



# **RQF LEVEL 3**



BDCOF301 BUILDING CONSTRUCTION

**Opening Fixation** 

TRAINER'S MANUAL





# **OPENING FIXATION**





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### **TABLE OF CONTENT**

AUTHOR'S NOTE PAGE (COPYRIGHT)	i
ACKNOWLEDGEMENTS	ii
COORDINATION TEAM	iii
TABLE OF CONTENT	iv
LIST OF ABBREVIATIONS AND ACRONYMS	V
INTRODUCTION	1
LEARNING OUTCOME 1: SELECT TOOLS, EQUIPMENT AND MATERIALS	3
Topic 1.1: Identification of Tools and Equipment	7
Topic 1.2: Identification of materials used in opening fixation	11
LEARNING OUTCOME 2: PREPARE WORKING AREA	22
Topic 2.1: Interpretation of drawing while performing opening fixation	25
Topic 2.2: Identification of particular characteristics of openings	30
Topic 2.3: Appropriate measurements of opening	34
LEARNING OUTCOME 3: INSTALL DOOR, WINDOW, VENTILATOR AND LIGHTING INTO THE OPENING	44
Topic 3.1: Marking and measuring area for drilling holes	47
Topic 3.2: Proper Installation of openings	51
Topic 3.3: Convenient finishing of opening in accordance with construction Materials used	55
BIBLIOGRAPHY	67

### **LIST OF ABBREVIATIONS AND ACRONYMS**

**%:** Percentages

**2D:** Two dimensions

**3D:** Three dimensions

**CBET:** Competency Based Education Training

M.S: Mild Steel

**PPE:** Personal Protective Equipment

**RCC:** Reinforced Cement Concrete

RTB: Rwanda TVET Board

**TVET:** Technical and Vocational Education and Training

#### INTRODUCTION

This trainer'ws manual encompasses all methodologies necessary to guide you to deliver the module titled: Opening Fixation. Students undertaking this module shall be exposed with practical activities that will develop and nurture their competences. The writing process of this training manual embraced competency-based education and training (CBET) philosophy by providing practical opportunities reflecting real life situations.

The trainer's manual is subdivided into units, each unit has various topics and you will start by guiding a self-assessment exercise to help students rate themselves on their level of skills, knowledge and attitudes about the unit.

The trainer's manual will give you the information about the objectives, learning hours, didactic materials and proposed methodologies and crosscutting issues.

A discovery activity follows to help students discover what they already know about the unit.

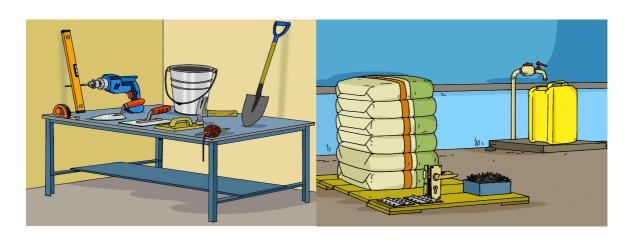
This manual will give you tips, methodologies and techniques about how to facilitate students to undertake different activities as proposed in their trainee manuals. The activities in this training manual are prepared such that they give opportunities to students to work individually and in groups.

After going through all activities, you shall help students to undertake progressive assessments known as formative and finally facilitate them to do their self-reflection to identify their strengths, weaknesses and areas for improvements.

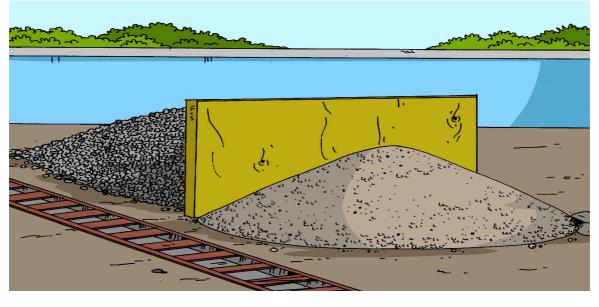
Remind them to read points to remember sections, which provide the overall key points and takeaways of the unit.

Learning outcomes	Learning Hours	Topics
	nours	
Select tools, equipment	10	1.1. Identification of Tools and
and materials		Equipment
		1.2. Identification of materials
Prepare working area	10	2.1. Interpretation of drawing
		2.2. Identification of particular
		characteristics of openings
		2.3. Appropriate measurements of
		opening
Install door, window	20	3.1. Marking and measuring area for
and lighting into the		drilling holes
opening		3.2. Proper Installation of openings
		3.3. Convenient finishing of opening in
		accordance with construction

### **LEARNING OUTCOME 1: SELECT TOOLS, EQUIPMENT AND MATERIALS**







#### **Learning outcome 1: Self-Assessment**

- 1. Ask trainees to look at the unit Illustration in their Trainee Manuals and together discuss:
  - a. What does the illustration show?
  - b. What activities are performed using the tools, equipment and materials in the illustration above?
  - c. What do you think will be topics to be covered under this unit based on the illustration?
- **2.** After the discussion, inform students that this unit is intended to provide them with the knowledge, skills and attitudes to select tools, equipment and materials for performing opening fixation. They will cover identification of tools and equipment as well as identification of materials needed while fixing openings.
- **3.** Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that:
  - a. The purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning.
  - b. There is no right or wrong ways to answer this assessment. It is for their own reference and self-reflection on the knowledge, skills and attitudes acquisition during the learning process.
  - c. They should think about themselves: do they think they have the knowledge, skills or attitudes to do this? How well?
  - d. They read the statements across the top and put a check in column that best represents their level of knowledge, skills or attitudes.
  - e. At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas of improvement and actions to be taken.



Knowledge		kills	P	Attitudes
1. Identify tools and	1.	Select tools and	1.	Safe handling of tools
equipment needed du	ing	equipment to be		and equipment
opening fixation referr	ing	used during		
to their function		opening fixation		
2. Identify required mate	rials 2.	Classify materials	2.	Be responsible while
basing on their functio	ns	used during		and after using tools
and quality		fixation of opening		and equipment
3. List materials required	3.	Select required	3.	Take safety measures
during opening fixation	ı	materials basing on		while selecting tools
		their functions and		and equipment
		quality		
4. Describe Handling of to	ools 4.	Apply techniques	4.	Proper wearing of PPE
and equipment proper	ly	to maintain tools		during classification of
		and equipment		materials, tools and
				equipment
5. Describe the quality of	5.	Maintain tools and	5.	Correct storage of tools
materials to be used in		equipment		and equipment
opening fixation				

# 宁 Steps:



# Task 1:

- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to analyze pictures provided under task 1 in their trainee manuals and answer the questions that follow. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are given.
- 2. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Encourage all students to give their views.
- 3. After the presentations/sharing session, inform students that this activity was not intended for them to give the right answers but to give them a picture of what they will cover in the unit.

### **Topic 1.1: Identification of Tools and Equipment**



#### Objectives: By the end of the topic, trainees will be able to:

- a. Select tools and equipment to be used during opening fixation
- b. Select required materials basing on their functions and quality
- c. Maintain tools and equipment



Time Required: 2 hours



**Learning Methodology:** Group discussion, brainstorm, four corners, Jigsaw, debate, think- pair- square- share, role play, lecture method

#### Materials, tools and equipment Needed:



- Materials: Chalks, pen, markers, papers, flip charts, etc
- **Tools:** Computer, tape measures, trowels, different types of hammers, spirit levels, spade and shovels, mortar pan, building line, floats, etc.
- Equipment: Boots, masks, helmets, gloves, overcoats, earmuffs....

#### **Preparation:**





- Connect with construction project managers to organize field site visits related to selection of different tools and equipment.
- Availability of tools and equipment to be used.
- Avail material for maintenance of tools and equipment.
- Prepare the required PPE for all trainees and other safety tools and equipment.

#### **Cross Cutting Issues:**

 Ensure gender balance while forming groups, allocating tasks and during presentations.



- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of taking care of tools and equipment.
- ✓ Promote standardization culture among students through realizing the need/importance of selecting standards tools and equipment.

#### **Prerequisites:**



- Simple calculations (algebra, geometry);
- Safety, Health and environment measures;
- Chemistry (Metal properties);
- Mechanic (behavior of metallic tools and equipment).

