Masonry

Level-II

Learning Guide-24

Unit of competence: Read and Interpreting plan and Working Drawings

Module title: Reading and Interpreting plan and Working Drawings

LG CODE: EIS MAS2 M06 LO1-LG-24

TTLM CODE: EIS MAS2 M06 TTLM 0919V1

Lo1: Identify types of drawings and their purposes

Instruction sheet-1	**Learning guide 24**	

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

- Identifying The purpose and advantage of different types of drawing
- Identifying different aspects of drawings

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 purpose and advantage of different types of drawing
- Identify different aspects of drawings

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 5.
3. Read the information written in the information “Sheet 1, and information Sheet 2,
4. Accomplish the Self-check 1, and Self-check 2” in page -7 and 17 respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to next information sheet.

Information sheet-1	Identifying purpose and advantage of different types of drawing

1.1 purpose and advantage of drawing

The main purpose of construction drawings is to provide a graphic representation of what is to be built. Construction drawings should be concise and coordinated to avoid, wherever possible, ambiguity and confusion. Delays and misunderstandings can be minimized by properly coordinating the drawings.

Working drawing is the general term used for drawings that form part of the production information that is incorporated into tender documentation and then the contract documents for the construction works. This means they have legal significance and form part of the agreement between the employer and the contractor.

Specifications will detail the materials, standards, techniques, and so on required to carry out the works. Construction drawings provide the graphical representation, indicating the arrangement of components, detailing, and dimensions and so on. They may sometimes contain some of the information set out in specifications, but this should be avoided if possible, by referring to specifications rather than duplicating information.

Construction drawings are generally drawn to scale, either in an elevation, plan or section view. A complete set of construction drawings tends to comprise floor plans, elevations, sections and detail drawings that together provide a complete representation of the building. On many projects, each major trade will have separate trade drawings, e.g. electrical, plumbing and so on.

Advantages: The advantages of drawing are primarily that it’s easy to

- Improved creativity. Painting and drawing would obviously make use of one's imagination.
- Improved memory.
- Improved communication skills.
- Improved problem solving skills.
- Stress relief
- More positive emotions.
- Release of hidden emotions.
- Increase of emotional intelligence.

1.2 Identify types of drawings.

A different type of drawings is used in construction such as architectural drawings, structural, electrical, plumbing and finishing drawings. These drawings provide layout plans and details for construction of each and every part of the building.

Drawings play an important role in the construction field to convey the ideologies and perspective of the designer to the layman at site. The drawings may be used to indicate the overall appearance, inside or outside the structure, or they may be used to indicate precise measurements and other details for construction.

There are different types of drawing used for the construction process. Depending upon the purpose they serve, construction drawings are divided into 5 types,

1.2.1. Architectural Drawing

Architectural drawing can be termed as the mother drawing for all the other drawings used for construction. It contains all the details of the project such as location site plan, setting out plan, elevations, sections and other details.

- **Site Plan:** This is primary drawing used for marking out the plan on the ground. It represents the location, orientation and information about the site's topography, landscaping utilities ,and site work.
- **Working Plan:** This drawing gives the information of horizontal dimensions of the building, thickness of walls, clear spaces inside the building and column locations. it also shows the openings required in the building such as doors, windows and ventilators.
- **Section Drawings:** Section drawings represents the material of construction to be used, heights and measurement of the different components of buildings, type of structural components such as type of slab , etc. Its represents the drawing when the building is cut through a vertical plane.
- **Elevation Drawing:** Elevation drawing represents the information of openings, size and shape of external surface, height of building and finish of the building after completion. These drawings are made by having an aesthetic view of the building.

1.2.2. Presentation drawings

Drawings intended to explain a scheme and to promote its merits. Working drawings may include tones or hatches to emphasize different materials, but they are diagrams, not intended to appear realistic. Basic presentation drawings typically include people, vehicles and trees, taken from a library of such images, and are otherwise very similar in style to working drawings. Rendering is the art of adding surface textures and shadows to show the visual qualities of a building more realistically. An architectural illustrator or graphic designer may be employed to prepare specialist presentation images, usually perspectives or highly finished site plans, floor plans and elevations etc.

Figure 1.1 presentation drawing

1.2.2. Structural Drawing

Structural drawings can be termed as the backbone drawing of the building. It consists all the information about the structural intervention that is coming on a building. It contains many type of drawing with very minute details and description.

- **General Note:** This is more of a code and by laws of the buildings. No drawing is found in this, but the details of all the structural drawings are mention in this such as concrete mix, lapping length, curing time, abbreviation, codes and other work procedures.

- **Excavation Drawing;** This drawing represents the footing excavation dimension, column position, footing plan and grid lines of column.
- **Column Layout:** This drawing represents the position and orientation of columns and column reinforcement details.
- **Plinth Beam Layout:** This drawing represents the dimensions, position and section of plinth beam and the details of reinforcement in plinth beam.
- **Lintel Beam Layout;** this drawing represents the dimensions, position and section of lintel beam and the details of reinforcement in lintel beam.
- **Roof Beam and Shuttering Layout:** This drawing represents the details of reinforcement of roof beam, its section and shuttering details.
- **Roof Slab Layout**: This drawing represents the details of reinforcement of roof slab, its section and openings in the roof for various purposes such as stairs or skylight.

1.2.3. Electrical Drawing

Electrical drawing represents the details of electrical fixtures, location of switches, fan, light and others. It also represents the load calculation, tapping for electricity, wiring path and other interventions such as AC and UPS and its components.

1.2.4. Plumbing Drawing

Plumbing drawings give the location of sanitary, piping for water supply system, fixture, and the process to connect every fixture.

1.2.5. Finishing Drawings

Finishing drawings represents the finish type of every component of the building such as flooring pattern, painting color, false ceiling shape, plastering texture and elevation design. These details are sometime given in elevation drawings also.

There is no standard rule of drawings required for a project. Depending upon the type of building and requirement, types of drawings are made and issued.

Self-Check -1	Written Test

Directions: choose the Answer all the questions listed below. Use the Answer sheet provided in the next free space

1. Write the different type of drawings (3 points)

2. Write the defnation of Electrical drawing (3 points)

Note: **Satisfactory rating - 3 out of 6points Unsatisfactory - below 3 out of 6 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____

_____

_____

_____

2. _____

_____

_____

Information sheet-2	**Identifying different aspects of drawings**

2.1. Introduction

Plans are a set of drawings or two-dimensional diagrams used to describe a place or object, a set of plans can also take the form of a digital file in a proprietary format

A work of art can be analyzed by considering a variety of aspects of it individually. These aspects are often called the elements of art. A commonly used list of the main elements includes form, shape, line, color, value, space, texture and perspective.

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

- artistic drawing
- 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.

2.1.1. Different aspects of drawings

Floor plans;

The most important architectural drawing is floor plan. It contains more information than all the other working drawings. The floor plan represents a tremendous amount of the project designer's time spent in analyzing and meeting the needs of the client. Basically the floor plan is a horizontal sectional view of the building taken about 150 cm above the floor line.

Purpose: - to install the floor, to layout, constrict walls & partitions.

- Floor plan should show:-Necessary dimension
  - ✓ Interior dimension -Floor label
  - ✓ Opening dimension -Door and window symbol
  - ✓ Column center to center -Symbols of plumbing fixture

4. Change of direction -Grid lines and column
5. Over all dimensions -Cutting planes

-Floor finish

-Pavements, drainage lines, ramps

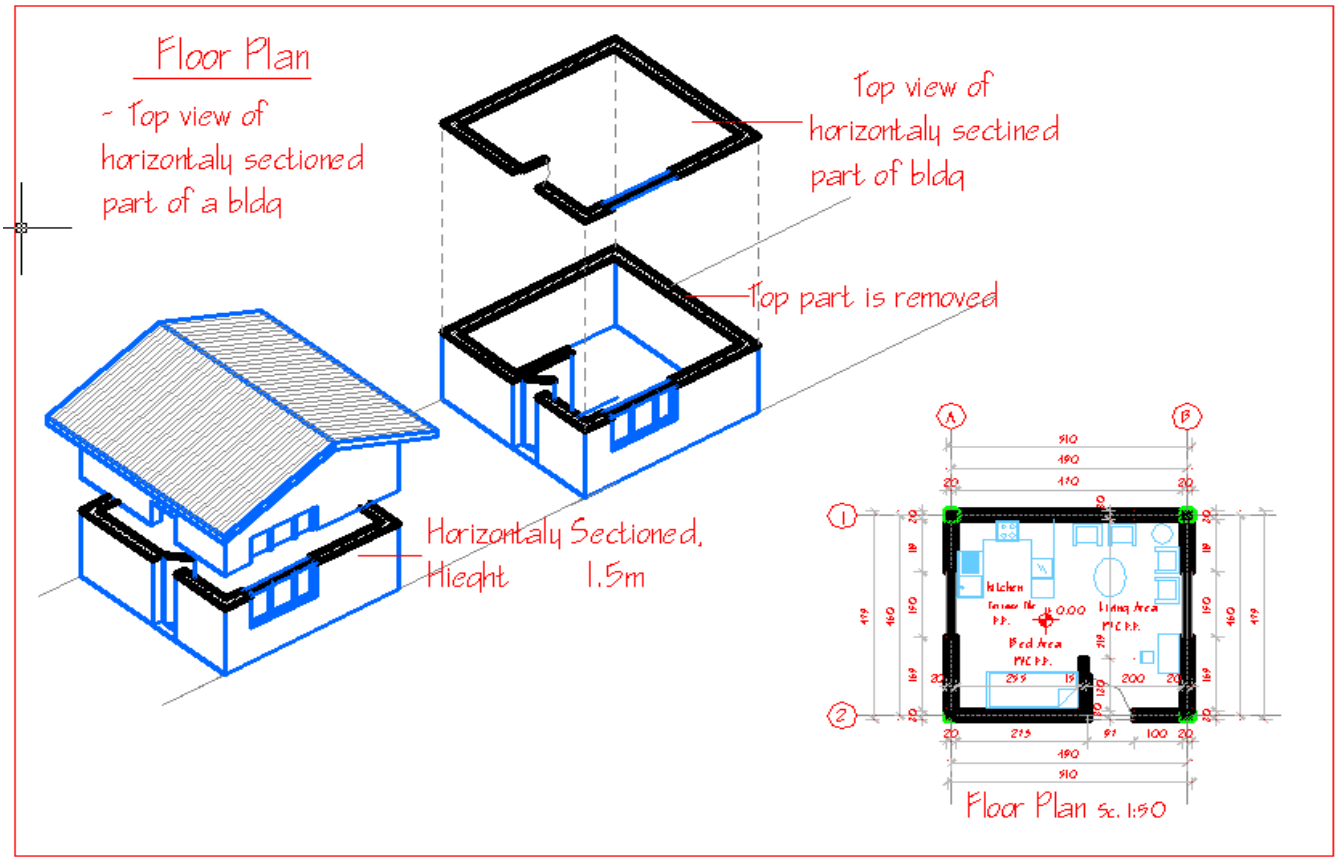


Figure 2.1 floor plan

- **Elevation drawing: -**

Is a view of a building containing a height dimension?

Purpose: - to show the height of the building & window & door.

- ✓ **Elevation should show:-**
  - Dimension
- Notes indicating material (wall finish).
- Labeling views, two methods are used to label elevation views.

