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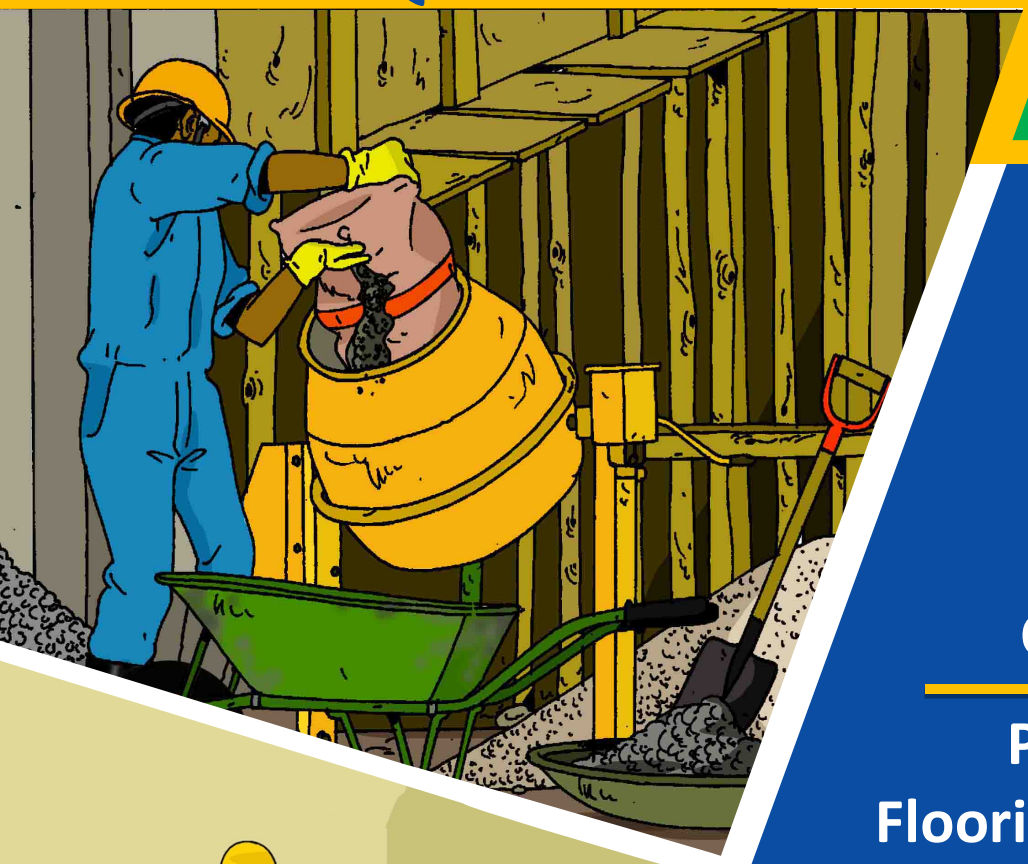

BDCCF301

BUILDING CONSTRUCTION

Perform Cement Flooring Construction

TRAINER'S MANUAL

December 2023

PERFORM CEMENT FLOORING CONSTRUCTION

2023

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KIGALI-RWANDA

Original published version: December 2023**.**

ACKNOWLEDGEMENTS

Rwanda TVET Board (RTB) would like to recognize all parties that contributed to the development of the Trainer's and Trainee's manuals for TVET Certificate III in **Building Construction** for the module: **"BDCCF301 Perform Cement Flooring Construction".**

Thanks to Swisscontact for your technical and financial support towards the implementation of this project.

We would also wish to acknowledge all trainers, technicians, and practitioners for their contribution to this project.

The Management of Rwanda TVET Board appreciates the efforts of its staff as well who coordinated this project.

Finally, RTB would like to extend its profound gratitude to MCT Global team that technically led the entire assignment.

Under Rwanda TVET Board (RTB) guiding policies and directives

Under Swiss contact supervision and involvement

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TABLE OF CONTENT

LIST OF ABBREVIATIONS AND ACRONYMS

BDC: Building construction

F.R.C: Fibre-reinforced concrete

P.P.E: Personal Protective Equipment

P.S.C: Pre-stressed Concrete

R.B.C: Reinforced Brick Concrete

R.C.C: Reinforced Cement Concrete

RQF: Rwanda Qualification Framework

RTB: Rwanda TVET Board

TVET: Technical and Vocational Education and Training

INTRODUCTION

This trainer's manual encompasses all methodologies necessary to guide you to deliver the module titled: Perform cement-flooring construction. 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 your strengths, weaknesses, and areas for improvements.

Remind them to read the point to remember section, which provides the overall key points and takeaways of the unit.

Learning outcomes	Learning Hours	Topics
Learning outcome 1: Prepare tools, equipment and materials	**3 hours**	1.1 Selection of tools and equipment used for cement pavement.
		1.2 Selection of materials used in cement pavement
Learning outcome 2: Prepare the hard-core base	**10 hours**	2.1 Compaction and leveling the ground base.
		2.2 Laying and leveling of hardcore materials on the ground base.
Learning outcome 3: Prepare concrete	**5 hours**	3.1 Select ingredients for concrete
		3.2 Apply mix ratio
		3.3 Carry out concrete mixing
Learning outcome 4: Perform screeding	**22 hours**	4.1 Layers application of screeds on the hardcore at a regular interval
		4.2 Pouring fresh concrete on top and slightly deep into hardcore
		4.3 Screeding concrete for leveling the floor with reference to set screeds
		4.4 Application of layer of smoothing surface
		4.5 Clean the workplace

LEARNING OUTCOME 1: PREPARE 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 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 prepare materials, tools and equipment for cement flooring. They will cover selection of tools, equipment and materials used to prepare and perform cement pavement.
3. Ask trainees to fill out the self-assessment at the beginning of the learning outcome in their trainee manuals. Explain that:
    a. The purpose of the self-assessment is to become familiar with the topics in the learning outcomes 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. Put a check in the column that best represents their level of knowledge, skills or attitudes.
4. 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.

