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BUGESERA DISTRICT

MARKING GUIDE

TSS 2nd TERM DISTRICT COMPREHENSIVE ASSESSMENT
SCHOOL YEAR: 2024-2025

SECTOR: CONSTRUCTION AND BUILDING SERVICES

...../100

TRADE: BUILDING CONSTRUCTION

RQF LEVEL: LEVEL 3

MODULE CODE AND TITLE: BDCBB 301 ELECT BRICK AND BLOCK OF ELEVATION MASONARY WALL

DURATION: 3hours

DATE: / / 2025

INSTRUCTIONS TO CANDIDATE:

- ✓ This exam has three sections.
- ✓ Maximum marks...../...100.... Marks
- ✓ Attempt all Questions in A
- ✓ choose only three questions among five questions in section B.
- ✓ Choose only one question among two question in section C
- ✓ Use pencil to draw any sketch mandatory
- ✓ Draw a line after answer the question

TSS 2nd TERM DISTRICT COMPREHENSIVE ASSESSMENT
SCHOOL YEAR: 2024-2025

SECTION A attempt all questions (55marks)

Q1. What do you understand about I” Queen closure?” (2marks)

ANSWER: A Queen Closure is a brick cut along its length, creating two equal halves./2marks

Reference: L.O.4. Elevate brickwalls on indicative content 4.2; adequate setting out of walls is done according to the drawing

Q2. Mortar may be defined as a material composed of fine aggregate and cement, which forms a hardened mass after mixing with water. List any three (3) characteristics of good mortar (3marks)

ANSWER: A good mortar should have the following three characteristics: /3marks

1. It should be cheap and durable /1marks
2. It should be easily workable /1marks
3. It should have a good adhesion with bricks, blocks and stones /1marks
4. It should set and harden quickly, so that speed of construction work may be maintained.
5. It should offer a good resistance to the penetration of rain water

Reference: L.O.3. Prepare mortar on indicative content 3.4; relevant mortar mixing is done according to the standard.

Q3. Complete the figures below by using the following words: Cellular, Frogged, Perforated, cored, hollow (5marks)



a).....



b).....



c).....



d).....



e).....

ANSWER: for each 1marks



a) Cored brick



b) Hollow brick



c) Frogged bricks



d) Perforated brick



e) Cellular brick

Reference L.O.1. Select tools, equipment and materials on indicative content 1.4; adequate materials are selected according to the standard.

Q4. Give any four (4) the defects caused by dampness entering through walls of buildings? **(4marks)**

ANSWER: Dampness in building walls can cause several defects, including:

1. **Peeling and Flaking of Paint** – Moisture causes the paint to lose adhesion, leading to peeling, bubbling, and discoloration. **/ 1marks**
2. **Growth of Mold and Mildew** – Damp conditions promote fungal growth, which can lead to health issues and unpleasant odors. **/ 1marks**
3. **Weakening of Structural Components** – Continuous dampness can weaken bricks, mortar, and concrete, reducing the strength of the structure.
4. **Efflorescence** – White, powdery salt deposits appear on walls due to water evaporating and leaving behind soluble salts. **/ 1marks**

Reference L.O.4 Elevate brick walls on indicative content 4.2; adequate setting out of walls is done according to the drawing

Q5. What do you Understand about “Segregation of mortar” in masonry and what its disadvantages in durability are of mortar **(2marks)**

ANSWER: Segregation of mortar refers to the separation of its constituent materials (cement, sand, and water) due to improper mixing, poor workmanship, or excessive water content. **/ 1marks**

Disadvantages of Segregated Mortar on Durability/ 1marks

1. Weak Bond Strength

- Segregated mortar leads to poor adhesion between bricks or blocks, reducing overall wall strength.

2. Increased Porosity & Water Penetration

- Uneven mortar composition creates porous areas, allowing moisture to seep through, leading to dampness, efflorescence, and reduced durability.

3. Reduced Load-Bearing Capacity

- Inconsistent mortar weakens masonry joints, reducing the structure's ability to bear loads and increasing the risk of cracks.

