pencil is sometimes useful. This is an electrical pencil sharpener and it is a heavy duty. Very precise and sensitive pencil sharpener. Be very carefull in dealing with it so that it will not consume your pencil easily.
Drawing		are a basic requirement of any graphics course. You need a number ranging from 2B to 2H. These letters refer to the hardness of the pencil lead. When sketching a soft lead such as 2B is can be used to produce quick drawings and

Pencils		shading. On the other hand , when drawing precisely a 2H or even a harder pencil such as a 4H is ideal. This type of pencil keeps its sharp edge for longer and produces very fine lines.
A **refillable pencil**		is very convenient to use if you are constructing a drawing that needs a constant thickness of line. The refills are available in a range of thicknesses and either hard or soft leads. Disadvantages are that the refillable pencils are relatively expensive and so are the refills. Also, the leads tend to break more easily.
Ink fountain pens		Often the pens can be bought with a variety of ‘nibs’ as a set. These can be used to draw / write in a vast range of styles. This type of writing is called ‘Calligraphy’. Ink pens are rarely used now as word processing software can be used to produce accurate styles of writing in a range of fonts.
A **fine pen**		(color - normally black) produce accurate lines. Fine pens are available with various thicknesses of 'tips'. They are especially useful for printing and placing notes alongside designs and sketches.
Eraser		is a soft and a consumable materials. There are two kinds of it, an eraser for pencil and an eraser for ink pen.

		
Circle templates		They are plastic with a number of accurate circles cut out. Small circles are difficult to draw using a traditional compass because the compass can easily slip on the paper. With a template, the circle diameter is selected and a sharp pencil is used to draw round the cutout circle. If these material is being used properly can produce precision on making circles but it is limited only for small diameter.
Ellipse templates		The description is similar to circle templates and these material can produce precise outcome for drawing ellipse / oval shapes accurately.
French Curves		are purchased in sets of three or four. These can be used in the same way as circle or ellipse templates. This will create an irregular curve shape.

A **Compass**		is an absolute essential piece of equipment. It is well worth buying a good set which includes at least two compasses allowing the drawing of small and large circles. The drawing opposite is a 'bow' compass. This is very effective in making big diameter of a circle and curves.
Divider		is looks like a compass but it differs with its uses. Both ends are pointed, not like a compass the other end has an attachment of a lead pencil.
Compass Adapter		is an attachment of a compass and effective for inking process.
A **protractor**		is a typical protractor , a semi-circular piece of plastic with 180 degrees printed around its curve. These instrument is not advisable to draw curves. The purpose of these instrument is for determining angles only.

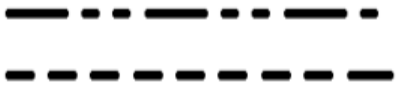
Masking Tape		is also calleda scotch tape which is used to fasten drawing papers on drawing tables to prevent the sliding of drawing paper

Table 1.1. Drawing instruments

1.4 Alphabet of line

- **Purpose of Alphabet of line**

Name of Alphabet of line	Line	Description
Visible Line (Object Line)		These are thick, continuous lines use to show the visible edge of an object. Every edge or surface that is visible is represented by these lines.
Hidden Line		Hidden lines are dashed lines that represent an edge or surface that cannot be seen in the view. These lines are medium thick lines consisting of short dashes, about 3 mm long with gaps of nearly half their length between them. It uses to show the hidden part of an object.
Section Line		These are thin continuous lines, uniformly spaced and are used to show a part in section. These lines are usually drawn at an angle of 45^o (may be 60^o or 30^o) to the horizontal
		These lines are represented by long and short dashes with the ratio of 6:1

Center Line		to 4:1. These lines are used to centre the symmetrical views of circular parts, to indicate centre points, axis of the symmetrical parts, axis of symmetry and also for giving the location of dimensions.
Dimension Line		These lines are with their arrowheads, shows the direction and extent of a dimension.
Extension Line		These are lines that are used to terminate the dimension line. They are drawn perpendicular to the feature to be dimensioned.
Cutting Plane Line		These lines are made up of alternately a long dash and a short dash in the ratio of 6:1 to 4:1 and are drawn as center lines but are extra thick at ends and having arrows touching them. These are used to show the edge of the cutting plane when an object is being sectioned to show the hidden details. The arrows attached to the ends of such lines indicate the direction in which the section is to be seen.
Short Break Line		These are thin lines drawn freehand and are used to show a break of an object which extends over a short length of the drawing or to indicate the irregular boundary of an object.
		These are thin ruled lines having freehand zigzags at suitable intervals and are used when the break extends

Long Break Line		over a considerable length of the drawing.
Phantom Line		Phantom lines are used to show the movement of an object.

Table 1.2 . Description of Alphabet of lines

1.5. Lettering

Use of Lettering

Lettering is used to tell the materials, sizes, and distances in drawings.

✓ **Lettering Techniques**

Most engineering lettering is single-stroke Gothic font. Lettering is drawn freehand and is drawn within light horizontal guidelines.

All lettering uses upper case letters. Lower case letters are rarely used in technical drawings. There are three aspects of good lettering: proportions and forms of the letters, composition and spacing, and practice.

There are six fundamental drawing strokes and their directions in basic lettering. Horizontal strokes are drawn from left to right, vertical strokes are drawn from top to bottom, and curved strokes are drawn downward.

Fig.1.6. Letters and Numbers

- **Types of lettering**

Bold Face Letter-Bold face letters are letters that are thick or that have heavy stems.

BOLD FACE

Light Face Letter-Letters with very thin stems are called light face letters.

LIGHT FACE

Fig. 1.7. Lightface and Boldface letters

1.6. Drawing Geometric Construction

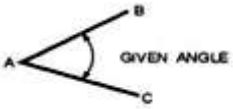
Geometry is the study of the size and shape of things. It involves accurate measurements and relationship of straight and curved lines in drawing figures (circles, squares, triangles, hexagons, etc.). Geometry studies all construction of lines, points, etc. in relationship to one another. Location of points and lines produce geometry. Extreme accuracy in construction and measurement of lines and angles are needed.

The construction of any geometric figure starts with a point. A point is a geometric element that has no dimension.

Line-Line is a geometric element that has only one dimension.

Dividing Line in to Two (bisect line) - it is dividing or bisecting a line into two equal parts

Angle-Is made by the intersection of two lines



Dividing angle in to Two(bisect angle) -it is dividing or bisecting an angle into two equal parts

1.7. Multi-view Or Orthographic Drawing

- ✓ **Orthographic projection**

Orthographic projection is a means of representing a **three-dimensional** (3D) object in **two dimensions** (2D). It uses multiple views of the object, from points of view rotated about the object's center through increments of 90°.

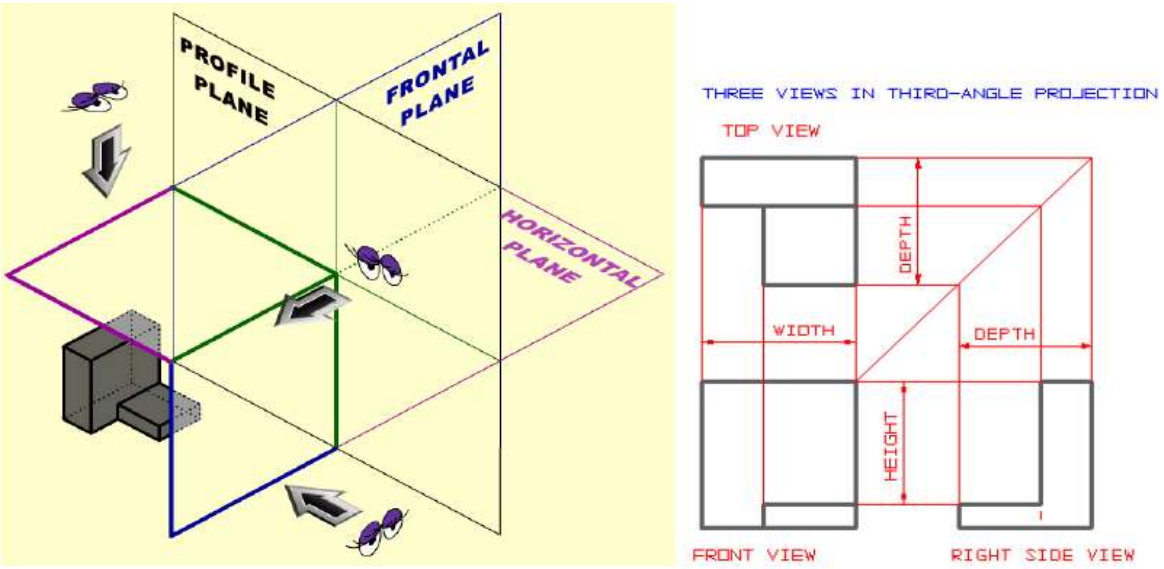


Fig. 1.8.Orthographic projection

✓ **Types of Projection**

Plane of Projection

There are two main systems used for projecting and unfolding the views:

- **First Angle of Projection** - This is primarily used in Europe and Asia. You should understand both methods.

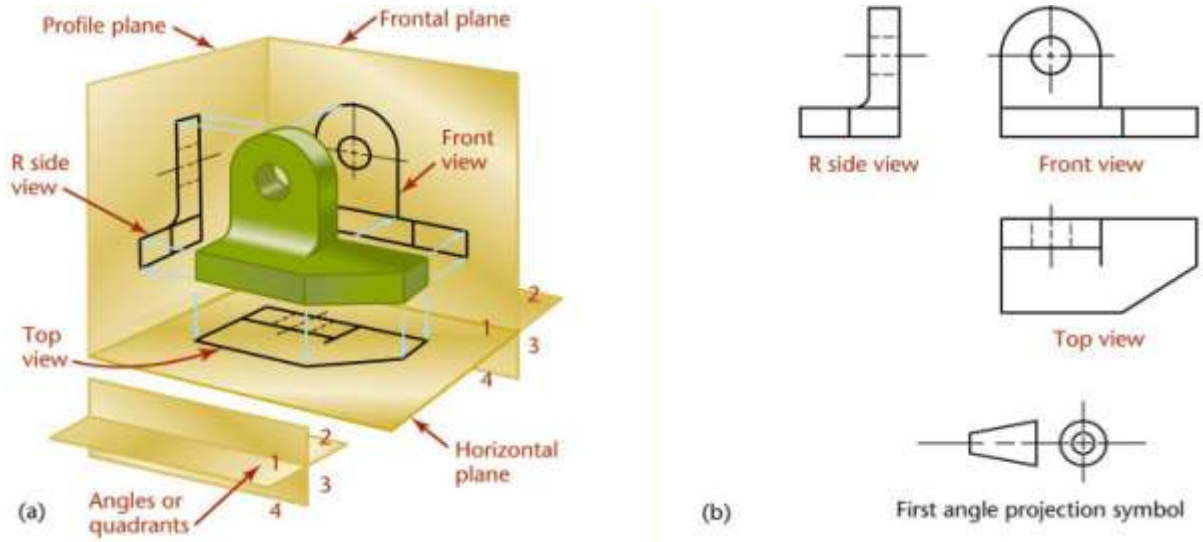


Fig. 1.8.First Angle of Projection

- **Third Angle of Projection**

Third-angle projection which is used in the United States, Canada and some other countries.

-The 3 major planes(Frontal, Horizontal and Profile are assumed to extend infinitely into space as in Fig 2.14.

-A drawing is obtained by projecting each view of the object onto the plane of projection and then folding out the planes as in Fig2.14

-The object is assumed to be placed in the third quadrant..

-The planes of projection are between the observer and object in third angle projection..

A front, top and **right** hand side view(RHSV) are formed

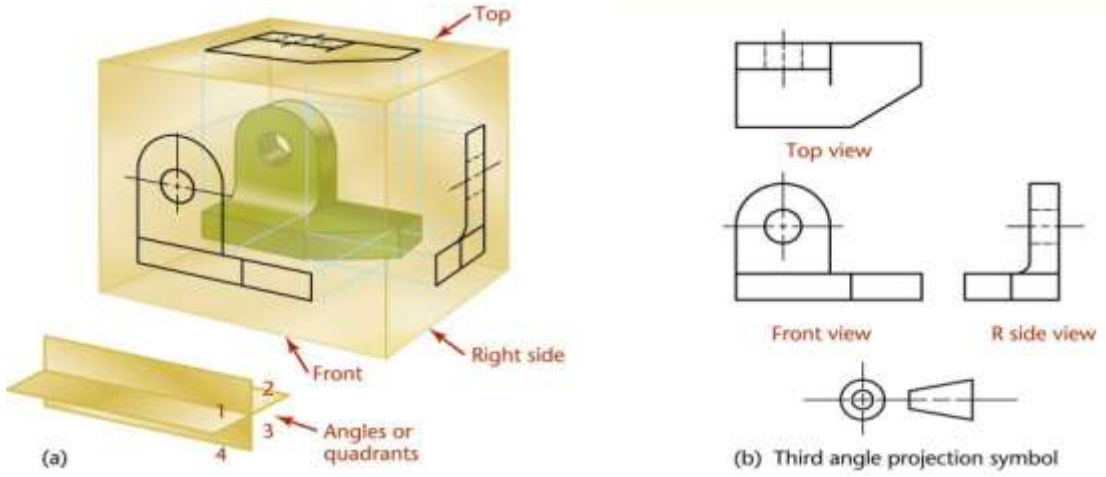


Fig. 1.8.Third Angle of Projection

- 3rd angle projection is more commonly used in industry than 1st angle projection.

-In 3rd angle projection, the front view is at the front, the top view is at the top and right view on the right. It is much easier to understand than 1st angle. In 1st angle the front view is on the top, the top view on the bottom and the left view on the right.

- **Views of an Object**
  - The top, front, and bottom views align vertically
  - The rear, left-side, front, and right-side views align horizontally
  - To draw a view out of place is a serious error

Self-Check -1	Written Test

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

1._____ is used to produce ground profile along the center line of road

A. site plan C. longitudinal plans

B. cross sectional plan D. locality plans

2. Which one of the following is used to create an irregular curve shape.

A. French Curves C. A Compass

B. A protractor D. Divider

3. _____ is a trace of a vertical plane intersecting a particular surface of the proposed road construction.

A. cross sectional view C. Profile View

B. longitudinal plans. D. site plan

4. _____is normally used with a drawing board, set squares and clips.

A. T-square C. Protractor

B. Circle templates D. Compass

Note: **Satisfactory rating - 3 and 5 points Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-2	Identifying Conventions of Drawing

2.1 Conventions of Drawing

Drawings are necessary for enabling the construction Engineer to execute the project. It facilitates the preparation of detailed estimates and helps in inviting tenders. The binders get an accurate idea of the work involved from the drawings while executing the project, drawings help to line out the works in the field and to carry out the work in the manner conceived by the engineer. Accurate and comprehensive drawings therefore very important part of the highway project preparation.

Drawings which are commonly used in high way work are may be

- ordinance survey maps,
- plans,
- longitudinal section (profile),
- transverse sections (cross - sections)
- Detail drawings.

Conventions of Drawing:- Northing direction, scale, dimension's, line weight, Train terminal (station), Refueling, hospitals, Restaurants, symbols of church, symbols of mosque, symbols of national parks…etc..

Maps. There are two types of maps.

- **Key maps**: - Shows the proposed and existing roads and important places to be connected. the scale of maps chosen suitably depending up on the length of the road
- **Index map**: - Shows the general topography of the area Details are symbolically represented.

By using the maps you locate.

- Area of geologically unstable ground
- National parks
- Mining site
- Monastery
- Existing roads
- Historical heritage

Self-Check -2	Written Test

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

1._____ Shows the proposed and existing roads and important places to be connected.

A. ‘east point’ symbol
B. Key maps
C. Index map
D. ‘west point’ symbol

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-3	Understanding of Project Quality requirements

3.1Project Quality

Quality can be defined as meeting the legal, aesthetic and functional requirements of a project. Requirements may be simple or complex, or they may be stated in terms of the end result required or as a detailed description of what is to be done. But, however expressed, quality is obtained if the stated requirements are adequate, and if the completed project conforms to the requirements.

Law defines quality in terms of professional liability, a legal concept that requires all professionals to know their trade and practice it responsibly. Every architect and engineer who offers his or her expertise to owners is subject to professional liability laws.

❖ Site Plans Quality requirement

- **General Requirements:**

➢ All Site Plans (sometimes called a *Plot Plan*) shall be clearly and accurately drawn to scale on paper – minimum size is 8.5” x 11”, maximum size is 11” x 17”.

➢ The Site Plan must be drawn to one of four standard scales:

- 1” = 20’–0” or 1” = 30’–0” for parcels of less than one acre (44,560sf);
- 1” = 40’–0” or 1” = 50’–0” for parcels between one and 2½ acres (111,400sf);
- For parcels > 2½ acres or of an irregular shape where the above scales would exceed the size of an 11”x17” paper, site plan **overviews** at scales of up to 1” = 100’–0” are required along with an inset plan of the proposed structures and on-site sewage system (OSS) at one of the scales noted above. Refer to the attached **Site Plan example**.
  - ✓ Line work – Use “solid” lines for all improvements at grade. Use “dashed” or “broken” lines for all improvements below grade (septic systems) or above grade (roof lines).
  - ✓ Clearly differentiate on drawings between **existing** and **new** conditions or improvements. Use the abbreviation (E) to indicate existing.

➢ **easements**

Indicate the location and dimensions of all easements in relation to property lines, structures and OSS components. Typical easements include those for utilities, access, drainage dike and railroads.

➢ **Driveway Encroachment**

Indicate the location and dimensions of all connections between the adjacent public roads and private driveways or roads.

➢ **Site Topography and Storm/Surface Water Drainage Systems**

- Flat and gentle slope (elevation change) lots: Indicate general direction of water flow (using arrows) and approximate % of slope.

Note: Slope % = (rise or drop in height) divided by (horizontal run or distance) multiplied by 100.

- Steeper slope lots (15% or > slope): Indicate the locations, direction and grades for all such slopes. Indicate location of natural drainage ditches and all cut banks that exceed 4' in height. Identify any erosion or landslide areas as well as any potential unstable slopes. For lots with slopes 25% or greater, provide contour lines at a minimum of 2' intervals.

Reference Elevations

Indicate the relative elevations of all property corners, wells, drain fields, drainage systems and building floors. Use an established reference point such as plumbing stub-out or first floor level as a reference point elevation. Use the following abbreviations: FF = finish floor, FG = finish grade.

- **Surface Waters** *(not shown on Site Plan example)*

Indicate location of all surface water bodies including all marine waters, lakes and ponds, along with their associated shorelines, ordinary high-water lines and their required setbacks.

- **Critical Areas – Streams, Creeks and Wetlands**

Indicate location of all surface water features such as streams, creeks and wetlands, along with their associated buffer areas and required setbacks.

- **Vicinity Map** *(not shown on Site Plan example)*

A map clearly showing a detailed route to the site including the nearest intersections and landmarks must accompany all Site Plans. The map does not need to be to scale and may be a separate attachment.

- **Property Improvements: Existing and/or Proposed:**
  - ***Existing* Structures and/or Building Envelopes**

Show location of all existing structures and their setbacks from property lines and other structures. Identify each building by its use (residence, garage, storage, etc.).

  - ***Proposed* Structures and/or Building Envelopes**

Indicate the location and clearing limits of all proposed structures including decks, porches and retaining walls. Identify each building by its use (residence, garage, storage, etc.). Indicate setback dimensions in relationship to property lines, other structures, easements, wells and OSS components. Building wall lines and roof overhang lines to be clearly marked to match floor plans.

- ***Existing and Proposed* Driveways, Parking Areas and Sidewalks**

Indicate the location and dimensions of all driveways, parking areas, sidewalks and emergency vehicle turn-around areas.

- ***Existing and Proposed* Wells**

Indicate the location of all wells and distances to adjacent structures and on-site sewage system components (OSS). Include any OSS components on adjacent properties within the 100' well radii.

- ***Existing and Proposed* On-Site Sewage System (OSS) Components**
  - Indicate the location and dimensions of all OSS components including septic tanks, pump tanks, pretreatment units, transport lines and primary/reserve drain fields.

- Indicate the direction and % of slope of all primary/reserve drain field areas. Include at least two reference distances to property lines or other site features shown on the OSS permit site plan.

- ***Existing and Proposed*** **Water and Utility Lines**

Show location of all water, sewer and utility lines.