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify types of tools and equipment used in cement flooring	**1.** Select tools and equipment used for making cement pavement	**1.** Manage time while selecting tools and equipment and preparing materials used in cement flooring
2. Explain safety precautions for handling tools and equipment	**2.** Handle safely tools and equipment used in cement flooring	**2.** Demonstrate team spirit while working with other
3. Identify materials used for cement flooring	**3.** Prepare materials used for cement pavement	**3.** Be attentive to details while selecting materials, tools and equipment
4. Describe properties of materials used in cement flooring	**4.** Minimize wastage of materials while preparing for cement flooring	**4.** Take responsibility for tools and equipment maintenance

Steps:

Discovery activity:

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 discuss and answer questions provided under task 1 in their trainee manuals. 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.
4. Introduce Topic 1.1: Selection of tools and equipment used for cement pavement.

Topic 1.1: Selection of tools and equipment used for cement pavement

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

a. Select tools and equipment used to make cement pavement
b. Apply basic maintenance techniques tools and equipment used to make cement pavement
c. Select PPE (Personal Protective Equipment) used to make cement pavement

Time Required: 1 hour

Learning Methodology:
Role play, small group work, brainstorming, individual work, large group discussions

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water, Aggregate/Gravels, Hard core stones, Chalk, pen, Admixtures etc.
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, Notch trowel, Steel ruler, Hammer, Scraper, hacksaw blade, straight.
- **Equipment:** Wheelbarrow, Concrete mixer, Concrete vibrator.

Preparation:

- Preparation of workshop for masonry
- Connect with construction project managers to organize field site visit related to selection of different tools and equipment
- Avail material for maintenance of tools and equipment (Water, Oil...).
- 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 standardization culture among students for tools, equipment and materials to be used in cement pavement flooring
	**Pre-requisites** ➢ Construction basic technical drawing, ➢ Building Set out, ➢ Fundamentals of building materials, ➢ Construct stones structures, ➢ Elect bricks & blocks masonry wall, ➢ Plastering of structure elements, ➢ Opening fixation

Activity 1: Problem Solving

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 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 they have.

Activity 2: Guided Practice

Task 3:

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to carry out the activities 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 crosscutting issues that may arise such as gender, 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 1.1b,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 3: Application

Task 4:

1. Explain to trainees that the following task links them to the world of work. Ask them to choose one facility in the school neighborhood, fix 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 while performing the cement pavement. Their report should emphasize on the:
    a. Types and function of tools and equipment found at the site. Are there any equipment at the site that they have never seen before?
    b. How the tools and equipment are maintained at the site?
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 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: Selection of materials used in cement pavement.

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

a. Explain types and properties of materials used for cement pavement
b. Select materials, tools and equipment used for cement pavement
c. Identify properly the materials used for cement pavement

Time Required: 2 hours

Learning Methodology:
Small group work, brainstorming, large group discussions, Jigsaw, Role-play.

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water Aggregate/ Gravels, Hard core stones, Chalk, pen, Admixtures.
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, Notch trowel, Steel ruler, Hammer, Scraper, hacksaw blade, straight.
- **Equipment:** Wheelbarrow, Concrete mixer, Concrete vibrator.

Preparation:

- Teacher provides the samples of different types of materials such as: cement, Fine aggregate, Coarse aggregate, Water, Stone, Bricks If those materials are not available.
- Teacher prepares pictures of these types of materials such as cement, Fine aggregate, Coarse aggregate, Water, Stone, and Bricks, which are used in cement pavement floors.

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 standardization culture among students for tools, equipment and materials to be used in cement pavement flooring
- ✓ Promote financial education by emphasizing the need/importance of quantifying materials for mortar

Pre-requisites

- ➢ Fundamental of building materials
- ➢ Construction of building materials

Activity 1: Problem Solving

Task 5:

1. Using an appropriate methodology such as pair-share, small groups, large group discussion, or guided discussion, brainstorming, guide trainees to read the scenario provided under task 5 related to the types of materials used to construct cement pavement 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 6:

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to carry out the activities 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. 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 results 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.

Activity 3: Application

Task 7:

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees perform the task on the field of the scenario and make a report on the following:
   a. various materials used to construct cement pavement
   b. properties of materials used at different sites
   c. physical properties of cement at the construction sites
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. You can also ask them to go to another facility to compare practices
3. Tell trainees that each one will share his/her experience gained from workplace 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 report.

Formative Assessment

1. Choose the right answers

a) The following tools are used in cement pavement construction except

   A. Hand brush
   B. Steel float
   C. Pan/bucket
   D. Painting roller

Answer: D. Painting roller

b) The following are the examples of Equipment which can be used in cement flooring construction except

   A. Wheelbarrow
   B. A5 printing machine
   C. Grading machine
   D. Concrete Vibrator
   E. Rammer machine

Answer: B. A5 printing machine

c) The main materials required in construction of cement floor are

   A. Sand, cement, water, stones, glasses and admixtures
   B. Sand, cement, water, stones, plywood and admixtures
   C. Sand, cement, water, stones, gypsum board and admixtures
   D. Sand, cement, water, stones, coarse aggregates and admixtures

Answer: D. Sand, cement, water, stones, coarse aggregates and admixtures

d) We use Admixtures in mortar to:

   A. Modify the properties of mortar
   B. Improve the properties of mortar
   C. A and B are correct answers
   D. None of above is right answer