1. Related to the main gate to the house.
2. Related to Orientation of a building to north ward.

- Front - North
- Rear - East
- Right - South
- Left - West

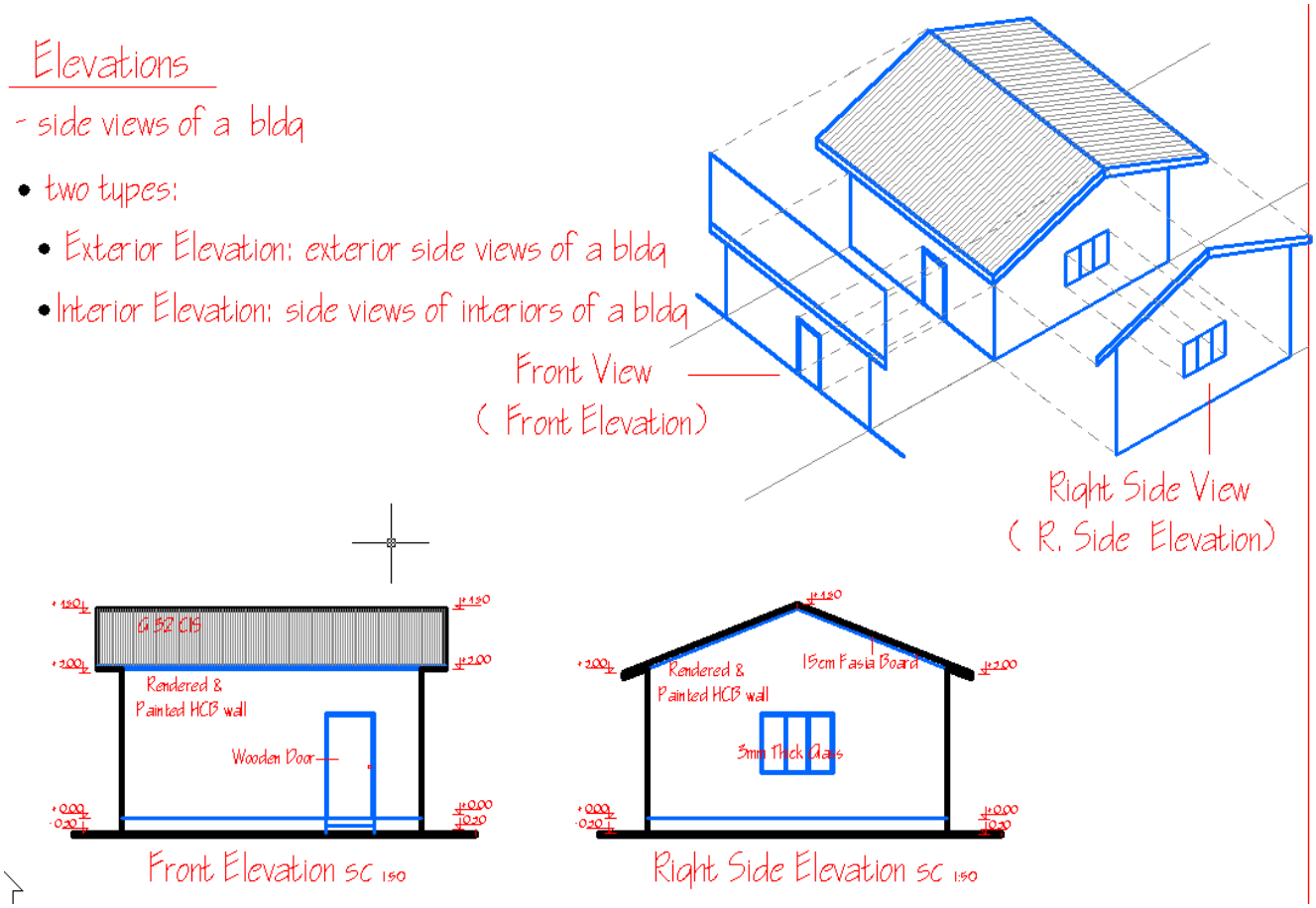


Figure 2.2 Elevation drawing

- **Sectional drawing**;

Sections are an orthographic projection that has been cut a part to show interior features or vertical views slicing the building.

Purpose: - Describe the construction materials of the structure.

Types of section: -

- ✓ **Full section**; -show the entire building construction & also show the interior spaces in elevation.
  - Longitudinal section: - take on the long axis of the building.
  - Cross section; - Taken a cross its narrow (short) axis of the building.
- ✓ **Wall section**; - shows the construction of a typical wall to a large scale.
- ✓ **Detail section**:-sections views cut through a small segment of a building & drawn with enlarge scale.
  - That provides essential specific information.
    - •Window & door section.
    - •Stair section
    - •Structural Detail section.
    - •Chimney detail.

Sectional drawing is drawn in scale of 1:50 in common working drawing package.

Placement of cutting plane It is best to be passé through:-

- Stairs: - to show vertical movement.
- Window & door: - to show details in opening.
- Important interior spaces to show the interior spaces well.

Generally it depends on the need to convey the greatest amount of information & clarity for those building the structure.

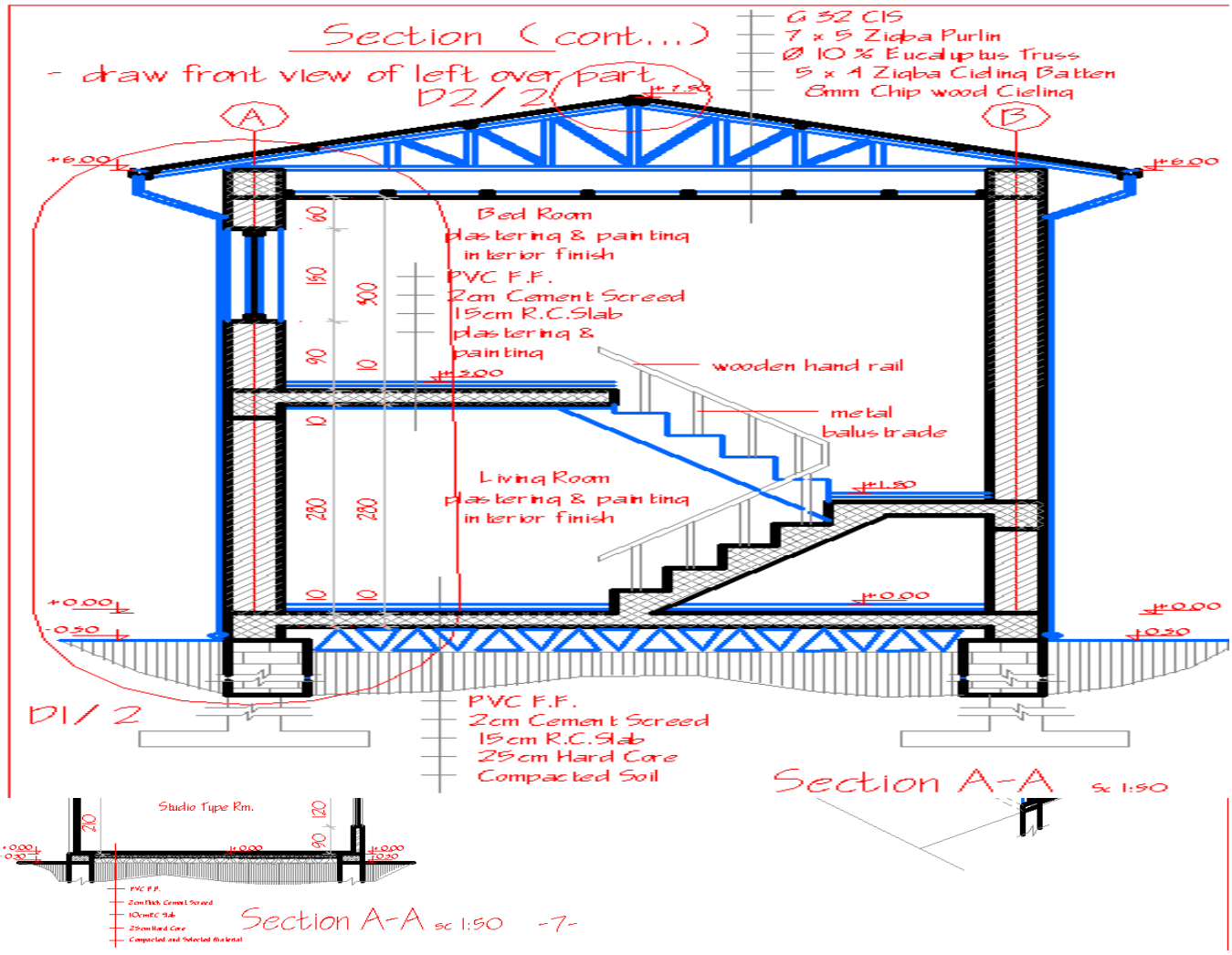
Number of section taken

It is various according to the structural complexity of the particular building.

Section should show: -

- ✓ Height dimension
- ✓ Description (necessary notes)
- ✓ Floor level & there material.

- ✓ Foundation construction material.
- ✓ Door &window Frames.
- ✓ Roof construction.
- ✓ Symbol



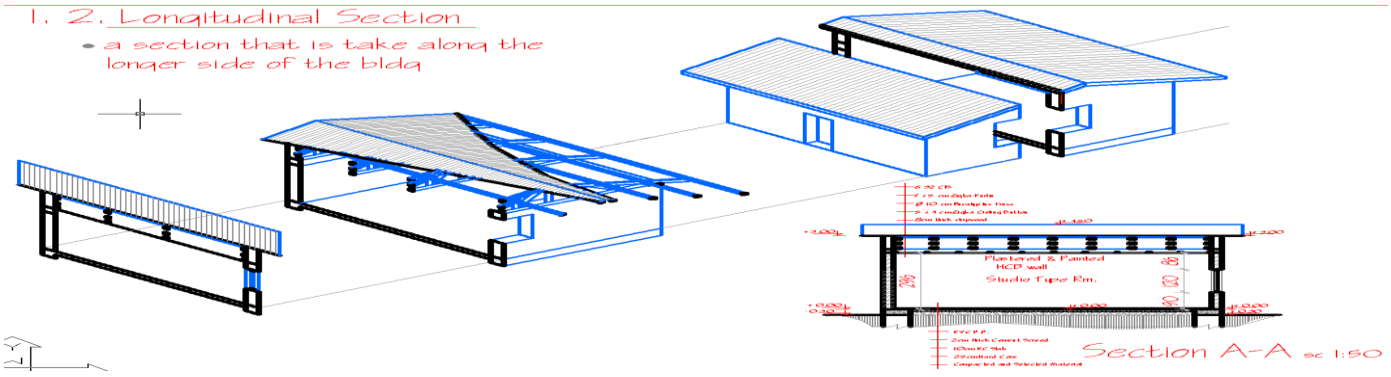


Figure 2.3 B Sectional drawing

- **Foundation plan: -**

Is a drawing showing the site & configuration of the floor plan. It is a drawing that shows the location of foundation wall concrete footings that shows the location of foundation wall concrete footings etc. which are required to support a structure.

Purpose: - to shows the entire foundation system. At point just after the back filling is completed.

To show all components such as the foundation wall footings, grade beams & any sub structure elements. It draws the same scale to the floor plan.

Foundation plan should show	
Foundation wall thickness.	Grid lines
Position at which detailed of foundation taken.	Level for excavation
Position of wall relative to foundation	Dimension
Position of services to be installed below ground level	Footing, grade beam

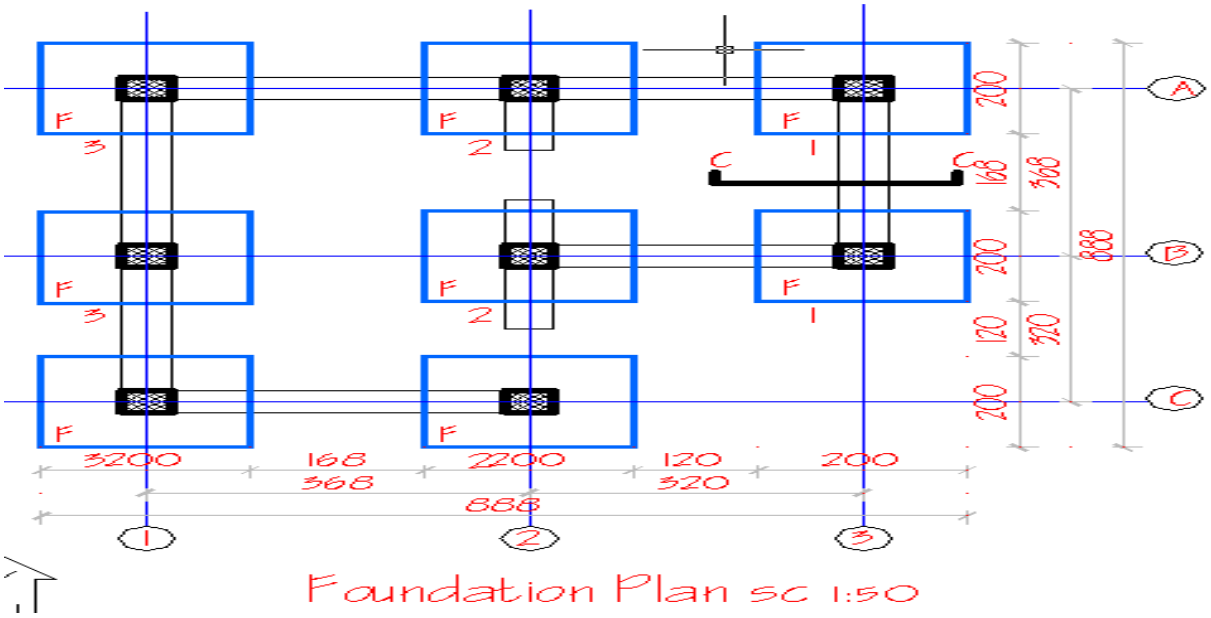


Figure 2.4 Foundation plan:

- **Site plan**:

Is the top view of a building which shows the location of the house on the site together with information on terraces walks driveways, contours, elevation & utilities?