- ***Existing and Proposed*** **Fuel Tanks**
  - Show location and size of all heating fuel tanks (propane or other fuels).
  - Indicate all required setbacks from structures.
  - Note if tank is located below grade.
- ***Existing and Proposed*** **Buffers and Open Spaces** *(not shown on Site Plan example)*

Indicate the location and dimensions of all existing buffers and open spaces in relation to property lines, structures and OSS components.

- ***Existing*** **Impervious Surfaces** *(applicable only to projects located in a* ***watershed****)*

Show all existing impervious surfaces and include dimensions. Such surfaces include all structures, covered decks, driveways and sidewalks including graveled surfaces.

- ***Proposed*** **Impervious Surfaces** *(applicable only to projects located in a* ***watershed****)*

Show all proposed impervious surfaces and include dimensions. Provide calculation summary on Site Plan or separate attachment. Refer to following example:

- **Impervious Surface Calculations**

Subject Area	Existing Area	Proposed Area	Subtotal Area
House	2,000sf	500sf	2,500sf
Garage	800sf	-	800sf
Covered Porch	-	65sf	65sf
Driveway	555sf	-	555sf
Sidewalk	165sf	-(40)sf	125sf

Total area of impervious surfaces =4,045sf

- **basic calculations of heights, areas, volumes, scale and grades**

- **AREA**

Definition = 1m2 is the area of a square having sides whose length is 1m. Consequently every unit of length can be converted into an area if it is multiplied by itself.

Therefore:

mm x mm = mm2	**cm x cm = cm2**	**m x m = m2**	**km x km = km2**

Other special units are:

10m x 10m = 100m^2 = 1are	**100m x 100m = 10,000m^2 = 1hectare**

It is always advisable when working out areas to make sure that all the units are the same.

- **VOLUME**

Definition = 1m3 is the volume of a cube where each side is 1m. Volumes are calculated by multiplying a base area (e.g. m^2) with a third dimension.

Therefore:

mm^2 x mm = mm^3 cm^2 x cm = cm^3 m^2 x m = m^3 km^2 x km = km^3

The most important units for road works are = cm3 and m3

Relationship between the various units of volume*:*

	cm3	**dm3** **1 liter**	**m3**
1cm^3	**1**	**0.001**	**0.000001**
1dm^3	**1000**	**1**	**0.001**
1m3	**1,000,000**	**1,000**	**1**

- **SCALE**

The scale of a map or a plan is the ratio of a distance measured on the plan or map to its corresponding distance on the ground. Example 1:100, 1:10,000. Scale primarily depends on the type of the work done (the accuracy with which a distance is to be transferred from the map or the plan). In general, scales may be categorized as follows:

For maps

- Large scales < 1:200
- Intermediate scales 1:2000 to 1:10,000
- Small scales 1:10,000 to 1:100,000,000

For plans

- Site plans 1:50 to 1:500
- Detail plans 1:1 to 1:20

A scale bar or a graphical scale is another form of indicating the scale of a drawing. It usually appears with numerical scales on the drawing sheet.

Horizontal Scales: -1:2500 - 1:200, which is the same as the plan and so its length on the drawing corresponds to the plan. Both the plan and the associated longitudinal section are often shown on the same drawing sheet.

Vertical scales: - the vertical scale of the longitudinal section is usually exaggerated and drawn to 1:100 or 1:50 which allows the difference in height to increase five times or ten times and thus seen clearly.

Drawing Scales: -The scale of a map is the ratio between any distance on the map and the same distance on the ground. If 10mm on a plan represents ground distance of 10kilometers, the scale would be very small and there would be little detail shown. If however, the same 10mm represents only 1m on the ground, the scale would be large and even small details would be shown.

Method of showing scale

The scale of a map or a plan can be shown in three ways.

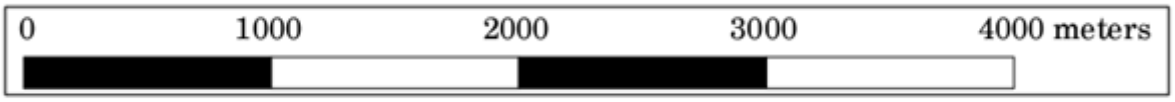
It may simply be expressed in words: - For example, one centimeter represents one meter. By definition of scale this simply means that one centimeter on the plan represents one meter on the ground.

(1 centimeter represents 250 meters)

By a representative fraction: - with this method of showing scale, a fraction is used in which the numerator represents the number of unit on the map(always 1) and the denominator represents the number of the same units on the ground. With a scale of 1cm represents 1m, the representative fraction will be 1/100, sometimes shown as 1:100, since there are 100cm in 1m.

1: 25 000

By a draw scale: - a line is drawn on the plan and is divided in to convenient intervals such that distances on the map can be easily obtained from it.



Self-Check -3	Written Test

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

1.Which one of the following is not true about Title Block

A. Indicate the property owner's name, site address, tax parcel number (Assessor's Tax ID #), drawing title and date.
B. Indicate drawing scale, as noted in the General Requirements above, in the Title Block.
C. Show an arrow indicating the NORTH direction.
D. None

2. _____ Indicate the location and dimensions of all connections between the adjacent public roads and private driveways or roads.

A. Easements B. Reference Elevations
C. Driveway Encroachment D. Property Lines

3. _____ Scale of the longitudinal section is usually exaggerated and drawn to 1:100 or 1:50 which allows the difference in height to increase five times or ten times and thus seen clearly.

A. Drawing Scales B. Vertical scales
C. Horizontal Scales D.map Scales

Note: **Satisfactory rating –3 and 4 points** **Unsatisfactory - below 3 and 4 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-4	**Reading maps and sketch**

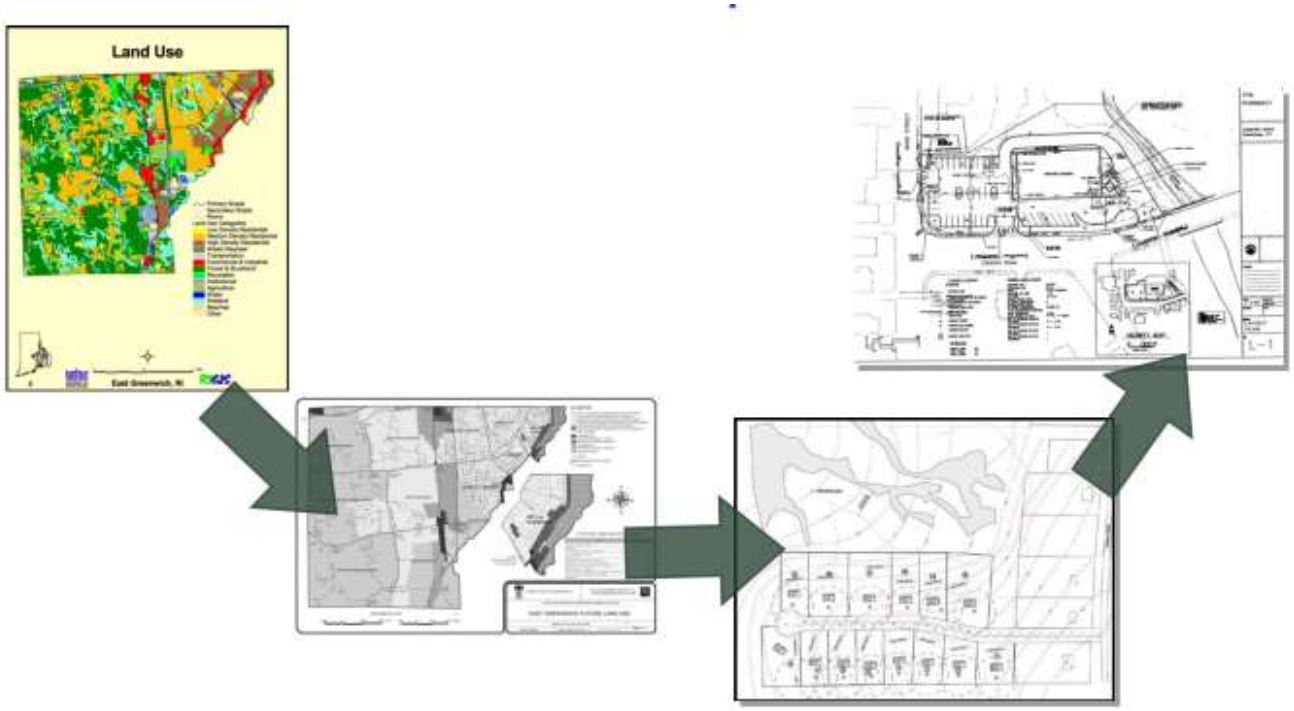
4.1. Reading maps

- **What is a map?**

A map is simply a drawing or picture of a landscape or location. Maps usually show the landscape as it would be seen from above, looking directly down.

As well as showing the landscape of an area, maps will often show other features such as roads, rivers, buildings, trees and lakes.
A map can allow you to accurately plan a journey, giving a good idea of landmarks and features you will pass along the route, as well as how far you will be travelling.

How are these maps different?



They move from general to specific

Fig. 4.1. differences between maps

- **Key Map Elements**

Title

North Arrow

Scale

Legend

Fig. 4.2. Elements maps

- **Title Block**

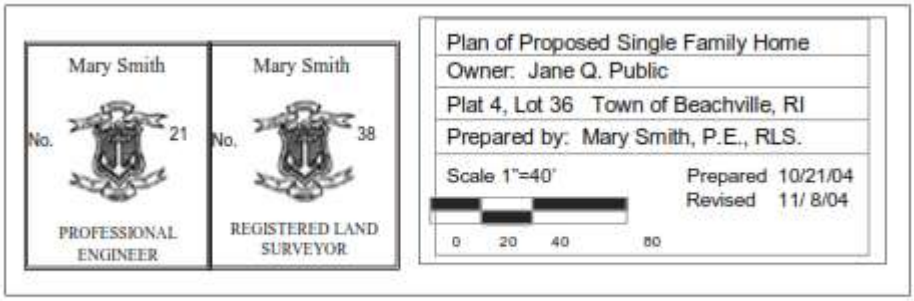


Fig. 4.3. Title Creation& Revision Dates Source

- **North Arrow**

- **Scale**

Written Scale

1:12,000 (ratio)
1 in. equals 12,000 in.

1” = 40’ (Equivalent)
1 in. equals 40 ft.
Or 40 scale

Graphical Scale

Graphic scales are the most reliable!

- **Legends**

Provide a guide to the symbols used

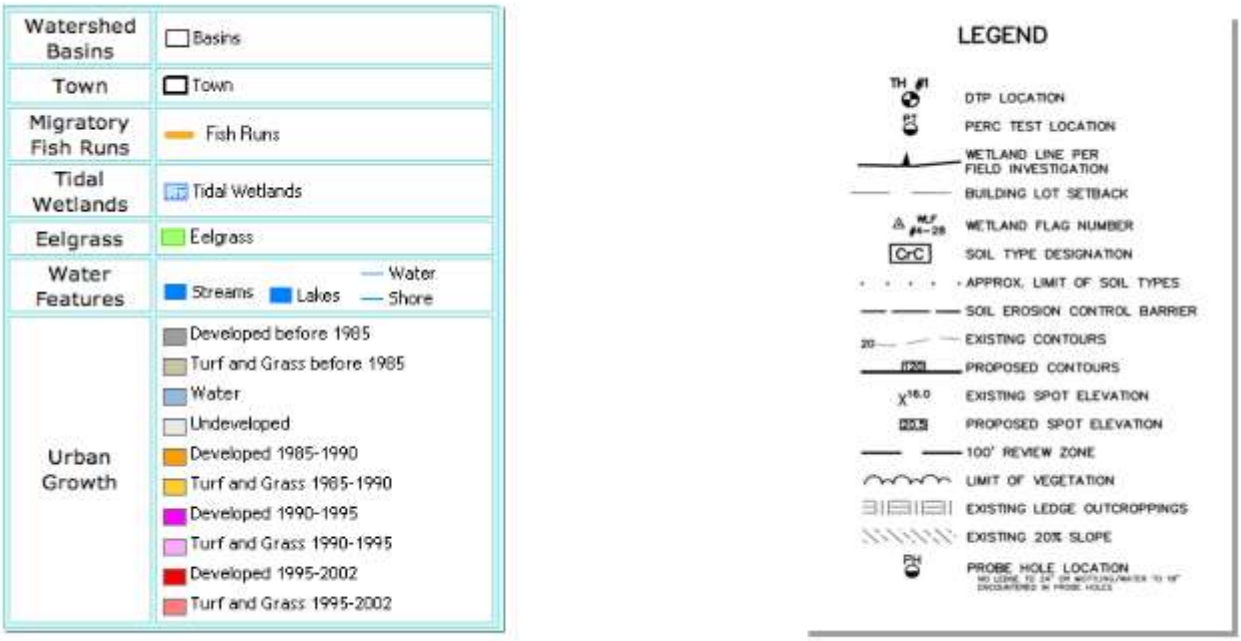


Fig. 4.4. legends

- **How to read a topo map**

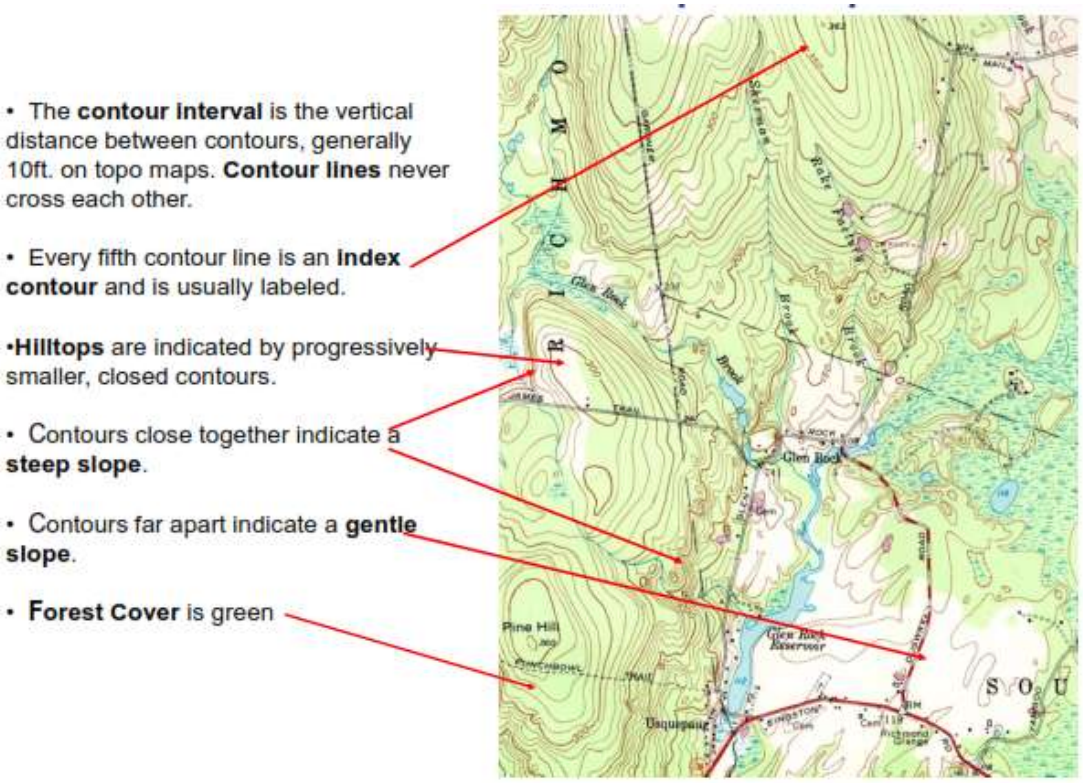


Fig. 4.5. a topo map

✓ Topographic Map Symbols

➢ Use of Color

Blue – used for all water features.
Red – major roads & highways.
Green – identifies vegetation such as forest cover, orchards, etc.
Brown – used to depict contour lines as well as some landform features.
Black – man-made features & all labeling & lettering.
Purple – revisions & new map data.

Self-Check -4	Written Test

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

1._____ is simply a drawing or picture of a landscape or location

A. Site B. Map

C. Contour D. Grid

2. Which one of the following Provide a guide to the symbols used.

A. Scale B. North Arrow

C. Legends D. Title Block

3._____Is used to depict contour lines as well as some landform features.

A. Brown B. Blue

C. Purple D. Green

Note: **Satisfactory rating –3 points** **Unsatisfactory - below 3 and 4 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-5	Concept of Environmental Protection

5.1Environmental protection policies

Relevant principles of this act, which could impact on the contract, include:

- That pollution and degradation of the environment must be avoided or, where they cannot be altogether avoided, are kept to a minimum and corrected.
- The waste is avoided, or where it cannot be altogether avoided, minimized.
- The negative impacts of the contract, on the environment and the people in the environment, are prevented and where they cannot be altogether prevented, are kept to a minimum and corrected.

✓ **Construction**

Construction activities, or actions which could impact negatively on the environment and therefore be a transgression of the above acts, include:

- Pollution of water source
- Soil pollution

Pollution of water sources

- At water points – by destroying the river banks, vegetation and contamination by workers.
- When disposing of left-over bituminous binders, cement, oil/lubricants and other construction products, spillage or inappropriate and clumsy usage or handling of these materials.
- When washing and cleaning of equipment.
- Contamination by workers.
- Contamination due to construction activities e.g. gravel and spoil in water courses..

- **Environmental protection requirements**

Relevant principles of this act, which could impact on the contract, include:

- That pollution and degradation of the environment must be avoided or, where they cannot be altogether avoided, are kept to a minimum and corrected.
- That waste is avoided, or where it cannot be altogether avoided, minimized.
- That negative impacts of the contract, on the environment and the people in the environment, are prevented and where they cannot be altogether prevented, are kept to a minimum and corrected.

- **Absence of mitigation construction and operations activities**

The following construction and operations activities as having potential, in the absence of mitigation, to result in the introduction of deleterious substances (contaminated runoff) into the River:

- Hazardous materials spill in the vicinity of the river/marsh during the course of roadway construction.
- Release of re-suspended, contaminated bottom sediments during the course of construction of roadway embankment over Riel Pond.
- During operation, introduction of contaminants (deleterious substances) into the River Marsh as a result of discharge of roadway/bridge runoff from storm water management facilities.
- During operation, release of hazardous materials as result of a spill associated with a vehicular accident on the roadway, bridge deck or approaches.
- During operation, introduction of contaminants (deleterious substances) into the Sturgeon River/Riel Marsh as a result of roadway/bridge maintenance procedures.

The above-described environmental protection measures will achieve the following:

- Minimization of the potential for hazardous materials spills to occur during construction
- Minimization of the potential for any spill occurring during construction or operation to reach the Sturgeon River or Riel Marsh.
- Minimization of the volume of spilled material that could reach the Sturgeon River or Riel Marsh during construction.
- Minimization of the risk that spilled material could pose to water quality or aquatic organisms.
- Minimization of the volume of hazardous materials that could reach the Sturgeon River or Riel Marsh in the event of a spill resulting from a vehicular accident during roadway operation.
- Establishment of clear emergency response plans that ensure speedy and effective clean-up of any spills that do occur during construction or operation and full compliance with all spill reporting guidelines and regulations.
- Minimization of potential for the introduction of deleterious substances as a result of roadway/bridge maintenance procedures. The measures discussed above adhere to existing best management practices for roadway/bridge maintenance.

- **Environmental management plan**

The environmental management plan contains all aspects of a project's environmental management, and should be prepared by the contractor before work commences on any construction project.

Environmental protection planning is an important component of overall planning and implementation of mega-projects. Industrial activities, including those associated with the construction of the PGPL's LNG terminal, are reviewed and approved by Government agencies through a variety of approvals, authorizations and permits addressing issues ranging from human health and sanitation to fisheries and wildlife habitat avoidance or protection. The Environmental Management Plan (EMP) is an important integration document between the various approvals, authorizations and permits issued for specific components and/ or activities of the undertaking.

The purpose of the EMP is to:

- outline environmental protection measures to be followed during construction of jetty / pipeline and operations of the facilities owned by PGPL such as the storage vessel, pipeline, jetty, etc;
- ensure that commitments to minimize environmental effects are met;
- document environmental concerns and appropriate protection measures;
- provide concise and clear instructions to Project personnel such as PGPL staff and contractors regarding procedures for protecting the environment and minimizing environmental impact;
- provide a reference document for personnel when planning and/or conducting specific activities;
- provide contingency plans for accidental events;
- communicate changes in the program through the revision process; and
- Provide a reference to applicable legislative requirements.