Q6. Match the types of safety signs (column A) with the typical examples at workplace (Column B) **(5marks)**

types of safety signs	typical examples
1.Prohibition Signs	A. Safety helmets must be worn
2.Warning Signs	B. Danger Electric shock risk
3.Mandatory Signs	C. Emergency escapes
4.Safe Condition Signs	D. Hydrant
5.Fire Equipment Signs	E. Children must not play on this site

ANSWER: Here is the correct matching of the types of safety signs with their typical examples: **for each 1mark**

Types of Safety Signs

Typical Examples

1. **Prohibition Signs** —————→ **E.** Children must not play on this site
2. **Warning Signs** —————→ **B.** Danger Electric shock risk
3. **Mandatory Signs** —————→ **A.** Safety helmets must be worn
4. **Safe Condition Signs** —————→ **C.** Emergency escapes
5. **Fire Equipment Signs** —————→ **D.** Hydrant

Reference L.O.2: Prepare working area on indicative content 2.3 .Appropriate safety equipment, signs and posts are positioned according to the standards.

Q7. Answer by true or false

(5marks)

- i. High sand content in mortar always improves its strength.
- ii. Mortar segregation can lead to cracking and shrinkage in masonry structures.
- iii. Using coarse sand in mortar can contribute to segregation.
- iv. Excess water in mortar does not cause segregation.
- v. Precise ingredients are quantified according to the mix ratio.

ANSWER: Here are the correct **True or False** answers **.for each 1marks**

- i. **False** – High sand content can weaken the mortar as it reduces the cement-binding capacity.
- ii. **True** – Mortar segregation can cause cracking and shrinkage due to uneven drying and weak bonding.
- iii. **True** – Coarse sand can lead to segregation because it does not mix well with finer particles, causing uneven distribution.
- iv. **False** – Excess water does cause segregation by making the mixture unstable, leading to separation of cement and sand.
- v. **True** – Accurate quantification of ingredients according to the mix ratio ensures proper mortar strength and performance.

REFERENCE L.O.3.Prepare mortar on indicative content 3.3. Precise ingredients are quantified according to the mix ratio.

Q8. Define term “Bonding”

(2marks)

ANSWER: Bonding in masonry refers to the arrangement and interlocking of bricks, blocks, or stones using mortar to create a strong, stable, and durable structure./**2marks**

REFERENCE L.O.4.Elevate brick walls on indicative content 4.3Systematic brick laying is done according to the type of bond

Q9. Outline any eight (8) point to follow in storing tools and equipment **(4marks)**

ANSWER : Points to follow in storing tools and equipment: for each /0.5marks

1. Have a designated place for each kind of tools and equipment.
2. Label the storage cabinet or place correctly for immediate finding.
3. Store them near the point of use.
4. Wash and dry properly before storing.
5. Store sharp tools properly when not in use with sharp edge down.
6. Put frequently used items in conveniently accessible locations.
7. Gather and secure electrical cords to prevent entanglement or snagging.
8. Cutting boards should be stored vertically to avoid moisture collection.
9. Metal equipment can be stacked on one another after drying such as storage dishes and bowls.
10. Make sure the areas where you are storing the equipment are clean and dry.

REFERENCE L.O.2. Prepare working area on indicative content 2.2.Relevant storage spaces are identified according to types of construction materials.

Q10. Choose the letter corresponding to the correct answer in each statement: **(5marks)**

1.In reinforced concrete arches, reinforcement is mainly provided at which location?

- a) Extrados
- b) Intrados
- c) Haunch
- d) Crown

2.Which of the following is the primary function of an arch in construction?

- a) To increase the aesthetic appeal of a structure
- b) To provide ventilation
- c)To support loads by distributing weight evenly
- d) To reduce the need for foundations

3.Which of the following is NOT a type of arch?

- a) Segmental Arch
- b) Pointed Arch
- c) Barrel Arch
- d) Spiral Arch

4.What type of arch requires centering (temporary support) during construction?

- a) Masonry Arch
- b) Reinforced Concrete Arch
- c) Steel Arch
- d) Prefabricated Arch

5.What is the term for the curve formed by an arch?

- a) Extrados
- b) Intrados
- c) Spandrel
- d) Haunch

ANSWER: for each 1marks

1. b) Intrados
2. c) To support loads by distributing weight evenly
3. d) Spiral Arch
4. a) Masonry Arch
5. b) Intrados

REFERENCE: L.O.4. Elevate brickwalls on indicative content 4.4. Systematic construction of lintels, Arches, piers and pillars according to the standards

Q11. Why timber lintel isn't commonly used? **(2marks)**

ANSWER: It is not commonly used nowadays because it has shown some defects like:

- 👍 It is weak (for some spans) / **1marks**
- 👍 It easily attacked by fire / **1marks**
- 👍 It can easily decay (rotting)

REFERENCE: L.O.4. Elevate brickwalls on indicative content 4.4. Systematic construction of lintels, Arches, piers and pillars according to the standards

Q12. Identify the types of personal protective equipment, at least four (4) types. **(2marks)**

ANSWER: Here are common types of Personal Protective Equipment (PPE): **for each 0.5marks**

1. **Head Protection** – Helmets and hard hats protect against falling objects, impact, and electrical hazards.
2. **Eye and Face Protection** – Safety goggles, face shields, and safety glasses protect against flying debris, chemicals, and radiation.
3. **Hearing Protection** – Earplugs and earmuffs reduce exposure to high noise levels that can cause hearing loss.

