Carpentry Level I I

Learning Guide-29

Unit of Competence: Carry out measurements and calculation for building structure

Module Title: Carrying out Measurements and calculations for Building structure

LG Code: EIS CRP2 M7 LO3-LG-29

TTLM Code: EIS CRP2 M7 TTLM 0919v1

LO 3: Perform calculations

Instruction Sheet	Learning Guide #29

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

- determining Appropriate calculation factors
- calculating material quantities using factors
- confirming and recording Results

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

- Determine and correct method appropriate calculation factors select for achieving required result.
- Calculate Material quantities correct for the project using appropriate factors.
- Confirm and result recorded.

Learning Instructions:

Read the specific objectives of this Learning Guide.
Follow the instructions described below 3 to 5.
Read the information written in the information “Sheet 1, Sheet 2, and Sheet 3, Accomplish the “Self-check 1, Self-check 2, and Self-check 3 in page 4, 8, and 11 respectively If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1 in page -12.
Do the “LAP test” in page – 12(if you are ready).

Information Sheet-1	Determining Appropriate calculation factors

1.1 Introduction calculation factors

Calculations is a manual that provides end users with a comprehensive guide for many of the formulas, mathematical vectors and conversion factors that are commonly encountered during the design and construction stages of a construction project. It offers readers detailed calculations, applications and examples needed in site work, cost estimation, piping and pipefitting.

The book is divided into sections that present the common components of construction. The first section of the books starts with a refresher discussion of unit and systems measurement; its origin and evolution; the standards of length, mass and capacity; terminology and tables; and notes of metric, U.S, and British units of measurements.

1.2 Key Features

- Work in and convert between building dimensions, including metric system
- Built-in right-angle solutions
- Areas, volumes, square-ups
- Complete stair layouts
- Roof, rafter and framing solutions
- Circle: arcs, circumference, segments

1.3 Performing calculations factor

- **Lengths**: the standard unit for length is the meter (m). For shorter lengths centimeter (1m = 100cm) is used which is again subdivided into millimeters (1cm = 10mm). For longer distances however, kilometer (1000m = 1km) is used.
- **Area:** The area of a section of road is normally rectangular in shape and the area is obtained by multiplying the length of the road by the width of the road. The unit used for *l* and *w* must be the same (normally both are expressed in meters (m).5

$$Area = l \times w$$

- **Volumes**: 1m3 is the volume of a cube where each side is 1m. Volumes are calculated by multiplying a base area (e.g. m2) with a third dimension.

The calculation of volumes is the most common calculation for road construction work. This is required to develop the bill of quantities, then to measure work for actual construction purposes

(Estimating resource requirements and time to complete work, material requirements, etc.), and finally to measure the completed work items.

- **Weight:** 1 kilogram (kg) is the weight of one cubic decimeter (dm3) or one liter of water with a temperature of 4° C. Other units commonly used in construction are: gram (g) and tone
- **Capacity:** 1 liter of water is the volume of water contained in one cubic decimeter (dm3) at 4°C
- **Density**: weight in kg per m3 volume in normal processed condition of the material.
- **Perimeter:** is the distance around a two dimensional shape, or the measurement of the distance around something; the length of the boundary.
- **A perimeter**: is a path that surrounds an area. The word comes from the Greek peri (around) and meter (measure). The term may be used either for the path or its length - it can be thought of as the length of the outline of a shape. The perimeter of a circular area is called circumference.

Self-Check -1	Written Test

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

1. List key futures (**5 points)**
2. Write the definition of Calculations. (**3 points**)

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: _____

Short Answer Questions

1. _____
   _____
   _____
2. _____
   _____

2.1. Calculating material quantities

Quantity is a term used in the building industry for the number or amount of materials required for a particular task. For instance, before constructing the roof frame for a House, a carpenter must be able to calculate the sizes, lengths and amount of timber Needed so that the correct quantities can be ordered from the supplier.

Now that you know how to take measurements for materials you might need to use, it's time to put it all together by calculating quantities.

2.1.1. Calculating Bricks and mortar

Calculating how many bricks are needed to build a wall is a multi-step process. We're going to work through how to do that now. Then we'll calculate the materials needed to make the mortar.

- **Bricks** :- the wall we're going to work out is the west wall on the drawing below, and just the

External leaf (the outside wall). We're going to assume an external wall height of 2400, and that standard bricks will be used.