Activity 1: Problem-Solving

詞Task 2

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to analyze the

scenario and answer the questions provided under task 2 related to the types of tools and

equipment used to fix openings in their trainee manuals. Make sure instructions are

understood, all the students are actively participating and necessary materials/tools are

provided and being used.

2. Using an appropriate methodology such as question and answer in a large group, pair

presentations or small group presentations, students share their answers to the class.

Write their responses for reference. Encourage all students to give their views.

3. After the sharing session, refer students to **Key facts 1.1a** and discuss them together while

harmonizing their responses provided in the sharing session and answer any questions

that they may have.

Activity 2: Guided Practice

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to analyze the

scenario and complete the table provided under task 3 in their trainee manuals. Make

sure instructions are understood, all the students are actively participating and necessary

materials/tools are provided and being used.

2. During the task, students should be given a degree of independence to apply the

knowledge and skills acquired in activity 1. Your role is to guide them by using probing

questions such as Why? What? How? to enable them to come to informed responses.

3. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, inclusivity, financial education among others. Also attitudes and behavior changes should be handled during this activity.

4. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.

5. After the sharing session, refer students to **Key Facts 1.1b** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions that they may have.





1. Explain to trainees that the following task link them to the world of work. Ask them to choose one facility in the school neighborhood, make an appointment with a technician, ask permission to assist him/her for that particular day and upon completion, elaborate a short report preferably one-half page on experience they will have gained on workplace exposure.

2. Using an appropriate methodology such as individual work, pairs or small groups trainees perform the task on the field and make a report on the various tools and equipment that they will need to fix openings for the following tasks:

- a. Measuring.
- b. Marking.
- c. Leveling.
- d. Cutting.
- e. Power tools.
- f. Holding.
- g. Safety Protection.
- h. Transporting.
- i. Mixing.
- j. How are they maintained?

- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do at workplace. Then they can compare best practices and limitations at the workplace. You can also ask them to go to another facility to compare practices.
- 4. Tell trainees that each one will share his/her experience gained from the workplace with the rest of the class.
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe for submitting the report.

### Topic 1.2: Identification of materials used in opening fixation

#### Objectives: By the end of the topic, trainees will be able to:



- a. Describe the quality of materials to be used in opening fixation.
- b. Select required materials based on their functions and quality.
- c. Classify materials used during fixation of opening.

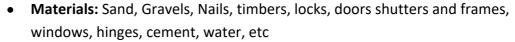


Time Required: 2 hours



**Learning Methodology:** *Group discussion, site visit, brainstorm, four corners, Jigsaw, debate, think- pair- square- share, role play, lecture method.* 

#### Materials, tools and equipment Needed:





- **Tools:** Trowels, spade and shovels, tape measure, spirit level, building line, floats, straight edge, different types of hammers, etc.
- **Equipment:** concrete mixer and PPE's (Boots, masks, helmets, gloves, overcoats, overall, safety belt, goggles, earmuffs,...)

#### **Preparation:**

- Preparation of workshop for opening fixation.
- Connect with construction project managers to organize field site visit related to selection of different tools and equipment.
- Availability of tools and equipment to be used.
- Avail material for maintenance of tools and equipment.
- Prepare the required PPE for all trainees and other safety tools and equipment.

#### **Cross Cutting Issues:**

 Ensure gender balance while forming groups, allocating tasks and during presentations.



- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of taking care of tools and equipment.
- ✓ Promote standardization culture among students through realizing the need/importance of selecting standards tools and equipment.

#### **Prerequisites:**



- Simple calculations (algebra, geometry);
- Safety, Health and environment measures;
- Chemistry (Metal properties);
- Mechanic (behavior of metallic tools and equipment).

Activity 1: Problem-Solving

Task 1

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to answer the

questions provided under task 5 related to the types of materials used to fix openings in

their trainee manuals. Make sure instructions are understood, all the students are actively

participating and necessary materials/tools are provided and being used.

2. Using an appropriate methodology such as question and answer in a large group, pair

presentations or small group presentations, students share their answers to the class.

Write their responses for reference. Encourage all students to give their views.

3. After the sharing session, refer students to **Key facts 1.2** and discuss them together while

harmonizing their responses provided in the sharing session and answer any questions

they have.

Activity 2: Guided Practice

Task 2:

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to read the

scenario and complete the tables provided under task 6 in their trainee manuals. Make

sure instructions are understood, all the students are actively participating and necessary

materials/tools are provided and being used

2. During the task, students should be given a degree of independence to apply the

knowledge and skills acquired in activity 1. Your role is to guide them by using probing

questions such as Why? What? How? to enable them to come to informed responses.

3. While students are still performing the task, use this opportunity to discuss or address any

cross-cutting issues that may arise such as gender, inclusivity, standardization culture,

financial education among others. Also attitudes and behavior changes should be handled during this activity.

- 4. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. Encourage all students to give their views.
- 5. After the sharing session, refer students to **Key Facts 1.2** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.





- 1. Explain to trainees that the following task link them to the world of work. Ask them to choose one facility in the school neighborhood, make an appointment with a technician, ask the permission to assist him/her for that particular day and upon completion, elaborate a short report preferably one-half page on experience they will have gained on workplace exposure.
- 2. Using an appropriate methodology such as individual work, pairs or small groups trainees perform the task on the field and make a report on the materials you will select by completing the table below:

No	Name of material	Function of material on this	Quality of the materials
	needed	task	

- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do at the workplace. Then they can compare best practices and limitations at the workplace. You can also ask them to go to another facility to compare practices.
- 4. Tell trainees that each one will share his/her experience gained from the workplace with the rest of the class.
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe for submitting the report.

# Formative Assessment

- 1. Read the statements below and respond by True or False
  - a. While making concrete, the function of cement is to bind sand and gravel together.
  - b. Water used to make concrete or mortar while fixing openings must be fit drinkable quality.
  - c. Sources of sand are pit (pit sand) and River sand only.
  - d. If gravels for making concrete while fixing openings are hard and strong and contain impurities, it means they have good quality.
  - e. A good plasticity is the property of cement to use in opening fixation.
  - f. Hinges are used to connect the shutter to its frame.
- 2. MUKARANGE primary school located in MUKARANGE sector needs to replace its old windows and doors made in timber by metallic ones. The Head teacher gives you a paid task to identify and select all necessary tools, equipment and materials for undertaking activity. You are tasked to select the tools, equipment and materials for performing the activity by completing the table below:

Nº	Tools and equipment	Function	Proposed cleaning system for each
1.			

Nº	Materials	Uses	Quality of material
1.			

#### **Answers**

a. While making concrete, the function of cement is to bind sand and gravel together.

Answer: True

b. Water used to make concrete or mortar while fixing openings must be fit drinkable quality.

**Answer: True** 

c. Sources of sand are pit (pit sand) and River sand only.

**Answer: False** 

d. If gravels for making concrete while fixing openings are hard and strong and contain impurities, it means they have good quality.

**Answer: False** 

e. A good plasticity is the property of cement to use in opening fixation.

**Answer: True** 

f. Hinges are used to connect the shutter to its frame.

**Answer: True** 

MUKARANGE primary school located in MUKARANGE sector needs to replace its old windows and doors made in timber by metallic ones. The Head teacher gives you a paid task to identify and select all necessary tools, equipment and materials for undertaking activity. You are tasked to select the tools, equipment and materials for performing the activity by completing the table below:

#### **Answer:**

Nº	Tools and equipment	Function	Proposed cleaning system for each
1.	Measuring tape, Decameter	Used for Measuring	Dry cleaning is required
2	Chalk line and fill, Pencils	Used for marking	Dry cleaning is required
3	Plumb bob and Water level, Spirit level, Dumpy level and tripod	Used to level vertically or horizontally	Dry cleaning is required for dumpy level and plumb bob, While wet or water cleaning is required for spirit level and water level
4	Hand saw, Machete	Used for any required cutting	Dry cleaning is required
5	Electrical portable drilling machine(s)	Used for drilling or boring holes	Dry cleaning is required and Oil cleaning are necessary
6	Clamps, Brackets	Used to hold or maintain materials or components in position	Dry cleaning is required and Oil cleaning are necessary
7	Overall, Helmet, Goggles, Safety belt, Gloves, Safety shoes Face mask Ear protection	They are all required and used for safety protection and increase well-being of workers while performing fixation of opening	Wet or water cleaning is necessary
8	Wheelbarrow, Bucket Mortar pan	Used to carry or transport mortar and , concrete; they also used to move other tools from one place to other	Wet cleaning or Water cleaning is required for all