Self-Check -5	Written Test

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

1. One of the following is not an Environmental Management Plan.

A. ensure that commitments to minimize environmental effects are met

B. document environmental concerns and appropriate protection measures

C. provide contingency plans for accidental events

D. Establishment of clear emergency response plans

2. Which one of the following is not a sources of Pollution of water

A. When washing and cleaning of equipment

B. Soil pollution

C. Contamination due to construction activities e.g. gravel and spoil in water courses

D. Contamination by workers

Note: **Satisfactory rating –3 points** **Unsatisfactory - below 3 and 4 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-6	Organizations codes and regulations

6.1. Organizations codes

- **The employment practices code**

The Employment Practices Data Protection code deals with the impact of data protection laws on the employment relationship. It covers such issues as the obtaining of information about workers, the retention of records, access to records and disclosure of them. Not every aspect of the code will be relevant to every organization – this will vary according to size and the nature of its business. Some of the issues addressed may arise only rarely – particularly for small businesses. Here the code is intended to serve as a reference document to be called on when necessary.

- **The benefits of the code**

The Data Protection Act 1998 places responsibilities on any organization to process personal information that it holds in a fair and proper way. Failure to do so can ultimately lead to a criminal offence being committed.

The effect of the Act on how an organization processes information on its workers is generally straightforward. But in some area sit can be complex and difficult to understand, especially if your organization has only limited experience of dealing with data protection issues. The code therefore covers the points you need to check, and what action, if any, you may need to take. Following the code should produce other benefits in terms of relationships with your workers, compliance with other legislation and efficiencies in storing and managing information.

Following the code will:

- ✓ increase trust in the workplace – there will be transparency about information held on individuals, thus helping to create an open atmosphere where workers have trust and confidence in employment practices.

- ✓ encourage good housekeeping – following the code encourages organizations to dispose of out-of-date information, freeing up both physical and computerized filing systems and making valuable information easier to find.

- ✓ protect organizations from legal action – adhering to the code will help employers to protect themselves from challenges against their data protection practices.

- ✓ encourage workers to treat customers' personal data with respect– following the code will create a general level of awareness of personal data issues, helping to ensure that information about customers is treated properly.

- ✓ help organizations to meet other legal requirements – the code is intended to be consistent with other legislation such as the Human Rights Act 1998 and the Regulation of Investigatory Powers Act 2000 (RIPA).

- ✓ assist global businesses to adopt policies and practices which are consistent with similar legislation in other countries– the code is produced in the light of EC Directive 95/46/EC and ought to be in line with data protection law in other European Union member states.

- ✓ help to prevent the illicit use of information by workers– informing them of the principles of data protection, and the consequences of not complying with the Act, should discourage them from misusing information held by the organization.

Self-Check -6	Written Test

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

1.One of the following is not the benefits of employment practices code

A. Decrease trust in the workplace
B. Encourage workers to treat customers' personal data with respect
C. Encourage good housekeeping
D. Help to prevent the illicit use of information by workers

Note: **Satisfactory rating –3 points** **Unsatisfactory - below 3 and 4 points**

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

Answer Sheet

Score = _____

Rating: _____

Operation Sheet 1	Dividing Line in to Two (bisecting line)

1.1. Steps of bisecting a line

Steps 1-Place your compass point on A and stretch the compass MORE THAN half way to point B.
Steps 2-With this length, swing a large arc that will go BOTH above and below segment AB.
Steps 3-Without changing the span on the compass, place the compass point on B and swing the arc again. The new arc should intersect the previous one above and below the segment AB.
Steps 4-With your scale/ruler, connect the two points of intersection with a straight line.
Steps 5-This new straight line bisects segment AB. Label the point where the new line and AB cross as C. Segment AB has now been bisected and AC = CB.

Operation Sheet 2	Dividing angle in to Two(bisecting angle)

2.2. Steps in bisecting an angle

1. Place the point of the compass on the vertex of angle BAC (point A).
2. Stretch the compass to any length so long as it stays ON the angle.
3. Swing an arc with the pencil that crosses both sides of angle ABC. This will create two intersection points (E and F) with the sides of the angle.
4. Place the compass point on E, stretch your compass to a sufficient length and draw another arc inside the angle - you do not need to cross the sides of the angle.
5. Without changing the width of the compass, place the point of the compass on F and make a similar arc. These two small arcs in the interior of the angle should be crossing each other.
6. Connect the point of intersection of the two small arcs to the vertex A of the angle with a straight line.

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 8-12 hours.

Task 1: bisect a line

Task 2: bisect an angle

List of Reference Materials

1. Basic Highway Plan Reading

Basic infrastructure Operations

Level I

NTQF

Learning Guide-33

Unit of Competence: Read and Interpret Plans, Maps and Specifications

Module Title: Reading and Interpreting Plans, Maps and Specifications

LG Code: CON BIO1M10 LO2-LG-33

TTLM Code: CON BIO1 TTLM 1019v1

LO 2: Check changes to drawing

Instruction Sheet	Learning Guide #33

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

- Procedure of amendments and Checking of Panel
- Checking amendments to specifications

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**:

- Identify Procedure of amendments and Checking of Panel
- Check amendments to specifications to ensure Currency of information

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 and Sheet 2”.
4. Accomplish the “Self-check 1 and Self-check 2,” **in page 52 and 55** respectively.

. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**

6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Procedure of amendments and Checking of Panel

1.1. Procedure of amendments

An amendment is a change to a project that is decided after the drawings have been finalized. Amendments are sometimes called revisions. These changes could happen because the client requests them (for example, the client may want an extra window in the study) or because the builder realizes something will work better if it's done slightly differently. Either way, they need to be shown on paper so that everyone knows about them, they are constructed correctly and there are no arguments later. So obviously it is important to use the latest version of the plans.

If this means that the building will vary from the way it was shown in the original contract documents, a written instruction will be issued by the architect/client and, if necessary, the drawings will be amended (changed) and re-issued**.**

It is vital that all drawings are signed and amended according to the following procedure so that a true and accurate record is kept of the current state of construction for each project.

At completion of each project the drawings received by Structures Engineering shall be deemed to be the current and latest version. Therefore any amendment to the drawings, for any purpose, will require the Consultant to re-issue Structures Engineering with a new amended electronic and full size hardcopy.

- **SAMPLE FORMAT FOR REVISED AMENDMENT PRACTICE**

Appl. No. : XX/YYY, YYY Confirmation No. WXYZ
Applicant : James Q. Inventor
Fil1ed : April 09, 2017
TC/A.U. : 1744
Examiner : John Doe
Docket No. : 12345/JAS/R758
Customer No. : 88888

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

- **AMENDMENT**

Sir: In response to the Office action of October 16, 2003, please amend the above-identified application as follows:

Amendments to the Specification begin on page **X** of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page **X** of this paper. **Amendments to the Drawings** begin on page **X** of this paper and include both an attached replacement sheet and an annotated sheet showing changes.

Remarks/Arguments begin on page **X** of this paper.

An **Appendix** including amended drawing figures is attached following page **X** of this paper.

- **Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

- **Listing of Claims:**

Claims 1-5 (canceled)
Claim 6 (previously presented): A bucket with a handle.
Claim 7 (withdrawn): A handle comprising an elongated wire.
Claim 8 (withdrawn): The handle of claim 7 further comprising a plastic grip.
Claim 9 (currently amended): A bucket with a green **blue** handle.
Claim 10 (original): The bucket of claim 9 wherein the handle is made of wood.
Claim 11 (canceled)
Claim 12 (not entered)
Claim 13 (new): A bucket with plastic sides and bott

- **Amendments of drawing**

The attached sheet of drawings includes changes to Fig. 2. This sheet, which includes Fig. 1-2, replaces the original sheet including Fig. 1-2. In Figure 2, previously omitted element 13 has been added.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

1.2. Checking of Panel

- **Standards**

BS ISO 7200 Technical Drawings- Title Blocks identifies the title block requirements to be used on engineering drawings.... The drawing sheet size should be in accordance with "BS EN ISO 5457 TD- Sizes and layout of drawing sheets".

- **Notes**

A title block is the form on which the actual drawing is a section. The title block includes the border and the various sections for providing quality, administrative and technical information. The importance of the title block cannot be minimized as it includes all the information which enables the drawing to be interpreted, identified and archived.

The title should include sufficient information to identify the type of drawing e.g. general arrangement, or detail. It should also clearly describe in a precise way what the drawing portrays.

The notes below relate to the title boxes included on in the title block to convey the necessary information. The standard drawing sizes and layouts are described elsewhere.

The basic requirements for a title block located at the bottom right hand corner of a drawing are

- The registration or ID number
- The drawing title
- The Legal Owner of the Drawing

These items should be written in a rectangle which is at the most 170mm wide. The tile block should also include boxes for the legal signatures of the originator and other persons involved production of the drawing to the required quality.
In other forms of title block , the title block contains the following information:

- the name of the company or organization
- the title of the drawing
- the drawing number, which is generally a unique filing identifier
- the scale
- the angle of projection used, either first or third, generally shown symbolically
- the signature or initials of the draftsman, checker, approving officer, and issuing officer, with the respective dates
- other information as required

The drawing should also include a symbol identifying the projection. The main scale and the linear dimension units if other than "mm".

Mechanical drawings should list the standards use for: indicating the surface texture: welds: general tolerances and geometric tolerances, as notes referring directly the the relevant standards or a general note referring to the BS 8888. (BS 8888 lists all of the relevant standards.) BS 8888 should really only be referenced if the drawing is in full accordance.

The drawing title block should indicate the date of the first revision. In separate boxes to the title block the current revision with an outline description of the revision should be indicated.
On completion of each drawing revision an additional revision box should be completed thus providing a detailed history of the drawing.

- **Typical Title Box**

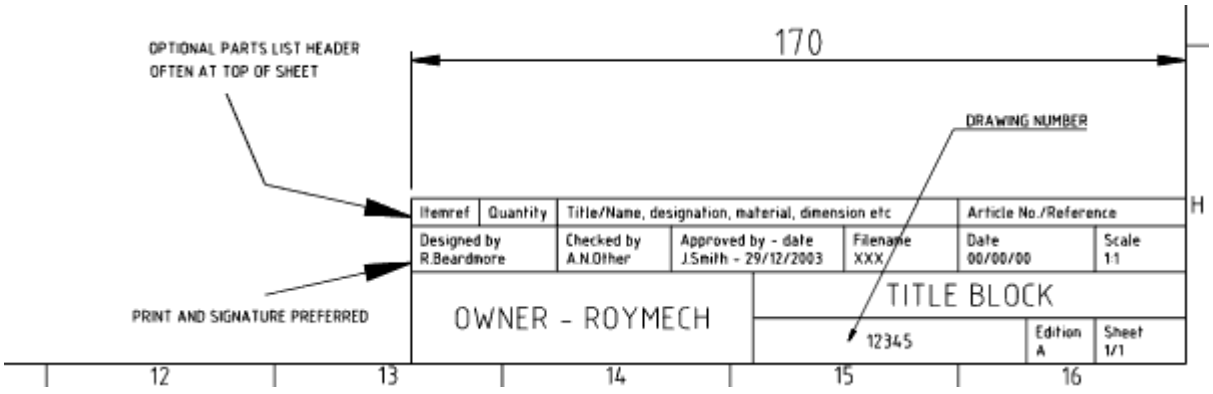


Fig.1.1. Title box

- **Typical Revision Box**

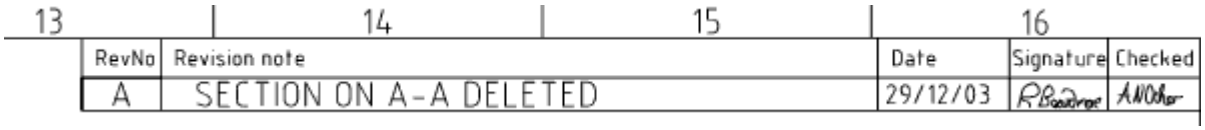


Fig.1.1. Revision box

Standard Drawing updates are released tri-annually: March, July and November.

The below amendment table captures the respective amendments and any approved exceptions to the tri-annual cycle.

Drawing	Title	Change Type	Description of change
SD1174	R C Box Culverts – Installation of Precast Units and Construction of Headwalls Height = 375 to 600	Withdrawn	• SD1260 supersedes SD1174, therefore SD1174 is now withdrawn.
SD1243	Precast Culvert Headwalls - Headwall Connections	Amendment	• Formerly titled Culvert Headwalls – Precast Headwall (Reinforced Concrete Pipe Culverts) • For smaller pipe/box culvert size up to 450 mm, the requirement of the connection detail can be omitted dependent upon site conditions and risk of separation of headwall, as assessed by the project engineer. Factors such as low flow in small culverts and ease of maintenance in the event of headwall separation can be considered for risk assessment. • For pipe/box culvert up to 1200 mm in size, a new connection detail is included using steel brackets bolted into the headwall units and the culverts. In this option, the precast cut-off wall is also included, resulting in no cast insitu concrete for the construction of these culverts. • For larger culverts of size > 1200 mm, the previous cast insitu headwall extension detail remains unchanged. The required reinforcement for the headwall extension are now provided. • Galvanised steel anchor assemblies shall be used for exposure up to classification B2, and stainless steel anchor assemblies are to be used for higher exposure classifications C1 and C2.

Drawing	Title	Change Type	Description of change
SD1250	R C Box Culverts and Slab Link Box Culverts – Culverts Height = 375 to 600	New	• SD1250 will supersede and replace existing Standard Drawings 1303, 1316, 1317, 1318 and 1320 which will be withdrawn. • New drawing features: revised design of the base slabs, wingwalls and aprons to meet AS 5100 crack control requirements and higher exposure classifications, including a dowelled construction joint for apron to base slab. Fish passage requirements. • New combined drawing is arranged in construction/installation sequence as follows: Drawing 1 for General Arrangements, set out and dimensions, and Notes. Drawing 2 for Typical Base Slab and Apron details relevant to large RC box culverts. Drawing 3 for Installation of large RC box culverts, including Holding Down Anchor fabrication details, and for Typical details of case insitu Headwalls and Wingwalls (end structures).
SD1260	R C Box Culverts and Slab Link Box Culverts – Culverts Height > 600	New	• SD1260 will supersede and replace Standard Drawing 1174 which will be withdrawn. • New drawing features: Revised design of the base slabs and aprons to meet AS 5100 crack control requirements and higher exposure classifications, including a dowelled construction joint for apron to base slab. A dowelled construction joint for apron to base slab is now specified. Fish passage requirements. • New combined drawing is arranged in construction/installation sequence as follows: Drawing 1 for General Arrangements, set out and dimensions, typical details of cast insitu Headwalls (end structures) and Notes. Drawing 2 for Typical Base Slab and Apron details relevant to large RC box culverts, and Installation of small box culverts.
SD1303	R C Box Culverts and Slab Link Box Culverts – Construction of Headwalls and Wingwalls Height > 600	Withdrawn	• SD1250 supersedes SD1303, therefore SD1303 is now withdrawn.
SD1304	Pipe Culverts – Wingwalls, Headwall and Apron for Pipe Diameter 750 to 2400	Amendment	• Increased apron reinforcement detail to meet AS 3600 shrinkage and temperature crack control reinforcement requirements.
SD1308	Precast Roof Slab for 1050 to 2100 Diameter Roadway Type Access Chamber	Amendment	• Steel C shaped reinforcing bar diameter changed from 20 to 16.
SD1316	R C Box Culverts and Slab Link Box Culverts – Installation of Precast Units Height > 600	Withdrawn	• SD1250 supersedes SD1316, therefore SD1316 is now withdrawn.

Table.1.1. Respective amendments and any approved exceptions

Self-Check -1	Written Test

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

1.Which one of the following is not true about The basic requirements for a title block located at the bottom right hand corner of a drawing.

A. The registration or ID number
B. The drawing title
C. The Legal Owner of the Drawing
D. The Legal Owner phone number

2. In other forms of title block , the title block contains one of the following information

A. the name of the company or organization
B. the title of the drawing
C. the drawing number, which is generally a unique filing identifier
D. the scale
E. All

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet- 2	Checking amendments to specifications

2.1 Amendments of *specifications*

Please replace paragraph [0021] with the following amended paragraph: [0021] In the construction of the bucket of this invention, various materials have been selected [[and]] which offer a number of diverse properties [[,]] and allow for varied functions of the article. For caustic solutions, the bucket can be made of a durable polymer plastic material. Where an aesthetic appeal is desired, the bucket can be any [[of]] one of many attractive colors. The following listing list of properties serves to define possible uses for the buckets.

Please replace paragraph [0045] with the following amended paragraph:

[0045] Figure 1 displays a bucket of the invention. As can be seen from the drawing, the a handle is attached to the upper lip of the structure and connected at points diametrically opposite each other on the circumference.

Please add the following new paragraph after paragraph [0075]:

[0075.1] An optional feature of the articles of the invention is the addition of a tetrafluoroethylene coating to the bucket to provide protection from any contents which might be caustic. The coating can be provided to the surface during the manufacturing process or can be added in a later step.

Please delete the paragraph beginning at page 2, line 4, which starts with “Under normal circumstances”

Appl. No. XX/YYY,YYY
Amdt. dated Jan. 15, 2004
Reply to Office action of Oct.09, 2017

Appl. No. XX/YYY,YYY
Amdt. dated Jan. 15, 2004
Reply to Office action of Oct. 16, 2003

- **REMARKS/ARGUMENTS**

In the specification, the paragraphs [0021] and [0045] have been amended to correct minor editorial problems. The new paragraph [0075.1] added after paragraph [0075] discusses in general terms the features taken from Example 4.

In amended Figure 2, the previously omitted element numeral 13 has been added.

Claims 6-10 and 12-13 remain in this application. Claims 1-5 and 11 have been canceled. Claims 7 and 8 have been withdrawn.

The examiner has acknowledged that claims 6 and 9-10 are directed to allowable subject matter. Claim 7-8 have been withdrawn as the result of an earlier restriction requirement. Claim 13 adds an additional feature from Example 2 in the specification.

In view of the examiner’s earlier restriction requirement, applicant retains the right to present claims 7-8 in a divisional application ……..

……
……

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,
SMITH, JONES & BROWN

By_____

Martin J. Gallagher
Reg. No. 99,999
Tel.: (101) 555-2345

Attachments

Appl.No. XX/YYY,YYY
Amdt. Dated Jan. 15, 2004
Reply to Office action of Oct. 16, 2003
Replacement Sheet

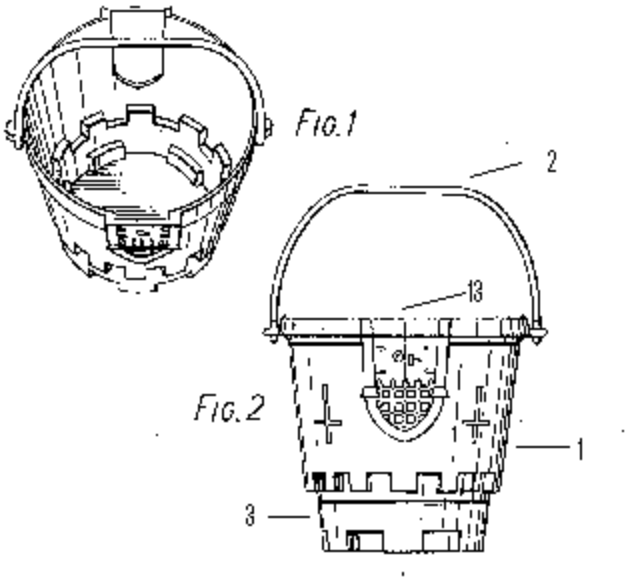


Fig2.1. Example of attachment

Appl.No. XX/YYY,YYY
Amdt. Dated Jan. 15, 2004
Reply to Office action of Oct. 16, 2003

Annotated Sheet Showing Changes

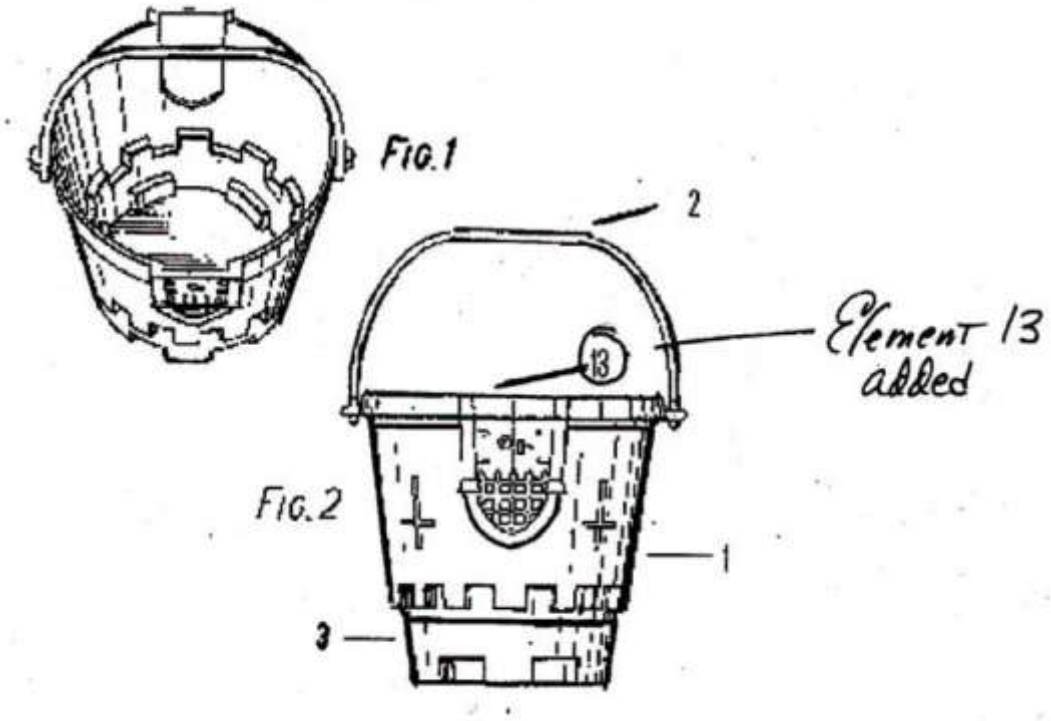


Fig 2.2. Example of attachment changed

Self-Check -2	Written Test

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

1.which one of the following is not true about checking specification amendment.