4. **Respiratory Protection** – Masks and respirators protect against dust, fumes, vapors, and airborne contaminants.
5. **Hand Protection** – Gloves made from materials like latex, leather, or rubber protect against cuts, chemicals, burns, and infections.
6. **Foot Protection** – Safety boots and shoes with reinforced toes and slip-resistant soles protect against falling objects, punctures, and electrical hazards.

Reference L.O.1. Select tools, equipment and materials on indicative 1.2.Appropriate equipment is selected according to the standard

Q13. Mention any four (4) requirements of mixing area.

(2marks)

ANSWER: Requirement of mixing area. For each 0.5 marks

- It should be easy to clean
- Mixing should be free from waste matter.
- It should be free from soap and grease matter.
- It should be free from organic vegetable.

REFERENCE L.O.2. Prepare working area on indicative content 2.1.Adequate mixing place is prepared as per standard.

Q14. Depending on the type of construction and required strength. Enumerate any six (6) recommended mixing ratios for bricklaying mortar.

(3marks)

ANSWER: The mixing ratio for bricklaying mortar depends on the type of construction and the required strength. Here are six commonly recommended mortar mix ratios: **for each 0.5marks**

1. **General Bricklaying (Moderate Strength)** – 1 part cement : 5 parts sand
2. **Strong Mortar for Load-Bearing Walls** – 1 part cement : 4 parts sand
3. **High-Strength Mortar (Structural Walls)** – 1 part cement : 3 parts sand
4. **Lime Mortar for Improved Workability** – 1 part cement : 1 part lime : 5 parts sand
5. **Wet or Harsh Weather Conditions** – 1 part cement : ½ part lime : 4 parts sand
6. **Low-Strength Mortar for Non-Load-Bearing Walls** – 1 part cement : 6 parts sand

REFERENCE L.O. 3. Prepare mortar on indicative content 3.2. Mixing batch are prepared correctly reference to the mixing ratio.

Q15. Give different classification of wall according the load system, at least any three (3) point for each class. **(3marks)**

ANSWER: 1. Load-Bearing Walls (Structural Walls)

- **Supports Loads:** These walls bear the loads from the structure, such as the weight of floors, roofs, and other elements. / **0.5marks**
- **Transmits Forces:** The forces from the superstructure (building above) are transmitted through these walls to the foundation. / **0.5marks**
- **Integral to Structure:** The wall acts as an essential part of the overall building framework, providing strength and stability. / **0.5 marks**

2. Non-Load-Bearing Walls (Partition Walls)

- **Does Not Bear Loads:** These walls do not carry any load from the building structure, except their own weight. / **0.5marks**
- **Divides Spaces:** Primarily used to divide rooms or spaces without contributing to the structural strength of the building. / **0.5marks**
- **Flexibility in Design:** Can be easily modified, removed, or relocated without affecting the building's stability. / **0.5marks**

REFERENCE L.O.4. Elevate brickwalls on indicative content 4.2. Adequate setting out of walls is done according to the drawing.

Q16. Compare the substructure and superstructure of a building in terms of their construction requirements. **(2marks)**

ANSWER: for each 1marks

The **substructure** focuses on stability, load transfer, and ground interaction, while the **superstructure** ensures usability, aesthetics, and protection

REFERENCE L.O.4. Elevate brickwalls on indicative content 4.2. Adequate setting out of walls is done according to the drawing.