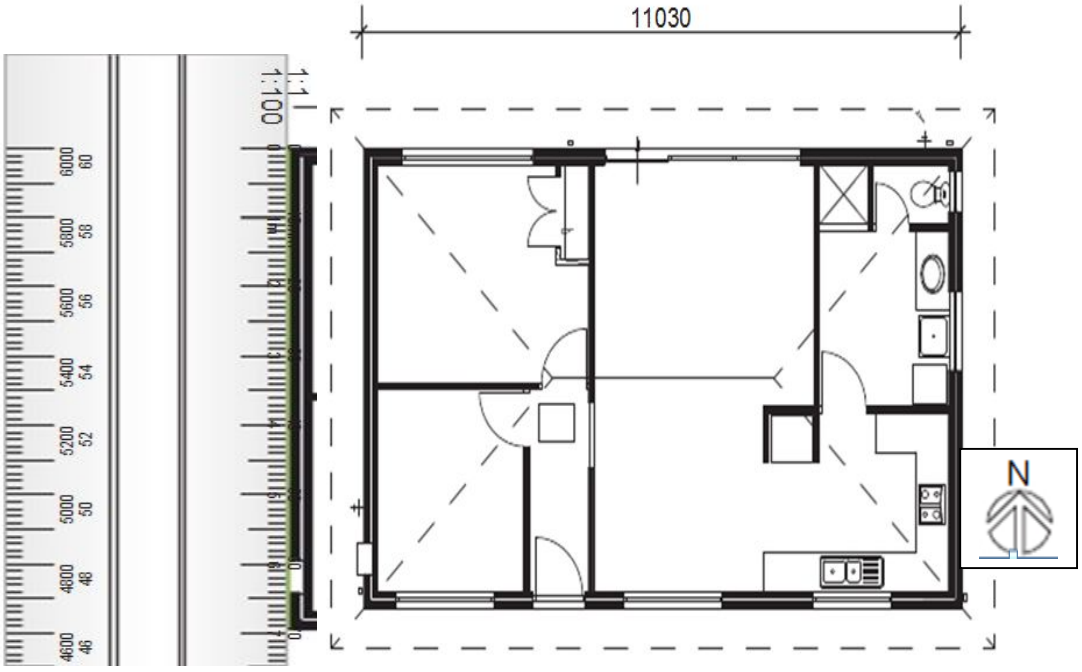


Figure 2.1.FLOOR PLAN,

SCALE 1:100

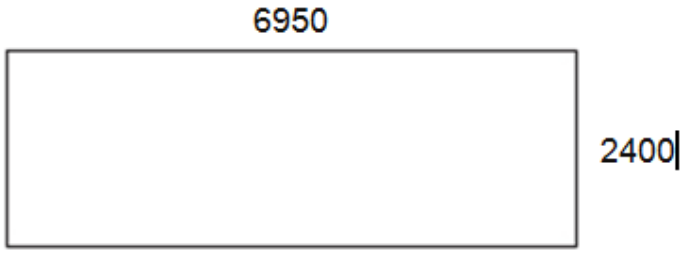
1: Identify the wall:-Use the north point to determine that the west wall is on the left-hand side of the plan.

2: Find the length of the wall:

the wall hasn't been dimensioned, so we'll have to measure it using a scale rule. Wecan see that the floor plan has been drawn at a scale of 1:100 (100 times smaller than real life) so we need to use the side of the scale rule showing 1:100.

❖ The scale rule says that the length of the wall is 6950. Can you just go ahead and use That?

3: Calculate the area: Draw a diagram of the wall to help.



4: Check the units:

we usually measure area in square metres (m2), so let's convert those dimensions From millimetres to metres first, so we can calculate the area more easily. To do that, we move the decimal point three places to the left, so 6950 mm becomes 6.95 m, and 2400 mm becomes 2.40 m.

5: Apply the formula: Area (rectangle) = W × H = 6.95 × 2.40 = 16.68 m2

6: Determine bricks per square meter (m2):

now that we know the area of the wall to be built, it's time to work out how many bricks Are needed. The first part of doing that is to find out how many bricks are needed to Build 1 m^2 of wall. To do that, we need to know what kind of bricks are being used and Then check the manufacturer's information on those bricks.

The table that follows shows the kind of information you would find on a brick Manufacturer's website – it shows how many bricks of each size are needed for 1 m^2 Of wall. The one that's in bold (6cm * 25cm) is a standard brick, which is the size we're Using. .

7: Calculate brick quantity:

To work this out, we simply multiply the number of square metres of wall by the number Of bricks required per square meter.

Square meters of wall = 16.68

Bricks required per square meter = 48.5

Multiply 16.68 × 48.5 = 808.98

We can't order 0.98 of a brick, so we'll need to round that number up to 809 bricks.

Solution: 809 bricks are needed to build the west wall.

- **Mortar:-**

  Cement, lime and sand are used to make mortar. The manufacturer's mortar table Below tells us the ratio of cement to lime to sand required.