9	Spade, Shovels , Concrete mixer	They are used to mix concrete or mortar while during fixation of opening	Wet cleaning or Water cleaning is required for all
10	Ladder and Scaffolds	Used to reach and work on high level	Dry cleaning is required
11	Building line	It is used for aligning or having any alignment required.	Dry cleaning is required
12	Screwdrivers	They are needed and used to fix or drive screws and removing them	Dry cleaning is required
13	Trowel	It is used to collect and apply mortar where needed while performing opening fixation work	Dry required and oil is cleaning
14	Floats( steel and wooden)	Their function is to finish mortar or concrete while performing fixing activities.	Dry is required and oil is cleaned for steel floats while wet cleaning is required for wooden floats.
15	Stone hammer or club hammer	Is used for breaking stones as well securing, fixing material in position it can also be used to compact concrete placed in formwork.	Dry cleaning is required
16	Claw or nail hammer	It is used for fixing or removing nails when needed in opening fixation activities.	Dry cleaning is required

Nº	Materials	Uses	Quality of material
1	Sand	Used to produce concrete and mortar. Enhances the strength and workability of concrete and mortar.	<ul> <li>It should be clean and coarse.</li> <li>It should be free from organic matter such as tree leaves, roots.</li> <li>It should contain sharp, angular and durable grains.</li> </ul>

2	Cement Mortar	Used to make finishing around the opening after being fixed.	<ul> <li>It should not contain salts, which attract the moisture from the atmosphere.</li> <li>It should be well graded (contain particles of various sizes in suitable proportions)</li> <li>It should be chemically inert</li> <li>It must be strong enough</li> <li>It must be durable</li> <li>It must respect designed proportion ratio</li> <li>It must have good workability</li> <li>It must adhere and stuck to the structure.</li> </ul>
3	Gravels	Are filler materials used to increase the strength of concrete	<ul> <li>It Should be hard, strong and durable,</li> <li>Free from impurities such as clay, loam, vegetables and other such foreign matters.</li> </ul>
4	Water	Helps for the hydration of the cement during preparation of mortar and concrete It is also used for curing and washing or cleaning tools and equipment after work.	<ul> <li>It should be free from acids.</li> <li>It should be free from Iron, vegetable matter or other substances that have a negative effect on concrete or mortar.</li> <li>It must fit for drinking purposes (portable or quality water).</li> </ul>
5	Cement	It is used as a binder material in preparation of mortar and concrete.	<ul> <li>It should be clean and coarse.</li> <li>It should be free from organic matter such as tree leaves, roots.</li> <li>It should contain sharp, angular and durable grains.</li> <li>It should not contain salts, which attract the moisture from the atmosphere.</li> <li>It should be well graded (contain particles of various sizes in suitable proportions)</li> </ul>
6	Nails	Used to fix or hold frames in position or to attach frames together with structure opening to be fixed.	<ul> <li>Must be durable and withstand a lot of wear and tear</li> <li>Must be consistent in size and shape</li> </ul>

		Used as lugs or hold fast for fixing frames made in timber materials, to help connecting hinges, shutter and frames made in timber.  They are also used to join parts of scaffoldings.	
7	Timbers	Mainly are required for making wedges, frames and shutters (frames or shutter in timber) and also in fabrication of scaffolding.	<ul> <li>They should be corrosion resistance</li> <li>Should meet the specified size and dimensions as per industry standards</li> <li>Should be Strong and resist applied load</li> <li>Must resist stripping and maintain their shape during installation and removal.</li> </ul>
8	Screws	Are used as nails to fix or hold frames in position or to attach frames together with structures containing openings to be fixed especially for metallic frames and connecting locks to shutters.	<ul> <li>They have to be made in strong and durable materials</li> <li>They must have threads</li> <li>Their heads must be designed based on standards.</li> <li>Their size and length must be based on activity to be performed.</li> <li>They must be made in ant-corrosive materials</li> </ul>
9	Hinges and locks	Hinges help to connect shutter to its frame and allow movement of shutter. Locks help to lock and unlock the opening after being fixed and allow the users to control access within structure	<ul> <li>They have to be made in strong and durable materials</li> <li>Their size and length must be based on activity to be performed.</li> <li>They must be made in ant-corrosive materials</li> <li>They must be aesthetically pleasant</li> <li>They must be easily replaced and cleaned.</li> <li>They must be fire resistant</li> </ul>
10	Concrete	Used to fill holes created in building structure, to secure frames by holding them in position.	<ul> <li>It must be strong enough</li> <li>It must be durable</li> <li>It must respect designed proportion ratio</li> <li>It must have good workability</li> </ul>



- While selecting tools or equipment, always remember to relate to their function such as Measuring, Marking, Levelling, Cutting, Mixing, Power tools, Holding, Safety protection, Transporting.
- To increase the lifespan of tools and equipment it is important to use them correctly.
- For better maintenance of tools and equipment follow instructions and guidelines from the manufacturer, check their condition before and after each work after all store them properly.
- Proper selection of materials must be based on their functions and quality.
- Pond, river and sea water should not be used unless and only if is fit for drinking
- The impurities in water may affect setting time, strength and durability of concrete and mortar, they can also cause efflorescence, surface discoloration and corrosion of steel.
- Hand mixing and Machine mixing are the main types of mixing concrete or mortar.
- Tools and equipment are classified as individual or collective<sup>1</sup>.
- Individual tools are handheld or portable devices that are operated by a single person, typically used for specific tasks, designed to be operated on at a time and are often smaller in size such as trowel, tape measure, handsaw.
- Collective tools are all equipment and others which are shared by workers on site
  also known as power tools or heavy machinery, require more than one person to
  operate them safely and effectively such as wheelbarrow, concrete mixer, building
  line, ladder.
- It is highly advisable to control and to do the follow up of every tool, equipment or machine used daily in order to know its condition and you have also to know what you can do after detecting any defect of each of them.
- Always refer to the manufacturer's instructions and guidelines for the best practices.
- Taking care of your tools and equipment will not only prolong their lifespan but also ensure safer and more efficient operation.

<sup>&</sup>lt;sup>1</sup> http://jindalititools.blogspot.com/2017/05/what-is-difference-between-tools-and-equipment.html



- Ask learners to re-take the self-assessment at the beginning of the unit. They should then
  fill in the table in their Trainee Manual to identify their areas of strength, areas for
  improvement and actions to take to improve.
- 2. Together with trainees, discuss the results and Identify any areas that are giving most trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

## **i** Further Information for the Trainer

- 1. Based on rapid change and development occurring in the construction industry; trainer is advised and recommended to use and explore the given reference( bibliography) located at the end of this manual as well as he/she can make further research.
- 2. Materials, tools and equipment provided for topics above (1.1 and 1.2) are not static as well as they are not fully listed so they can be adapted to meet with teaching situations based on trainer's observation.

### **LEARNING OUTCOME 2: PREPARE WORKING AREA**



#### **Learning outcome 2: Self-Assessment**

- 1. Ask trainees to look at the unit Illustration in their Trainee Manuals and together discuss
  - a) What does the illustration show?
  - b) What activities are performed in the illustration?
  - c) What do you think will be the topics to be covered under this unit based on the illustration?
- 2. After the discussion, inform students that this unit is intended to provide them with the knowledge, skills and attitude required to prepare a working area for opening fixation. They will cover the interpretation of drawing, appropriate measurements of opening as well as identification of particular characteristics of openings.
- **3.** Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that:
  - a) The purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning.
  - b) There is no right or wrong way to answer this assessment. It is for their own reference and self-reflection on the knowledge, skills and attitudes acquisition during the learning process.
  - c) They should think about themselves: do they think they have the knowledge, skills or attitudes to do this? How well?
  - d) They read the statements across the top and put a check in column that best represents their level of knowledge, skills or attitudes.
  - e) At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas of improvement and actions to be taken.