A. Please replace paragraph [0045] with the following amended paragraph

B. Please delete all the paragraphs which starts with “Under normal circumstances”

C. Please delete the paragraph beginning at Page 2, line 4, which starts with “Under normal circumstances”

D. Please add the following new paragraph after paragraph [0075]:

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

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

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

Technical drawing

Ethiopian design manual

Basic infrastructure Operations

Level I

NTQF

Learning Guide-34

Unit of Competence: Read and Interpret Plans, Maps and Specifications

Module Title: Reading and Interpreting Plans, Maps and Specifications

LG Code: CON BIO1M10 LO2-LG-33

TTLM Code: CON BIO1 TTLM 1019v1

LO 3: Locate and identify key features on a site plan

Instruction Sheet	Learning Guide #34

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

- Basic concept of civil construction terminology, Symbols and Abbreviations
- Interpreting legend on projects
- Achieve orientation of plan
- Key features of plans, elevations and formal Job Specifications
- Identifying service, features, contours and datum
- Procedures and techniques of reading and interpreting of plans and specifications
- Concept of Communicating ,working with others,time management and use relevant technology
- Procedure of report writing Skill and recording Results
- Understanding of consistent time with effectively and efficiently

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**:

- Recognize civil construction symbols and abbreviations
- Locate and correctly interpret legend on project and drawings, abbreviations symbol
- Achieve orientation of the plan with the site
- Identify and locate key features of the site
- Identify and locate key features services, features, contours and datum

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4” Sheet 5” Sheet 6” Sheet 7” Sheet 8” and Sheet 9”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3, Self-check 4 Self-check 5, Self-check 6, Self-check 7, Self-check 8, and Self-check 9” **in page -67, 71, 74,79,85,97,100,105, and 108** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 ” **in page -109.**
6. Do the “LAP test” **in page – 110**(if you are ready).

Information Sheet-1	Basic concept of civil construction terminology, Symbols and Abbreviations

1.1. civil construction terminology

Civil construction terminology is the language used on a worksite. Some of the terms have specific meanings related to the site and task.

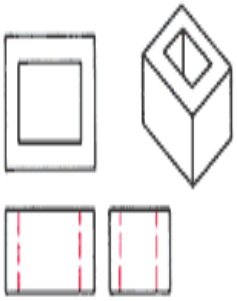
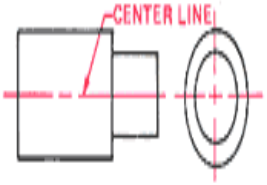
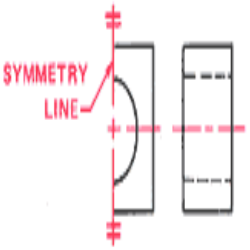
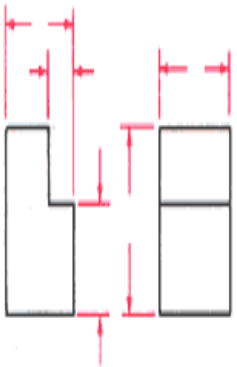
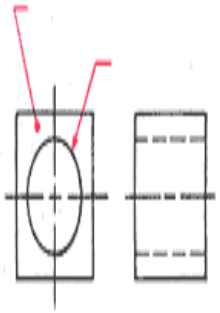
Some of the language used can change from one state to another or one site to another. If you are unsure of the meaning of any term used, speak with your supervisor immediately

- **Projections Symbols**

Symbols used to define whether a projection is either Third Angle (right) or First Angle (left).

- **Line symbol;**

To ensure correct communication between people of drawings, standards must be established. Standards include projection methods, terminology, dimensioning and symbols. Line has a definite meaning and sense to convey.

TYPE OF LINE	APPLICATION	DESCRIPTION
HIDDEN LINE THIN		THE HIDDEN OBJECT LINE IS USED TO SHOW SURFACES, EDGES, OR CORNERS OF AN OBJECT THAT ARE HIDDEN FROM VIEW.
CENTER LINE THIN ALTERNATE LINE AND SHORT DASHES		CENTER LINES ARE USED TO SHOW THE CENTER OF HOLES AND SYMMETRICAL FEATURES.
SYMMETRY LINE CENTER LINE THICK SHORT LINES		SYMMETRY LINES ARE USED WHEN PARTIAL VIEWS OF SYMMETRICAL PARTS ARE DRAWN. IT IS A CENTER LINE WITH TWO THICK SHORT PARALLEL LINES DRAWN AT RIGHT ANGLES TO IT AT BOTH ENDS.
EXTENSION AND DIMENSION LINES THIN DIMENSION LINE EXTENSION LINE		EXTENSION AND DIMENSION LINES ARE USED WHEN DIMENSIONING AN OBJECT.
LEADERS ARROW DOT THIN		LEADERS ARE USED TO INDICATE THE PART OF THE DRAWING TO WHICH A NOTE REFERS. ARROWHEADS TOUCH THE OBJECT LINES WHILE THE DOT RESTS ON A SURFACE.

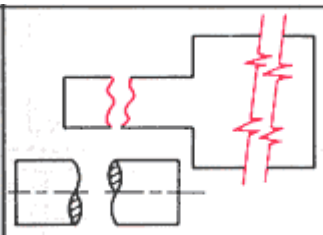
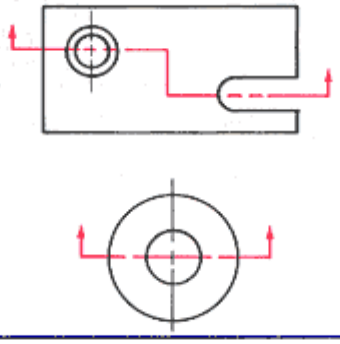
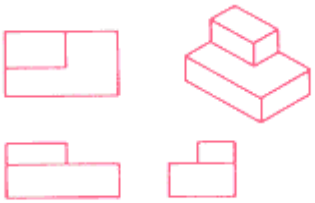
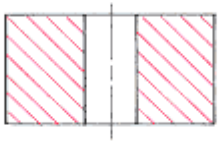
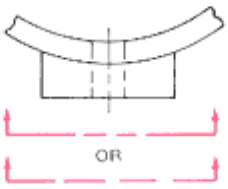
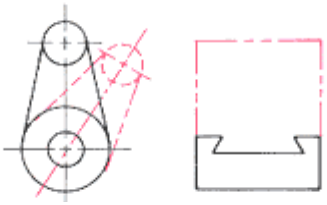
BREAK LINES THIN LONG BREAK THICK SHORT BREAK		BREAK LINES ARE USED WHEN IT IS DESIRABLE TO SHORTEN THE VIEW OF A LONG PART.
CUTTING-PLANE LINE THICK OR		THE CUTTING-PLANE LINE IS USED TO DESIGNATE WHERE AN IMAGINARY CUTTING TOOK PLACE.
VISIBLE LINE THICK		THE VISIBLE LINE IS USED TO INDICATE ALL VISIBLE EDGES OF AN OBJECT. THEY SHOULD STAND OUT CLEARLY IN CONTRAST TO OTHER LINES SO THAT THE SHAPE OF AN OBJECT IS APPARENT TO THE EYE.
SECTION LINES THIN LINES		SECTION LINING IS USED TO INDICATE THE SURFACE IN THE SECTION VIEW IMAGINED TO HAVE BEEN CUT ALONG THE CUTTING-PLANE LINE.
VIEWING-PLANE LINE THICK OR		THE VIEWING-PLANE LINE IS USED TO INDICATE DIRECTION OF SIGHT WHEN A PARTIAL VIEW IS USED.
PHANTOM LINE THIN		PHANTOM LINES ARE USED TO INDICATE ALTERNATE POSITION OF MOVING PARTS, ADJACENT POSITION OF MOVING PARTS, ADJACENT POSITION OF RELATED PARTS, AND REPETITIVE DETAIL.

Table 1.1. Line symbol

1.2 Civil construction Symbols and Abbreviations

Symbols: the representation of actual object by some notation which convey the necessary information.

- **Topography 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.

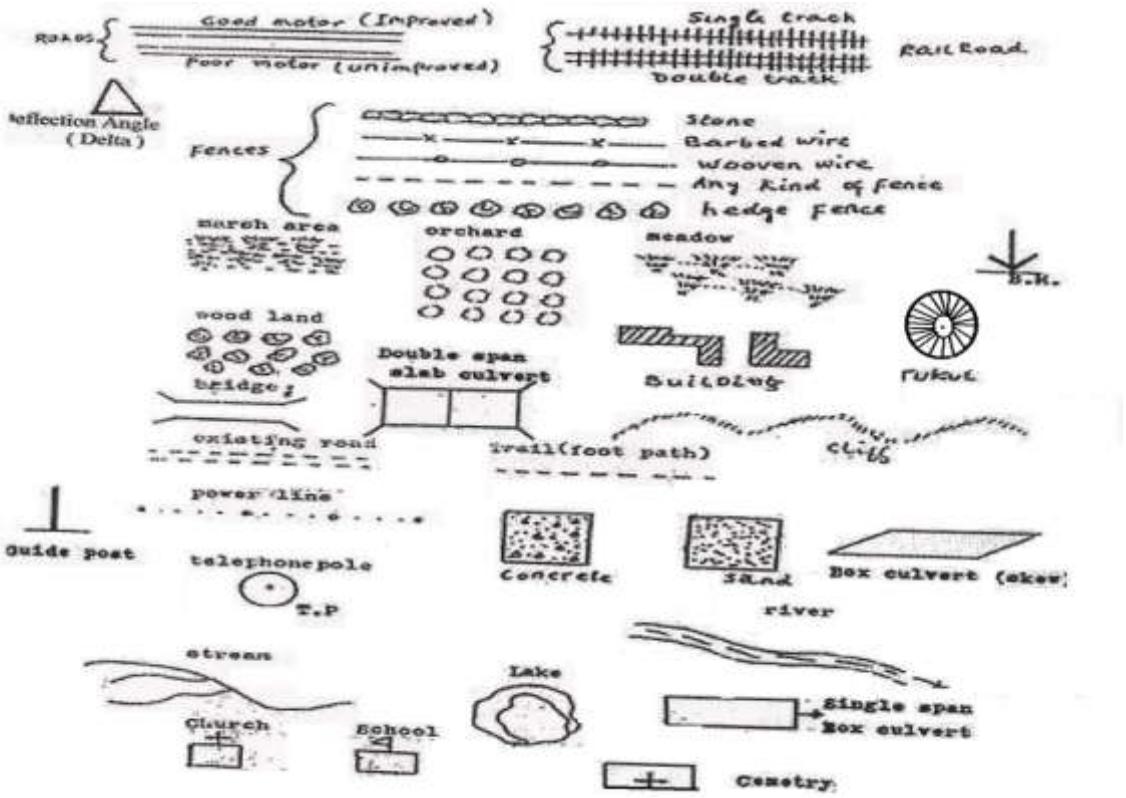
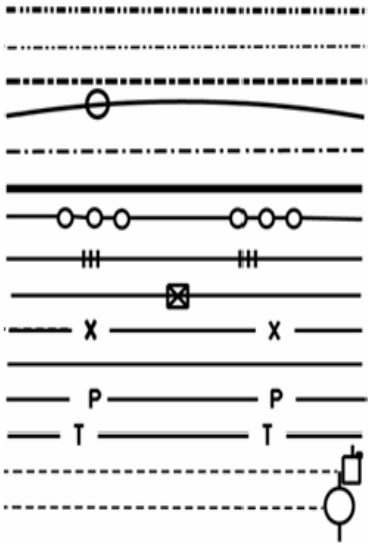


Fig1.1. Map symbols

CONVENTIONAL SYMBOLS

State or County Line
City Limit Line
Property Line
Survey or Base Line
Right of Way Line { Existing, Required, Limit of Access, R/W & Limit of Access, R/W Marker
Fence
Railroads
Power Line
Telephone Line
Power Poles
Telephone or Telegraph Poles



RIGHT OF WAY (ROW) SYMBOLS

Begin Limit of Access — BLA
End Limit of Access — ELA
Limit of Access
R/W and Limit of Access
Property and Existing R/W Line
Required R/W Line
Construction Limits (C = Cut, F = Full)
Easement For Constr & Maintenance Of Slopes (Permanent)
Easement For Constr Of Slopes (Temporary)
Easement For Const Of Drives (Temporary)

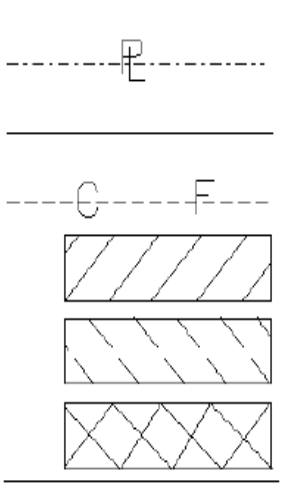


Figure 6-7. Conventional and Right of Way (ROW) Symbols

Fig1.1. Conventional and Right of way symbols

UTILITY SYMBOL ABBREVIATIONS

Plantation Pipe Line	PPL
Southern Natural Gas	SNG
Colonial Pipe Line	CPL
Overhead Cable	OC
Underground Cable	UC
Southern Bell Overhead	SBO
Southern Bell Undergound	SBU
American Tel. & Tel. Overhead	ATTO
American Tel. & Tel. Underground	ATTU
Western Union Overhead	WUO
Western Union Underground	WUU

RAILROAD

Railroad Tracks	
Railroad Milepost	MP
Railroad Crossing Sign	+73 30' +73 30'
Railroad Cross Sign & Signal	+73 30' +73 30'
Automatic Flashing Signal (R.R. x-ing)	
Automatic Gate (R.R. Crossing, Draw Bridge or Parking Lot)	
Automatic Gate with Flashing Signal	

Figure 6-14. Utility Symbol Abbreviations and Railroad Symbols.

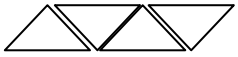
Fig1.3. Utility symbols

- **Structural symbol & abbreviation**

= no of bar,
Ø = diameter,


Column, beam & lintel Reinforcement concrete section

Bottom bar



Hard core symbol

F=footing C=column IB= intermediate beam RC= Reinforced concrete

Fig1.4. structural symbols

- **Abbreviations of road construction**

PVI Point of intersection
PC point of curvature
PT point of tangency

Self-Check -1	Written Test

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

1. Which one of the following is the symbol of state of country line

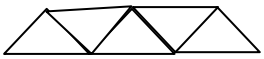
A. B.

C.  D. 

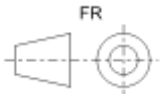
2. Which one of the following is the symbol of diameter?

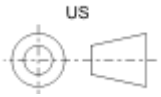
A. # B. Ø C.  D. 

3. Which one of the following is the symbol of Bottom bar?

A. B.  C.  D. 

4. One of the following is the symbol of third angel projection?

A. 

B. 

C.  D.  E .all

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet- 2	Interpreting legend on projects

2.1 Legend on projects

Standard legends have been supplied by DPTI as AutoCAD blocks appropriate to the drawing type on which they are to appear.

The appropriate legend is to be selected and modified to suit the project. Items that are not relevant to that project should not appear on the legend, however where an item is required in the legend on one sheet it shall appear in the legend on all sheets of that type. This means for example that the legend on all the General Construction drawings on a given project should be identical and preferably in the same location on each sheet.
Any additional legend symbols or definitions that are not part of the standard legends in the DPTI block library shall be approved by the DPTI Design Manager before being included on the drawing.

At times it may be necessary to show legends of multiple types (e.g. a General Construction drawing may require both Lighting and Services legends). In these situations the legend items shall be combined and duplications removed.
Where there is insufficient room on a given sheet for the necessary legend, reference may be made to another sheet containing the relevant items. This may be either another sheet of that type in the suite which has the relevant items on it, or it may be a dedicated 'Legend sheet'. Legends shall be drawn in paper space, on layer D-ENHA–Legend

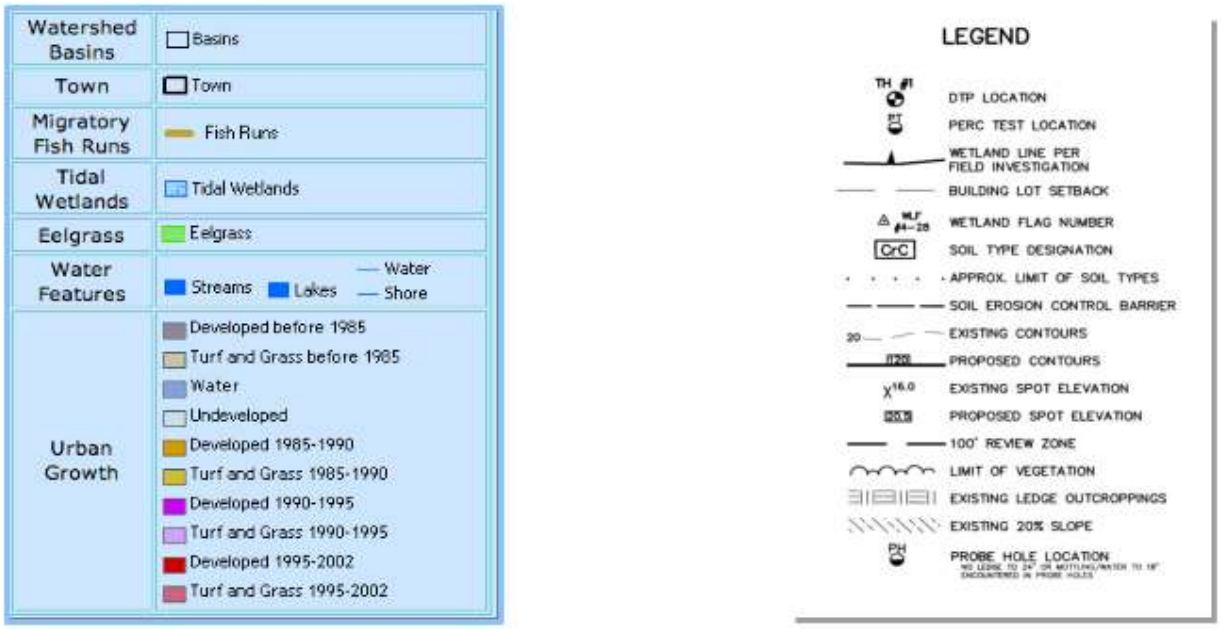


Fig.2.1. Legends

- **Legends on projects must contain**
  - The name of the company, organization or design authority from which the drawing originates.
  - The title or name of the drawing.
  - The drawing number.
  - A record of the information relative to the preparation of the drawing. This information could include the names of the draftsperson, checker and approving authority. It might also include a contractor's name and reference number.
  - A code number identifying the particular division or department within the design authority responsible for the drawing.
  - The drawing sheet size.
  - The predominant scale of the drawing.
  - This space is reserved for miscellaneous information such as modification number, the sheet number for multi sheet drawings, or the estimated mass of the item.
  - Additional blocks for other general information such as dimensions and tolerances notes, material notes, or surface finish requirements, should be placed in this area.