***Site plan should show*:-**

- ✓ Streets, sidewalks, parking
- ✓ Sewerage, man hole, drainage lines
- ✓ couture, trees
- ✓ Dimension
- ✓ Fences,
- ✓ North arrow
- ✓ Legend: - showing all symbols & materials used on the site.

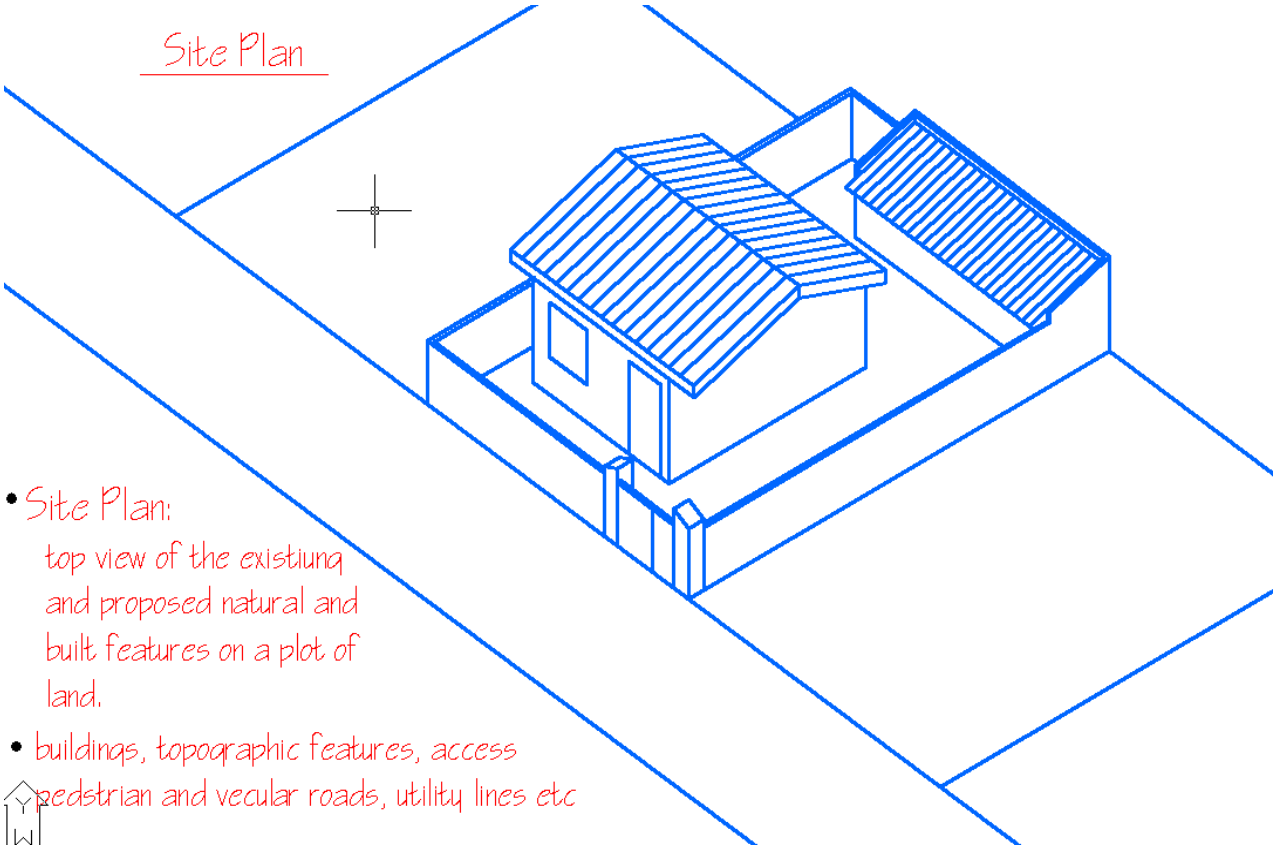


Figure 2.5 Site plan

- **Detail drawings**

Details – are enlarged drawings that provide essential specific information. a detail is often an enlarged segment of another section.

Purpose

- ✓ Used to describe and define areas that require additional emphasis
- ✓ Provided for areas that are too small on plans to describe fully and dimension accurately. Like parts toilet rooms, local rooms kitchen, stair, chimney etc.
- ✓ Well detailed designed
  - Reduced the involvement of the designer in construction phases
  - Easy to supervision
  - Easy to understand assembly of parts by this whole construction clear and reduces the construction phase. Most of the time the contractors' question, the delay of construction time is because of poorly detailed drawing.

Scale of Detail

- ✓ In almost every set of drawings, for a building of any size, detail drawings are necessary for a complete and finished project. Details may be presented in section, plan, elevation or isometric form and usually drawn in a scale 1:1, 1:2, 1:5, 1:10 and 1:20.
- ✓ Before detailing a number of facts can be adjusted.
  - The number of details to be shown
  - The scale of the details
  - What detail to show?

- Some of the more common areas where detailing should be used
  - ✓ Wall section
  - ✓ Stairs to describe framing connection to stair well riser /run dimension and its method of attachment
  - ✓ Chimney
  - ✓ Door and window sill and lintel installation
  - ✓ Foundation details
    - Floor and foundation connection

- Wall and foundation connection (exterior wall/ partition wall)
- Footing detail

✓ Roof details

- Roof opening and terminations
- Wall and roof connection
- Roof eave detail
- Roof flashing detail
- Flat roof construction detail
- Tress detail
- Sky light detail

✓ Frame connections.

Self-Check -2	Written Test

Directions: choose the best answer. Use the Answer sheet provided in the next page:

1. Site plan should show:- (2 point)
   A. Dimension B. North arrow
   B. Fences C. All
2. Which of the following Types of section : (2 point)
   A. Full section C. detail section
   B. Wall section D. all are correct
3. The most important architectural drawing is_____.(2 point)
   A. Floor plane C. door frame
   B. Roof structure D. none

Note: **Satisfactory rating – 3 and above points** **Unsatisfactory –below 3 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1._____

2._____

3._____

List of reference

- **Gary R. Bertoline et al. (2002) *Technical Graphics Communication*.**
- Alan Piper, *Drawing for Designers*. Laurence King Publishing 2007. ISBN 978-1-85669-
- *Ching, Frank (1985), Architectural Graphics – Second Edition, New York: Van Norstrand Reinhold, ISBN 0-442-21862-1*
- https://www.youtube.com/watch?v=ExRRHY9wT6Q
- https://www.bikecad.ca/custom_aspect_ratio
- https://www.youtube.com/watch?v=i8yUQfSrScc

Masonry

Level-II

Learning Guide-25

Unit of Competence: - Read and Interpreting plan and Working Drawings

Module Title: Reading and Interpreting plan and Working Drawings

LG CODE: EIS MAS2 M06 LO2 -LG-25

TTLMCODE: EIS MAS2 M06 TTLM 0919V1

Lo2: Apply commonly used symbols and abbreviations

Instruction Sheet-1	Learning guide 24

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

- Identifying, understanding and applying Commonly used symbols and abbreviations
- identifying ,understanding and applying Common building and construction terms

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, understand and apply Commonly used symbols and abbreviations on drawings
- identify, understand and apply Common building and construction terms used on drawings

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 5.
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,6 and 13 respective
5. If you earned a satisfactory evaluation from the "Self-check" proceed to next information sheet.

Information *sheet-1*	**Identifying, understanding and applying commonly used symbols and abbreviations**

1.1 Introduction

Some drawings need to convey a lot of information. To avoid confusion and to save space, abbreviations and symbols are used. These are standardized and you'll find that you soon become used to interpreting what they mean. In this section you'll be introduced to some of the more common abbreviations and symbols.

Symbols: the representation of actual object by some notation which convey the necessary information. Symbols are used instead of words on drawings to save space. There are a lot of them, but they're standardized (drawn the same way) to avoid confusion, so don't worry. Some of them look a lot like what they represent

Abbreviations : can be created in different ways. In some cases the word is shortened. A list of common abbreviations found on drawings or in general use in structural engineering, architecture and construction.

2.1.1. Symbols & abbreviations

- *Architectural Abbreviation*

HCB – Hollow concert block

GIS – Galvanized iron sheet

T—Double shutter

S—Single shutter

W—Window

D—Door

CB—Concert Block

FF—Floor Finishing

CIS-- Corrugated iron sheet

Ar= architectural

- *Architectural symbol*

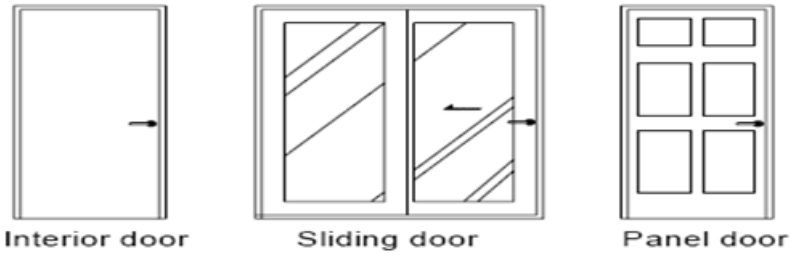
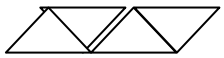
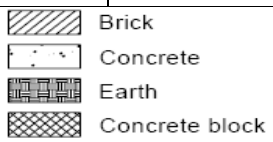


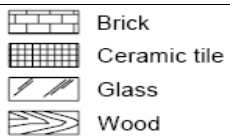
Figure 9. Examples of door symbols in plan view

Figure 1.1 Examples of window symbols in elevation view

Table 1.1 Structural symbol & abbreviation

#	no of bar		IB	intermediate beam
Ø	diameter,		FC	footing column
	Column, beam & lintel		UB	upper tie beam
	Bottom bar		L	lintel
	Hard core symbol		S	slab
F	footing		RCC	reinforcement cemented concert
C	column		C/C	center to center
GB	grade beam			





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

figure 1.2 projection symbol

- **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 LINE	CENTER LINES ARE USED TO SHOW THE CENTER OF HOLES AND SYMMETRICAL FEATURES.
SYMMETRY LINE CENTER LINE THICK SHORT LINES	SYMMETRY LINE	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.

. **Figure1.3 different types of line symbol**

Self-Check 2	Written Test

Directions: Choose the best answer 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 diameter?

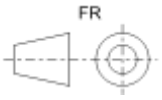
a) # B. Ø C.  D. 

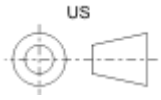
_____2 which one of the following is the symbol of Bottom bar?

A. ———— b . 

C .  d. 

_____3. One of the following is the symbol of Projections Symbols?

A. 

b. 

c.  d.  E. "A" and "B" are correct

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

3. _____

4. _____

5. _____

Information *sheet-2*	identifying ,understanding and applying Common building and construction terms

2.1 introductions of building and construction terms

The construction industry is a complicated industry, with architects, engineers, machine operators, project managers and laborers all combining to bring unique skill sets, understandings and their own interconnected vocabularies.