Knowledge	Skills	Attitude
1. Explain scale, units and	1. Apply scale after	1. Take appropriate
dimensions as elements	being interpreted	measurements of opening.
of drawing		
2. Explain sizes of openings	2. Interpret drawing	2. Proper identification of
for different buildings.	symbols and signs	characteristics of doors,
		windows, skylight and
		ventilation
3. Describe the	3. Demonstrate	3. Apply units on drawing as
characteristics of doors	different types of	required
and windows.	openings on	
	building	







- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to read in their trainee manuals and answer the questions for task 8. Make sure instructions are understood, all the students are actively participating and all necessary are given.
- 2. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Encourage all students to give their views.
- 3. After the presentations/sharing session, inform students that this activity was not intended for them to give the right answers but to give them a picture of what they will cover in the unit.

### Topic 2.1: Interpretation of drawing while performing opening fixation

#### Objectives: By the end of the topic, trainees will be able to:

- a. Describe the elements of drawing.
- b. Interpret scale, units, symbols and signs used as drawing elements.
- c. Interpret Floor plan drawing.
- d. Interpret Section drawing.



Time Required: 2 hours



Learning Methodology: Group discussion, site visit, brainstorm, four corners, Jigsaw, debate, think- pair- square- share, role play, lecture method.

#### Materials, tools and equipment Needed:



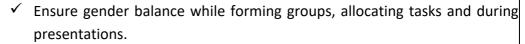
- Materials: Chalk, pen, produced drawings (section, floor plans),
- **Tools:** calculators, exercise notebooks, papers, graduated rulers, drawing templates, computer.
- **Equipment:** PPE's (Boots, masks, helmets, gloves, overcoats, overall, safety belt, goggles, earmuffs,....).



#### **Preparation:**

- Preparation of learning area (classroom).
- Availability of tools and equipment to be used.
- Avail of drawings (floor plans, sections) to be used.

#### **Cross Cutting Issues:**





- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of interpreting drawings.
- ✓ Promote standardization culture among students through realizing the need/importance of interpreting drawings.

#### **Prerequisites:**



- Construction drawing;
- Simple calculations (algebra, geometry).



## ∰Task 9

- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees read and answer the questions provided under task 9 related to interpretation of drawings in their trainee manuals. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.
- Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class.
   Write their responses for reference. Encourage all students to give their views.
- 3. After the sharing session, refer students to Key facts 2.1a and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

# Task 10

- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees read and answer the questions provided under task 10 related to interpretation of drawings in their trainee manuals. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.
- Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class.
   Write their responses for reference. Encourage all students to give their views.
- 3. After the sharing session, refer students to Key facts 2.1b and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.



# Activity 2: Guided Practice



- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to study figure 12 and answer questions provided under task 11 in their trainee manuals. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.
- 2. During the task, students should be given a degree of independence to apply the knowledge and skills acquired in activity 2. Your role is to guide them by using problem questions such as Why? What? How? When? to enable them to come to informed responses.
- 3. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, inclusivity, financial education among others. Also attitudes and behavior changes should be handled during this activity.
- 4. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. Encourage all students to give their views.
- 5. After the sharing session, refer students to **Key Facts 2.1a** and **2.1b** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.



# Task 12

- 1. Explain to trainees that the following task links them to the world of work.
- 2. Using an appropriate methodology such as individual work, pairs or small groups, ask trainees to study figure 14 and perform task 12 by completing a table given under this task.

On floor plan		On Sections	
Questions	Interpretations	Questions	Interpretations
Symbol represented by 1		What is the type of	
means what?		section S-06 – S-06?	
Symbol represented by 2		What is the type of	
means what?		section S-07 – S-07?	
Symbol represented by 3		How many doors	
means what?		and windows are on	
		section S-07 – S-07?	
How many external		How many doors	
doors?		and windows are on	
		section S-06 – S-06?	
What is the length for		What is the total	
window of main hall?		height of windows	
		for both sections?	
What is the total length		What is the starting	
of long wall( long side)?		height of the	
		window shown on	
		section S-06 – S-06?	
		What is the starting	
		height of the	
		window shown on	
		section S-07 – S-07?	
		What is the total	
		height of doors for	
		both sections?	

- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do in the workplace. Then they can compare best practices and limitations in the workplace. You can also ask them to go to another facility to compare practices.
- 4. Tell trainees that each one will share his/her experience gained from the workplace with the rest of the class.
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe for submitting their interpretation.

# Topic 2.2: Identification of particular characteristics of openings



#### Objectives: By the end of the topic, trainees will be able to:

- Describe doors, their functions, elements and their classification.
- Describe functions, elements and classification of windows. b.
- Describe skylight, their functions and types.



## **Time Required: 3** hours



Learning Methodology: Group discussion, site visit, brainstorm, four corners, Jigsaw, debate, think- pair- square- share, role play, lecture method.

#### Materials, tools and equipment Needed:



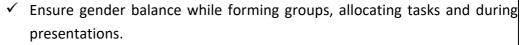
- Materials: door shutter, door frames, window shutter, window sash(shutter), hinges, video of openings, Projector, Chalk, pen, books
- **Tools:** computers, spirit level, tape measure, decameter,
- Equipment: PPE's (Boots, masks, helmets, gloves, overcoats, overall, safety) belt, goggles, earmuffs,..).

#### **Preparation:**



- Preparation of doors, windows.
- Connect with site engineers to organize field site visits related to skylight.
- Availability of computers and videos related to openings.
- Avail doors shutters, door frames, window shutters and frames.

#### **Cross Cutting Issues:**





- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of identifying characteristics of openings.
- ✓ Promote standardization culture among students through realizing the need/importance of using required openings.

#### **Prerequisites:**



- Technical drawings;
- Wall elevation;
- Simple calculations (algebra, geometry);
- Safety, Health and environment measures.



# ∰Task 13

- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to answer the questions provided under task 13 related to particular characteristics of openings in their trainee manuals. *Make sure instructions are understood, all the students are actively participating and necessary are provided and being used.*
- 2. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.
- 3. After the sharing session, refer students to **Key facts 2.2 and** discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.



# **Activity 2: Guided Practice**



- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to read the scenario and answer provided questions under task 14 in their trainee manuals. *Make sure instructions are understood, all the students are actively participating and all necessary are provided and being used*
- 2. During the task, students should be given a degree of independence to apply the knowledge and skills acquired in activity 2. Your role is to guide them by using questions such as What? Explain, How? to enable them to come to informed responses.

- 3. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, inclusivity, standardization culture, financial education among others, genocide. In addition, attitudes and behavior changes should be handled during this activity.
- 4. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.
- 5. After the sharing session, refer students to **Key Facts 2.2** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.





- 1. Explain to trainees that the following task link them to the world of work. Ask them to make tour in their school by observing available windows.
- 2. Using an appropriate methodology such as individual work, pairs or small groups trainees perform the task on the tour and make a report by completing the table below

Classification(types) based on						
Their position		Materials		Their configuration		
Names	Numbers	Names Numbers I		Names	Numbers	

- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do in the workplace.
- 4. Tell trainees that each one will share his/her experience gained from the workplace with the rest of the class.
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe for working.

# **Topic 2.3: Appropriate measurements of opening**

### Objectives: By the end of the topic, trainees will be able to:



- a. Describe the sizes of openings for residential buildings.
- b. Describe the sizes of openings for public buildings.
- c. Describe the factors affecting the number and location of windows in a building.



### Time Required: 3 hours



**Learning Methodology:** Group discussion, site visit, brainstorm, four corners, Jigsaw, debate, think- pair- square- share, role play, lecture method.

#### Materials, tools and equipment needed:



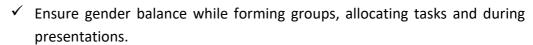
- Materials: door shutter, door frames, window shutter, window sash(shutter), hinges, video of openings, Projector, Chalk, pen, books
- Tools: computers, spirit level, tape measure, decameter,
- **Equipment:** PPE's (Boots, masks, helmets, gloves, overcoats, overall, safety belt, goggles, earmuffs,.....).

#### **Preparation:**



- Preparation of learning areas (classroom and workshop).
- Connect with construction site engineers to organize site visits related to measurements of opening.
- Availability of tools for measuring openings.
- Avail all required materials.

#### **Cross Cutting Issues:**





- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all .
- ✓ Promote financial education by emphasizing the need/importance of taking care of tools and equipment.
- ✓ Promote standardization culture among students through realizing the need/importance of selecting standards tools and equipment.