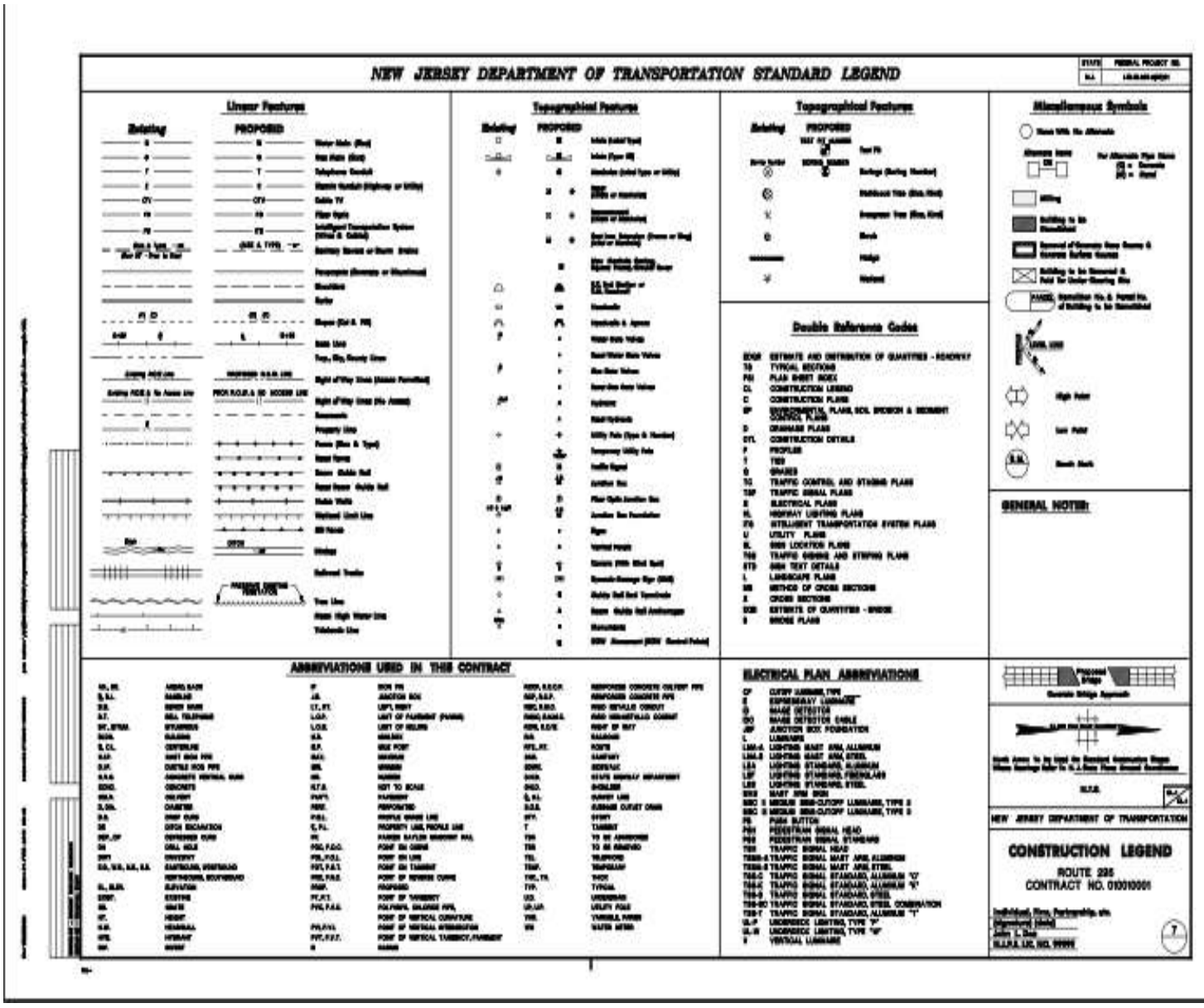


Fig.2.2. Example of standard Legend

Self-Check -2	Written Test

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

1. one of the following is not included in legend of projects
   A. The drawing sheet size.
   B. The predominant scale of the drawing
   C. The title or name of the drawing.
   D. The drawing number.
   E. None

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-3	Achieve orientation of plan

3.1 Orientation of a plan

Drawings shall be oriented so that the north point faces one of the following general directions (in order of preference)

- Towards the top of the drawing sheet
- Towards the left hand side of the drawing sheet
- Towards the right hand side of the drawing sheet
- Only in exceptional circumstances shall the direction of north be below the horizontal.

Generally all annotation shall be oriented such that it can be read either from the bottom or the right hand side of the drawing sheet. Chain ages and point numbers shall be aligned perpendicular to the relevant string and preferably on the right hand side of it. They shall be read in the same direction as the string.

Under no circumstances shall the model be rotated or moved from its original survey coordinates.

The orientation of urban roads is an important element for the road design. Its relationship with the prevailing wind direction can somehow affect the city temperature distribution and ventilation efficiency. Fazia Ali-Toudert from University of Freiburg concludes that in urban street the roads with east -west orientation are less efficient in releasing heat compared with the north south orientation (FaziaAli-Toudert,2006). Andreou concludes that under the same condition of shade and solar energy, street geometry, height/width ratio, orientation and trees can affect urban canyon microclimate (Fazia Ali-Toudert, 2014). They do not have a detailed study of t he relationship between t he orientation towards the prevailing wind, as well as to the impact on the surrounding thermal environment

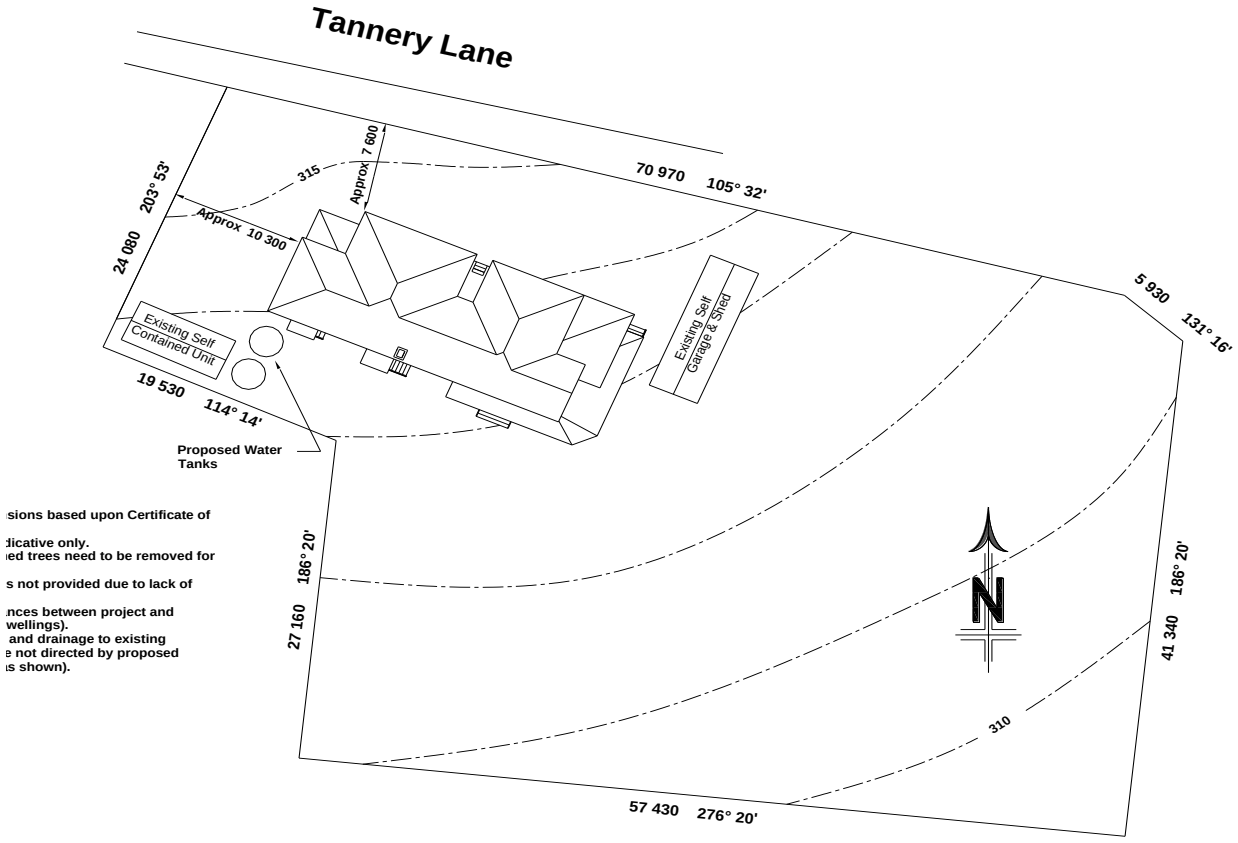


Fig.3.1. Orientation of a plan

Self-Check -3	Written Test

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

1. Drawings shall be oriented so that the north point faces in one of the following general directions (in order of preference)

A. Towards the top of the drawing sheet
B. Towards the left hand side of the drawing sheet
C. Towards the back hand side of the drawing sheet
D. Only in exceptional circumstances shall the direction of north be below the horizontal
E. None

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-4	Key features of plans, elevations and formal Job Specifications

4.1 key features of plans

- **Concept general arrangement drawings**

The information available at the concept stage of the project can be limited. These drawings are used to provide different options that may be appropriate for the particular site and road design.

✓ **Plan**

- outline of the structure
- cross fall or super elevation
- width between kerbs
- major towns (in each direction)
- contours of the existing surface
- property boundaries and fences
- public utilities and services
- abutments and Pier(s) centerlines
- relieving slabs
- approach and departure guardrail/extruded concrete barriers
- stream flow
- north Point
- road control line chain ages
- the Road Control is to be shown on the left hand side of the Plan view along with the Bridge Control. The horizontal alignment, bearing or radius, shall also be shown
- existing structures, to be shown in a dashed line, and with details such as span lengths, bridge width and composition. This is important particularly when a new bridge is being built on or near the same alignment as the existing bridge. Ensure the new piles are well clear of the existing piles taking into account any rake on the piles.

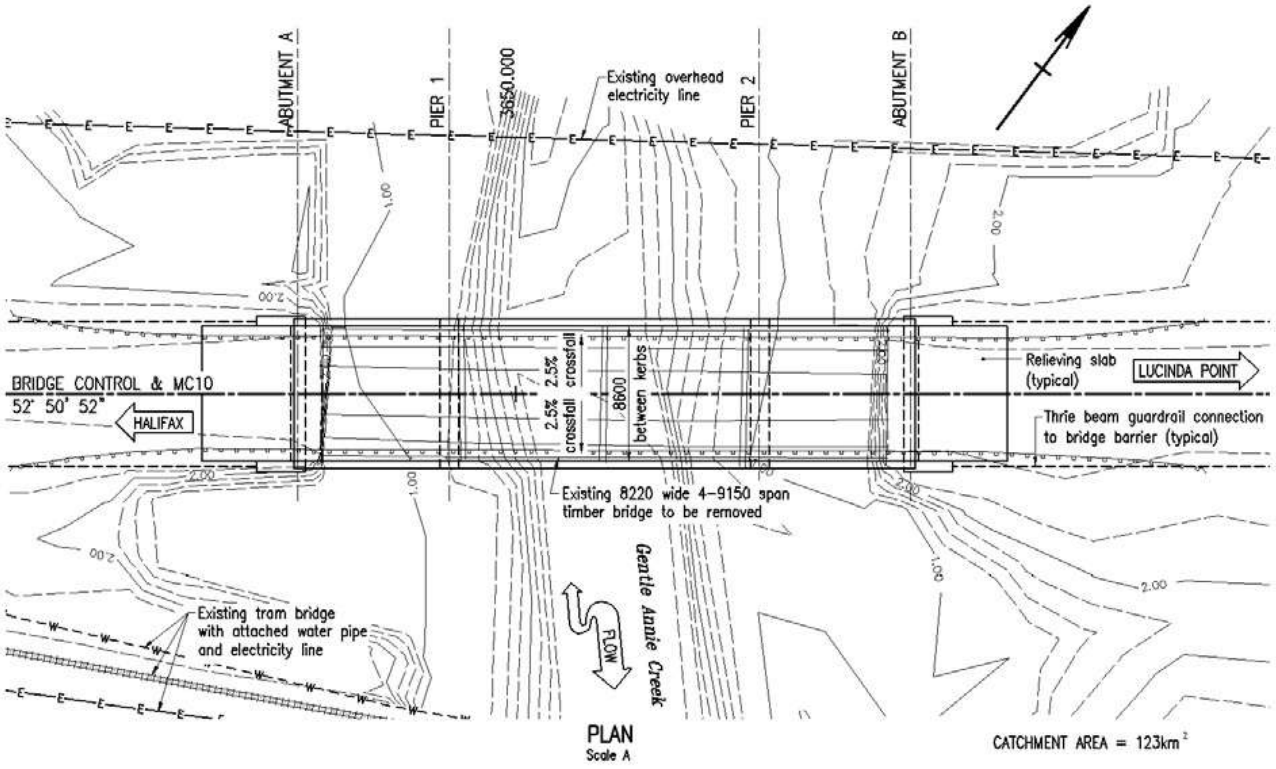


Fig.4.1. Concept General Arrangement Drawing - Plan

Features may include, but are not limited to:

- Two Bench Marks or Permanent Survey Marks shall be shown in the top left- hand corner along with the type of survey mark, its co-ordinates, Height and Height datum, for example PSM 166915, Star Picket, E274125.225, N2329910.650, Ht 3.970 AHD.
- Existing fences and property boundaries. Note any conflict that bridge components, such as embankment spill through, may have on property boundaries.
- Catchment area in the bottom right-hand side of the Plan view.
- All services such as electricity cables above or below ground, water mains, telecommunication cables etc. Particular reference shall be made for any service that may have an impact on the construction of the bridge. Clearly nominate the services and how they are treated, for example de-energized, relocated etc.
- Actual (not proposed) bore hole locations as detailed in the Geotechnical Report.
- Define excavation to clear waterway by hatching. For maintenance and inspection requirements a minimum clearance of 1200 mm is required between underside of deck units/girders and the ground surface at the abutments. The resulting embankment slopes from the excavated area up to the natural surface shall be a maximum gradient of 1 on 2.

4.2 Identifying key features of Elevation

The elevation gives details of Grade Heights, Surface Heights and Chain ages along the Road Control.

If this view is shown along any other alignment the line of section is to be clearly noted.

- outline of the structure
- individual span lengths and overall length of the structure between abutments
- excavation to clear waterway
- vertical clearances for overpass bridges
- existing surface cross section taken along the Control Line
- existing structures
- datum height
- table of grade heights and vertical alignment details.
- Heights shall be shown at abutments and piers table of surface heights.
- Show Heights at major changes in grade and at abutments and piers centerlines
- table of chain ages. Show chain ages for each surface Height and at abutment and pier centerlines
- hydraulic information including flood velocities and flood immunity Heights.

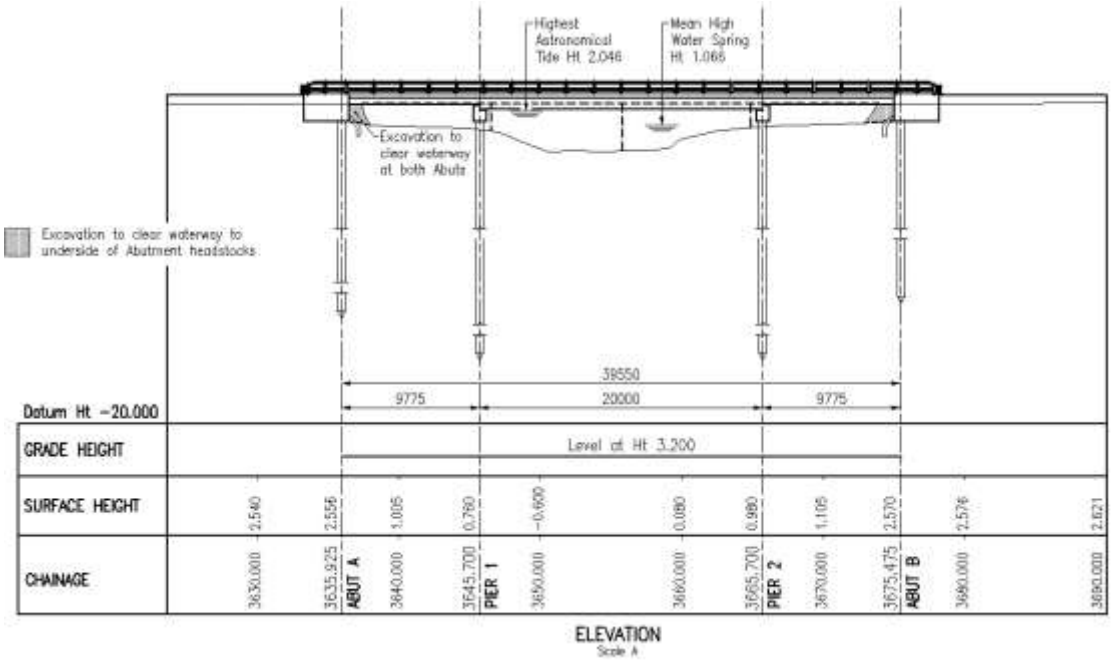


Fig.4.1. Features of an Elevation

Features may include, but are not limited to:

- services above or below the natural surface
- heights to PSC pile tips, toe of steel liners, toe of cast in place piles, soffit of pile caps and footings preboring requirements. Show a boxed note describing the location, size of auger and
- give a Height at the toe of prebore. Generally the diameter of the auger is 50 mm less than the nominated size of the PSC pile
- maximum reported flood Height and date
- recent water height and date
- articulation of the bridge. Fixed bearing, continuous joint or expansion bearing shall be shown at the centerline of the abutments and piers along with an explanation of the symbols used as shown below (placed on the left of the view):

  F denotes Fixed Bearing
  E denotes Expansion Bearing
  C denotes Continuous Joint.

4.3. Identifying key features of formal Job Specifications

- **Job specification**

Also known as employee specifications, a job specification is a written statement of educational qualification ,specific qualities, level of experience, physical, emotional, technical and communication skills required to perform a job, responsibilities involved in a job and other unusual sensory demands. it also includes general health, mental health, intelligence, aptitude, memory, judgment, leadership skills, emotional ability, adaptability, flexibility, values and ethics, manners and creativity, etc.

- **purpose of job specification**

  - Described on the basis of job description, job specification helps candidates analyze whether are eligible to apply for a particular job vacancy or not.
  - It helps recruiting team of an organization understand what level of qualifications, qualities and set of characteristics should be present in a candidate to make him her eligible for the job opening.
  - Job specification gives detailed information about any job including job responsibilities, desired technical and physical skills, conversational ability and much more.
  - It helps in selecting the most appropriate candidate for a particular jo

Self-Check -4	Written Test

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

1. One of the following is not the purpose of job specification

   A. It helps recruiting team of an organization understand what level of qualifications, qualities and set of characteristics should be present in a candidate to make him her eligible for the job opening.

   B. Job specification gives detailed information about any job including job responsibilities, desired technical and physical skills, conversational ability and much more.

   C. It helps in selecting the most appropriate candidate for a particular job.

   D. Give a Height at the toe of prebore

2. One of the following is not a Feature of an elevation.

   A. services above or below the natural surface

   B. maximum reported flood Height and date

   C. most appropriate candidate for a particular job.

   D. recent water height and date

3. One of the following is not a Feature of a plan.

   A. Catchment area in the bottom right-hand side of the Plan view.

   B. Existing surface cross section taken along the Control Line

   C. Existing fences and property boundaries

   D. Define excavation to clear waterway by hatching

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-5	Identifying service, features, contours and datum

5.1. Identifying service

Service: A thing that is **not tangible** like physical goods. It is mostly a characteristics connected with the **mind or psychology** of the persons.

Services cannot be measured wholly by physical specification alone. In the control of quality of the physical goods, it was assumed that a complete holdover the product specifications was all that was required in order to offer consistent quality to the customer.
But now, customer's/consumer's mind comes into the evaluation of the quality of a product, as much as the product's physical characteristics. Thus, the services product consists of:

- Physical items/facilitating goods
- Sensual benefits or explicit services, and
- Psychological benefits/implicit services

Service quality refers to the concept of delivering the service which **has no defects in all dimensions**.
Customers do not evaluate services only on the outcome of the services as there are:

- **Technical Quality**: What is being delivered
- **Functional Quality**: How it is delivered

- **Determinant of Service Quality**

- **Reliability:** Consistency of performance and dependability i.e. Keeping promises
- **Responsiveness:** Timely/prompt response to the service need of customers
- **Competence:** Knowledge and skill of both contact and supportive personnel
- **Access:** Ease of contact and approach ability
- **Courtesy:** Politeness, respect and consideration for the customers and friendliness the company and its workers
- **Communication:** Properly informing customers
- **Credibility:** Trustworthiness of the servicing company
- **Security:** Guarantee, safety and confidentiality
- **Tangibles:** Physical aspects of services like equipment used
- **Understanding:** Involves understanding customers' specific requirements, needs and expectations

5.2. Identifying features

"Bylaws and associated maps should identify and define all features considered and regulated by the municipality."