Answer: C. A and B are correct answers

2. Outline the different factors you can depend on while selecting cement pavement materials.

Answer. The factors are:

- Durability of materials, Availability of materials, Strength of materials, Insulation factors

3. What are the different PPEs to wear while working the cement floor?

   Answer:

   - Helmet, Gloves, Goggles, Face mask, Overall, Safety shoes

4. Why do we need pavement?

   Answer: we need pavement in order to obtain the comfort floor area for working

Points to Remember

- Cement pavement requires materials such as cement, sand, water, lime and aggregates.
- Various tools and equipment are also needed for leveling and mortar mixing
- Materials have physical properties that determine the quality of good materials; you should consider these while selecting the materials to be used in cement pavement.
- Always remember to conduct basic maintenance to your tools and equipment before, during and after use. Some common techniques are such as lubricating, inspecting regularly, cleaning and storing them carefully.
- The following are the tips to maintain tools in good condition:
  - Always clean tools after use
  - Oil tools after use
  - Store tools appropriately
  - Replace damaged parts of any tools immediately
  - Respect all instruction provided by manufacturer

Self-Reflection

1. Ask learners to retake 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).

ⓘ Further Information for the Trainer

1. https://www.lceted.com/2020/04/all-you-want-to-know-about-mason-tools.html
2. https://theconstructor.org/building/types-of-scaffolding-in-construction/11845/
3. https://theconstructor.org/building/types-concrete-blocks-masonry-units/12752/
4. https://www.engineersupply.com/Prepare-to-buils-a-brick-wall-with-the-right-tools.aspx

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 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 basic knowledge, skills and attitudes to prepare the working area. They will cover preparation of mixing place, identification of storage space as well as setting of signs posts and use of PPE.

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.
4. 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.

Key Competencies

Knowledge	Skills	Attitudes
1. Identify methods of preparing ground base	**1.** Apply methods of preparing ground base	**1.** Apply safety precautions while preparing hard core
2. Describe types of hard-core	**2.** Lay different types of hard-core	**2.** Avoid wastage of materials
3. Identify the methods of compacting ground base	**3.** Apply the methods of compacting ground base	**3.** Taking care on steps of laying hard-core.
4. Explain steps of laying hard-core	**4.** Follow steps of laying hard-core material	**4.** Comply with national and international standards

Discovery Activity

Task 81

1. Using an appropriate methodology such as pair-share, small group discussions, guided discussions or large group discussion, guide trainees to read and answer the questions based on their experience or research on the preparation of the hard-core base under task 8 in their trainee manuals. *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.

4. Introduce Topic 2.1: Compaction and leveling the ground base.

Topic 2.1 Compaction and levelling the ground base

	**Objectives:** By the end of the topic, trainees will be able to: a. Identify methods of preparing ground base b. Identify the methods of compacting ground base c. Apply methods of preparing ground base d. Apply the methods of compacting ground base e. Comply with national and international standards
	**Time Required:** *5 hours*
	**Learning Methodology:** Group discussion, Trainer guided, Role play, brainstorming, individual work,
	**Materials, tools and equipment Needed:** • **Materials:** Water, Aggregate/ Gravels, Hard core stones, Chalk, pen. • **Tools:** Wood floater, Tape measure, Sprit level, Spades, squares, trowel, Hammer, straight edge. • **Equipment:** Wheelbarrow, Rammer, roller compactor.
	**Preparation:** Preparation of the workshop/storage area for the masonry materials.
	**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 using the most efficient method of storing materials for the wall elevation.
	**Pre-requisites:** ✓ Safety, Health and environment at workplace ✓ Construction basic technical drawing ✓ Building Set out ✓ Fundamentals of building materials ✓ Construct stones structures

Activity 1: Problem Solving

Task 9

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 the questions that follow under task 9 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 2.1,** discuss them together while harmonizing their responses provided in the sharing session and answer any questions they might have.

Activity 2: Guided Practice

Task 10

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to perform the tasks provided under task 10 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. During the tasks, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, inclusivity, financial education among others. In addition, attitudes and behavior changes should be handled during this activity.
4. After the sharing session, harmonize students' responses by referring to **Key facts 2.1,** and discuss them together while answering any questions they have.

Activity 3: Application

Task 11:

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees analyze the scenario provided in the trainee manuals Activity 3 and carry out the tasks. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.

2. Students should make a report of what will be performed on the field about compaction and leveling ground base, which should include:

    a. A list of tools and equipment they will need for the task

    b. The tools and equipment used

    c. Methods of compacting applied

    d. Steps followed

3. 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 2.2: Laying and levelling of hard-core materials on the ground base.

Objectives:

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

a. Explain steps of laying hard-core
b. Lay different types of hard-core
c. Follow steps of laying hard-core material
d. Apply safety precautions while preparing hard core
e. Taking care on steps of laying hard-core.

Time Required: 5 hours

Learning Methodology:

Group discussion, Trainer guided Role-play, small group work, brainstorming, and individual work.

Materials, tools and equipment Needed:

- **Materials:** Sand,, Water, Hard core stones, Chalk, pen,
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, , , Hammer, , hacksaw , Hand saw, Building line, straight.
- **Equipment:** Wheelbarrow .

Preparation:

- Preparation of workshop for materials storage area

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

Prerequisites:

- ✓ Safety, Health and environment at workplace
- ✓ Construction basic technical drawing
- ✓ Building Set out
- ✓ Fundamentals of building materials
- ✓ Construct stones structures

Activity 1: Problem Solving

Task 12:

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 under task 12 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 2.2,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 2: Guided Practice

Task 13:

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 of the previous guided practice activity and perform the tasks that follow under task 13 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. During the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, inclusivity, environment sustainability 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, harmonize students' responses by referring to **Key Facts 2.2,** and discuss them together while answering any questions they might have.