#### **Prerequisites:**



- Technical drawings;
- Wall elevation;
- Simple calculations (algebra, geometry);
- Safety, Health and environment measures.

Activity 1: Problem-Solving

∰Task 16

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to answer the

questions provided under task 16 related to appropriate measurements openings in

their trainee manuals. Make sure instructions are understood, all the students are

actively participating and necessary materials/tools are provided and being used.

2. Using an appropriate methodology such as question and answer in a large group, pair

presentations or small group presentations, students share their answers to the class.

Write their responses for reference. Encourage all students to give their views.

3. After the sharing session, refer students to **Key facts 2.3** and discuss them together

while harmonizing their responses provided in the sharing session and answer any

questions they have.

Activity 2: Guided Practice

₹ Task 17

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to read the

scenario provided under task 17 in their trainee manuals and produce a report on.

Make sure instructions are understood, all the students are actively participating and

necessary materials/tools are provided and being used

2. During the task, students should be given a degree of independence to apply the

knowledge and skills acquired in activity 2. Your role is to guide them to produce a

complete report.

- 3. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, genocide, inclusivity, standardization culture, financial education among others. In addition, attitudes and behavior changes should be handled during this activity.
- 4. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, individual presentation, students share their answers to the class. Encourage all students to give their views.
- 5. After the sharing session, refer students to **Key Facts 2.3** and discuss them together while harmonizing their reports provided in the sharing session and answer any questions they have.



- 1. Explain to trainees that the following task link them to the world of work. Ask them to take measurements of openings (doors and windows) in their institution and compare with standard sizes as provided under task 18, inform them that report must include:
  - a. Tools used to measure;
  - b. Location of openings;
  - c. Type of openings measured;
  - d. Measurements of the openings
- 2. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do in the workplace. Then they can compare best practices and limitations in the workplace.
- 3. Tell trainees that each one will present his/her report with the rest of the class.
- 4. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe for submitting the reports.



#### 1. Read and answer the questions below

- a. What are the real dimensions of door opening, if the dimensions on drawing are 3.6 cm width and 4.8 cm height; scale used is 1:50?
- b. Dimensions of fixed door (real dimensions) are 900 cm x 200cm, if you want to present this door on drawing, determine the dimensions to use when scale is 1:100
- c. Briefly, explain three disadvantages and two advantages of skylight in building.
- d. How can you represent the unit of area and unit of volume?
- e. Door and window are openings, describing three functions of each in the building.
- f. Mention the sizes of the main single opening entrance (without fanlight) in residential buildings.
- g. Briefly explain the primary differences between doors, windows and skylights as openings in a building.
- h. What unique purposes do these openings serve?
- i. Describe two common types of doors used in residential buildings.
- j. How can skylights contribute to the energy efficiency of a building?
- k. Explain how they can enhance natural lighting and reduce the need for artificial lighting during the day.

#### Answers

a) What are the real dimensions of door opening, if the dimensions on drawing are 3.6 cm width and 4.8 cm height; scale used is 1:50?

#### **Answer:**

Formula to use:

Dimensions in real life = 
$$\frac{dimensions\ on\ drawing}{scale\ (used\ scale)}$$
Width dimension = 
$$\frac{3.6cm}{1/50} = \frac{3.6cm*503.6cm}{1/50} = \frac{3.6cm*50}{1}$$
= 180cm
Height dimension = 
$$\frac{4.8cm}{1/50} = \frac{4.8cm*504.8cm}{1/50} = \frac{4.8cm*50}{1}$$
= 240cm

b) Dimensions of fixed door (real dimensions) are 90cm x 200cm, if you want to present this door on drawing, determine the dimensions to use when scale is 1:100

#### **Answer:**

Formula to use: Dimensions on drawing = real dimensions x scale

Dimensions on drawing = real dimensions x scale

Width dimension = 
$$90cm * \frac{1}{100} = \frac{90cm}{100} 90cm * \frac{1}{100} = \frac{90cm}{100}$$

=0.9cm

Height dimension = 
$$200 \text{cm} * \frac{1}{100} = \frac{200 \text{ cm}}{100} 200 \text{cm} * \frac{1}{100} = \frac{200 \text{ cm}}{100}$$

=2cm

c) Briefly, explain three disadvantages and two advantages of skylight in building.

#### **Answer:**

Dis	sadvantages of skylight in building	Ad	vantages of skylight in building
<b>✓</b>	The major disadvantage of the	<b>✓</b>	They provide more natural ventilation of
	skylight is that the amount of		both air and light.
	light and heat cannot be	✓	It improves the aesthetic appearance of the
	controlled that comes through		building.
	the skylights.	✓	It minimizes the need for artificial lightning in
✓	In summer days, due to more		the room.
	heat coming through the	✓	It maintains the temperature balance in the
	skylights, artificial cooling of		room by constantly replacing the hot air with
	rooms is required.		fresh and cool air by the ventilated skylight.
✓	Accumulation of dust in the	✓	The eco-friendly addition of natural lighting
	skylights, which needs to be		means that skylights can also increase the
	cleaned regularly.		resale value of a home.
✓	Due to the improper sealing of		
	skylights, leakage is the major		
	problem faced in the homes.		
✓	The installation cost and		
	maintenance of the skylight is		
	more when compared to normal		
	windows.		

d) How to represent the unit of area and unit of volume?

#### **Answer:**

The unit of area is represented as <b>Sqm</b> or <b>m</b> <sup>2</sup>	The unit of volume is represented as <b>cum</b>
	or cm <sup>3</sup>

e) Door and window are openings; describe three functions of each in the building.

#### **Answer:**

Fu	Functions of door opening in building		nctions of window opening in building
✓	To provide the entrance and exit inside	✓	To allow natural light to enter a
	and movement within internal rooms.		building.
✓	To admit and allow ventilation and light.	✓	To provide ventilation when the
✓	To control the physical atmosphere (heat		glazed area is made to open and
	and cool) within the building.		trickle vent within their frame.
✓	To prevent the spread of fire.	✓	To keep out climatic effects such as
✓	They also act as a barrier to noise.		wind or cold.
✓	To provide sound and thermal insulation.	✓	To provide security.
✓	To keep out the cold and other climatic	✓	To decorate and give good
	effects.		appearance to the building
✓	Doors also have an aesthetic role.		
✓	Doors are generally used to separate		
	interior spaces (rooms, closets, etc.)		

f) Mention the sizes of the main single opening entrance (without fanlight) in residential buildings.

#### Answer:

The sizes of main single opening entrance (without fanlight) in residential building is long or width  $0.80 - 0.1 \text{m} \times 1.90 - 2.15 \text{m}$  height

g) Briefly explain the primary differences between doors, windows and skylights as openings in a building.

#### **Answer:**

Doors	Windows	Skylights
A door is a moveable	Windows are openings in	Skylights are type of fixed
A door is a moveable barrier secured in a wall opening. Also is a moving structure used to block off and allow access to an entrance to or within an enclosed space and secured in an opening left in a wall.	Windows are openings in a wall or other surface of a building that allows the passage of light and transmission of varying amounts of air and sound.  They consist of a frame, sashes and panes of glass (or other transparent or translucent material)	Skylights are type of fixed window provided on the sloping surface of a pitched roof They are parallel to the sloping surface covered with translucent or transparent material They allow natural light to come into the house
		directly during daytime

h) What unique purposes do these openings serve?

#### **Answer:**

- The unique of doors is to block off and allow access to an entrance to or within an enclosed space
- The unique of Windows is to allow natural light, ventilation, generally they are equipped with sill
- The unique of is that they are specifically designed to allow natural light from above, typically through the roof or a high ceiling
- i) Describe two common types of doors used in residential buildings.

#### **Answer:**

Two main types of doors are internal and external

**External doors** must be more durable because they must resist the external hazards, to protect security and they must be stronger.

Internal doors are less strong than the first group and all these are fixed internal in rooms, e.g. the flush doors etc.

j) How can skylights contribute to the energy efficiency of a building?