- **What is required to be on a Plat?**

  27 V.S.A. §1403 requires that all filed plats:

  - Be an **appropriate size** and **have correct margins** determined by the municipality.
  - Conform to municipality's **specifications**.
  - Be clearly **legible.**
  - Have a **scale** that allows pertinent data to be shown.
  - Have a **title block** that states the location of the land; scale in engineering units; date of compilation; name of record owner as of that date; the land surveyor's certification with the surveyor's seal, name and number, and a certification that the plat conforms with the requirements of section 1403.(There is an exception for this requirement when Site Plan Review is done. See *24 V.S.A. § 4416 & 27 V.S.A. § 1404(b)*.)
  - Correctly describe the **directional bearings** used.

- **Features Common to Both Plats and Plans:**

Plats and plans should have a **location map,** usually an inset, which allows reviewers to locate the subject parcel in the municipality. Plats and plans should have **a legend** or key, indicating what the line types and symbols signify on the plan.

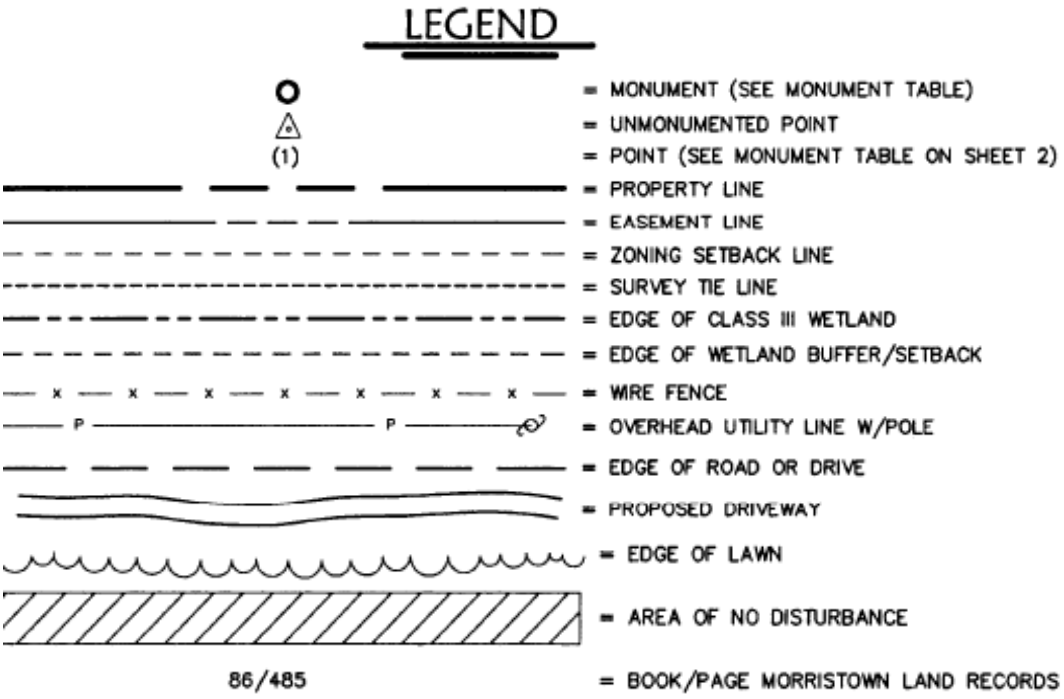


Fig 5.1. legend

A legend is essential to make sense of features shown on a subdivision plat or site development plan.

The **title block** contains basic information, including project title, landowner, site address, professional consultant or name of the firm that prepared the plan, date the drawing was done, revision dates, and more. The **north arrow** in combination with the *location map* allows the reader to orient the map to the project's location. It also allows a reviewer to orient themselves when a submission includes multiple plans.

5.3. Identifying contours

Contour drawings for construction drawings are used so as the designers can determine the best position of the proposed building horizontally and vertically.

They are usually prepared by surveyors on drawings called detail surveys. As the name implies the

purpose of the drawing is to detail the features of the site such as,

- Direction of fall of the land
- Location of Trees
- Location of existing structures
- Location of services
- Location of any other features that may affect the design & placement of the building.

Contours – The most common way of showing the shape of the ground on modern maps is by the use of contour lines. Contour lines give no visual illusion of relief and failure to recognize this, may cause difficulty in understanding their purpose.

- **SIMPLE PRINCIPLE** – The concept of a contour is very simple. It is an imaginary line drawn on a map, joining all places of equal height above a fixed datum line (usually sea level).

- **CONTOUR HEIGHTS** – On the map, each contour is drawn at a specific height above a fixed datum and the vertical distance represented by each is the same. The difference in height between contours is called the Vertical Interval (VI) or the Contour Interval and is shown in the marginal information on the map. It is from the height and spacing of contours that the shape of the ground is deduced and accurately calculated if necessary.

- **Understanding Contours**

Contours Lines - are imaginary lines that joint points of the same height above the datum (points of equal elevation. They allow a person viewing the plan which is 2 dimensional to form an impression of its 3 dimensional shape.

It is important that the contours refer to a datum so as construction based on the design will be built at the appropriate height.

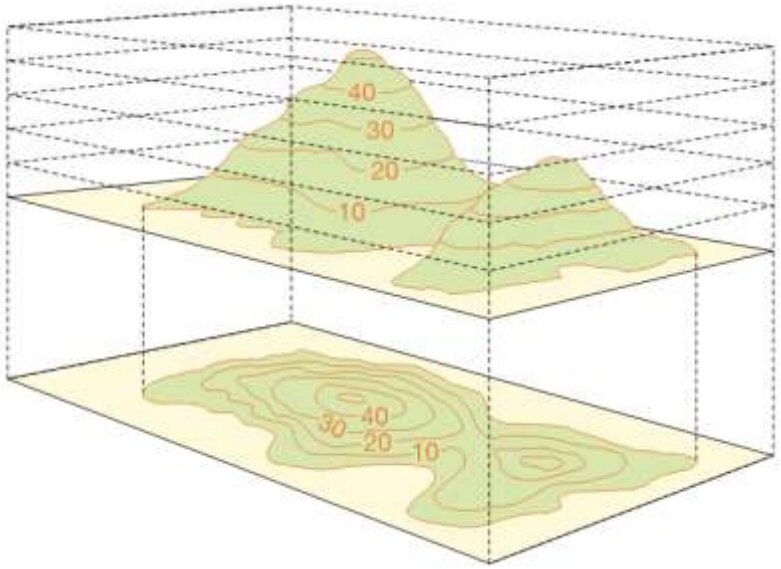


Fig 5.3. Contour lines

- **CONTOUR PATTERNS**

Each topographical feature, such as a spur or a knoll, is represented by its own particular contour pattern. Figure 5-4 shows some contour patterns. Important points to remember about contour patterns are:

- contour lines close together indicate steep slopes;
- contour lines far apart indicate gentle slopes;
- evenly spaced contour lines indicate uniform slopes;
- when the spacing of contour lines, reading from high to low, decreases, the slope is convex; and
- when the spacing of contour lines, reading from high to low, increases, the slope is concave.

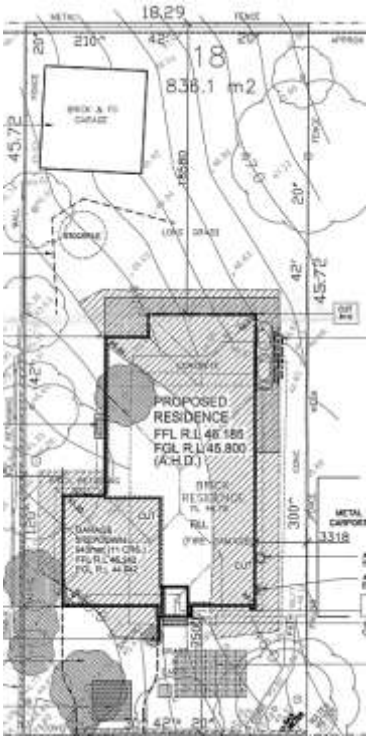


Fig 5.4. Contour patterns

5.4. Identifying datum

- Datum's are theoretically perfect points, lines, and planes.
- Datum's exist within a structure of three mutually perpendicular intersecting planes known as a datum reference frame.
- A part is oriented and immobilized relative to the three mutually perpendicular planes of the datum reference frame in a selected order of precedence.
- Since measurements cannot be made from theoretical surfaces, datum's are assumed to exist in and be simulated by the processing equipment.
- Datum's are specified in order of precedence as they appear in the feature control frame.
- Datum features are selected to meet design requirements. Functional surfaces, mating surfaces, readily accessible surfaces, and surfaces of sufficient size to allow repeatable measurements make good datum features.
- A datum (Tag) feature symbol is used to identify physical features of a part as datum features. Datum (Tags) feature symbols should NOT be applied to center-lines, center planes, or axes.
- Plane, flat-surface features not subject to size variations make the best datum's.
- When a cylinder is specified as a datum, the entire surface of the feature is considered to be the datum feature.

Self-Check -5	Written Test

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

1. One of the following is not the purpose of contour drawing to detail the features of the site.
   A. Direction of north arrow
   B. Location of Trees
   C. Location of existing structures
   D. Location of services

2. Which one of the following is not true about a contour pattern.
   A. contour lines close together indicate steep slopes.
   B. evenly spaced contour lines indicate uniform slopes.
   C. when the spacing of contour lines, reading from high to low, decreases, the slope is concave.
   D. when the spacing of contour lines, reading from high to low, increases, the slope is concave.

3. Which one of the following is not true about a Datum.
   A. Datum's are theoretically perfect points, lines, and planes.
   B. Datum's far apart indicate gentle slopes.
   C. Plane, flat-surface features not subject to size variations make the best datum's.
   D. Datum's are specified in order of precedence as they appear in the feature control frame.

4. _____ refers to the concept of delivering the service which has no defects in all dimensions.
   A. Quality Check
   B. Service Quality
   C. Technical Quality
   D. None

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-6	Procedures and techniques of reading and interpreting of plans and specifications

6.1. Reading and interpreting of plans and specifications

- **PLAN AND PROFILE SHEETS**

Plan and Profile sheets show the construction project from two viewpoints. The top half of a Plan and Profile sheet shows the construction project in PLAN VIEW (from above,) while the bottom half shows the construction project in PROFILE VIEW (from the side).

Plan and Profile Sheets identify and appropriately label existing and proposed features of the project; houses, culverts, power poles, fences, old & new bridges, etc.

Each “PLAN VIEW” on a Plan and Profile sheet displays the centerline of the road. It starts at the left of the sheet and continues to the right, moving on to the next sheet.

It is important to note that **everything drawn above the centerline is LEFT of the centerline, while anything drawn below is RIGHT of the centerline.**

The diagram below shows the PLAN VIEW; it is a “top” view. Observe the figure standing on the centerline facing ahead with outstretched arms pointing to the left and right.

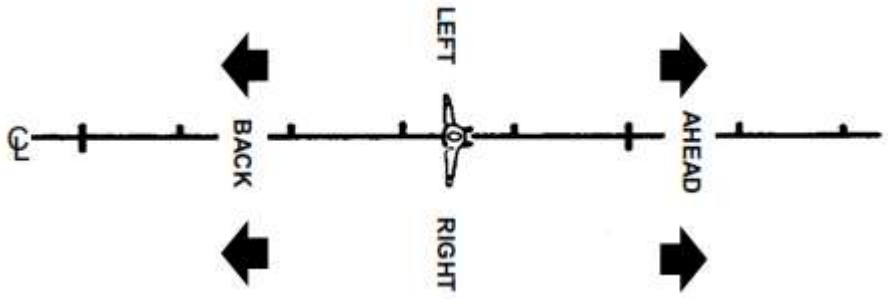


Fig.6.1.a plan view

Below is a representation showing the two lines associated with the PROFILE

VIEW (longitudinal cross-section).

Fig.6.2.a profile view

Sometimes the plan reader may require Plan and Profile information from a Plan Set where the sheets have been reduced to one-half (1/2) the original size. Remember from Chapter 2, that in order to **measure** items on a ½-size sheet it requires doubling the scale.

***** So be careful **measuring** items on a half size sheet using the scale written on the sheet, it will result in measurements double that intended by the Engineer!

Simply put, reducing the size of the sheet by ½ requires the plan reader to double the scale when **measuring**.
For instance, if the scale written on a ½ size sheet reads 1″=10', then the Engineering Scale used to **measure** items must be doubled to 1″=20'.

Remember, measuring on Plan Sheets reduced by ½ changes the scale. For instance, 1″= 20' becomes 1″= 40' and 1″= 4' becomes 1″= 8'.

While our concerns deal with "reading" the plans, it may become necessary to measure an object on a reduced size sheet. Be sure to check if the sheet has been proportionally reduced so you can use the appropriate engineering scale. For example, if a full size sheet calls for the scale 1″=10', reducing the sheet size by ½, requires changing the scale proportionally to 1″=20'

- **CURVES**
  - ✓ **HORIZONTAL CURVES**

Many times in a PLAN view the proposed road shows curves leading **around** obstacles, instead of going over or through them. These are **HORIZONTAL CURVES**. Below is a **Plan View** illustration of a highway curve going **around** a hill.

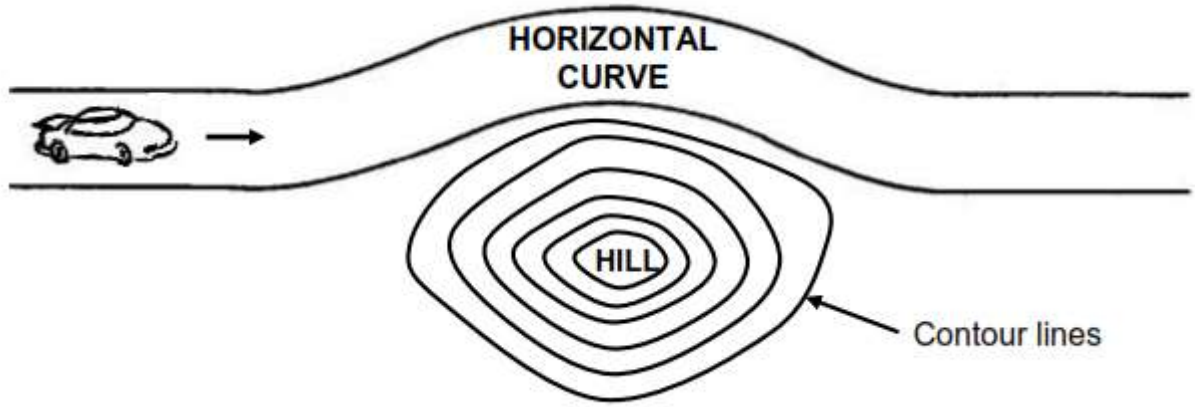


Fig.6.2.a horizontal curve

- ✓ **VERTICAL CURVES**

VERTICAL CURVES occur in two instances: when the proposed highway **goes over a hilltop** (crest) or when it travels **down into a valley** (sag).
Below are two **Profile View** illustrations: a vertical curve going over a hill (crest), and a vertical curve slanting into a valley (sag).

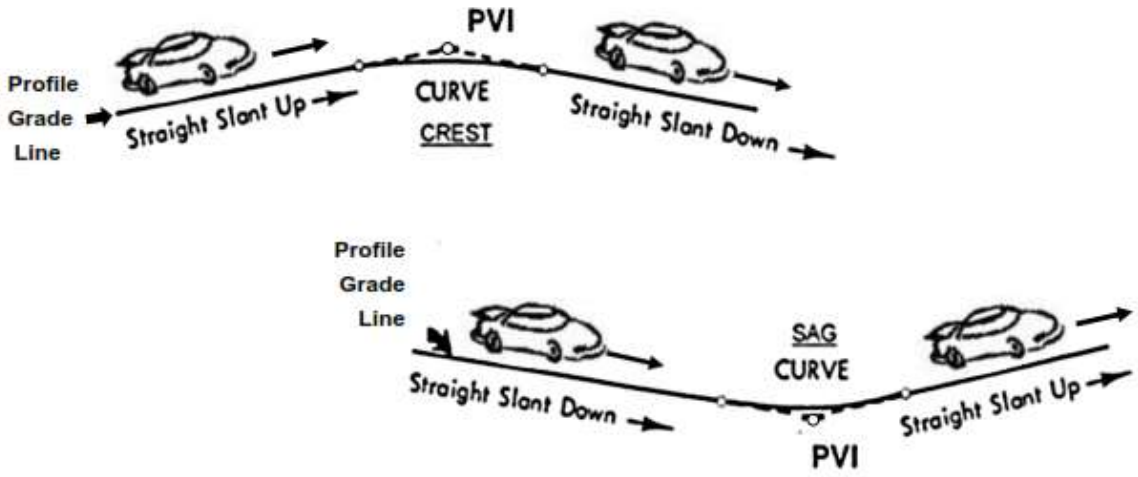


Fig.6.3.a vertical curve

It is possible for a highway to have a horizontal curve at the same place it has a vertical curve. However, there is **NO** relationship between a horizontal curve and a vertical curve.

- **Plan Views** show horizontal curves, not vertical curves.
- **Profile Views** show vertical curves, not horizontal curves.

Fortunately, both the Plan and Profile views are on the same sheet!

6.2 **Interpreting of plans and specifications**

The key to properly interpreting construction drawings lays in understanding the basic framework of a full set of drawings. Once a person can get past the initial apprehension of looking at the drawings, the meaning should become clear. It is not a big secret form of communication – it just looks that way.
It is hoped that this introductory course will serve to eliminate the confusion and frustration a person finds themselves in while reviewing construction documents.

It should be noted that the views and methods presented in this course are entirely those of the author/presenter. These views and methods should not be misconstrued as industry standards. (They should be but aren't yet).
A proper set of construction documents is made up of two equally important and linked elements:

Specifications
And
Drawings

The basic process of construction is a team effort from the consultants (Architects, Engineers), the Owners, working alongside the Contractors. It should not be an adversarial relationship. The process of teamwork is required in order to produce a superior product that everyone can use for future reference. Our reputations, as well as yours, are based on our last mistakes.
The task of interpreting the construction documents is fairly immense. It isn't easy when you haven't been involved in the process to look at something which resembles this:

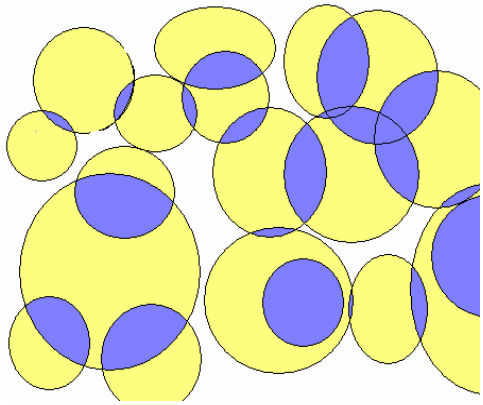


Fig.6.1. First idea of interpreting drawing

and realize that the Architect actually intends the final built product to look like this:

Fig.6.2. Idea of final built product

The design process leading up to construction documents can take years to complete, requiring different schemes and sketches. Some to these preliminaries can get quite intensive and detailed, going through 10 – 20 different variations.
I won't attempt to explain the actual design process since an explanation of that type is not required in order to understand the physical reality of construction documents.
The construction documents that are produced for the building process represent hundreds of hours of work, involving dozens of people and different offices, and represent hundreds of decisions along the way.

- **The purpose of blueprints**
  - Instrument of communication
  - Ideas on paper
  - details the elements of construction
  - communicate the idea to the builder
  - show resolved details of construction
  - we are supposed to know how to build
  - detail all areas of construction wither in visual or verbal form

  {no wiring to be surface applied, what type is used and where allowed)
  - we don't always say why it must be done that way but there will be a reason
  - { drying chamber uses plastic paint but will look just like a storage room}
  - construction documents should be complete to the best of our abilities in order to get an accurate, fair and reasonable price, and facilitate a smooth construction process.