Activity 3: Application

Task 14

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees research in their community on the compacting and leveling ground base at the construction site and make a report of it. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used*
2. Students should make a report of what will be performed which include:
    a. Describe the types of hard-core materials used
    b. Describe the steps to be followed laying hard-core materials on the ground base.
    c. Check marked level of hard-core methods and adjustment of hard-core base level for ground base.
3. 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 questions below and choose the most correct answer or answers

a. The following are the types of hard-core used in cement pavement construction except:

A. Hand brush

B. Stone hard-core

C. Brick hard-core

D. Murrum hard-core

Answer: A. Hand brush

b. The following are the methods of preparing ground base except:

A. Fill method

B. Cut and fill method

C. Concrete Vibrator

D. Cut method

Answer: C. Concrete Vibrator

2. What do you understand by the term compaction in cement flooring?

Answer: Compaction is the process of increasing soil density and removing air by using manual or mechanical means.

3. Outline the steps followed while leveling hard-core materials.

Answer:

- Selection of hard-core materials
- Mark hard-core level
- Laying of hard-core

4. What is the purpose of compacting the ground base for cement pavement?

Answer:

- To improve the strength and stiffness of ground
- It increases ground stability
- Reduce undesirable settlement of structure

Points to Remember

- There are various methods for preparing ground base of a cement pavement
- There are different types of hard-core used in cement pavement construction.
- Purpose of compacting ground base for cement pavement.
- Steps to follow while laying and leveling hard-core materials.

Self-Reflection

1. Ask trainees to re-take the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's 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).

Learning outcome 3: Self-Assessment

1. Ask trainees to look at the unit Illustration in their Trainee Manuals and together discuss:
    a. What do you see in the illustration?
    b. What is happening in the illustration?
    c. What topics do you think will 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 prepare concrete. They will cover the selection of ingredients for concrete, application of mix ratio, carrying out concrete mixing and application of mixing mortar methods.

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.

4. At the end of the unit, trainees will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas of improvement and actions to be taken.

Key Competencies:

Knowledge	Skills	Attitude
1. Describe the types of concrete	**1.** Select ingredients for concrete	**1.** Safe handling of tools and equipment
2. Describe the properties of concrete ingredients	**2.** Apply batching methods	**2.** Avoid wastage of materials
3. Explain the role of concrete ingredients	**3.** Follow the procedures of concrete mixing	**3.** Comply with national and international standards
4. Describe methods of batching	**4.** Mix concrete ingredients	**4.** Being organized to achieve the required result

Steps:

Discovery Activity

Task 15

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 questions provided under task 15 in their trainee's manuals. *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.

4. Introduce Topic 3.1: Select the ingredients for concrete

Topic 3.1: Select ingredients for concrete

Objectives:

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

a. Describe the types of concrete
b. Describe the properties of concrete ingredients
c. Explain the role of concrete ingredients
d. Explain the ingredients for concrete in compliance with Rwanda standard (RS 108 mortar masonry specification)
e. Explain the uses of concrete ingredients
f. Select ingredients for concrete

Time Required: 1 hour

Learning Methodology:

Small group work, brainstorming, large group discussions, Role play, individual work, Jigsaw

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water Aggregate/ Gravels,, Chalk .
- **Tools:** Spades, trowel, Hammer, sand sieve.
- **Equipment:** Wheelbarrow.

Preparation:

- Teacher provides the samples of different types of materials such as: cement, Fine aggregate, Coarse aggregate and water as the materials made concrete

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 standardization culture among students for tools, equipment and materials to be used in cement pavement flooring
- ✓ Promote financial education by emphasizing the need/importance of quantifying materials for mortar

Pre-requisites

- ✓ Fundamental of building materials
- ✓ Construction of building material

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 analyze the scenario and answer the questions provided under task 16 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

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 carry out the activities/tasks provided under task 17 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, standardization culture 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. Their responses should focus on the following points: how he/she prepared the ingredients of the mortar for bricks and blocks walls elevation, the properties required for this type of mortar as well as quantity for each ingredient used in the mortar.
5. After the sharing session, refer students to **Key Facts 3.1,** and discuss with them while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 3: Application.

Task 18:

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees perform the tasks related to the selection of ingredients for the concrete, under task 18 in their trainee's manuals. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.*

2. Students make a report which will include:

    a. Types of all the ingredients required

    b. Explain the use of each ingredient for concrete

    c. Describe the properties of the ingredients.

3. This activity can be done during class time and/or after class. Give students more independence in doing this task. Students present their reports for correction/marking.

Topic 3.2: Apply mix ratio

Objectives:

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

a. Identify mixing ratio proportioning and their application
b. Explain the methods of batching
c. Apply the mixing ratio according to grades of concrete

Time Required: 2 hours

Learning Methodology:

Role play, small group work, brainstorming, individual work, large group discussions

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water Aggregate/ Gravels, Admixtures.
- **Tools:** Wood floater, Spades trowel, straight edge, Gouge box
- **Equipment:** Wheelbarrow, Concrete mixer.

Preparation:

- Prepare the working area/workshop
- Prepare materials, tools and equipment
- Prepare handout notes

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 standardization culture among students for tools, equipment and materials to be used in cement pavement flooring
- ✓ Promote financial education by emphasizing the need/importance of quantifying materials for mortar

Pre-requisites

- ✓ Knowledge about health and safety in the workplace
- ✓ Fundamental of building materials

Activity 1: Problem Solving

Task 19

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 18 in their trainee's 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 3.2** and discuss together the mixing ratios for a concrete while harmonizing their responses provided in the sharing session and answering any questions they have.