#### **Answer:**

Skylights can contribute to the energy efficiency of a building in several ways:

- **1. Natural day lighting:** Skylights can provide a significant amount of natural daylight into a building, reducing the need for artificial lighting.
- **2. Passive solar gain:** In the winter, skylights can help to heat a building by allowing sunlight to pass through the glazing and warm the interior spaces. This can reduce the need for space heating, saving energy and money.
- **3. Ventilation:** Skylights can be opened to provide natural ventilation, which can help to remove hot air from a building in the summer. This can reduce the need for air conditioning, saving energy and money.
- **4.** Day lighting and ventilation controls: Advanced skylights can be equipped with sensors and controls that automatically adjust their position or opening to optimize day lighting and ventilation.
- k) Explain how they can enhance natural lighting and reduce the need for artificial lighting during the day.

#### **Answer:**

Skylights allow sunlight to penetrate the interior spaces directly, providing a bright and natural illumination like outdoor lighting.

This natural light has several benefits over artificial lighting:

- 1. **Improved mood and productivity:** Studies have shown that exposure to natural daylight can improve mood, increase alertness and boost productivity.
- 2. **Reduced eye strain:** Artificial lighting can cause eye strain and fatigue, especially when used for extended periods.
- 3. **Enhanced well-being:** Natural light has been linked to a variety of health benefits, including improved sleep quality, reduced stress levels and even a stronger immune system.
- 4. **Reduced energy consumption:** By reducing the need for artificial lighting, skylights can significantly lower a building's energy consumption, saving money on electricity bills



- Drawing containing information for construction is often called a plan.
- Scale drawings are drawings that represent something at a size other than their full size.
- Formulas to follow while working with scale.

Dimensions in real life = 
$$\frac{dimensions\ on\ drawing}{scale\ (used\ scale)}$$
 Dimensions on drawing =  $real\ dimensions\ x\ scale$ 

$$Scale = \frac{dimensions\ on\ drawing}{Dimensions\ in\ real\ life}$$

- Term unit refers to measurement, which is used as a standard for measuring construction elements (structures).
- In construction, symbols and signs are used to represent construction elements,
   fixtures and associated with some ideal and message.
- Reading plans is like decoding spaces and understanding the symbolic representation
  of the plan data and it helps to convey the idea without actually meeting the person in
  real life.
- Reading Scale and Basic Data, known Starting Point of a Floor Plan,
- 3 types of sections drawn for a set of plans are Full sections, Partial sections and Details.
- In general, the section is likely to be 1:50 (in metric units) but a construction detail of a wall junction needs to be a much larger scale than a general section of the whole building. The wall detail might have a scale of 1:10 or 1:5.
- Opening is defined as a gap or free space in structure which allowing the passage
- Doors or windows consist of two (2) main parts, which are frame and shutter (leaf).
- A door is a moving structure used to block off and allow access to an entrance
- Generally, doors are divided into two main groups (internal and external) and they are classified either on the basis of their Working operations, Materials used in their manufacture or fabrication as well as Function being performed by them.
- Skylight can be defined as a special type of opening provided in the roof of the building covered with transparent material to allow natural light to come into the house directly during daytime.
- When deciding to install skylights, it's important to do your due diligence.



- 1. Ask learners to re-take the self-assessment at the beginning of the unit. They should then fill in the table in their Trainee Manual to identify their areas of strength, areas for improvement and actions to take to improve.
- 2. Discuss trainees' results with them. Identify any areas that are giving many trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

# (i) Further Information for the Trainer

- Based on rapid change and development occurring in the construction industry; trainer is advised and recommended to use and explore the given reference( bibliography) located at the end of this manual as well as he/she can make further research.
- 2. Materials, tools and equipment provided for topics above (2.1, 2.2 and 2.3) are not static as well as they are not fully listed so they can be adapted to meet with teaching situations based on trainer's observation.

# **LEARNING OUTCOME 3: INSTALL DOOR, WINDOW, VENTILATOR** AND LIGHTING INTO THE OPENING



### **Learning outcome 3: Self-Assessment**

- **1.** Ask trainees to look at the unit Illustration in their Trainee Manuals and provide answers together for below questions as asked in their trainee manuals:
  - a. What is happening?
  - b. What do you think this unit will be about?
- 2. After the discussion, inform students that this unit is intended to provide them with the knowledge, skills and attitudes to install doors, windows and lighting into the openings. It covers finishing of openings in accordance with construction materials used, proper installation of openings as well as marking and measuring area for drilling holes.
- **3.** Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that:
  - a. The purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning.
  - b. There is no right or wrong ways to answer this assessment. It is for their own reference and self-reflection on the knowledge, skills and attitudes acquisition during the learning process.
  - c. They should think about themselves: do they think they have the knowledge, skills or attitudes to do this? How well?
  - d. They read the statements across the top and put a check in column that best represents their level of knowledge, skills or attitudes.
  - e. At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas of improvement and actions to be taken.



Knowl	edge	Skills		Attitud	de
1.	Describe the size of	1.	Perform different	1.	Fix doors and window
	hole required while		drilling methods		opening as required
	fixing frames in				
	opening				
2.	Describe method of	2.	Choose drilling	2.	Adequately fill holes
	drilling holes when		method depend on		created during fixing
	fixing opening		material to drill		
3.	Explain procedures	3.	Identify drilling	3.	Finish the surrounding
	of fixing opening		methods		of openings
					conveniently
4.	Explain how to fill	4.	Apply required	4.	Drill holes according to
	holes created		finishing depend on		required sizes
	during opening		material to be used		
	fixation				

# **宁** Steps:





- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to analyse picture provided under task 19 in their trainee manuals and answer the questions that follow. Make sure instructions are understood, all the students are actively participating and necessary are given.
- 2. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Encourage all students to give their views.
- 3. After the presentations/sharing session, inform students that this activity was not intended for them to give the right answers but to give them a picture of what they will cover in the unit.
- **4.** Introduce **Topic 3.1:** Marking and measuring area for drilling holes

# **Topic 3.1: Marking and measuring area for drilling holes**

### Objectives: By the end of the topic, trainees will be able to:



- a. Describe sizes of holes required while fixing openings.
- b. Describe methods of drilling holes.
- c. Choose the required drilling method based on construction materials and opening to be fixed.
- d. Mark and measure area for holes.



#### **Time Required: 4** hours



Learning Methodology: Group discussion, short questions, open ended questions, site visit, individual works, brainstorming, four corners, Jigsaw, debate, think- pairsquare- share, role play, lecture method.

#### Materials, tools and equipment needed:



- Materials: door shutter, door frames, window shutter, window sash(shutter), hinges, video of openings, Projector, Chalk, pen, books, markers, chalks, pen, internet,
- Tools: computers, spirit level, tape measure, decameter, electrical hand drilling machine, chisel, club hammer, computer, projector
- Equipment: Boots, masks, helmets, gloves, overcoats, overall, safety belt, goggles, earmuffs,.....

#### **Preparation:**



- Preparation of learning area (workshop/ classroom).
- Preparation of tools and equipment to be used.
- Avail required material, door frames, shutters, windows.
- Connect with construction site engineers for site visit related to opening installation.

#### **Cross Cutting Issues:**



- ✓ Ensure gender balance while forming groups, allocating tasks and during presentations.
- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of marking and measuring area for holes drilling.
- ✓ Promote standardization culture among students through realizing the need/importance of marking and measuring area for holes drilling.

#### **Prerequisites:**



- Technical drawings;
- Wall elevation;
- Simple calculations (algebra, geometry);
- Safety, Health and environment measures.

Activity 1: Problem-Solving

**ask 20** 

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to read and

answer the questions provided under task 20 related to marking and measuring area

for holes in their trainee manuals. Make sure instructions are understood, all the

students are actively participating and necessary materials/tools are provided and

being used.

2. Using an appropriate methodology such as question and answer in a large group, pair

presentations or small group presentations, students share their answers to the class.

Write their responses for reference. Encourage all students to give their views.

3. After the sharing session, refer students to **Key facts 3.1** and discuss them together

while harmonizing their responses provided in the sharing session and answer any

questions they have.

Activity 2: Guided Practice

=| =|<sub>Task</sub> 21

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to analyze the

scenario and answer questions provided under task 21 in their trainee manuals. Make

sure instructions are understood, all the students are actively participating and

necessary materials/tools are provided and being used.

2. During the task, students should be given a degree of independence to apply the

knowledge and skills acquired in activity 1. Your role is to guide them to come with

responses.