Construction has a number of unique 'terms', which these different professions and people use to describe their jobs, activities and what needs to be done.

2.1.1 Construction management terms

Construction management and construction project management are filled with acronyms, interesting terms and a good dose of jargon.

So here's a list of the construction management terms you should be aware of - and well versed in:

Work Breakdown Structure (WBS) - A work breakdown structure is one of the most important construction management terms. Work breakdown structures enable construction and project managers to breakdown project deliverables into sub-deliverables, which enables companies to manage project into manageable pieces.

Stakeholder - Stakeholder can often be confused with shareholder, and vice versa. A stakeholder is an important term, because a stakeholder is any person who is engaged with and influenced by a project including contractors, subcontractors, governments and communities.

Baseline - Baseline is a construction term which is thrown around a lot, and for good reasons. Baselines are used to measure the performance, progress and results of a project. Some of the more common baselines include cost baselines, production baselines and schedule baselines.

Triple constraint - The triple constraint is a term, but also a concept which you should be aware of. It refers to the 3 major and constant constraints involved in delivering a project: time, scope and cost with quality at the center of the constraints.

Gantt chart - Gantt charts are on the most powerful project management terms. A gantt chart is simply a visual representation of a schedule, and you will be seeing and hearing about a lot of gantt charts.

Contingency plan - Contingency plans are one of the construction terms you may hear during the planning phase of a project. A contingency plan is simply a 'backup' plan which a company can engage when the original plan fails to work or has some issues.

Critical path method (CPM) - The critical path method is a methodology which enables construction companies to analyse the critical steps in the project - separating them from the non-critical paths.

Deliverable - One of the most commonly used construction terms for project managers: the deliverable. Every project will require a certain number of required outputs/results - known as deliverables. A specific phase of a project or specific document or report is examples of deliverables.

Change requests - Most construction projects feature changes from the original plan. Change requests take on many different construction terms in the industry, including variations, change orders and change requests.

Quality control and quality assurance - Quality is a broad and extremely commonly used construction term. Quality refers to a product or service being fit for purpose, while quality control and assurance are terms which describe how quality will be maintained and communicated.

2.1.2. Construction technology terms

Construction technology has become more and more important for the construction industry in the last 10-15 years, and continue to grow in importance today.

The below construction technology terms highlight some examples of construction technology:

Construction software:- Construction software is one of the most commonly used construction terms, and it can refer to any software-based product or tool which seeks to digitize an aspect of a construction activity - through desktop based software and 'apps'.

Construction hardware: - construction hardware on construction sites, but when used in the context of technology, people are referring to hardware like sensors, which connect to software products to automate tasks and deliver insights through data.

Cloud-based - Cloud-based refers to a product which is stored, managed, and processed on a network of remote servers hosted on the Internet.

Interoperability - A less commonly used construction term, but an important one, construction interoperability refers to whether or not different tools can communicate directly with one another. For example, PDFs and word docs are not fully interoperable.

Artificial intelligence - A construction term which is pretty hot right now and thrown around all too often, artificial intelligence refers to systems which are able to perform tasks normally

requiring human intelligence, such as visual perception, speech recognition and complex decision making.

2.1.3 Building construction terms

Building construction has it's own set of building construction terms to know, and depending on your role or specific construction function, you may or may not hear a lot of these terms.

Balustrade - Balustrades are a common building construction terms because they are the vertical support members of stairs, platforms, landings and bridges.

FINIAL - Finials are like many building construction terms, rather confusing unless you know the definition. A finial is the decorative fitting used at the junction of ridges and hips. These junctions occur on conical, pyramid and domes roofs.

Herringbone bond - Herringbone can be used in a number of different ways, because it is a specific diagonal pattern used in paving, tiling and other pattern-based activities.

laminate - Laminate is a commonly used construction term, but one which can be confused. Laminate is simply any product made by bonding together two or more layers.

Rafter - There's plenty of different types of rafters (common rafters, cripple rafters, hip rafters etc.), but they all share a common meaning: they are the sloping member of a roof which provide the main structural support for the roofing material.

Seasoning - Don't get caught out if someone uses this construction term just before or during lunch. While they may be using the term to ask for the salt and/or pepper, there's a chance they are referring to the building construction term about eliminating excess moisture from timber by air or kiln drying.

Shoring - Kind of what it sounds like, shoring is a building construction term which refers to the support of a building to prevent it collapsing. Shoring is a term most commonly used before excavation or demolition.

Vent - Most people know what a vent is, but how about the technical definition? A vent is a pipe which enables the discharging of pressure and/or gas to limit pressure fluctuations.

Valve - Similar to the vent, a valve is a device which controls in this case, the movement of liquid or gas through a specific item such as a piston or gate.

Sump - A sump (also called a drain pit), is a pit at or below the lowest point of any structure. The sump collects unwanted water and facilitates its removal.

Acrow prop - An acrow prop (commonly referred to as acrows) are struts which are adjustable in length and used as temporary supports for structures and scaffold.

2.1.4 Construction equipment terms

Construction equipment terms are some of the more important construction terms to know, because they are often referred to in a direct manner:

Earthmover - Earthmover is a pretty straightforward construction term, referring to any machine which is built and used to dig dirt or move earth, including blackhoes and bulldozers.

Crawlers - Crawlers is a construction term which is harder to lock down, because it is more broad than many construction terms. Crawlers are versatile machines which do a bunch of things including digging trenches, lifting pipes and loading trucks - typically through various attachments including grapples, breakers and shears.

Cat skinner - Cat skinner is an interesting term which describes a person who actually operates a bulldozer.

Articulated truck - Articulated trucks are a particular type of truck used in construction and other industries like mining, to carry heavy loads over rough terrain and environment.

Hand tools - There are way too many hand tools to cover in a single construction term dictionary like this, so we'll leave the tools for another day.

2.1.5 Construction estimating terms

Construction estimating is a vital skill and practice in the industry, and can mean the difference between 'winning' and 'losing'.

The construction estimating terms below form a large part of the safety net, tools and strategies which construction companies use to better estimate their projects and ultimately deliver on time and on budget.

The next time you are in one of those construction estimating meetings, you'll be in good shape with these terms.

Bid bond - A bid bond is a formal and written guarantee issues by a third party, assuring that the work performed will be performed in-line with the contract.

Bill of materials - A bill of materials outlines in a list, the materials required to deliver a project (or part of a project).

Building information model (BIM) - A building information model is a computerised model of a building in multiple dimensions, allowing digital and hypothetical changes in plans.

CAD - CAD is one of the most common construction estimating terms, referring to any type of computer assisted drawing, which similar to BIM, allows for digital modelling and estimating.

Cost validation - A cost validation is a critical check and balance on a construction firms own estimate. A cost validation is a professional affirmation that the cost of the materials and/or labour is consistent with the estimate.

Performance bond - Similar to a bid bond, a performance bond is a guarantee secured by a third party by the winning bidder, that work will be completed according to the the contract and project plans and specs.

Riser diagram - A riser diagram is a diagram which companies use to illustrate and depict a system, such as an electrical or plumbing system which travels through and up and down a building.

Specification (spec) - Spec is a construction term which is thrown around a lot, but what does it actually mean? A specification is the inclusion of a product into the construction plan.

Value engineering - We will dive into construction engineering terms next, but value engineering is still estimating related, being a suggested alternative to save money on a construction project.

2.1.6 Construction engineering terms

Engineering is a technical subject and profession, and it has it's fair share of technical jargon and interesting construction terms.

There are many different types of engineering, and we will try to focus on construction-related engineering terms here.

Beam - Beams come in various forms including simple beams, cantilever beams and continuous beams, and all beams share the common term meaning of being a structural member which carries loads cross-ways to their longitudinal axis.

Cantilever - A cantilever is the part of a member which extends over a beam and is not supported at its end.

Continuity - Continuity shares many things in common with the word continue. Continuity describes the transfer of loads and stresses from member to member as if there were no connections.

Dead load - Dead load describes the loads from the weight of the permanent components of a structure - in contract to dynamic loads which vary over time.

Girder - Girder is another structural construction engineering term, referring to the main horizontal member spanning between to main supports.

Kip - Some words in construction engineering simplify normal everyday language. A kip is simply 1000 pounds.

Joist - Joist is one of the more commonly used construction terms, referring to a load-carrying member with a web system used to support floors and roofs - two of the most common elements of any building.

Shear - Most people have heard of sheared bolts, and this describes the term sheared well. Shear refers to the force resulting in two touching parts of a material sliding in opposite directions, often resulting in damage.

Torsion loads - A torsion load is a load which causes a member to twist.

Self-Check 2	Written Test

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

_____1.Which one of the following Construction engineering terms (3 points)

b) Beam C.) Torsion loads

B.) cantilever D). all are corect

_____2 which one of the following Construction equipment terms (3 points)

A.) Earthmover b) cemant

C). Sand d.) *aggregate*

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

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

Answer Sheet

Score = _____
Rating: _____

Name: _____ Date: _____

1. _____

_____

_____

_____

2. _____

_____

_____

List of References

ASTME (2007), Y14.38–2007: Abbreviations and acronyms for use on drawings and related documents, ASME

Masonry

Level-II

Learning Guide-26

Unit of competence: Reading and Interpreting plan and Working Drawings

Module title: Reading and Interpreting plan and Working Drawings

LG CODE: EIS MAS2 M06 LO3-LG-26

TTLM CODE: EIS MAS2 M06 TTLM 0919V1

LO3: Locate and identify key features on a site plan

instruction sheet-1	Learning guide 26

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

- Identifying building site location
- Identifying true north and building orientation

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 building site is from location drawings.
- Identify true north and building orientation from details provided on the site plan.
  - ✓ Identify The *key features of the site plan*

Learning Instructions:

6. Read the specific objectives of this Learning Guide.
7. Follow the instructions described below 3 to 5.
8. Read the information written in the information “Sheet 1, and Sheet 2,
9. Accomplish the “Self-check 1, Self-check and 2, **in** page -5 and 10 respectively.
10. If you earned a satisfactory evaluation from the “Self-check” proceed to “Read the next information Sheet

Information sheet-1	Identifying building site location

1.1. Building site location

Site location plan is a map base that shows the location of the application site in relation to surrounding roads, buildings and other land. Site location plans should. Identify sufficient roads and/or buildings on nearby land to ensure that the exact location of the application site is clear

A site layout plan shows a detailed layout of the whole site and the relationship of the proposed works with the boundary of the property, nearby roads and neighboring buildings. Most applications should include an existing site layout plan and a proposed site layout plan.

Construction Staking, also known as a Site Layout Survey, is the process of interpreting construction plans and marking the location of proposed new structures such as roads or buildings. Construction staking is performed to ensure a project is built according to engineering design plans.

A location plan: location plan provides an illustration of the proposed development in its surrounding context. This enables the planning authority to properly identify the land to which the application refers, and is typically based on an up-to-date Ordnance Survey (or similar) map. A location plan should use an identified standard metric scale, typically 1:1250 or, for larger sites, 1:2500, and generally fits onto an A4 size sheet when printed. It is important that the plan indicates the direction of North, to make its orientation clear.

The plan will typically illustrate the following:

- Roads and/or buildings on adjoining land.
- The site boundaries.
- Land necessary to carry out the proposed development (outlined in red).
- Any other land owned by the developer that is close to or adjacent to the site (outlined in blue).

A location plan is different to a site plan which is specifically focused on providing more detail of the development within the site boundaries, or a block plan which may give a slightly wider illustration of the immediate area surrounding the site.

1.2. Identifying Location Drawings

Sketch: - this can be defined as a draft or rough outline of an idea; it can be a means of depicting a Three-dimensional form in a two-dimensional guise.