Activity 2: Guided Practice

Task 20

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to mix ratios of various ingredients using an appropriate method, 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, financial education, standardization culture 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. Their responses should focus on the following points: how he/she prepared the mixing ratios for concrete, and explain which mixing methods were used and why.

5. After the sharing session, refer students to **Key Facts 3.2,** and discuss with them while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 3: Application.

Task 21

1. Explain to trainees that the following task links them to the world of work. Ask them to choose one facility in the school neighborhood, fix 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 elevate the wall for the following:
    a. Calculation of ingredients of concrete
    b. Mixing ratios
    c. Applied methods and why
3. This activity can be done during class time and/or after class. Give students more independence in doing this task. Students present their reports for correction / marking.

Topic 3.3: Carry out concrete mixing

Objectives:

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

a. Describe the methods of concrete mixing
b. Follow procedures of concrete mixing
c. Produce the concrete after mixing the ingredients
d. Apply safety precautions while mixing concrete

Time Required: 2 hours

Learning Methodology:

Small group work, brainstorming, large group discussions, Role-play, individual work.

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water, Aggregate/ Gravels, Chalkpen, Admixtures.
- **Tools:** , Spades, trowel, Notch trowel Gouge box.
- **Equipment:** Wheelbarrow.

Preparation:

- Prepare the mixing area
- Prepare materials, tools and equipment
- Prepare short notes/ handout notes

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 standardization culture among students for tools, equipment and materials to be used in cement pavement flooring
- ✓ Promote financial education by emphasizing the need/importance of quantifying materials for mortar

Pre-requisites

- ✓ Knowledge about health and safety in the workplace
- ✓ Fundamentals of building materials
- ✓ Construction of building materials

Activity 1: Problem Solving

Task 22:

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 22 in their trainee's 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 3.3** and discuss together while harmonizing their responses provided in the sharing session and answering any questions they have.

Activity 2: Guided Practice

Task 23:

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to prepare the concrete using an appropriate mixing method, provided under task 23 in their trainee's 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, standardization culture 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 3.3,** and discuss with them while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 3: Application.

Task 24:

1. Explain to trainees that the following task links them to the world of work. Ask them to choose one facility in the school neighborhood, fix 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 following:
    a. Steps followed
    b. Applied methods and why
    c. Type and properties of the concrete produced
3. This activity can be done during class time and/or after class. Give students more independence in doing this task. Students present their reports for correction/marking.

Formative Assessment

1. Outline the procedures for proper hand mixing step by step

   Answer:

   - Measured quantity of sand is spread evenly
   - The required quantity of cement is dumped on the sand and spread evenly
   - The sand and cement is the mixed intimately with spade until it gains even color
   - The sand mixture is then spread out and a measured quantity of coarse aggregate is spread on its top.
   - The whole mass is mixed at least three times by shovel
   - The hallow is made in the middle of mixture
   - Pour water in the hole made in mixture
   - Mix until mix became homogeneous

2. Distinguish volume batching from weight batching of concrete.

Answer:

   - Batching by volume: this is method of measuring ingredients of concrete by using container of known volume Ex: gauge box
   - Batching by weight: this is method of measuring ingredients of concrete by using balance

3. What is the reason why volume batching is not a good method for batching?

Answer: volume method is less precise as compared to weight batching, hence preferred only for minor or less important works, where a nominal mix of concrete is used rather than a designed mix. The volume of moist sand in loose condition weighs much less than the same volume of dry sand because of bulking.

4. Between those two methods, which one is used to make measurements of cement?

Answer: is weight batching method

5. Discuss the methods of mixing concrete

Answer: **Hand mixing:** it is used for mix for small scale unimportant concrete works while **Machine mixing:** It is achieved by the use of concrete mixers at the construction sites for medium and large-scale mass concrete work.

Points to Remember

- Types of concrete
- Method of batching
- Application of mixing ratio
- Methods of concrete mixing
- Procedures of concrete mixing

Self-Reflection

1. Ask learners to retake the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's 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).

Further Information for the Trainer

Look for more information on:

- Properties of concrete in construction
- Types of concrete
- Safety, health and environment required in construction

Self-Assessment

1. Ask trainees to look at the unit Illustration in their trainee's manuals and together discuss:
    a. What does the illustration show?
    b. What is the activity called?
    c. What materials, tools and or equipment are being used in the activity?
    d. What do you think this unit is about based on the illustration?
2. After the discussion, inform trainees that this unit is intended to provide them with the skills, knowledge, and attitudes required to perform screeding. They will cover layers application of screeds on the hardcore at a regular interval, pouring fresh concrete on top and slightly deep into hardcore, screeding concrete for leveling the floor with reference to set screeds, application of layer of smoothing surface as well as cleaning the workplace.
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.

4. 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.

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe types of screeds	**1.** Pour fresh Concrete	**1.** Taking care on steps of laying hard-core.
2. Describe properties of concrete	**2.** Follow the steps of concrete screeding	**2.** Demonstrate team spirit while working with others
3. Describe defects of concrete	**3.** Follow steps of smoothing surface with cement	**3.** Demonstrate endurance in your daily activities
4. Explain the steps of concrete screeding	**4.** Check defects of concrete	**4.** Comply with national and international standards during work execution
5. Explain steps of smoothing surface with cement	**5.** Clean working area	**5.** Take responsibility for safety measures at workplace and equipment maintenance
6. Identify cleaning tools and equipment	**6.** Store tools and equipment	

Steps:

Discovery activity

Task 25

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, trainees read and answer the questions provided under task 25 in their trainee's manuals. *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.