- 3. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, genocide, inclusivity, financial education among others. In addition, attitudes and behavior changes should be handled during this activity.
- 4. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.
- 5. After the sharing session, refer students to **Key Facts 3.1** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.





- 1. Explain to trainees that the following task link them to the world of work. Ask them to analyse scenarios provided under task 22 in their trainee manuals.
- 2. Using an appropriate methodology such as individual work, pairs or small groups ask trainees to perform the task by completing the table below as available in their trainee manuals.

SN	Non- recommended drilling	Reasons of rejecting drilling	Possible drilling methods for this activity	Types of bits(boring or masonry bits) recommended for		
	methods for this activity	methods		Door frames	Window frames	Masonry units
1.	•					
2.						
3.						
4.						

- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do in the workplace.
- 4. Tell trainees that each one will share his/her responses with the rest of the class
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe.
- 6. This activity can be done in classroom during class time or after class
- 7. After the sharing session, refer students to **Key Facts 3.1** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.
- 8. End by introducing **Topic 3.2:** Proper Installation of openings.

# **Topic 3.2: Proper Installation of openings**

#### Objectives: By the end of the topic, trainees will be able to:



- a. Describe procedures of fixing opening.
- b. Follow procedures of fixing opening.
- c. Install openings properly.

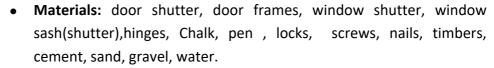


**Time Required: 14** hours



Learning Methodology: Group discussion, individual works, brainstorming, site visit, four corners, Jigsaw, debate, think- pair- square- share, role-play, lecture method.

#### Materials, tools and equipment needed:





- Tools: spirit level, tape measure, decameter, electrical hand drilling machine, chisel, club hammer, Trowels, floats, building line.
- Equipment: Concrete mixer, wheelbarrow, PPE's (Boots, masks, helmets, gloves, overcoats, overall, safety belt, goggles, ear protection,....).

#### **Preparation:**



- Preparation of tools and equipment to be used.
- Avail required material, door frames, shutters, windows.
- Connect with construction site engineers for site visit related to opening installation.

#### **Cross Cutting Issues:**

✓ Ensure gender balance while forming groups, allocating tasks and during presentations.



- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of installing opening properly.
- ✓ Promote standardization culture among students through realizing the need/importance of installing opening properly.

#### **Prerequisites:**



- Technical drawings;
- Wall elevation;
- Simple calculations (algebra, geometry);
- Safety, Health and environment measures.



- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to answer the questions provided under task 23 related to proper Installation of openings in their trainee manuals. Make sure instructions are understood, all the students are actively participating and necessary all are provided and being used.
- 2. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.
- 3. After the sharing session, refer students to **Key facts 3.2** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.



Activity 2: Guided Practice



- 1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to read the scenario provided under task 24 in their trainee manuals and answer questions related.
- 2. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.
- 3. During the task, students should be given a degree of independence to apply the knowledge and skills acquired in activity 1. Your role is to guide them to come with responses.

- 4. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, genocide, inclusivity, standardization culture, financial education among others. In addition, attitudes and behavior changes should be handled during this activity.
- 5. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, individual works and presentation, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.
- 6. After the sharing session, refer students to **Key Facts 3.2** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.



# Task 25

- 1. Explain to trainees that the following task link them to the world of work. Ask them to analyse scenario provided under task 25 in their trainee manuals.
- 2. Using an appropriate methodology such as individual work, pairs or small groups ask trainees to perform the task by completing the table below as available in their trainee manuals.

SN	Procedures to follow while fixing								
	Door and window openings	Skylight opening							
1									
2									
3									
4									
5									
6									
7									
8									

- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do in the workplace.
- 4. Tell trainees that each one will share his/her responses with the rest of the class.
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe.
- 6. This activity can be done in classroom during class time or after class.

# Topic 3.3: Convenient finishing of opening in accordance with construction Materials used

#### Objectives: By the end of the topic, trainees will be able to:



- a. Describe procedure of filling holes.
- b. Fill created hole as required.
- c. Choose finishing materials based on aesthetic requirements.
- d. Perform convenient finishing on surrounding of openings based on materials and aesthetic requirement.



**Time Required: 10** hours



**Learning Methodology:** Group discussion, individual works, brainstorming, site visit, four corners, Jigsaw, debate, think- pair- square- share, role-play, lecture method.

### Materials, tools and equipment Needed:



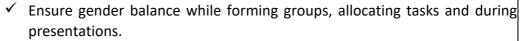
- Materials: door shutter, door frames, window shutter, window sash(shutter), hinges, locks, screws, nails, timbers, cement, sand, gravel, water.
- Tools: spirit level, tape measure, decameter, electrical hand drilling machine, chisel, club hammer, Trowels, floats, building line, straight-edge
- **Equipment:** Concrete mixer, wheelbarrow, PPE's (Boots, masks, helmets, gloves, overcoats, overall, safety belt, goggles, ear protection,....).

#### **Preparation:**



- Preparation of learning area (workshop/ classroom).
- Preparation of tools and equipment to be used.
- Avail required material, door frames, shutters, windows.
- Connect with construction site engineers for site visit related to opening installation.

#### **Cross Cutting Issues:**





- ✓ Ensure inclusivity while allocating tasks to students and provide facilities/environment that enable/allows participation of all.
- ✓ Promote financial education by emphasizing the need/importance of filling holes and finishing the surrounding of openings.
- ✓ Promote standardization culture among students through realizing the need/importance of filling holes and finishing the surrounding of openings.

#### **Prerequisites:**



- Wall elevation;
- Plastering works;
- Simple calculations (algebra, geometry);
- Safety, Health and environment measures.

Activity 1: Problem-Solving

覧Task 26

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to answer the

questions provided under task 26 related to Convenient finishing of openings in their

trainee manuals.

2. Make sure instructions are understood, all the students are actively participating and

necessary materials/tools and equipment are provided and being used

3. Using an appropriate methodology such as individual works, question and answer in a

large group, pair presentations or small group presentations, students share their

answers to the class. Write their responses for reference. Encourage all students to give

their views.

4. After the sharing session, refer students to **Key facts 3.3** and discuss them together

while harmonizing their responses provided in the sharing session and answer any

questions they have.

Activity 2: Guided Practice

三Task 27

1. Using an appropriate methodology such as individual work, pair-share, small group

discussions, guided discussions or large group discussion, guide trainees to read the

scenario provided under task 27 in their trainee manuals and answer questions

related.

2. Make sure instructions are understood, all the students are actively participating and

necessary materials/tools and equipment are provided and being used.

3. During the task, students should be given a degree of independence to apply the

knowledge and skills acquired in activity 3. Your role is to guide them to come with

responses.

- 4. While students are still performing the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, genocide, inclusivity, standardization culture, financial education among others. In addition, attitudes and behavior changes should be handled during this activity.
- 5. Using an appropriate methodology such as question and answer in a large group, pair presentations or small group presentations, individual works and presentation, students share their answers to the class. Write their responses for reference. *Encourage all students to give their views*.
- 6. After the sharing session, refer students to **Key Facts 3.3** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.





- 1. Explain to trainees that the following task link them to the world of work. Ask them to read and analyse scenarios provided under task 28 in their trainee manuals.
- 2. Using an appropriate methodology such as individual work, pairs or small groups ask trainees to perform the task by producing a report on a list of the remaining stages (main activities) and procedures to follow as available in their trainee manuals.
- 3. Give more guidance or instruction on what they will do. Link what they have done in the classroom to what they should do in the workplace.
- 4. Tell trainees that each one will share his/her report with the rest of the class.
- 5. This activity requires students to work independently with limited support from the trainer. During the task, students should be given a high degree of independence to apply the knowledge, skills and attitudes acquired to real life situations. Your role is to set clear instructions, methodology and timeframe for submitting a report.
- 6. This activity can be done in the classroom during class time or after class.



#### Read and answer the following questions

- 1. Briefly, discuss the most common techniques for finishing around openings.
- 2. Explain why finishing around the fixed openings is required.
- 3. How long can you wait before curing mortar used while finishing around openings?
- 4. Why is it necessary to fill holes created while fixing openings?
- 5. Briefly, describe how to fill holes created while fixing openings.
- 6. Describe procedures to follow while performing cement moulding.