Q17. Rearrange the following steps in the correct sequence for constructing an arch: Placing the voussoirs; Removing the centering after curing; Setting out the arch dimensions; Finishing and strengthening the arch; Erecting the centering. **(4marks)**

ANSWER: The correct sequence for constructing an arch is:

1. Setting out the arch dimensions / **1marks**
2. Erecting the centering / **1marks**
3. Placing the voussoirs / **1marks**

4. Finishing and strengthening the arch /0.5marks
5. Removing the centering after curing/0.5marks

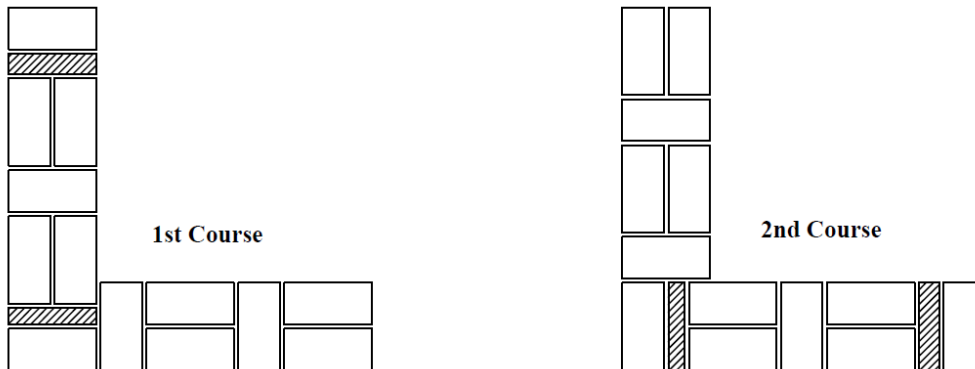
REFERENCE:L.O.4. Elevate brickwalls on indicative content 4.4.Systematic construction of lintels, Arches, piers and pillars according to the standards

SECTION B Choose only three questions (30marks)

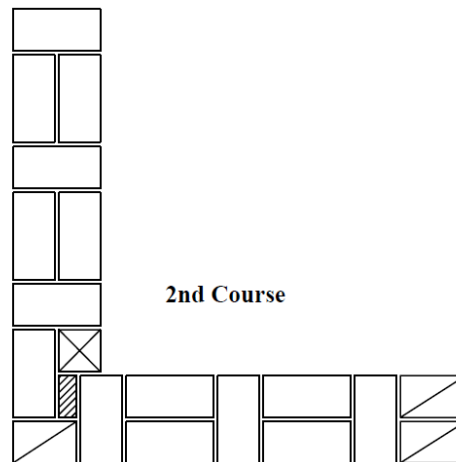
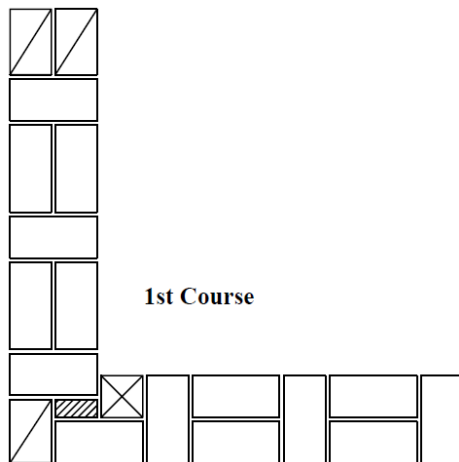
Q18. The double Flemish bond is used, where a better appearance of the wall is required. With Clear sketches show 1st and 2nd of Courses of Right Angle in double Flemish bond. **10marks**

ANSWER:

1ST METHOD



2ND METHOD



REFERENCE L.O.4. Elevate brick walls on indicative content 4.3 Systematic brick laying is done according to the type of bond

Q19. Briefly explain the following the properties of good bricks **(10marks)**

- Color:
- Shape:
- Size:
- Soundness:
- Hardness:

ANSWER: Properties of Good Bricks (10 marks)

a. Color (2 marks)

- Good bricks should have a **uniform** and **bright red** or **deep cherry** color.
- A consistent color indicates **proper clay composition** and **uniform burning** in the kiln.

b. Shape (2 marks)

- Bricks should be **rectangular with sharp edges and corners** for proper alignment in masonry.
- They must have a **uniform and smooth surface** to ensure good bonding with mortar.

c. Size (2 marks)

- Standard bricks should conform to prescribed dimensions (e.g., **190mm × 90mm × 90mm** in many countries).
- Uniform size ensures **easy handling, proper bonding**, and **aesthetic appearance** in construction.

d. **Soundness (2 marks)**

- A good brick, when struck together or dropped from a short height, should produce a **clear, ringing sound**.
- This indicates **high density** and **absence of internal cracks or cavities**.

e. **Hardness (2 marks)**

- A good brick should be **hard enough to resist scratches** from a sharp object like a knife or nail.
- Hardness ensures **durability, resistance to wear, and ability to withstand heavy loads**.