4. Introduce Topic 4.1: Layers application of screeds on the hardcore at a regular interval.

Topic 4.1: Layers application of screeds on the hard core at a regular interval

Objectives:

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

a. Describe types of screeds
b. Explain the steps of concrete screeding
c. Follow the steps of concrete screeding
d. Describe properties of concrete
e. Describe defects of concrete

Time Required: 5hours

Learning Methodology:

Role-play, small group work, brainstorming, individual work, large group discussions.

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water Aggregate/ Gravels, Chalk, pen, Admixtures.
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, Notch trowel, Steel ruler, Hammer, Scraper, hacksaw blade, straight edge.
- **Equipment:** Wheelbarrow, Concrete mixer, Concrete vibrator.

Preparation:

- Prepare pictures of these types of materials such as Laterite soil, Coarse aggregate, Water, Stone, etc., which are used in screeding concrete.
- Preparation of workshop for layers application of screeds on the hardcore

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 standardization culture among students.
Pre-requisites ✓ Construction basic technical drawing, ✓ Building Set out, ✓ Fundamentals of building materials, ✓ Construct stones structures, ✓ Erect bricks & blocks masonry wall, ✓ Plastering of structure elements, ✓ Opening fixation

Activity 1: Problem Solving

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 use their prior experience in construction and answer the questions provided under task 26 in their trainee's manuals. *Make sure instructions are clear, 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 4.1,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have

Activity 2: Guided Practice

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 analyze the scenario and undertake the tasks provided under task 27 in their trainee's manuals and arrange them from the first to the last step. *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 probing questions such as *Why? What? How?* to enable them to come to informed responses.
3. During the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, 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 while giving reasons for the arrangement of the steps.

   Write their responses for reference. *Encourage all students to give their views.*
5. After the sharing session, harmonize students' responses by referring to **Key Facts 4.1,**

Activity 3: Application.

Task 28:

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees analyze the scenario provided under task 28 in the trainee's manuals, apply layers on screeds of the hard-core, and make a report of the task. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.*

2. Students should make a report of what will be performed during the assignment which should include:
    a. The tools, equipment and materials used
    b. Type of the screed achieved/performed
    c. Requirements of good screed versus the achieved one
    d. Thickness of screed done
3. 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 4.2 Pour fresh concrete on top and slightly deep into hard core.

Objectives:

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

a. List accordingly the state of concrete.
b. List properly the properties of concrete.
c. Identify concrete operations/ production of fresh concrete.

Time Required: 5 hours

Learning Methodology:

Small group work, brainstorming, large group discussions, Role-play, individual work.

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water Aggregate/ Gravels, Hard core stones, Chalk, pen, Admixtures.
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, Notch trowel, Steel ruler, Hammer, Scraper, straight edge.
- **Equipment:** Wheelbarrow, Concrete mixer, Concrete vibrator.

Preparation:

- Provide the samples of different types of concrete materials such as Cement, Fine aggregate, Coarse aggregate, Water.
- Prepare pictures of these types of concrete materials such as Stone hardcore, Cement, Fine aggregate, Coarse aggregate and Water which are used in cement pavement floors.

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 standardization culture among students.
- ✓ Promote financial education by emphasizing the need.

Pre-requisites

- ✓ Elect bricks & blocks masonry wall,
- ✓ Fundamental of building materials
- ✓ Construct stones structures,

Activity 1: Problem Solving

Task 29:

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 and answer the questions provided under task 29 in their trainee's 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 4.2,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 2: Guided Practice

Task 30

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, guide trainees to refer to the previous scenario on the application of layers screeds mentioned earlier in their trainee manuals and undertake the tasks of pouring the fresh concrete on top and slightly deep into hard-core. *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 probing questions such as *Why? What? How?* to enable them to come to informed responses.

3. During the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, 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 while giving reasons for the arrangement of the steps.
   Write their responses for reference. *Encourage all students to give their views.*
5. After the sharing session, harmonize students' responses by referring to **Key Facts 4.2,**

Activity 3: Application.

Task 31

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees analyze the scenario about the community work provided under task 31 in the trainee's manuals and pour the fresh concrete on top and slightly deep into hard-core and make a report of the task. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.*

2. Students should make a report of what will be performed during the task which should include:
   a. the properties of the poured concrete
   b. factors affecting the concrete
   c. The defects concrete observed. The repair is done.

3. 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 4.3 Screed concrete for levelling the floor with reference to set screeds

Objectives:

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

a. Identify steps of concrete screeding.
b. Describe the process for installing the screed
c. Describe the procedures of floor screeding
d. Follow the steps of concrete screeding

Time Required: 5 hours

Learning Methodology:

Small group work, brainstorming, large group discussions, Role-play, individual work.

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water, Aggregate/ Gravels, , Chalk, pen, Admixtures.
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, Notch trowel, Steel ruler, Hammer, Scrape, mortar pan straight edge.
- **Equipment:** Wheelbarrow, Concrete mixer, Concrete vibrator.

Preparation:

- Teacher provides the samples of different types of screeds.
- Teacher prepares pictures of these types of screeds, which are used in cement pavement floors.

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 standardization culture among students.

✓ Promote financial education by emphasizing the need.
Pre-requisites ✓ Construct stones structures, ✓ Erect bricks & blocks masonry wall, ✓ Fundamental of building materials

Activity 1: Problem Solving

Task 32

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 32 in their trainee's 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 4.3,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 2: Guided Practice

Task 33

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion and guide trainees to study the scenario provided under task 9 in their trainee manuals and use it to perform screeding concrete for leveling the floor with reference to set screeds. *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. During the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, 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, harmonize students' responses by referring to **Key Facts 4.3.**

Activity 3: Application.