Site Plans :– used to locate site, buildings, define site levels, indicate services to buildings, identify parts of site such as roads, footpaths and boundaries and to give setting-out dimensions for the site and buildings as a whole. Suitable scale not less than 1: 2500

Floor Plans: – used to identify and set out parts of the building such as rooms, corridors, doors, windows, etc. Suitable scale not less than 1:100

Elevations: – used to show external appearance of all faces and to identify Doors and windows. Suitable scale not less than 1: 100

Sections: – used to provide vertical views through the building to show method of construction. Suitable scale not less than 1: 50

Component Drawings: – used to identify and supply data for components to be supplied by manufacturer or for components not completely covered by assembly drawings. Suitable scale range 1: 100to 1: 1

Assembly Drawings: – used to show how items fit together or are assembled to form elements. Suitable scale range 1: 20 to 1: 5

1.2.1. How to Choose a Building Location

When growth forces your company to move to a bigger or second location, there's a lot that needs to be done. The first step is to choose a new location to build on. To do this, there are a few obvious considerations like traffic, ease of access for customers, and the commute for employees, but there some other factors you may not be aware of. These other factors will have a big impact on the long-term success of the new building.

1.2.1. Site Survey

When you find a site you think might be a winner, check the following criteria to see how it stacks up.

- Grade of the site- will there need to be a lot of dirt work to get the site ready?
- Load capacity- how much weight cans the soil support?
- Dimensions- are the site big enough for your project?
- Environmental Factors- is the site located in a flood plain or high-wind zone?

Self-Check -1	Written Test

Directions: choose the best answer. Use the Answer sheet provided in the next page:

1. Floor Plans Suitable scale not less than(3 points)
   A. 1:200 B) 1:100
   B. 1:250 C) 1:150
2. When you find a site you think might be. (3 points)
   A. Grade of the site-
   B. Dimensions
   C. Load capacity
   D. All are correct

Note: **Satisfactory rating – 3 above point Unsatisfactory - below 3 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1._____

_____

2._____

_____

Information sheet-2	Identifying true north and building orientation

2.1. Building Orientation

Building orientation refers to the way a building is situated on a site and the positioning of windows, rooflines, and other features. A building oriented for solar design takes advantage of passive and active solar strategies. Passive solar strategies use energy from the sun to heat and illuminate buildings. Building orientation and building materials also facilitate temperature moderation and natural day lighting. Active solar systems use solar collectors and additional electricity to power pumps or fans to distribute the sun's energy. Heat is absorbed and transferred to another location for immediate heating or for storage for use later.

To make the most of the sun for warmth and natural light, your home's main living areas (or any rooms you use a lot) should face north. The main glazing in the house, such as windows and glass doors, should also face north. Anywhere between 20°W – 30°E of true north is fine.

Ideally, for energy-conserving purposes, a house on an east- or west-facing lot should also have the long side facing south if possible. With the ridge line oriented east-west, this may mean that a narrow side of the house faces the street.

The fact the Sun is lower in the sky in winter than in summer allows us to plan and construct buildings that capture that free heat in winter and reject the unneeded heat in summer. The solar orientation of the whole building plays an important part in ensuring such a 'passive' process works consistently.

2.1.1. How to Optimize Building Orientation

It is best to incorporate passive solar systems into a building during the initial design. Passive solar systems utilize basic concepts incorporated into the architectural design of the building. They usually consist of: o Rectangular floor plans elongated on an east-west axis o Glazed south-facing wall of Thermal storage medium exposed to the solar radiation o Light shelves/overhangs or other shading devices which sufficiently shade the south-facing elevation from the summer sun; south elevation overhangs should be horizontal while east and west elevations usually require both horizontal and vertical overhangs5 o Windows on the east and west walls, and preferably none on the north walls In addition to passive solar and energy-conserving strategies, active solar systems can be integrated into a building's design and systems. Buildings designed to serve as active solar collectors should not be shaded by nearby trees or buildings and should have solar arrays or roof area facing south. Both passive and

active solar collectors should be oriented at the angle of your location's latitude (in New Jersey, this is approximately 40°N)

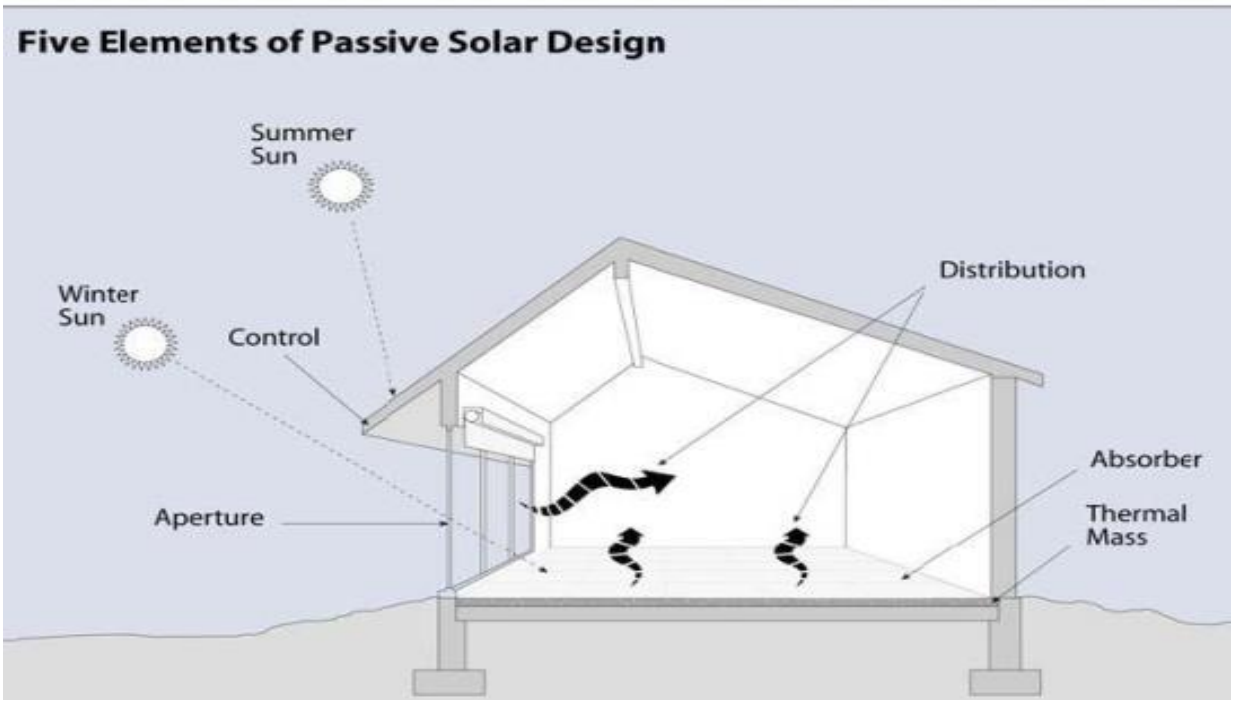


Figure 1.1. Elements of passive solar design

2.2. Identifying True North

Project North - is the way architects like to lay out a plan on a sheet, i.e. long side in the long direction of the paper, trying to have north(or close to it straight up on the sheet). So basically you start your project as if there was NO site, Draw the building how you'd like it on the paper. Then when you get site info, bring it in and rotate it to match PROJECT NORTH. Then use the rotate this project function to get the True north views as needed. This is the part that is somewhat tricky, you need to determine the angle off of horizontal that your plan needs to rotate, input that, and it may rotate the wrong way, so you do it again with a negative or adding 90, or whatever gets it right.

North Facing Windows: Windows which face North never get sunlight coming through them. If the window is facing North East, or North West you'll get some in the mornings / evenings especially during summer. Without any sunlight this natural heat source is nonexistent.

2.3. Identify the *key features of the site plan* (plot plan)

It shows the location of the house on the site. Together with information on terraces, drive ways, contours, elevation & utilities.

A site plan is a drawing showing various properties in terms of their owners, locations, elevations, states of development and features such as roads, utility supply lines, etc.

2.3.1. Site orientation

This refers to a system of defining the site in terms of its direction of the north, south, east & west or orientation is important in planning the building area to take into consideration factors such as the direction rain, wind & sun within the site always an arrow (symbol) indicating the north must be drawn on the site plan.

2.3.2. Components of a site plan

Survey beacons: these are concrete pillars located at principal corners of the site and at every change in the direction of boundaries. They define the boundary and area of the site.

- Elevations: these are the different heights on the surface of the site in relation to a standard reference point known as the bench mark (BM).

    - ✓ Locations which have equal elevations are joined together using contour lines.
    - ✓ These lines help to define the topography of the land within a site.

Site orientation: This refers to a system of defining the site in terms of its direction to the north, south, east and west.

- ✓ Orientation is important in planning the building area to make into consideration such factors as the direction of rain, wind and sun within the site.

- Physical features: these are permanent objects or features existing within the site or adjoining sites which are used for referencing or identification of the site.

    - ✓ Ex. Existing buildings, trees, roads, fences, etc.

- Access road: these shows the means of reaching the site. Access road: these shows the means of reaching the site.

- Utilities: A site plan shows utility supply lines such as for water, electricity and gas.

The scales used in drawing a site plan are:

- ✓ For small sites: Scales of 1:100, 1;200
- ✓ For large sites: Scales of 1:500, 1:1000, 1:2500

- **Checklist site plan**

  - ✓ Property lines-lengths each side, direction
  - ✓ Adjoining building, streets, sidewalk parking, curbs parkways.
  - ✓ Existing structures and proposed structure.
  - ✓ All utilities lines (sewer, electric, telephone).
  - ✓ Contours, existing, new: contour elevations.
  - ✓ Dimension
    - Property lines
    - Side yards, pears, front yard
    - Street center line
    - Length of walks and walls
    - Dimensions of building to property line
  - ✓ Fences, structural retaining walls, area ways and pools
  - ✓ North arrow
  - ✓ Drainage lines
  - ✓ All existing paving weather to remain or to remove, new paving, parking lots, steps, platforms, signs, play fields, foundations, etc.
  - ✓ Tree, shrubs, if exist
  - ✓ Legend showing all symbols and materials and materials used on the site.

Self-Check -2	Written Test

Directions: give short answer. Use the Answer sheet provided in the next page:

1. Define building orientation (3 points)
2. Define True North. **(3** points)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1. _____

_____

2. _____

_____

List of Reference

- https://www.youtube.com/watch?v=p53DT5mGadE
- https://www.youtube.com/watch?v=HYQjpy77bes
- https://www.youtube.com/watch?v=ly8orBNiNQM
- BS EN ISO 7519: Technical drawings. Construction drawings. General principles of presentation for general arrangement and assembly drawings.

Masonry

Level-II

Learning Guide-27

Unit of competence: Reading and Interpreting plan and Working Drawings

Module title: Reading and Interpreting plan and Working Drawings

LG CODE: EIS MAS2 M06 LO4-LG-27

TTLM CODE: EIS MAS2 M06 TTLM 0919V1

Lo4: Identify and locate key features on drawings

instruction sheet-1	Learning guide 27

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

- identifying key features of plans, elevations and sections
- identifying Client requested variations

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 key features of plans, elevations and sections.
- Identify Client requested variations to standard plans on drawings.

Learning Instructions:

11. Read the specific objectives of this Learning Guide.
12. Follow the instructions described below 3 to 6.
13. Read the information written in the information “Sheet 1, and Sheet 2,
14. Accomplish the “Self-check 1, and Self-check 2, in page, 8 and 14 respectively.
15. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1 in page -15.
16. Do the “LAP test” in page – 15 (if you are ready).

Information sheet-1	identifying key features of plans, elevations and sections

1.1. Introduction

Key Plans are floor **plans** showing primary **architectural** elements of each building by floor level. They graphically represent walls, doors, windows, room numbers, and other features. **Key Plan** reports are available with varying levels of detail: Base **Key Plan**: room number, square footage.

1.1.1. Identifying key features construction plans

The basic components of structural construction building plan include are the foundation, floors, walls, beams, columns, roof, stair, etc. These elements serve the purpose of supporting, enclosing and protecting the building structure.

- **Roof**

The roof forms the topmost component of a building structure. It covers the top face of the building. Roofs can be either flat or sloped based on the location and weather conditions of the area.

- **Parapet**

Parapets are short walls extended above the roof slab. Parapets are installed for flat roofs. It acts as a safety wall for people using the roof.