Table 2.1 mortar mixer ratio

Mortar			
M^3 mortar – GP cement + Hy Lime	**Cement**	**Lime**	**Sand**
	1	1	3/4

The ratio of cement to lime to sand shown in the table above is 1:1:3/4.This means thatFor e very one bucket (or barrow load or shovel full) of cement in the mortar mix, weneed to add th esame amount of lime and six times that amount of sand,which isacalculation involving ratio f or quantities

Self-Check -2	Written Test

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

1. write the types of mortar (**5 points)**
2. Write the definition of quantities. (**3 points**)

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: _____

Short Answer Questions

2. _____
_____
_____

2._____
_____

Information Sheet-3	confirming and recording Results

3.1. Introduction of Results Recording

Once you have recorded and valuated the inspection results for a characteristic in the results recording function, you can also confirm the activities for the operation. Depending on the setting of the operation control key for an inspection operation, the system displays the dialog box for entering the activity times automatically or you must call it up manually:

- If the confirmation indicator for the operation control key is set to "milestone confirmation" or "confirmation required", the system automatically displays the dialog box Record Work Done.
- If the confirmation indicator is set to "confirmation possible, but not necessary," you must call up the dialog box for entering the activity times manually by choosing Edit ® Confirm activities in the overview screen for characteristics.
- In the dialog box Record Work Done, enter the values for the setup time, machine time or labor time, whichever is applicable. The dialog box also displays the activity times that have previously been recorded.
- Only one person can confirm activities for a specific QM order at any given time. If several people are trying to confirm activities for the same QM order, the system will display a message, indicating that the QM order is currently locked.
- After you have entered the activity times, choose Continue to close the dialog box and to return to the main screen in the results recording function.
- Save the data

3.2. Recording measurements

How you record a measurement will depend on how it's goingto be used. Different tasks and different workplaces will have different requirements.

The most important thing is that all measurements, calculationsor totals need to be recorded clearly and accurately, including

using the correct units. It's important that anyone reading the

Information can understand it and rely on it.

3.2.1 Tests Results Record

This is an important record to be maintained at construction site as a proof for construction quality. This record consists of tests of various materials such as cement, sand, aggregates, water, steel reinforcement used at construction site, test records of concrete cubes, concrete cylinders, slump tests etc.

These records are arranged as an index page with details of each material, page numbers of records etc. Individual pages consists of each materials, with their test dates, results etc.

All the tests carried out at site or in laboratory are recorded in the record book. Some of the tests carried out at construction sites for civil works are:

- Cube tests for concrete works for each location or structural members.
- Sieve analysis of coarse aggregates, impact or abrasion tests.
- Sieve analysis of coarse sand for concrete works, masonry sands for masonry works, plastering and pointing works etc.
- Tests for impurities of aggregates and sands.
- Bulking of sand test for concrete and masonry works.
- Slump tests and compacting factor tests for concrete works.
- Crushing strength test, tolerance, and water absorption test, efflorescence tests of bricks, stones or masonry work.
- Moisture contents of timber.
- Manufacturer tests reports provided by the vendors for admixtures, reinforcing steels etc.

Self-Check -3	Written Test

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

1. Write the Tests Results Recording (**4 points)**
2. List the tests carried out at construction sites for civil works are: (**4 points)**

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: _____

Short Answer Questions

1. _____
   _____
   _____

_____

_____

_____

Operation Sheet 1	calculating material quantities using factors techniques

Techniques for calculating material quantities using factors

Procedure:-

Steps 1 Prepare you before for the work

Step 2: Prepare calculation instruments and A4 paper

Step 3: start calculate mortar ingredients and bricks to $2m^2$

Step 4: Properly collate your result

Step 5: finally summit to your teacher

- by using the above procedure do the following LAP test

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 1 hour.

Task 1 calculating material quantities using factors

.

- **www.newton.dep.anl.gov, Daniel Ryan, silica sand**
- **www.state.ar.us/asc/silica.htm, Arkansas geological**

Annex I

Answer keys for learning guide -27

Answer key

Self-check

Information Sheet-1

1. Work in and convert between building dimensions, including metric system

- Built-in right-angle solutions
- Areas, volumes, square-ups
- Complete stair layouts

2. Calculations is a manual that provides end users with a comprehensive guide for many of the formulas**,**

Information Sheet-2

1. Cement mortar, lime mortar, compo mortar

2. Quantity is a term used in the building industry for the number or amount of materials required for a particular task**.**

Information Sheet-3

1. This is an important record to be maintained at construction site as a proof for construction quality

2. Tests for impurities of aggregates and sand

Bulking of sand test for concrete and masonry works.

Slump tests and compacting factor tests for concrete works.

The trainers prepare TTLM

No	Name	Region	Qualification level	TVET College	Phone number
Zeyede Tekle	B	Dire dawa	DDPTC	0921153259	zedjesus22@gmail.com
Yibeltal Shitie	B	Amhara	MOTTA PTC	0912455288	yibecon2019@gmail.com
Mihiretu Hambisa	B	Oromia	NEKEMTIE PTC	0910195546	mihambi@gmail.com
Tariku W/Agegne	A	SNNP	DILAPTC	0916512167	mamush572@gmail.com
Fikrie Shiferaw	A	Somale	JIJIGA PTC	0913294412	

Facilitator

No	Name	Region	TVET Bureau	Email & phone number	Phone no
1	Tilahun Tesfaye	Amhara	Amhara TVED Bureau	Tilahun tesfaye eewnetu@gmail.com	0940651823
2	Abere Dagnaw	Amhara	Amhara TVED Bureau	Aberedagnaw10@gmail.com	09 18 1 41 11
3	Abdulahi Muktare	Somale	Somalia TVET Bureau		0935635068