Task 34

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees analyze the scenario about the screed concrete for leveling the floor with reference to set screeds provided under task 34 in the trainee's manuals, construct one for a warehouse in the neighborhood, and make a report of the task. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.*

   Students should make a report of what was performed during the task which should include:
   a. the steps followed for concrete screeding
   b. Procedures undertaken

3. 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 4.4 Application of layer of smoothing surface

Objectives:

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

a. Identify the required layers for cement pavement.
b. Follow steps of smoothing surface with cement
c. Describe the steps of smoothing the surface with cement.
d. Check defects of concrete

Time Required: 5 hours

Learning Methodology:

Small group work, brainstorming, large group discussions, Role-play and individual work.

Materials, tools and equipment Needed:

- **Materials:** Sand, Cement, Water, , Chalk, pen, Admixtures.
- **Tools:** Wood floater, Steel floater, Tape measure, Sprit level, Spades, squares, trowel, Notch trowel, Steel ruler, Hammer, Scraper, straight edge, Sponge.

Equipment: Wheelbarrow.

Preparation:

- Teacher provides the samples of different required layers for cement pavement.
- Teacher prepares pictures of the required layers for cement pavement, which are used in cement pavement floors.

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 standardization culture among students.
- ✓ Promote financial education by emphasizing the need.

Pre-requisites

- ✓ Building materials/ application of layer of smoothing surface.

Activity 1: Problem Solving

Task 35

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion, trainees refer to the task on making screed concrete for leveling the floor with reference to set screeds provided under task 35 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 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 4.4,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 2: Guided Practice

Task 36

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion and guide trainees to analyze the scenario provided under task 36 in their trainee's manuals and perform the layer of smooth surface for the cement pavement floor. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.*

   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. During the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, 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. The presentations should be guided by the following:
    a. The required layers for cement pavement.
    b. The steps of smoothing surface with cement.
5. Write their responses for reference. Encourage all students to give their views. After the sharing session, harmonize students' responses by referring to **Key Facts 4.4**

Activity 3: Application.

Task 37

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees analyze the scenario provided under task 37 in the trainee's manuals, perform the layer of smooth surface for the cement pavement floor, and make a report of the task. Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used.

2. Students should make a report of what was performed during the task which should include:
    a. the number of layers,
    b. The steps followed while smoothing surface.

3. 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 4.5 Cleaning workplace

Objectives:

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

a. Describe different methods of cleaning the workplace
b. Clean tools and equipment
c. Store tools and equipment

Time Required: 2 hours

Learning Methodology:

Small group work, brainstorming, large group discussions, Role-play, individual work.

Materials, tools and equipment Needed:

- **Materials:** Water.
- **Tools: Broom, morper, Rag, Sponge**.
- **Equipment:** Wheelbarrow, Concrete mixer, Concrete vibrator.

Preparation:

- Teacher provides the samples of different required layers for cement pavement.
- Teacher prepares pictures of the required layers for cement pavement, which are used in cement pavement floors.

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 standardization culture among students.
- ✓ Promote financial education by emphasizing the need.

Pre-requisites

- ✓ Fundamental of building material,
- ✓ Construct stones structures,
- ✓ Erect bricks & blocks masonry wall.

Activity 1: Problem Solving

Task 38:

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 38 in their trainee's 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 4.5,** and discuss them together while harmonizing their responses provided in the sharing session and answer any questions they have.

Activity 2: Guided Practice

Task 39:

1. Using an appropriate methodology such as individual work, pair-share, small group discussions, guided discussions or large group discussion and guide trainees to analyze the scenario provided under task 39 in their trainee's manuals and clean the workplace. 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. During the task, use this opportunity to discuss or address any cross-cutting issues that may arise such as gender, 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. The presentations should be guided by the following:

a. The procedures for performing the cleaning for the floor.
b. list of tools and materials required for cleaning
c. the methods to use to clean the working site/area, and the tools and equipment
d. Storage of the tools and equipment after use.

5. Write their responses for reference. Encourage all students to give their views. After the sharing session, harmonize students' responses by referring to **Key Facts 4.5**

Activity 3: Application.

Task 40

1. Using an appropriate methodology such as individual work, pairs, or small groups trainees analyze the scenario provided under task 40 in the trainee's manuals, perform the cleaning of the workplace, and make a report of the task. *Make sure instructions are understood, all the students are actively participating and necessary materials/tools are provided and being used*

2. Students should make a report of what was performed during the task which should include:
    a. The methods of cleaning the working area
    b. Methods of cleaning tools and equipment
    c. Factors to follow in storing tools and equipment
    d. The process of storing tools and equipment

3. 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. What are the types of screeds used to perform cement screeding?

Answer:

- **Bonded Screed**: Bonded screeds would be from a thickness of 15mm to a thickness of 50mm.
- **Un-bonded Screed**: are not bonded directly to the base. This is ideal for thickness greater than 50 mm for standard screed.
- **Floating Screed**: is generally laid on a layer of insulation with a slip membrane over it separating the insulation from the screed, then 65mm of screed for domestic dwellings (75mm for commercial locations).
- **Bonded Screed**: This type of screed is bonded onto the substrate by slurring bonding to the concrete substrate. This is the ideal type of screed for thinner applications where heavy loading is anticipated. Bonded screeds would be from a thickness of 15mm to a thickness of 50mm.
- **Floating Screed:** Floating screed is generally laid on a layer of insulation with a slip membrane over it separating the insulation from the screed. The build-up is generally a slip membrane (sheet of Polythene) 150mm+ Insulation another Slip Membrane, then 65mm of screed for domestic dwellings (75mm for commercial locations).

  Another popular type is a floating screed with under floor heating which is basically a screed laid over an under-floor heating system. Always ensure the system is working before the screed is laid over it, this can avoid costly repairs and arguments on site.