- **Lintels**

Lintels are constructed above the wall openings like doors, windows, etc. These structures support the weight of the wall coming over the opening. Normally, lintels are constructed by reinforced cement concrete. In residential buildings, lintels can be either constructed from concrete or from bricks.

- **Beams and slabs**

Beams and slabs form the horizontal members in a building. For a single storey building, the top slab forms the roof. In case of a multi-story building, the beam transfers the load coming from the floor above the slab which is in turn transferred to the columns. Beams and slabs are constructed by reinforced cement concrete (R.C.C).

- **Columns**

Columns are vertical members constructed above the ground level. Columns can be of two types: Architectural columns and structural columns. Architectural columns are constructed to improve the building's aesthetics while a structural column takes the load coming from the slab above and transfers safely to the foundation.

- **Walls**

Walls are vertical elements which support the roof. It can be made from stones, bricks, concrete blocks, etc. Walls provide an enclosure and protect against wind, sunshine, rain etc. Openings are provided in the walls for ventilation and access to the building.

Masonry construction is defined as a type of construction in which masonry units are placed by hand with mortar between them. There are many types of masonry walls, but the most common may be classified as:-

- ✓ Clay masonry
- ✓ Stone masonry
- ✓ Cavity wall masonry
- ✓ Hollow unit masonry such as concrete masonry unit (CMU)
- ✓ Solid masonry such as clay or concrete brick units
- ✓ Grouted masonry such as clay or concrete brick units filled by pouring grout,
- ✓ reinforced grouted masonry, and
- ✓ Reinforced hollow unit masonry.

These have developed in different ways and have a variety of uses in common construction.

- **Floors**

The floor is the surface laid on the plinth level. Flooring can be done by a variety of materials like tiles, granites, marbles, concrete, etc. Before flooring, the ground has to be properly compacted and leveled.

- **Stairs**

A stair is a sequence of steps that connects different floors in a building structure. The space occupied by a stair is called as the stairway. There are different types of stairs like a wooden stair, R.C.C stair etc.

- **Plinth Beam**

Plinth beam is a beam structure constructed either at or above the ground level to take up the load of the wall coming over it.

- **Plinth**

The plinth is constructed above the ground level. It is a cement-mortar layer lying between the substructure and the superstructure.

- **Foundation**

The Foundation is a structural unit that uniformly distributes the load from the superstructure to the underlying soil. This is the first structural unit to be constructed for any building construction. A good foundation prevents settlement of the building.

1.2. Identify feature of section

A **section plan** is a vertical slice drawing showing the internal features of your property. The **section plan** is to help the architect to get an idea of the height of the internal floors of the property and features on the wall. The **section plan** is usually combined with other **plans** on a measured building survey.

Section drawings are created to view a specific section on the building. There are different kinds of sections that can be made. First is the

Basic room section: - where the interior of the room layout can be viewed in elevation.

Detail section: - The detail section is utilized to view an accurate depiction of the internal contents. For example the detail section for a wall, will show internal cuts of gyp board, stud, plates and insulation. The section cut gets more detailed by producing an enlarged section from the area of the section cut.

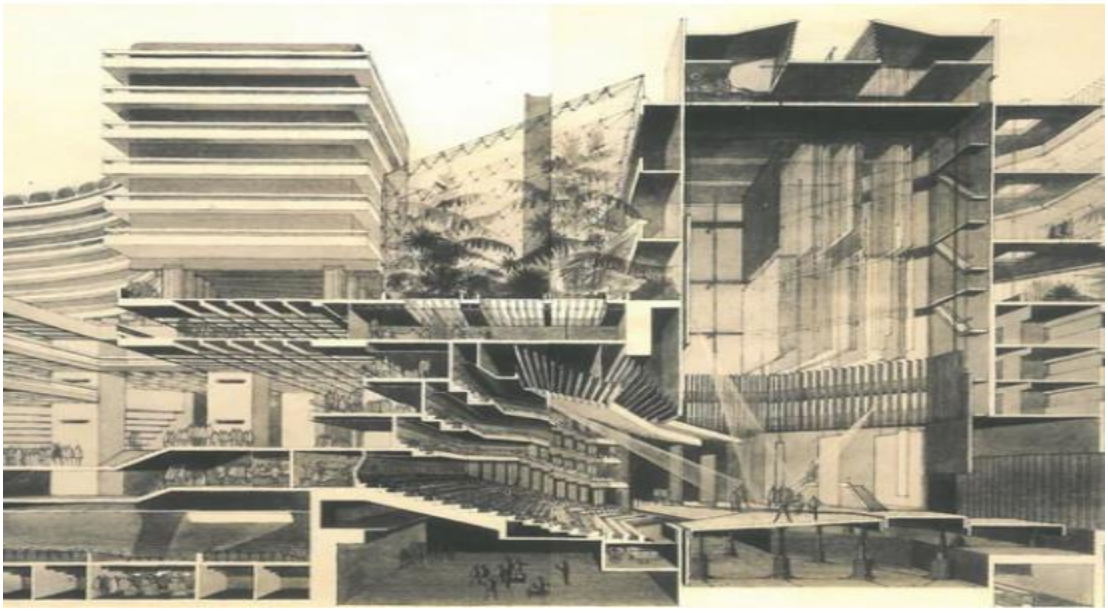


Figure 1.1 section drawing

1.3 identify features of elevation

An elevation drawing is an orthographic projection drawing that shows one side of the house. The purpose of an elevation drawing is to show the finished appearance of a given side of the house and furnish vertical height dimensions. Four elevations are customarily drawn, one for each side of the house.

- An elevation plan ordinarily includes the following:
    - Identification of the specific side of the house that the elevation represents
    - Grade lines
    - Finished floor and ceiling levels
    - Location of exterior wall corners
    - Windows and doors
    - Roof features
    - Porches, decks and patios
    - Vertical dimensions of important features
    - Material symbols
- Grade Line, Floors & Ceilings
    - ✓ The reference point for most elevations is the grade line.
    - ✓ All features, which are below the grade line, should be drawn with hidden lines.
    - ✓ Examples are: foundation walls, footers & window wells
    - ✓ Drawing a centerline through the house where appropriate indicates the finished floor-to-finished ceiling height..
- Wall, Windows & Doors
    - ✓ All visible wall corners are shown on the elevation using object lines.
    - ✓ Windows and doors located on the exterior wall must be included on the elevation.
    - ✓ It is customary to place tops of windows the same height as the tops of doors
- **Roof Features**
    - ✓ The elevation drawing is where the roof style and pitch are shown, as well as chimney height and size. The roof pitch symbol is preferred when indicated the roof pitch.
    - ✓ If more than one roof height is anticipated, the highest section should be drawn first.

- Dimensions, Notes & Symbols

  Dimensions on the elevation are mainly vertical height dimensions.

Features that must be dimensioned are:

- ✓ Thickness of the footer
- ✓ Distance from the footer to the grade
- ✓ Finished floor-to-finished ceiling distance
- ✓ Overhang width
- ✓ Height of the top of windows and doors
- ✓ Height of the chimney above the roof

Notes should be included where additional information is needed. Typical notes included are:

- ✓ Grade info.
- ✓ Exterior wall material notation
- ✓ Roof covering material identification
- ✓ Fascia material
- ✓ Flashing material

Many symbols may be used to further indicate specifics on the house.

- The Procedure for Drawing an Elevation Plan
  - ✓ Place the floor plan directly above the space where the elevation is to be drawn. The exterior walls to be represented by the elevation should be facing down toward the elevation.
  - ✓ Project all points down to the free space.
  - ✓ Indicate the bottom of the footer and draw a horizontal line. Now measure in all vertical heights, basement ceiling height, floor joist height, first floor, etc… from this reference point.
  - ✓ Remove construction lines and determine if changes are desired in the overall design.
  - ✓ Add details such as railings, window mentions, trim, window wells, etc…
  - ✓ Add dimensions, notes and symbols.
  - ✓ Check drawing and be sure to print one copy to check.
  - ✓ Turn-in drawing

Self-Check -1	Written Test

Directions: give short answer. Use the Answer sheet provided in the next page:

1. Features that must be dimensioned are: (2point)
   A. Thickness of the footer
   B. Distance from the footer to the grade
   C. Finished floor-to-finished ceiling distance
   D. All
2. An elevation plan ordinarily includes : (2 point)
   A. Finished floor and ceiling levels
   B. Location of exterior wall corners
   C. Windows and doors
   D. Roof features
   E. All are correct
3. Types of masonry walls, but the most common may be classified as:- (4 point)
   A. Clay masonry
   B. Stone masonry
   C. Cavity wall masonry
   D. All

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1._____

2._____

3. _____

Information sheet-2	identifying Client requested variations

2.1. Introduction

Clients: have a major role to play in the promotion of a systematic approach to the management of health and safety in construction. They will set the tone of the project and make decisions crucial to its development. The client is the person for whom the project is carried out

A Request: for Quote (RFQ) is commonly used when a requestor knows what they want but need information on how vendors would meet the requirements and/or how much it will cost.

A Request: for Proposal (RFP) is the most formal and intensive of the three for both the requestor and the vendor.

2.2. Identifying variation

A variation (sometimes referred to as a variation instruction, variation order (VO) or change order), is an alteration to the scope of works in a construction contract in the form of an addition, substitution or omission from the original scope of works.

Almost all construction projects vary from the original design, scope and definition. Whether small or large, construction projects will inevitably depart from the original tender design, specifications and drawings prepared by the design team.

This can be because of technological advancement, statutory changes or enforcement, change in conditions, geological anomalies, non-availability of specified materials, or simply because of the continued development of the design after the contract has been awarded. In large civil engineering projects variations can be very significant, whereas on small contracts they may be relatively minor**.**

- Variations may include:
  - ✓ Alterations to the design.
  - ✓ Alterations to quantities.
  - ✓ Alterations to quality.
  - ✓ Alterations to working conditions.
  - ✓ Alterations to the sequence of work.

Variations may also be deemed to occur if the contract documents do not properly describe the works actually required.

- Variations may not (without the contractors consent):

- Change the fundamental nature of the works.
  - ✓ Omit work so that it can be carried out by another contractor.
  - ✓ Be instructed after practical completion.
  - ✓ Require the contractor to carry out work that was the subject of a prime cost sum.

In legal terms, a variation is an agreement supported by consideration to alter some terms of the contract. No power to order variation is implied, and so there must be express terms in contracts which give the power instruct variations. In the absence of such express terms the contractor may reject instructions for variations without any legal consequences.

Standard forms of contract generally make express provisions for the contract administrator(generally the architect or engineer) to instruct variations (for example, FIDIC Clause 51.1). Such provisions enable the continued, smooth administration of the works without the need for another contract.

Variation instructions must be clear as to what is and is not included, and may propose the method of valuation.

2.2.1. Valuation of variations

Variations may give rise to additions or deductions from the contract sum. The valuation of variations may include not just the work which the variation instruction describes, but other expenses that may result from the variation, such as the impact on other aspects of the works. Variations may also (but not necessarily) require adjustment of the completion date.

- Variations may be valued by:
  - ✓ Agreement between the contractor and the client.
  - ✓ The cost consultant.
  - ✓ A variation quotation prepared by the contractor and accepted by the client.
  - ✓ By some other method agreed by the contractor and the client.

Valuations of variations are often based on the rates and prices provided by the contractor in their tender, provided the work is of a similar nature and carried out in similar conditions. This is true, even if it becomes apparent that the rates provided by the contractor were higher or lower than otherwise available commercial rates.

2.3. Client Request

The process of selecting consultants might involve the preparation by the client of a 'request for proposals' (RFP) which is sent out to each prospective consultant. Consultants respond by submitting 'consultant's proposals' to the client.

The request for proposals describes the nature of the project, the nature of the appointment and a description of the information required from the consultant.