- If I've done a good job, you can too.
- If the information cannot be found on either the drawings or specifications, then you cannot make an assumption as to the desired result.
- ASSUME is a dirty word in our industry. If you assume, you have a 50 percent chance of being wrong. If you are wrong, you may have to change it. It all comes down to responsibility, if you make the decision without being granted the right to do so, you are automatically accepting the responsibility for it and all the ramifications resulting from that decision are now yours. In the end, it may cost you time and money. Don't assume.
- Always ask the question – do it in writing, leave the decisions to those responsible for them, limit your liability

Drawings may include: Site Plan

- Floor Plans
- Reflected Ceiling Plans
- Elevations Building Sections Wall Sections
- Door, Window, Building Details
- Finish Schedules, Door Schedules, Window Schedules
- Interior Elevations
- Millwork / Miscellaneous Details

Specifications include:

- General Contractual Conditions
- Supplementary General Conditions (Specific to the Actual Project)
- Individual Specification Sections for all Materials and Installations
- Finish Schedules,

There are several drawing type formats as well as specification formats. Each consultant has the opportunity to select a type that they fee will work best for the particular project. Typically, offices have developed standards that they like to use making them cost-effective and efficient Basic drawing types are known as

Key Notes : The first example is a key note drawing. This method sets the material descriptions aside and numerically references them into the wall section. It allows for typical assemblies to be listed as well as for additional materials to be added without much complication. This method requires constant referencing back to the note legend until one learns all the numeric references.

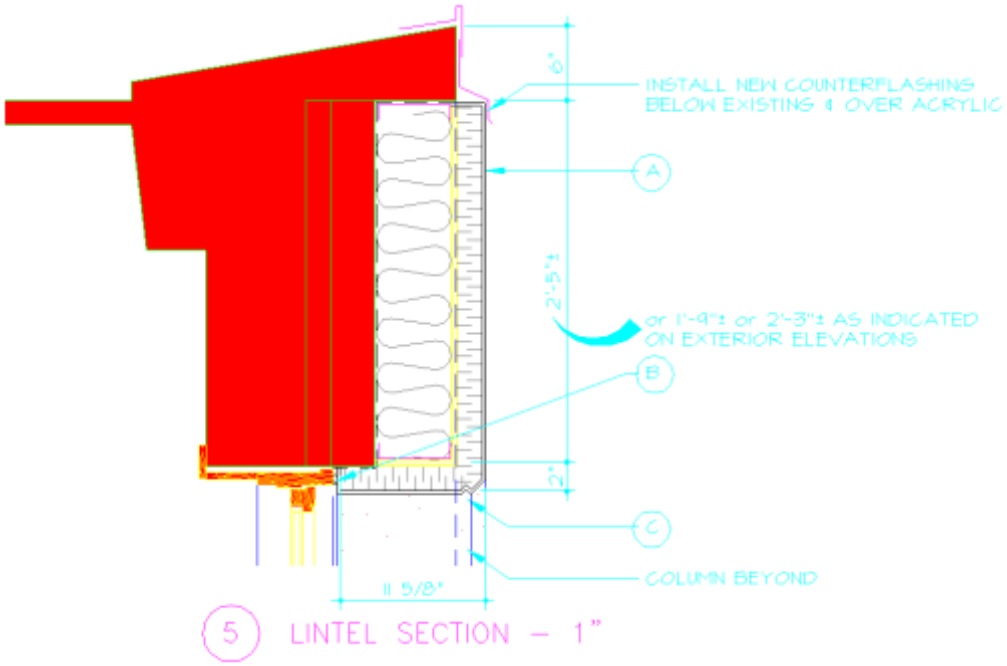


Fig.6.3. Lintel section-1'

Descriptive Method : The second example is a descriptive drawing. This method illustrates and calls up the materials within each detail. Typically, there is a standard detail on the sheet for the basic component systems and additional details are referred back to it.

This method is detail specific however it doesn't take to changes within the systems well.

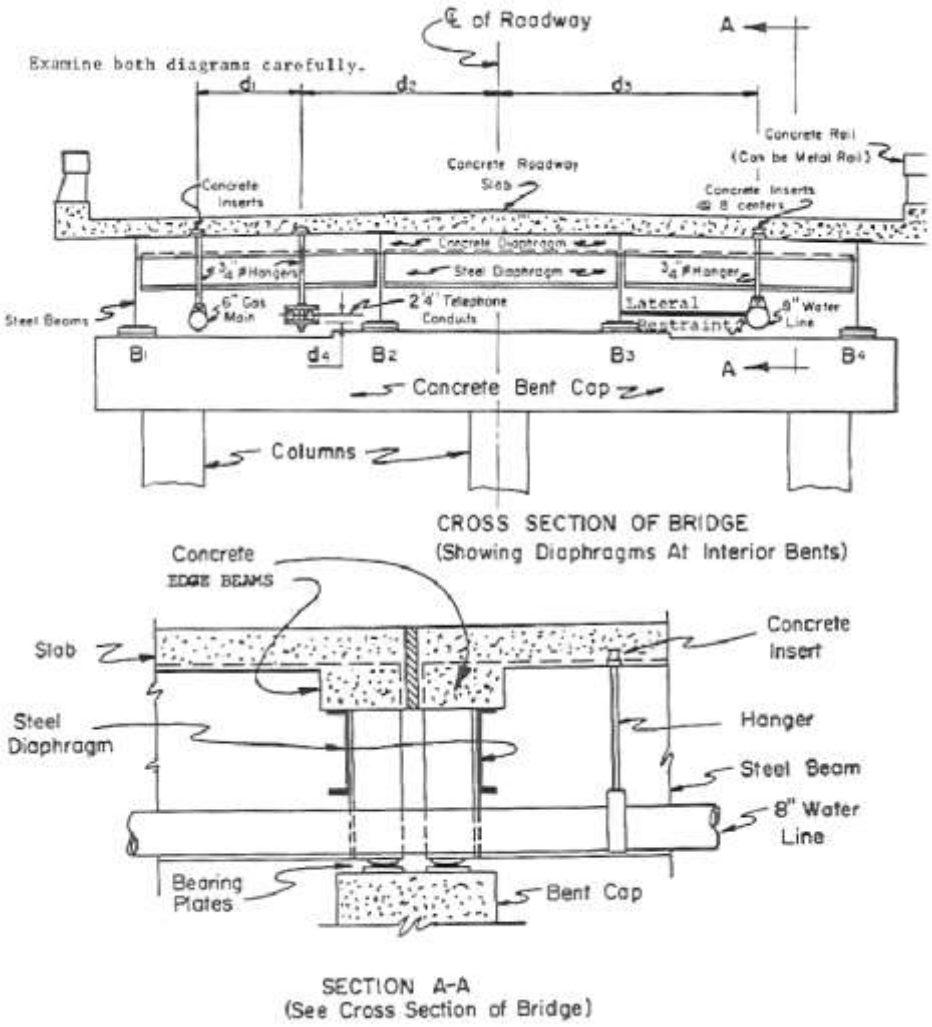


Fig.6.3. Cross Section of Bridge

The basic difference between these two is only in how you will find the information. All of the information is the same and included on the drawings, it's just located or referenced in a different manner.

Specifications also have variations on their formats.

- descriptive
- generic / global

Descriptive specs will tell you what to use by name, how to install it and where.

Generic specifications will not list any product by name, nor give a clear direction to its use. This type is common to the National Master Spec where they are attempting to not "favor" any one product – rather they spec what is intended towards the product type, quality, standards and reference methods.

Drawings are the visual method by which we show the construction. Drawings are interpretive and subject to each person's own bias.

Everything shown on the drawings will be noted in the specifications.

- earth moving
- accessories.

Specs may contain items not shown on the drawings that can impact your schedule, costs, and or work

- time frames
- sequencing
- cash sums
- additional materials
- switches
- totes, etc.

The written language has precedence over drawings because lawyers and judges can't read drawings. They deal in the written text. A drawing can be subject to interpretation whereas the typed word must be clear and specific.

- **Integration of Specs & Prints**
  - How are the two items linked.
  - Order of precedence
  - Liability of errors and omissions
  - Drawings and Specs make up the contract. You cannot have one without the other in some form.
  - smaller projects will have the spec right on the drawings, some other types may have the drawings contained within the specs.
  - don't ever assume that what you have is all inclusive without checking.

- **Interpreting the Written Language**
  - Construction terms
  - Abbreviations and Acronyms
- **Drawings Scales**
  - Purpose of different scales
  - Large vs. Small Scale drawings

- **Element Identification**
  - Line weight
  - Line type
  - Hatching
  - Key Notes
  - Order of Precedence

- **Schedules and Symbols**

- Purpose of Schedules
- Symbol interpretation
- Cross-referencing

- **Site / Location Plans**
  - Surveys
  - Landscaping
  - Plot Plans

- **Foundation Plans**
  - Foundation members
  - Foundation Types
  - Reading Plans

- **Wall Sections**
  - Large Scale Details
  - Overall Sections
  - Dimensions
  - Orientation/Cross Referencing
  - Materials

- **Detail Drawings**
  - Purpose
  - Cross-References
  - Interpretation

- **Millwork**
  - Orientation
  - Cross-references

- **Structural**
  - Foundation
  - Wall Sections
- **Specifications**
  - General Conditions
  - Supplementary General Conditions
  - Specific Sections

- **Total Contract Documents**
  - Overall Comprehension
  - Specifications/ Addenda
  - Drawings

- Order of precedence
- Co-ordination

- **Legal Issues**
  - Building Codes
  - Authorities Having Jurisdiction
  - Bidding Procedures Contract

Self-Check -6	Written Test

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

1. One of the following is not identified and appropriately labeled by Plan and Profile Sheets on existing and proposed features of the project.

A. houses
B. old & new bridges
C. Building Codes
D. culverts

2. _____occur in two instances: when the proposed highway goes over a hilltop (crest) or when it travels down into a valley (sag).

A. Vertical curves
B. Horizontal curves
C. Diagonal curves
D. Inclined curves

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-7	• Concept of Communicating ,working with others,time management and use relevant technology

7.1. Concept of Communicating

- **Communication**

is an active process in which information (including ideas, specifications, goals, feelings, work orders, and so on) is exchanged among two or more people.

Communication is any verbal or non-verbal behavior which gives people an opportunity to send their thoughts and feelings, and to have these thoughts and feelings received by someone else.

Communication needs to be clear and effective in order to achieve its aim. When it is not, all kinds of problems can result.

- **Elements of Communication**
  - listening
  - seeking clarification
  - body language
  - blocking and barriers
  - general attitude
- **Ineffective Communication**

If people working together are not able to communicate well, it can lead to confusion, unhappiness, frustration and annoyance. It can also mean that an organization's goals will not be met**.**

- **Poor communication may lead to:**
  - time being lost because work needs to be redone
  - accidents
  - Poor quality service and/or products
  - Wastage
  - people feeling "left out"
  - mistakes being made because instructions are not clear
  - teams not working well

- **EXERCISE EFFECTIVE COMMNUCATION**

Effective communication

At any workplace where people are able to communicate clearly tends to be a more efficient working environment.

Communication is any verbal or non-verbal behavior which gives people an opportunity to send their thoughts and feelings, and to have these thoughts and feelings received by someone else.

Effective communication leads to:

- clear instructions so people know exactly what they are expected to do and do it properly
- people feeling involved because they are well informed
- higher morale and job satisfaction
- people working better as a team
- time and effort saved as people are clear on what to do

- **CONCEPTS OF EFFECTIVE COMMUNICATION**

- Gives choices regarding communication style to adopt
- Involves creation and exchange of understanding
- Effective communication is achieved when the message received is close in meaning to the message sent.

7.2. Concept of working with others

Working in a team is essential to ensuring the allocated work gets completed on time and to the required standards. It is particularly important where the safety of the personnel/workers onsite is concerned.

A key component of teamwork is communications and being able to listen to instructions and follow them through. When issuing instructions or seeking clarification of an instruction or direction ensure you speak clearly and without confusion. If necessary be prepared to repeat the questions or instructions in a different manner to ensure understanding.

7.3. Concept of time management

managing your time when working within a team will enable to team to meet the team targets and are able to progress though tasks in a logical and sequential manner.

when managing your time, priorities and workloads it is essential that you take responsibility for achieving the tasks located to you. If you believe you will be unable to meet the requirements, speak to your supervisor, explain why you won't able to complete the tasks and ask for assistance.

most supervisors will prefer to know in advance that a person will not be able to complete the tasks in the required time frame before the deadline has arrived.

Self-Check -7	Written Test

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

1. ----------when working within a team will enable to team to meet the team targets and are able to progress though tasks in a logical and sequential manner.

A. Working in a team B. Communicating clearly

C. Managing your time D. Using technology

2. All acquired from effective communication Except

A. Clear instructions so people know exactly what they are expected to do and do it properly

B. time being lost because work needs to be redone

C. people feeling involved because they are well informed

D. Higher morale and job satisfaction

3. One of the following is not the concept of Effective communication

A. Gives choices regarding communication style to adopt

B. Involves creation and exchange of understanding

C. Effective communication is achieved when the message received is close in meaning to the message sent.

D. mistakes being made because instructions are not clear

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-8	• Procedure of report writing Skill and recording Results

8.1. Report writing

Reports are written in accordance to accepted standards (formats). There are some minimum requirements, which the report has to satisfy for it to be accepted. In any report, a minimum number of words – which sufficiently presents the message accurately and precisely – is needed.

Requirements for different reports vary. For instance, educational reports (e.g. laboratory practical reports), reports for seminars and workshops, research reports, research findings for publication in reputed scientific Journals, etc. Despite the many variations in the formats of reports, almost always a technical report consists of the following parts; Abstract, Introduction, Literature Review, Materials and Methods, Experimental Setup, Results, Discussion (often times, the results are combined with discussions), Conclusions and Recommendations, References and Appendices. It must be noted that this is only a general guideline and not a "strict biblical command". In real life, there is likely to be some minor (or even major) variations. As a rule of thumb, any technical report must be styled and detailed to focus on the intended reader(s). For instance, a report intended for a village meeting will differ significantly in style and level of detail from a research paper intended for publication in a scientific Journal.

Abstract

This is a brief summary (150 – 300 words) of the work being reported. It is simply a synopsis of what was done, why, how, the main findings, the main conclusions and/or recommendations. Although the abstract appears first in the report, it is usually written last after everything has been put in place. Usually this is the most difficult part of the report to write, as it has to reflect in a nutshell the rest of the report!

Introduction

This is the background information (briefly) justifying the work being reported. It is a synopsis of what has been done prior to the present work (reference to the literature), strengths and weaknesses of the methods used in the past and what has been done in the present work that distinguishes it from the past works.

Literature Review

This presents a detailed coverage of what others have done that is closely related to the present study. This has to reflect the scope of knowledge (most updated) that is reported in the literature related to the work being reported in the present study. It forms a sound basis for meaningful interpretation of the results obtained in the present study**.**

Materials and Methods (Methodology)

The materials used (sources and quality/grade), methods used (briefly explain each method in detail to enable the reader to replicate your work, if deemed necessary. For standard methods, make reference to the standard(s) concerned (e.g. AACC------), a brief account of how non- standard experiments were done is usually necessary.

Results and Discussion

This part is normally presented in tabular and/or graphical forms. It is a brief discussion of main findings based on the results obtained and experience of other workers (literature). Sometimes the results are presented separate from the discussion.

Conclusions and/or Recommendations

Your personal inferences regarding the results, your recommendations for further work, etc. You should be honest and admit main weaknesses that might have affected the results obtained in your reported work (i.e. main sources of error – if any).

References

All sources of information cited in the literature review and elsewhere. Avoid including general reading materials that were used to obtain a general background on the subject matter.

Appendices

Any relevant information, which you strongly feel is necessary for the wholesomeness of the report, but which could not be conveniently fitted into the bulk of the report.

- **REPORTS AND DOCUMENTS**

Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

- Date of issue.
- Project title and number.
- Name, address, and telephone number of testing agency.
- Dates and locations of samples and tests or inspections.
- Names of individuals making tests and inspections.
- Description of the Work and test and inspection method.
- Identification of product and Specification Section.
- Complete test or inspection data.
- Test and inspection results and an interpretation of test results.
- Record of temperature and weather conditions at time of sample taking and testing and inspecting.
- Comments or professional opinion on whether tested or inspected Work complies with
- the Contract Document requirements.
- Name and signature of laboratory inspector.
- Recommendations on retesting and re inspecting.

8.2. Recording Results

- **RECORD DRAWINGS**

➢ **Record Prints**: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

✓ Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

❖ Record data as soon as possible after obtaining it.
❖ Record and check the markup before enclosing concealed installations.

✓ Mark the Contract Drawings and Shop Drawings completely and accurately**.** Use personnel proficient at recording graphic information in production of marked-up record prints.
✓ Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
✓ Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

➢ **Record Digital Data Files:** Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
✓ Format: Annotated PDF electronic file.
✓ Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
✓ Refer instances of uncertainty to Architect for resolution.
✓ Architect will furnish Contractor one set of digital data files of the Contract Drawings in PDF format for use in recording information.

➢ **Format:** Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
✓ Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
✓ Format: Annotated PDF electronic file.

- ✓ Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
- ✓ Identification: As follows:
    - Project name.
    - Date.
    - Designation "PROJECT RECORD DRAWINGS."
    - Name of Architect.
    - Name of Contractor.

- **RECORD SPECIFICATIONS**

- ➢ **Preparation:** Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
- ✓ Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- ✓ Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
- ✓ Note related Change Orders, record Product Data, and record Drawings where applicable.
- ➢ **Format:** Submit record Specifications as paper copy scanned PDF electronic file(s) of marked-up paper copy of Specifications.

Self-Check -8	Written Test

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

1. Which one of the following is not included in a Test and Inspection Reports.
   A. Date of issue
   B. Names of individuals who makes the design.
   C. Description of the Work and test and inspection method.
   D. Recommendations on retesting and re inspecting.

2. One of the following is not included when we prepare a full set of corrected digital data files of the Contract Drawings.
   A. Format: Annotated PDF electronic file.
   B. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
   C. Refer instances of uncertainty to Architect for resolution.
   D. Owner will furnish Contractor one set of digital data files of the Contract Drawings in PDF format for use in recording information

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

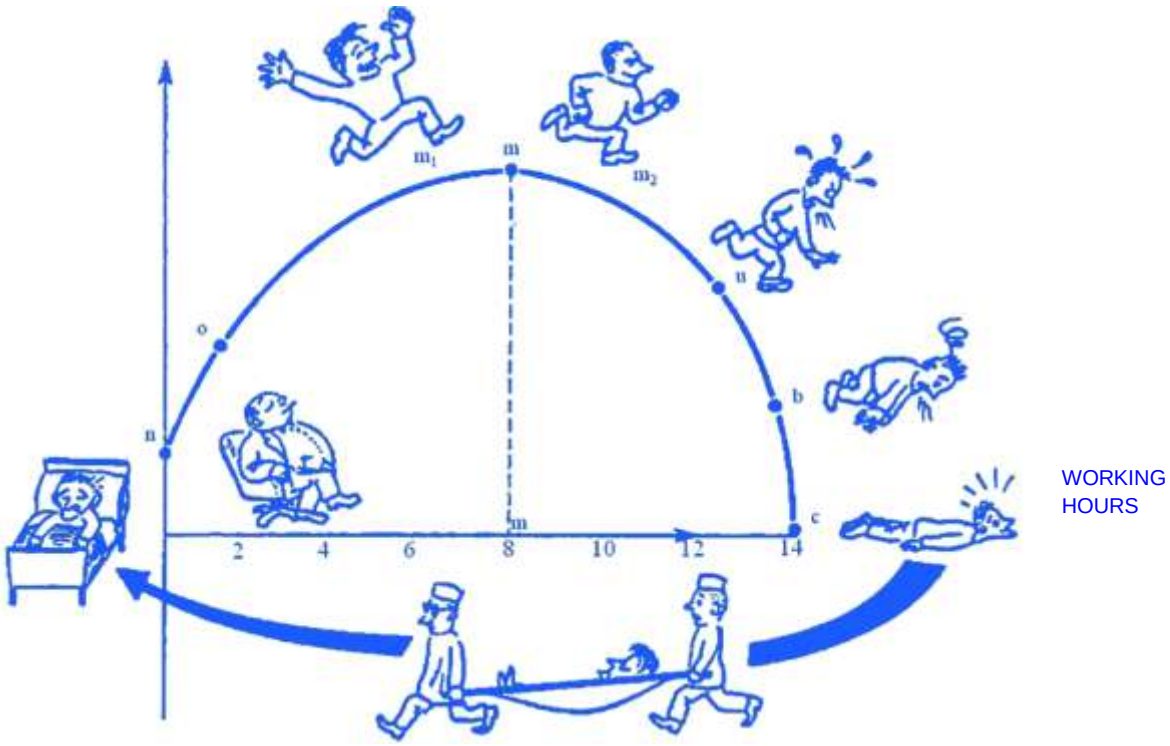
Information Sheet-9	• **Understanding of consistent time with effectively and efficiently**

9.1. **Understanding of consistent time with effectively and efficiently**

By gradually implementing various work techniques we are going to increase our efficiency and work better and with better results. L.I. Seiwert lists ten benefits derived from planning and using up our time well:

- delivering tasks at a smaller amount of energy invested,
- better organization of one's work,
- better work results,
- less chaos and stress,
- more satisfaction from work,
- higher motivation,
- time to engage in tasks of 'higher order',
- less pressure at work and better focus on efficiency,
- fewer mistakes,
- quicker attainment of work and personal goals.