2. What are the properties of concrete?

Answer:

- Fresh concrete possesses the following properties:
  - Workability
  - Segregation
  - Bleeding
- On the other hand, hardened concrete possesses the following properties:
  - Strength
  - Durability
  - Impermeability
  - Creep
  - Shrinkage

3. Identify the defects of concrete.

Answer:

- Color Variations
- Crazing
- Dusting
- Rain damage
- Spalling
- Efflorescence
- Honeycombing
- Blistering

4. What do you understand by the term screeding?

Answer:

Screeding a floor is the simple act of applying a well-blended mixture of ordinary Portland cement with graded aggregates and water to a floor base, in order to form a sturdy subfloor that is capable of taking on the final floor finish or act as a final wearing surface. The term "screeding" is a familiar one in the building trades, where it refers to the action of flattening poured concrete into a smooth, flat layer prior to finishing the surface.

5. What are the purposes of screeding?

Answer:

The screeds primary purpose, using one-part cement to three to five parts sharp sand, is to give a smooth and level floor on which to lay your chosen floor finish. The thickness of the screed allows it to take up normal variations in flatness and levelness of the base on which it is laid.

6. What are the properties of fresh concrete and hardened concrete?

Answer:

- Fresh concrete possesses the following properties:
  - Workability
  - Segregation
  - Bleeding

- Hardened concrete possesses the following properties:
  - Strength
  - Durability
  - Impermeability
  - Creep
  - Shrinkage

7. Classify the different unwanted materials on construction site

   Answer:

   - Hazardous waste: is waste with properties that make it potentially dangerous or harmful to human health or environment.
   - Non-hazardous waste: is any waste that causes no harm to human or environmental health but may still be subject to certain management requirements.

8. What is the importance of proper storage of tools and equipment?

Answer:

- Improve safety and health of the employees,
- Reduces overall tool cost through maintenance,
- It ensures that tools are in good repair at hand,
- Teaches workers principles of tool accountability,
- Avoid rust of the tools and equipment.

9. What is the importance of storing tools and equipment?

Answer:

- Reduces overall tool cost through maintenance,
- It ensures that tools are in good repair at hand,
- Teaches workers principles of tool accountability,
- Avoid rust of the tools and equipment.

10. Outline different factors to follow while storing tools and equipment

    Answer:

    - Have a designated place for each kind of tools and equipment.
    - Label the storage cabinet or place correctly for immediate finding.
    - Store them near the point of use.
    - Wash and dry properly before storing.

- Store sharp tools properly when not in use with sharp edges down.
- Put frequently used items in conveniently accessible locations.
- Gather and secure electrical cords to prevent entanglement or snagging.

Points to Remember

- The types of screeds used to perform cement screeding
- The properties of concrete
- The defects of concrete
- Steps of concrete screeding
- Safe store of tools and equipment
- Importance of proper storage of tools and equipment
- Factors to follow in storing tools and equipment
- Process of storing tools and equipment

Self-Reflection

1. Ask trainees to re-take the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's 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).

Summative assessment

Integrated situation

Read the integrated situation here below and perform the task the follow:

La Novella Motel located in Bugesera District has gained the competitive edge over its competitors and the market increased dramatically. Therefore, it is facing the problem of accommodating its esteemed clients and has decided to extend the business. It has signed a contract with GOOD APPEARANCE CONSTRUCTION AND SERVICES LTD to construct a five-room house. The project is at the phase of making cement pavement in the rooms, and each room with $4m^2$ should have a mason to perform cement flooring. As a Mason in GOOD APPEARANCE CONSTRUCTION AND SERVICES LTD, you are requested to work in one of the rooms within 7 hours. Given that, the mix ratio of mortar is 1:3. All materials, tools and equipment are provided and furthermore the smoothness is very important.

Resources

Tools	Wood floater, Steel floater, Tape measure, Spirit level, Spades, Steel squares, Trowel, Notch trowel, Steel ruler, Hammer, Scraper, Straight edge, Mason's line, Mortar pan, Stones, Damp level, Calibrated Gauge Box.
Equipment	PPE, concrete mixer, Wheelbarrow
Materials/ Consumables	Sand, Cement, Water, Lime, Nails

Checklist

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Prepare tools,	1.1. Appropriate tools and equipment are selected according to the work to be performed	Tools and equipment are properly selected			12

equipment and materials (20%)	1.2. Materials are selected according to the required quality.	Materials are properly selected			8
Learning outcome 2: Prepare the hard core base (20%)	2.1. The ground base is well compacted and levelled in accordance to the design.	The ground base is well compacted and levelled			5
	2.2. Hard core base are systematically laid on the ground base and levelled.	Hard core base are systematically laid on the ground base and levelled			15
Learning outcome 3: Prepare concrete (20%)	3.1. Ingredients for concrete mix are selected according to the applicable quality standards.	Ingredients for concrete mix are selected			5
	3.2. Mix ratio are accurately applied according to the standard requirements and expected concrete strength.	Mix ratio are accurately applied			8
	3.3. Concrete mixing is carried out at a convenient place.	Concrete mixing is conveniently carried out.			7
Learning outcome 4: Perform screeding (30%)	4.1. Sufficient layers of screed are strategically applied on the hard-core base at regular intervals.	Sufficient layers of screed are strategically applied			8
	4.2. Fresh concrete is efficiently poured on top of and slightly deep into hard-core base.	Fresh concrete is efficiently poured			7

	4.3. Cement screeding is continuously done for levelling the floor with reference to set screeds.	Cement screeding is continuously done			8
	4.4. A layer of smooth surface is promptly applied on the top of screed surface and further smoothed.	Layer of smooth surface is promptly applied			7
	4.5. The workplace is systematically cleaned according to the required standards	Workplace is systematically cleaned			10
Total marks					**100**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): **70%**					

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December, 2023