- The request for proposals might include:
  - ✓ The strategic brief.
  - ✓ The management structure.
  - ✓ The scope of consultant services required and how fees should be quoted and broken down against stages of the project.
  - ✓ The project programmer.
  - ✓ The construction budget (without contingencies and VAT).
  - ✓ The intended method of procurement (or a request for options if the procurement route has not been chosen yet).
  - ✓ The form of agreement and conditions of engagement (such as step-in rights, warranties, a model enabling amendment making a BIM protocol part of the contract documents, and so on).
- The level of professional indemnity insurance required.
  - ✓ The selection criteria that will be used.
  - ✓ The procedure that will be followed.
  - ✓ If building information modeling (BIM) is being used, the Employer's Information Requirements (EIR).
  - ✓ Targets for post-occupancy evaluation.
- It might request consultant's proposals including:
  - ✓ A list of key personnel to be allocated to the project, their role in the project, CVs of staff and a description of relevant experience on similar projects.
  - ✓ Hourly rates to be applied to any work outside the proposed scope of services.
  - ✓ Identification of any sub-consultants the candidate intends to use.
  - ✓ A broken-down payment and resource schedule with trigger dates against work stages.
  - ✓ Evidence of professional indemnity insurance.
  - ✓ A list of recently completed commissions with referees and detailed of other consultants involved.
  - ✓ A statement of design intent based on the brief.

If the request for proposals involves significant design work from the consultant, it is good practice for the client to offer payment for the work involved in preparing these designs. This will encourage the consultant to prepare their proposal more carefully, and will also demonstrate to them that the client is serious about the project and is likely to treat them fairly.

2.3.1. Building variations expensive

There are several reasons that variations to contracted work cost so much. The first is that a building contract is a legal document – and to get it changed may require the services of a lawyer.

Other things that can contribute to costs in variations are:

- Cost differences between specified work / products and updated requirements
- Pre-agreed penalty clauses for variations
- Extra material costs (especially if materials have already been bought)
- Added labor or work costs - particularly if work has already started, if variations require alterations to completed work or plans, or if there's a need to call back tradespeople to the site
- Added engineering, drafting or approval expenses – especially for revisions to structural work, which can easily cost three or four times more than just materials and labor

A bit of variation wiggle room's usually necessary on a project as big as building a house, but if there is a scope of allowed variations, it'll also need to have its limits and conditions. To be clear, builders often need to request variations too, where original plans mightn't turn out to be the best, most practical or most sensible option.

2.3.2. How to properly manage variations

If you want to request variations to what's in your contract, your builder will usually provide a quote for the cost of the variations. It's then a matter of:

- agreeing to changes and costs (in writing),
- negotiating a different solution

Insist that prices and all the details of variations required are put in writing and signed off by both parties before work is done.

There's a difference between being friends with your builder, and having a good professional relationship. Many bitter disputes begin with the assumption that everyone's chummy enough to put the paperwork aside till later. It's in everyone's best interests to ensure that there's absolute clarity and a well-managed paper trail when it comes to anything to do with contracted work and payments.

Depending on what's being requested, you'll need to remember that variations can have a very significant impact on deadlines and completion dates too.

2.3.3. Why do client need to request variations?

When it comes to project owners, the need for variations is usually the result of miscommunication, misunderstanding or rushing in without being thorough enough with contracts.

Disputes often arise over what's been agreed upon, and whether or not what's being asked actually constitutes a 'variation', or a fair interpretation of what's stated on the contract.…

- The more common variations people request include:
  - ✓ variations in design
  - ✓ variations in quantities
  - ✓ variations in models and styles of products
  - ✓ variations in quality
  - ✓ variations in the order in which things are constructed

And as we've already mentioned, sometimes it's the builder who needs to request variations, perhaps because there's an issue with the original plans, or an unforeseen issue with the site. Make sure your contract's very clear about the need for the builder to submit detailed requests for variations in writing, along with any changes to proposed costs.

2.3.4. How to avoid variations

The best way to avoid expensive variations is to be well prepared. Be very thorough, careful and involved when it comes to planning – and never sign a contract until you're certain it's absolutely specific about everything you want.

- This means making sure your contract includes things like:
  - ✓ Brand and model names for things like toilets, taps, power points, door handles, locks, range hoods, light bulbs etc.
  - ✓ Specific detail on the number of coats of paint to be used, texturing / application preferences etc.
  - ✓ specific colors, shades and products to be used

Self-Check -2	Written Test

Directions: say true or false and use the Answer sheet provided in the given space.

1. Consultants respond by submitting 'consultant's proposals' to the contractor. (2point)
2. Require the contractor to carry out work that was the subject of a prime cost sum (4 point)

3 Clients have a major role to play in the promotion of a systematic approach to the management of health and safety in construction (2 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1._____

2._____

3._____

Operation Sheet 1	Techniques of identifying key features of plans, elevations and sections

Techniques for identifying key features of plans, elevations and sections are;

Step 1-selects appropriate drawing instrument.

Step 2-prepare drawing title board with A4 paper.

Step 3-sketch free hand site plan, floor plan and elevation drawing with Owen your idea.

Step 4-clear the drawing table surface .

Step 5- start draw on the drawing table use appropriate instruments.

Step 6-transfer your free hand sketch on your title bored and using dimension.

Step 7- finally summit your drawing for your teacher.

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 hours.

Task 1: identifying key features of plans, elevations and sections

List of References

- The JCT 05 Standard Building Contract: Law and Administration By Issaka Ndekugri, Michael Rycroft
- https://www.youtube.com/watch?v=k95m8RU0xYw
- **https://www.youtube.com/watch?v=DCmZzuFflhw**
- **https://courses.cit.cornell.edu/arch262/notes/13a.html**
- **https://study.com › academy › lesson › orthographic-drawing-definition.**
- **https://www.youtube.com/watch?v=x5dHMQmADg8**

Masonry

Level-II

Learning Guide-28

Unit of competence: Reading and Interpreting plan and Working Drawings

Module title: Reading and Interpreting plan and Working Drawings

LG CODE: EIS MAS2 M06 LO5-LG-28

TTLM CODE: EIS MAS2 M06 TTLM 0919V1

Lo5: Correctly read and interpret specifications

instruction sheet-1	Learning guide 28

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

- Identifying Customer variations to standard specifications
- Applying Correcting interpretations of essential elements
- Identifying Building Code

Identifying Building Code 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 customer variations to standard specifications
- Apply Correct interpretations of essential elements to estimation, planning and supervisory tasks and communicated.
- Identify Building codes or standards affecting the work to be undertaken, including references to Ethiopian standards and the Building Code of Ethiopia.

Learning Instructions:

17. Read the specific objectives of this Learning Guide.
18. Follow the instructions described below 3 to 6.
19. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
20. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 11 and 12**respectively.
21. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1**in**

Information sheet-1	Identifying Customer variations to standard specifications

1.1. Customer variations

Variation in construction means modification of design, changes in quality, quantity of work including the alteration of standard of materials or goods to be used in the work and the removal from site any kind of material not in accordance in the contract. In our country, Variation order has become major issue in the construction industry. This had resulted in cost overruns, delay and in some contracts dispute, between parties.

The aim of this paper was to identify the root causes of variation; effects of variations on projects in Ethiopia and the means of reducing the impact of variation order. The method of the study involved literature review, primary data collection, interview and closed - ended-questionnaires. The study revealed that most causes of variation were change of design by client and inadequate working details. Establishment of oversight project management committee and flow of information were identified as means of controlling variations during project administration.

1.2. Standard specification

A specification is a written description of the building to be constructed. It supplements the information on the drawings and, like the drawings; it is a legal part of the contract between the client and the builder. A specification might only be a few pages long for a small project such as an addition to a house, or it might be a multi-volume set of bound books for a big project such as a shopping mall or high-rise building. For a large commercial or industrial project there may be a specification for the architectural features, and additional specifications for the plumbing, electrical and mechanical requirements of the job.

Standard specifications are written for a small group of specialized structures that must meet rigid operational requirements. Standard specifications are referenced or copied in project specifications, and can be modified with the modification noted and referenced.

1.3. The purpose of a specification

Drawings are the best way to convey most of the information required for a building project, but a specification is needed to explain anything that cannot be included clearly in the drawings. Specifications are commonly used to communicate the following.

- Fixture and fittings to be used, where things like dimensions, color or model number are important

- To provide instructions to the builder or mason for how something is to be done. For example, drawings might show that internal walls are to have a plaster finish, but it is the specification that tells the plasterer how – 'bring walls to a reasonable flat surface by the application of a cement render float coat while the plaster is setting''.
- To provide instructions to the builder about things that may not be part of the finished building but that nevertheless need to happen during the project – for example, safety barriers, disposal of rubbish or protection or adjoining properties.

Specifications usually include a clause about making good any damage to, parts of masonry, footpaths, fences and any other amenities in the vicinity of the project.

1.3.1. Layout

The specification for a house is divided into sections that each deal with a specific trade that will be involved in the project. The sections are usually arranged in the same order that the job will be done in starting with basement, concreter and bricklayer through to painter, floor coverer and landscaper at the end. Each section may contain detailed descriptions specific to that job or it may just contain general instructions about workmanship, quality and so on. In that case, it will refer to a schedule at the end of the specification. The schedule will have details for a particular job; for example, sizes of building materials, paint finishes, types of doors, and so on. A section called 'preliminaries' at the start of the specification deals with general things, such as the extent of the work, temporary services, the job sign, site sheds and toilets, temporary fences or hoardings and access for the client during construction.

1.3.2. Changes

Sometimes changes, called amendments, might be made to the specification. Amendments could relate, for example, to changes to materials or products used or methods of carrying out specified work. They should be clearly marked so that everyone who needs to notices them. Amendments usually have to be signed or initialed by both the builder and the client to show them both agree. On rare occasions, the specification may conflict with the drawings. For example, the specification may call for the front door to have a glass panel in the top half, yet the elevation may show no glass in the door. In this case, the builder should contact the architect or client and ask for clarification.

1.3.3. Costing

A section in the specification will deal with 'provisional sums' and 'prime costs'. Provisional sum items are such things as the construction material like, block, brick, binding agent and so on, which may not have been selected by the time the contract is signed. When these items are eventually selected by the client, the contract price will be adjusted up or down according to the

actual cost. Prime costs are those costs that the builder can't reasonably be expected to put an exact figure on when tendering for the job.

Self-Check -1	Written Test

Directions: choose the best answer. Use the Answer sheet provided in the next page:

1 a section in the specification will deal with _____and _____

A, provisional sums' and 'prime costs C.) Cement and lime

B. levels and finishes D).None

2 Sometimes changes is called (2 point)

A. specification C. float

B. amendment D. chisel

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1._____

2._____

Information sheet-2	Applying Correcting interpretations of essential elements

2.1. Introduction

The most important part of any building project is affordability, and using an independent cost estimating service is important when planning a self-build or renovation project. An independent estimate will provide a benchmark price, which can be used to price-check builders' quotes and material costs.

Estimating in construction is important because almost everyone has a budget they have to meet for a project. Almost everyone wants to know how much it will cost before they are willing to start. Estimates are also used to narrow down a choice in a contractor.

2.2 Essential Elements in Construction Cost Estimation

With an accurate construction cost estimate in hand, you will know how long a project will take and how much it would cost you. However, getting an accurate construction cost estimate can be tricky. The consequences of an underestimate or an overestimate can affect your construction project to a great extent. Getting a construction cost estimation carried out can take up some time and cost, but it is worth the effort as your business will be able to make big savings in terms of cost and money.

Many elements make up the construction estimating process. The following are some key terminologies and core concepts applicable to estimators and the industry itself:

Bonds: As a general rule of thumb, an owner typically needs a contractor to arrange for the issuance of a performance bond in favor of the project owner. The bond functions as a form of guarantee of delivery. In the instance that the contractor fails to complete the project according to the terms of the contract, the owner is entitled to compensation for monetary losses up to the amount covered by the performance bond.

Capital Costs: Capital costs are essentially the expenditures affiliated with establishing a facility. Such costs include the following:

- The cost of acquiring land
- The cost of conducting feasibility studies and the pre-design phase
- Compensating the architect, engineer, and specialist members of the design team
- The total cost of construction (which covers not only labor, materials, and equipment, but also administrative, permitting, and supervision costs, as well as any insurance fees or taxes)

- The cost of any temporary equipment or structures that are not part of the final construction
- The cost of hiring a commissioner
- The cost of inspecting the structure when it is close to completion

Contingencies: Since even the most accurate estimate is prone to be affected by unforeseeable factors, such as materials wastage, an estimate will typically have a pre-determined sum of money built in to account for such added expenditures.