British physiologist Sheldon showed the relation between long working hours, wellbeing and health of employees in the form of the ”happiness curve” presented in Pic. 1.



The points marked on Sheldon's curve signify as follows:
m — the maximum point at which a person feels satisfaction from work (corresponding to 5–8 hours of work),
o — decreasing the number of working hours leads to decreasing satisfaction levels and results in psychosomatic (physiological) disturbances (the O point — the obesity zone),
n — no efficiency point,
u — extending working hours beyond the maximum point leads to overwork and causes health problems, e.g. ulcers,
b — nervous breakdown,
c — total work incapacity due to a stroke (when working from 10 to 16 hours daily).
However, the latest research conducted by American doctors has neither proved or refuted Sheldon's results. The research outcomes boiled down to the observation that ”the more successful a manager is, the less likely s/he is to develop a heart or coronary disease”. At the same time the research revealed that our health is more importantly affected by our emotional and physical constitution, eating habits, amount of physical activity, propensity to drink alcohol or smoke cigarettes, unbalanced lifestyle, and insufficient amount of sleep rather than by long working hours.
Time as an economic category poses considerable challenges. Each scientific and research institution will strongly benefit from effective time management. Let's use this simplest but most important of our resources — our time — wisely.

Self-Check -9	Written Test

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

1. One of the following is not the L.I. Seiwert's ten lists of benefits derived from planning and using up our time well.
   A. Delivering tasks at a smaller amount of energy invested
   B. Less satisfaction from work
   C. Time to engage in tasks of 'higher order',
   D. Less pressure at work and better focus on efficiency,
2. The point marked ”U” on Sheldon's curve signify represents.
   A. The maximum point at which a person feels satisfaction from work (corresponding to 5–8 hours of work),
   B. Nervous breakdown
   C. Extending working hours beyond the maximum point leads to overwork and causes health problems, e.g. ulcers
   D. Total work incapacity due to a stroke (when working from 10 to 16 hours daily).

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Operation Sheet 1	Report writing

1.1. Steps for writing a Report.

Steps 1- Write the Abstract
Step 2- Write the Introductory part.
Step 3- Write the Literature Review
Step 4- Include Materials and Methods (Methodology)
Step 5- Include Results and Discussion
Step 6- Write the Conclusions and/or Recommendations
Step 7- Include References
Step 8- Appendices

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 8-12 hours.

Task 1: write a Report.

List of Reference Materials

1. Highway Plan Reading Volume I (English Version) 2013 Edition
2. Basic Highway Plan Reading
3. Drafting and Design Presentation Standards

   Volume 3: Structural Drafting Standards

   Chapter 11: General Arrangement Drawings

   November 2011

Basic infrastructure Operations

Level I

NTQF

Learning Guide-35

Unit of Competence: Read and Interpret Plans, Maps and Specifications

Module Title: **Reading and Interpreting Plans, Maps and Specifications**

LG Code: **CON BIO1M01 LO2-LG-35**

TTLM Code: **CON BIO1M01 TTLM 0219v1**

LO4: Read and interpret job specifications

Instruction Sheet	Learning Guide #35

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

- Method of identifying Job Specifications
- Identify standard project specification
- Identified Material attributes from specification

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**:

- Identify Job specifications from drawings, notes and descriptions
- Identify Standards of work, finishes and tolerances from the project specifications
- identify Material attributes from specifications

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 2 and Self-check 3” **in page -117, 123 and 125** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet

Information Sheet-1	Method of identifying Job Specifications

1.1. Identifying Job Specifications

- **INFORMATION FURNISHED BY THE EMPLOYER**

Certain information contained in these Contract Documents or provided separately is being offered in good faith but in the circumstances pertaining to the type of information supplied, no guarantee can be given that all the information is necessarily correct or representative of the in situ conditions.

More specifically this applies to all deflection surveys, soil tests, soil mapping, drilling results, geophysical surveys, geological reports, borrow pit information, material surveys and reports and similar information, the accuracy of which is necessarily subject to the limitations of testing, sampling, the natural variation of material and formations being investigated and the measure of certainty with which conclusion can be drawn from any investigations carried out.

- **POSSESSION OF SITE**

Further to the relevant clauses of the General Conditions of Contract, possession of the site will be given to the Contractor provided that the Contractor has signed the Contract Documents, lodged the performance security and provided the appropriate insurance conforming to the requirements of the General Conditions of Contract.

Any delays in commencement of work caused by this requirement will not be grounds for an extension of time for completion of the Works or any part thereof, nor shall it form the basis of any claim for additional payment.

- **HOURS OF WORK**

The hours of work shall be between 7:00am to 6.00pm Monday to Friday, and 8.00am to 6.00pm on Saturday, unless otherwise approved by the Engineer upon written application.

The following restrictions to the working hours shall apply:

- ✓ Work shall not exceed 10 hours on any Monday to Friday.
- ✓ Work shall not exceed 8 hours on any Saturday.
- ✓ Work shall not occur between Good Friday and Easter Monday, or between Christmas Day and New Year's Day inclusive.

- **ACCESS TO SITE**

The Contractor shall be given possession of site within 14 days of the Date of Acceptance. The Employer is to arrange and negotiate all formalities to obtain required approvals to facilitate the Contractor's access to Site.

The Contractor shall make his own arrangements for access to the various parts of the Site where works are to be constructed but all such accesses shall be subject to the approval of the Engineer.

- **CONTRACTOR'S ACTIVITIES OUTSIDE THE SITE BOUNDARY**
  - ✓ **General**

The Contractor shall seek the prior approval of the Engineer for activities outside of the site boundary prior to commencing negotiations with landowners. The Contractor shall plan such operations in a manner that will minimize inconvenience to local communities (including dust, noise, etc.) and shall undertake to restore the area to an acceptable condition upon completion of his activities in that area.

  - ✓ **Material from Private Lands**

Where the Contractor proposes to obtain material from private lands by agreement with the owner, the Contractor shall obtain the written agreement of the owner. The written agreement shall indicate the agreed conditions of entry, removal and rehabilitation.

  - ✓ **Material from Crown Lands**

No material required for the work under the Contract shall be taken from any Crown lands, road reserve, river, creek or watercourse without the written approval of the relevant authority.

Where the Contractor proposes to obtain the material from any of the aforementioned sources, the Contractor shall make available to the Engineer for review by the written approval of the relevant authority before any material is taken.

- **SITE ESTABLISHMENT**

The Contractor shall erect, for his own use, such buildings, compounds, sanitary accommodation, explosive magazines and associated services as are required for the supervision and construction of the Works.

The Contractor, subject to the agreement of the Engineer, may be permitted to use portions of the site, other than those areas required for compounds and stockpile sites, for establishment of such buildings and compounds.

At the completion of the works, these facilities will remain the property of the Contractor and shall be removed, or disposed of, and the area left to the satisfaction of the Engineer.

- **SITE MANAGEMENT**

Payment for Site Management shall be compensation in full for the costs of maintaining offices, supervisory, technical and administration personnel and facilities both on and off the site.

This item shall not include for maintenance or depreciation of plant, the cost of which shall be deemed to be included in the relevant work item.

- **PROGRAMME OF WORK**

The Program required in terms of the General Conditions of Contract shall be submitted to the Engineer not later than **14 days** after the Contractor has been issued with the order to commence.

The Program shall not be in the form of a bar chart only, but shall show clearly the critical activities by way of a Critical Path. The Program shall also show the anticipated quantities of work to be performed each month, the inter-related activities, the plant, and labor resources as well as the anticipated earnings for the various sections of work.

The Program shall also show the order in which the Contractor plans to accept responsibility for maintenance of sections of existing roads both on and off the site.

Explains, both verbally and in writing, the Road constructions codes, laws, and regulations to architects, engineers, property owners, and contractors.

Issues written notices of code violations requiring corrective action.

Self-Check -1	Written Test

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

1. The Contractor shall be given possession of site within_____ of the Date of Acceptance.

A. 16 days B. 18 days

C. 14 days D. 12 days

2. One of The following is not in the restrictions to the working hours shall apply

A. Work shall not exceed 10 hours on any Monday to Friday.

B. Work shall not exceed 12 hours on any Sunday.

C. Work shall not exceed 8 hours on any Saturday.

D. Work shall not occur between Good Friday and Easter Monday, or between Christmas Day and New Year's Day inclusive.

3. The Contractor shall seek the prior approval of the Engineer for activities outside of the site boundary prior to commencing negotiations with landowners.

A. True B. False

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet- 2	Identify standard project specification

2.1 A standard project specification

- **CLEARING AND GRUBBING**

Before any construction starts the roadway must be cleared of debris. Unless there are specific reasons, agreed to by the Engineer in writing, all materials including trees, grass, crops and structures, which fall within the road alignment must be removed.

Also all major stumps and roots need to be removed (grubbed out) and the holes left must be filled with compacted suitable fill material.

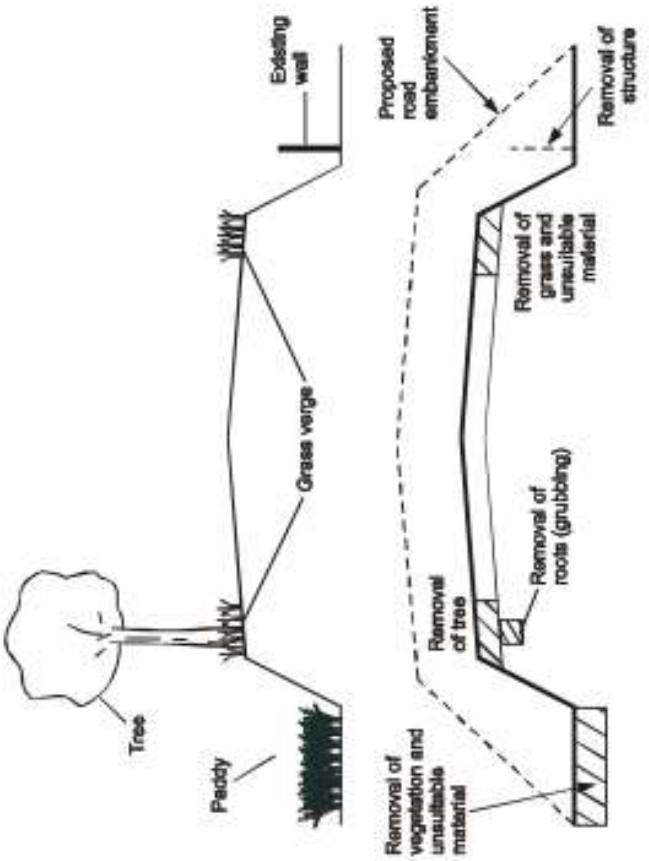


Figure 2.1 an example of the clearing and grubbing which is required.

- **Excavation**

Before any excavation, including the removal of any areas of unsuitable materials, cross-sections should be taken of the undisturbed ground. From this information, and the cross sections taken of the completed road, earthwork quantities can be calculated.

No existing material, which will remain in the completed works, should be loosened unnecessarily during excavation.

Excavation works, along with all construction activities, must be undertaken in as safe a manner as possible to minimize the dangers to road users and the contractors personnel.

✓ **Excavated Material**

Excavated materials need assessing as suitable or unsuitable. Suitable materials should be used when possible in the works. The excavated materials can be temporarily stockpiled, but must cause no damage to roads, services or property and not prevent water draining from the road or from the surrounding land.

✓ **Drainage and Channel Excavation**

During construction, ditches are required to be maintained to ensure proper drainage at all times. Any necessary ditches and channels should be constructed and maintained to ensure there is no damage to the roadway section. All existing ditches, or drainage channels, which the road crosses, need to be closed at the edge of the embankment, unless pipes or structures are to be constructed and, where necessary, alternative outfalls are to be provided.

✓ **Borrow Pits**

The borrow pits should be kept as drained as possible. Borrow pits should not be constructed where they might:-

- Affect the stability or safety of the highway or any railway or other structures, which may be present.
- Prevent natural or artificial drainage or irrigation.
- Damage adjacent property or future expansion plans for he highway.

As materials are only paid for when included in the embankment, there is no need to measure the volume of material removed from any borrow pits.

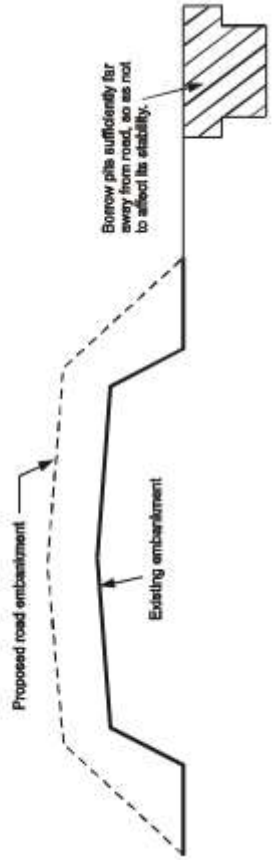


Figure 2.1. Borrow pits location

- **EMBANKMENT**

Before placing any material, clearing and grubbing and the removal of any unsuitable materials needs to have been completed. Also any necessary information to determine earthwork quantities should have been collected (normally cross sections of the original ground).

Where an existing embankment is widened, the new fill material must be fully keyed into the old embankment by means of benching. Steps not less than 300 mm high and 600 mm wide should be cut into the old embankment prior to any filling, see Figure 3. Material cut from these benches may be used as fill, if it is suitable.

Normally embankments should be constructed in layers approximately parallel to the finished grade of the road. The grade and cross fall should be maintained during construction, as this will enable water to run off the embankment allowing construction work to start as soon as possible after rainfall and avoid soft spots forming.

- **SUBGRADE**

The sub grade is the layer of embankment immediately below the pavement. This may be undisturbed local material or may be soil excavated elsewhere and placed as fill. In either case it has to be prepared to give added strength.

All sub grade material must be free of vegetable matter. The material also needs to be of a type and moisture content that it can be compacted to form a stable layer. If the material in the sub grade level is found to be unsuitable, this must be excavated and replaced with suitable material, which should then be compacted.

The sub grade must be prepared over the full width of the embankment, including the shoulders. This is generally carried out in lengths of greater than 100 meters. In some cases to maintain traffic, part width working may be necessary. If this is the case it is vital that the full width of the embankment meets the sub grade material and compaction requirements.

- **PAVEMENT LAYERS**

On large contracts Contractors are required to make arrangements for areas to process and stockpile pavement materials. Therefore generally the preparation and storage of materials along the road should not be allowed. On small contracts, however, or when existing pavement materials are to be used in the new works this may be allowed.

A sample for each material proposed to be used, along with test results, has to be submitted at least seven days before the material is used. The sample should be checked to see if the materials conform to the Specification. If the materials meet the requirements of the Specification, approval should be given by the Engineer for their use.

- **BITUMINOUS LAYERS AND MIXES**

Samples of all materials proposed to be use in the works, along with test results, should be received by the Engineer at least 14 days before the proposed use of materials. If the materials comply with the Specification, agreement should be given for test mixes or trials to be undertaken. Even if the initial bitumen sample provided complies with the Specification each consignment of bitumen delivered to site must be accompanied by a certificate. This should show the place of manufacture and the results of standard tests carried out on the particular batch of bitumen.

- ✓ **Bituminous Prime Coat**

A bituminous prime coat is a thin layer of bitumen sprayed on to a prepared road base. Either MC 30 or MC 70 cut back bitumen should be used, which should be sprayed within the temperature range included in Table 5.1. The prime coat will normally be sprayed from a spray bar at the rear of a bitumen distributor, as shown in Photo 2, at the rate given in the Contract Documents. Alternatively the rate can be directed by the Engineer.

- ✓ **Bituminous Tack Coat**

A tack coat is normally applied to make the road surface sticky prior to dense bituminous surfacing or carpeting being placed. To ensure this occurs the tack coat should therefore only be sprayed immediately before the carpeting is placed.

The tack coat will normally be applied by bitumen distributor unless labor intensive methods are agreed. The tack coat material requires to be uniformly distributed over the surface without streaking.

- ✓ **Primer Seal**

A primer seal consists of pea gravel material rolled into a cut back bitumen, which has been sprayed on to a prepared surface. The Pea gravel should be graded so that 100% of the material falls within the size range of 2.4 mm to 6.3 mm. The Pea-gravel must be free from any organic matter or clay and should be completely dust free.

The procedure to be followed is:

- Cut back bitumen is sprayed on the prepared surface
- Screened pea gravel aggregate spread to provide a dense uniform cover one stone thick.
- The aggregate to be rolled into the bitumen immediately using a rubber tyred roller for at least 4 passes before the road is opened to traffic.

- ✓ **Bituminous Surface Treatment**

This surfacing consists of nominal single size aggregate rolled into a bitumen layer, which has been sprayed on to a prepared surface. This is often known as a single surface dressing. The procedure can be repeated using a smaller single size stone rolled into the gaps to promote a good interlock between the layers, this is known as a double surface dressing.

- ✓ **Dense Bituminous Surfacing (Asphalt)**

A dense Bituminous Surfacing consists of graded aggregates, including a filler, coated with bitumen. The material is laid hot and is compacted to form a dense impervious layer. The surfacing can either form the road surface or a seal coat can be laid on the asphalt.

- **Premix Bituminous Seal Coat (Manual Method)**

A seal coat consists of generally fine graded aggregates coated with bitumen. This is placed on newly laid bituminous carpeting or an existing bituminous surface, to seal the surface. However, if well graded premixes, which have been properly controlled, have been placed a seal coat may not be required.

The aggregates should consist of 6.3mm downgraded clean pea gravel free from any vegetable matter. Where required to achieve the grading the aggregate should be mixed with clean natural sand, which is non-plastic, and also contains no vegetable matter.

Self-Check -2	Written Test

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

1. During construction, are required to be maintained to ensure proper drainage at all times.

A. Bridges B. Culverts

C. ditches D. Caves

2. Before placing any material, clearing and grubbing and the removal of any unsuitable materials needs to have been completed.

A. True B. False

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet- 3	Identified Material attributes from specification

3.1. Material attributes from specification

- **Products**

Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term **"product**" includes the terms **"material,"** "**equipment,**" "**system**," and terms of similar intent.

- **Named Products:** Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
- **New Products**: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
- **Comparable Product**: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- **Basis-of-Design Product Specification**

A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

Self-Check -3	Written Test

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

1.An Items that have not previously been incorporated into another project or facility is?

A. Named Products B. Comparable Product

C. New Products D. None

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

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

Answer Sheet

Score = _____

Rating: _____

List of Reference Materials

1. APCRDA Technical specifications (draft) for construction of Roads

The trainers (who developed the LEARNING GIDE)

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Key answers for Reading and Interpreting Plans, Maps and Specifications

LO-1- Identify types of drawings

Self-Check -1-

1. B 2. A 3. C 4.A

Self-Check -2-

1. B

Self-Check -3

1. D 2.C 3. B

Self-Check -4-

1. B 2. C 3. A

Self-Check -5-

1. D 2. B

Self-Check -6-

1. A

LO-2- Identify types of drawings

Self-Check -1-

1. D 2. E

Self-Check -2-

1. B

LO-3- Identify types of drawings

Self-Check -1-

1. B 2. B 3. A 4. B

Self-Check -2-

1. E

Self-Check -3-

1. C

Self-Check -4-

1. D 2. C 3. B

Self-Check -5-

1. A 2. C 3. B 4.B

Self-Check -6-

1. C 2. A

Self-Check -7-

1.C 2. B 3.D

Self-Check -8-

1.B 2. D

Self-Check -9-

1. B 2. C

LO-4- Identify types of drawings

Self-Check -1-

1. C 2. B 3. A

Self-Check -2-

1. C 2. B

Self-Check -3-

1. C