#### **Answers**

1. Briefly, discuss the most common techniques for finishing around openings.

#### **Answer:**

N°	Most common techniques for finishing around openings	Explanations/ discussions
1	Drywall compound	This technique is used to create a smooth finish around a fixed opening (door, window).  It can be painted or stained to match the décor of the room.
2	Caulk	Caulk technique is a flexible material that can be used to seal around a fixed opening, it is a good option for areas that are subjected to moisture
3	Panelling	This technique is used to create a decorative finish around a fixed opening,

		It is also performed in a variety of styles and finishes according to a look that matches the
		décor of the room.
4	Moulding	It is a decorative trim used to frame windows, doors and other openings.
		It can be made from a variety of materials,
		including plaster, stucco, wood and metal.
		It is a popular choice for finishing around fixed
		doors and windows
		It is durable, versatile and easy to install and
		create a custom look that matches the style of
		the home.

2. Explain why finishing around the fixed openings is required.

#### **Answer:**

Finishing around the fixed openings is required due to the following reasons:

- ✓ It enhances the aesthetics of the building: Filling the holes provides a clean and polished appearance to the finished installation.
- ✓ Waterproofing: filling holes with an appropriate material helps to seal any gaps and prevent water infiltration.
- ✓ It helps to improve and increase Soundproofing, pest prevention and energy efficiency
- ✓ It increase durability of structure
- ✓ It also help to increase security within the building
- 3. How long can you wait before curing mortar used while finishing around openings?

#### Answer:

It is advised and recommended to allow or wait considerable period (at least 24 hours) before curing the mortar

4. Why is it necessary to fill holes created while fixing openings?

#### Answer:

It is necessary to fill holes created while fixing openings due its advantages:

- ✓ Protecting the wall from damage
- ✓ Maintaining structural Integrity
- ✓ Minimize the chance of cracking to the structure.
- ✓ Increase strength of structure
- 5. Briefly, describe how to fill holes created while fixing openings.

#### **Answer:**

Below are explanations which describe how to fill holes created while fixing openings

- i. Prepare the area or clean the holes: Remove any loose debris from the hole by using a cloth or a soft brush.
- ii. Choose the right filler: Type of filler to use depends on the material that the wall is made of and the size of holes. For example, if the wall is made of brick, you will need to use a mortar or cement concrete-based filler.
- iii.Batch and mix the filler materials: Follow the instructions on the filler's packaging to mix it correctly
- iv. Fill the holes or apply the filler: use appropriate tools depending on size of holes and filler materials to apply
- v.**Perform initial finishing of the filler and let it dry:** Do not leave filler unfinished , you really need to make it even and allow at least 24 hours before you perform other finishing on it.
- 6. Describe procedures to follow while performing cement moulding.

#### **Answer:**

Below are explanations which describe procedures/steps to follow while performing cement moulding:

- i.**Prepare the area:** Clean the area with a damp cloth to remove any dirt or debris if applicable remove any existing molding or trim
- ii. **Mix the cement mortar:** According to the package directions, mixing until the mortar reaches the desired consistency.

- iii. **Apply the cement mortar:** Use appropriate tools such as trowel to apply the even coat of cement mortar around the opening.
- iv. Level the mortar: Use leveling tools to ensure that the mortar is leveled
- v. Finish the mortar as desired: Use appropriate tool depending on finishing requirements such as wooden float, sponge, steel float or other
- vi. Cure the mortar: allow considerable period(at least 24 hours) to cure the mortar
- vii. Paint or stain the mortar: Once the mortar has cured, you can paint or stain it to match the decorative desired.



- The exact dimensions of the hole will depend on the size of the hold fast.
- The actual dimensions of the hole may need to be adjusted depending on the specific circumstances such as materials used for construction.
- All methods of drilling holes are not recommended in opening fixation because some can damage frames.
- Rotary drilling, masonry drill, hole saw and sawzall are recommended methods of drilling holes while fixing openings.
- While drilling, use a drill press if possible because it helps to ensure that the hole is drilled straight and evenly.
- It is important to use a sharp drill bit that is the correct size for the hole you need to drill.
- It is important to use a sharp drill bit that is the correct size for the hole you need to drill.
- Spacing of Hold Fasts depends on materials which made frames.
- Frames can be fixed either in construction progress or in the opening left in construction during the construction process.
- Shutters or leaves are attached to the frames by hinges.
- To ensure that the seal is secure, allow the caulk or roofing cement to dry completely before using the skylight.
- If the skylight opening is damaged, you can repair it with mortar or concrete or you can replace the opening if the damage is extensive.
- Steps of finishing around opening vary according to techniques and materials used.
- When performing finishing around a fixed door or opening, there are several techniques such as Casing, Trim, Jamb Extensions, Drywall Return, Plaster or Stucco Finish, Tile or Stone Surround, Integrated Shelving or Storage and others might be used.
- The choice of finishing technique depends on various factors, including the architectural style, interior design, available materials and budget while each technique offers a different aesthetic and functional outcome.
- Sill is required to allow run-off water from windows .



- Ask learners to re-take the self-assessment at the beginning of the unit. They should then fill in the table in their Trainee Manuals to identify their areas of strength, areas for improvement and actions to take to improve.
- 2. Discuss trainees' results with them. Identify any areas that are giving many trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

# (i) Further Information for the Trainer

- 1. Based on rapid change and development occurring in the construction industry; trainer is advised and recommended to use and explore the given reference( bibliography) located at the end of this manual as well as he/she can make further research.
- 2. Materials, tools and equipment provided for topics above (3.1, 3.2 and 3.3) are not static as well as they are not fully listed so they can be adapted to meet with teaching situations based on trainer's observation.

# **Summative assessment**

#### **Integrated situation** Resources Kigoma secondary school is located in Southern Province, Tools: Wood floater, Steel floater, Tape Ruhango district, Bweramana Sector. After facing the problem measure, Spirit level, of overcrowded classes which affect the quality of their Spades, Steel square, education because the students are not comfortable in class, trowel, Steel ruler, for that Ruhango district sponsored the project of constructing Hammer, Scraper, Blade, 2 classrooms for Kigoma secondary school. After the Straight edge, Hand saw, completion of the elevation and roof structure, Kigoma Chisel ,Hand drill ,Single secondary school has launched an offer of fixing windows and brace, Claw bars, Pincer, Pliers ,Nail princh, Screw doors where each classroom has four (4) windows and two (2) driver, Wooden mallet, doors, and each door has 210cm×90cm×15cm, and each Hack saw, Sponge window has 150cm×120cm×15cm. SPECOS company ltd hired you to do this project. As a mason you are requested to fix Equipment: Wheelbarrow, Bucket, those openings whereby each one shall last 2 hours as Concrete mixer, maximum. Windows, doors, accessories and other needed Vibrator machine, PPE materials are available on the site. (Helmet, Boot, Gloves, Overall), Radder, Scaffolds, Ratchet tie down Materials/ Consumables: Nails, Sand, Cement, Water, Gravels

Associable	Assessment criteria		Obsei	rvation	Marks
Assessable outcomes	(Based on performance criteria)	Indicator	Yes	No	allocati on
Learning outcome 1: 1. Select tools, materials and	1.1. Appropriate tools are selected according to the work to be performed	Tools are selected			5
equipment (20%)	1.2. Appropriate equipment is selected according to the work to be performed	Equipment is selected			7
	1.3. Adequate materials are selected according to the standard	materials are selected			8
Learning outcome 2:  Prepare working area	2.1. Appropriate safety equipment, signs and posts are positioned according to the standards	safety equipment, signs and posts are positioned			10
(30%)	2.2. Technical drawing is checked careful for measurement specification according to the project specification	Technical drawing is checked			10
	2.3. Appropriate measurements of opening are checked for transporting doors or windows	measurements of opening are checked			10
Learning outcome 3:	3.1. Continuous measurement of the opening is checked for drilled holes according to the marked area	measurement of the opening is checked for drilled holes			20
Install door, window, ventilator and lighting into the opening	3.2. Appropriate door or window are installed according to the direction and workability of the opening	door or window are installed			15

(50%)	3.3. Convenient jamb of the opening is finished in accordance with construction materials used	jamb of the opening is finished		15
Total marks				100
Percentage Weightage				100%
Minimum Passing	line % (Aggregate): 70%			

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December, 2023