Equipment Costs: Equipment costs refer primarily to the cost of running (and possibly renting) heavy machinery, such as cement mixers and cranes; it is therefore important to note that the equipment in use influences how rapidly you can complete a project. In actuality, the use of equipment can potentially impact many costs outside of the project scope directly associated with running the equipment.

Escalation: Escalation refers to the natural inflation of costs over time, and is especially crucial to take into account for long-running projects. Some projects have escalation clauses that address how to handle this type of inflation.

Indirect Costs: Indirect costs are expenses indirectly associated with construction work, such as administrative costs, transport costs, smaller types of equipment, temporary structures, design fees, legal fees, permits, and any other number of expenditures, depending on the particular nature of the project.

Labor Hour: The labor hour, or 'man-hour,' is a unit of work that measures the output of one person working for one hour.

Labor Rate: The labor rate is the amount per hour paid to skilled craftsmen. This includes not only the basic hourly rate and benefits but the added costs of overtime and payroll burdens, such as worker compensation and unemployment insurance.

Material Prices: Because the cost of materials is prone to fluctuation (based on market conditions and factors like seasonal variations), cost estimators may look at historical cost data and the various phases of the buying cycle when calculating expected material prices.

Operations and Maintenance Costs: More a concern for the owner than the contractor, operations and maintenance costs are accounted for during the design phase. Making decisions that lower the total lifetime cost of a building may result in higher construction costs. Operating costs include expenses such as land rent, the salaries of permanent operations staff, maintenance costs, renovation expenses (as required), utilities, and insurance.

Profits: To turn a profit, the contractor needs to add a margin on to the actual cost of completing the work. Subcontractors do the same when preparing their own quotes.

Quantity Take-Off: Developed during the pre-construction phase, a quantity take-off measures the labor and materials required to complete a construction project.

Subcontractor Quotes: Most contractors will hire multiple specialist subcontractors to complete parts of the construction; you will then add the subcontractors' quotes to the contractor's total estimate. It can be very beneficial to use a tracker in order to collect and record all of the subcontractor documentation in one place.

Variances: Owners frequently allocate construction budgets that are greater than cost estimates, since even in-depth cost estimates tend to underestimate actual construction costs. This may happen for a number of reasons: for example, wage increases, which can be difficult to forecast, will drive up construction costs. Seasonal or natural events, such as heavy rainfall, may call for action to protect construction or restore the construction site. Large projects in urban areas may face regulatory or legal issues, such as a demand for additional permitting. And finally, owners who start construction without first finalizing the project's design will go in over-budget to account for design changes, as well as the inevitable cost increases that result from throwing a project off-schedule.

Self-Check -2	Written Test

Directions: give short answer. Use the Answer sheet provided in the next page:

1. _____are essentially the expenditures affiliated with establishing a facility (6 point)
   A. Capital cost C. Labor cost
   B. Tack off D. None
2. Which of the following are key terminologies of estimation?
   A. Variation C. indirect cost
   B. Profits D. all are correct
3. Capital costs are essentially the expenditures affiliated with establishing a facility.
   Such costs include the following:
   A. The cost of acquiring land
   B. The cost of hiring a commissioner
   C. The cost of inspecting the structure when it is close to completion
   D. All are correct

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

4. _____

5. _____

6. _____

Information sheet-3	Identifying Building Code

3.1 introductions

Building codes come in different varieties depending upon the type of construction and subject they are seeking to regulate. Many of the building codes adopted by governments in the United States are based upon model building codes drafted by the International Code Council (ICC).

Building codes are sets of regulations governing the design, construction, alteration and maintenance of structures? They specify the minimum requirements to adequately safeguard the health, safety and welfare of building occupants.

Virtually all residential construction must adhere to comprehensive building codes and standards governed by local and state laws. Because of the cost and complexity of developing and maintaining such codes, state and local governments typically adopt nationally recognized model codes, often amending them to reflect local construction practices, climate and geography.

Most countries and communities adopt internationally recognized Codes for this purpose. The Codes address all aspects of single- and two-family as well as multifamily construction, including structural elements and the electrical, plumbing, heating, ventilation and air conditioning systems, and energy conservation requirements as well as the overall construction elements of the sector.

Scope

- This Code Standard specifies requirements for the design and construction of masonry, both Unreinforced and reinforced, using manufactured units of clay, concrete, or units of square-dressed Natural stone, and random rubble masonry stone, lay in mortar.
- The thickness of a wall determined from strength considerations may not always be sufficient to satisfy requirements for other properties of the wall such as resistance to fire, thermal insulations, Sound insulation or resistance to damp penetration.

3.2. Building masonry specification code with EBCS

All masonry units, whether new or reused shall be selected for durability and strength so as to Be appropriate to the expected exposure and use.

- Solid Concrete Blocks
- Hollow Concrete Blocks
- Brick masonry

3.2.1. solid masonry

Solid masonry shall be brick or solid concrete block masonry units lay contiguously in mortar. All units shall be laid with full shoved mortar joints, and all head, bed and wall joints shall be Solidly filled with mortar.

- ✓ **Construction**

The horizontal distance between cross joints in successive masonry courses should normally be not less than one-quarter of the length of the units but in no case less than 50mm for bricks or 75mm For blocks. Those patterns which depart from the principle of having adequate distance between the Cross joints in adjacent courses, particularly stack bond, should be used only where experience or Experimental data indicate that they are satisfactory for the particular construction.

•The overall dimensions of walls and the positions and sizes of openings and piers should be Chosen bearing in mind the dimensions of the type of unit to be used and the dimensions of the special Units, so that cutting of the units will be kept to a minimum and irregular or broken bond will be Avoided, The types of masonry bonds and joint finishes that are commonly used in brickwork and

Block work

3.2.2. Hollow concrete block masonry

Hollow concrete block masonry is that type of construction made with hollow masonry units in Which the units are all laid and set in mortar.

•All units shall be laid with full face shell mortar beds. All head and end joints shall be filled solidly with mortar for a distance in from the face of the unit or wall not less than the thickness of the Hollow block work may be suited to the incorporation of reinforcement within the voids of the units, which are filled with concrete.

- **Construction**

Where two or more hollow units are used to make up the thickness of a wall, the stretcher courses shall be bonded at vertical intervals not exceeding 900mm by lapping at least l00mm over the unit below or by lapping vertical intervals not exceeding 450mm with units which are at least 50 percent greater in thickness than the units below; or by bonding with corrosion-resistant metal ties conforming to the requirements for cavity walls. There shall be one metal tie for not more than each 0.5sq.m of wall area. Ties in alternate courses shall be staggered, and the maximum vertical distance between ties shall not exceed 500mm, and the maximum horizontal distance shall not exceed 1m. Longitudinal face shells.

3.3. general requirements of mortar

- Mortar shall consist of a mixture of cementations material and sand (fine aggregate) that is free

From material deleterious to the mortar and to embedded items, and to which sufficient water and any

Specified additives or chemical admixtures have been added. The ingredients shall be proportioned to produce a mortar that will have the following characteristics:

- ✓ Adequate workability to permit the masonry units to be properly placed.
- ✓ Appropriate durability in the specific local environmental conditions.
- ✓ The ability, when tested in accordance with Appendix A, to impart to the masonry built with it the compressive strength and the flexural tensile strength that are required to the structure.

3.4. Tolerances in masonry

- Unless otherwise specified, all masonry shall be built to the specified dimensions within the tolerances given in Table 3.1.

Table 3.1 Tolerances in Masonry Construction

Item		Tolerance
(a)	Horizontal position of any masonry element specified or shown in plan at its base or at each story level	± 15mm
(b)	Deviation within a story from a vertical line through the base of the member	± 10mm per 3m of height or 0.05 time thickness of walls, whichever is less
(c)	Deviation from vertical in total height of building (from base)	± 25mm
(d)	Relative displacement between load-beating walls in adjacent stores intended to be in vertical alignment	± l0mm
(e)	Deviation (bow) from line in plan in any length up to 10m	Single curvature: ± l0mm Multiple curvature: (see Note 1)

(f)	Deviation of bed joint from horizontal, or from the level specified or shown in elevation	± l0mm in any 10m length ± 15mm total
(b)	Deviation from specified thickness of bed joint	± 3mm average in any 3m length
(h)	Deviation from specified thickness of perpend	- 5, + l0mm
(i)	Deviation from width of cavity	± 15mm

Notes:

1. for walls with multiple curvatures in plan, the permitted displacement of any point over a length of 10m shall be such that all points on the surface of a wall lie within two lines in plan 15mm apart parallel with the nominal center line of the wall.
2. Tighter tolerances than these may be required where statutory requirements ~re to be met, such as at property boundaries or in relation to minimum dimensions of rooms.

3.5. General Requirements of Quality

(1) Solid concrete blocks shall be free from laminations, cracks and other defects that would impair the proper setting, strength or permanence of the construction. They shall be well compacted, properly cured and have uniform color and texture

- **Dimensions**

(1) The nominal dimensions of solid concrete blocks shall be as indicated in Table 3.2

Table 3.2 Nominal Dimensions of Solid Concrete Blocks

Breadth,	Height, h	Length, I
loomm	200mm	400mm
150mrn	200mm	400mm
200mm	200mm	400mm

(2) The maximum tolerances for the dimensions of solid concrete blocks shall be ±5rnm of the Nominal dimensions indicated in Table 3.2

- **Classification**

(1) Solid concrete blocks shall be classified into the following three classes.

(a) Class A and B load bearing units suitable for use as:

External wall pointed, rendered, plastered and the like

- ✓ The inner leaf or cavity walls or as backing to brick or stone masonry
- ✓ Internal wall or partitions
- ✓ Panels in steel framed and reinforced concrete framed buildings.

(b) Class C, non-load bearing units suitable for use as:

- ✓ Non-load bearing walls and partitions, and
- ✓ Non-load bearing internal panels in steel framed and reinforced concrete framed buildings,

- **Compressive strength**

The minimum compressive strength for each class of solid concrete blocks shall be as indicated in Table 3.3.

Table 3.3 Minimum compressive strength

Class	Average of 6 units	Individual units
Nzmm'	Nzmm'	
A	4.2	3
B	4.0	3
C	2.0	1

Self-Check -3	Written Test

Directions: say true or false Use the Answer sheet provided in the in the given space:

1. Adequate workability to permit the masonry units to be properly placed. (3 point)
2. The nominal dimensions of solid concrete blocks thickness shall be 400mm. (3 point)
3. Hollow concrete block masonry is that type of construction materials. (2 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Answer Sheet

1._____

2. _____

3_____

list of reference

- Celant G. (ed.), Architecture & Arts 1900/2004, Skira, Milan 2004
- Ethiopian building code of standard (EBCS1995)
- https://www.youtube.com/watch?v=45UUd-EEcHA
- https://painters.edu.au/Business-Development/Training-Resources/Read-and-Interpret-Plans.htm
- https://www.youtube.com/watch?v=tijB0FyZS1U

This learning guide prepared by :

No	Name of trainer	Qualification	Region	E-mail
1	Dereje Teshome	Construction technology & managment(MS)	Diredewa	Derat8@gmail.com
2	Haymanot Kefale	Construction technology (BSc)	Benishangul	Hayimanot 281@gmail.com
3	Jemal Abdulahi	Construction technology(BSc)	Harar	_____
4	Mohammed Hassen	Construction technology(BSc)	Somali	Mohammedhassen286@gmail.con
5	Muluken Solomon	Construction technology & management(MS)	Oromia	Mulecot99@gimal.com
6	Solomon Eshetu	Construction technology (BSc)	Amhara	Natansolomon10@gmail.com
7	Zelallem taye gedifew	M.A IN LEADER SHIP (MA)	Amhara	Tayezelalem22@gmail .com
8	Addisu wodago	VOCATIONAL MANAGIMENT (MA)	Amhara	Addalvy20102gmail.com