REFERENCE L.O.1. Select tools, equipment and materials on indicative content 1.3 Adequate materials are selected according to the standard

Q20.a. Describe any five(5)ways of good cement storage **(5marks)**

ANSWER: Five Ways of Good Cement Storage (5 Marks)

1. Store in a Dry Place (1 mark)

Cement should be stored in a moisture-free environment to prevent absorption of moisture, which can lead to lump formation and reduced strength.

2. Stacking on Raised Platforms (1 mark)

Cement bags should be placed on wooden or concrete platforms at least **150 mm above the ground** to prevent moisture absorption from the floor.

3. Maintain Proper Ventilation (1 mark)

The storage area should have **proper air circulation** to reduce humidity and prevent condensation, which can damage the cement.

4. Stacking in a Systematic Manner (1 mark)

Bags should be stacked in **small piles (not exceeding 10 bags in height)** with a minimum gap of **300 mm from walls** to allow easy handling and inspection.

5. Use First-In-First-Out (FIFO) Method (1 mark)

Older cement bags should be used first to prevent prolonged storage, which can lead to a reduction in cement quality over time.

Proper cement storage ensures high-quality construction, prevents wastage, and maintains cement strength.

REFERENCE L.O.2. Prepare working area on indicative content 2.2. Relevant storage spaces are identified according to types of construction materials.

b. State and explain two (2) methods of mixing mortar

(5marks)

1. Hand Mixing(2.5mark)

- This method is used when only a small quantity of mortar is needed.
- **Explanation:** Hand mixing is cost-effective for small projects but requires more labor and effort. It is important to mix thoroughly to ensure uniform strength and workability.

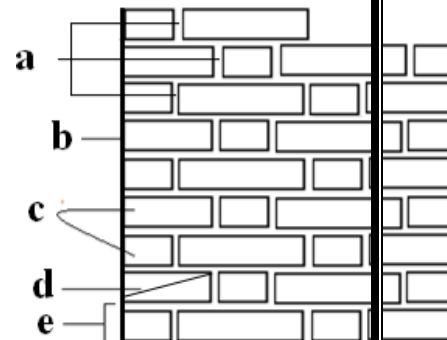
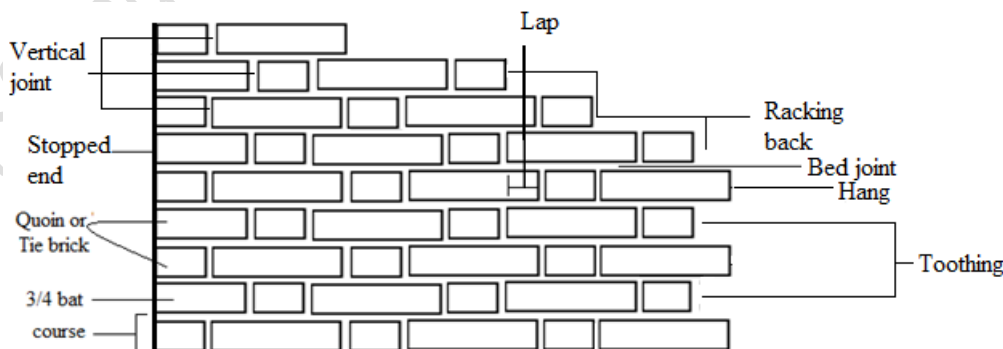
2. Machine Mixing(2.5 mark)

- This method is used for larger construction projects where a consistent and high-quality mix is required.
- **Explanation:** Machine mixing ensures a more consistent blend, saves time, and reduces labor compared to hand mixing. However, it requires access to equipment and proper maintenance of the mixer.

REFERENCE L.O.3. Prepare mortar on indicative content 3.4. Relevant mortar mixing is done according to the standard.

Q21. The Figure below indicate the Technical terms for bonding structure in bricklaying. Redraw the figure and name it's Parts.

(10marks)



ANSWER:

REFERENCE L.O.4. Elevate brick walls indicative content 4.3. Systematic bricklaying is done according to the type of bond.

Q22. Give 10 tools used in building construction and its function for each (10marks)

ANSWER: Here are 10 essential tools used in building construction along with their functions:

1. **Building Trowel Masonry trowel** is a hand trowel used in brickwork or stonework for leveling, spreading and shaping mortar or concrete.

2. Cold Chisel

A cold chisel is a tool that cuts bricks and veneer stone in half. It has a flat, wide head.

3. Brick Hammer or Mason's Hammer

The **brick hammer** features a blunt side that can be used for cutting bricks or stones in half. It is ideal for quick and decisive tasks such as chopping bricks. Masonry demands a larger hammer face and a heavier hammer.

4.Tape measure and folding ruler: This used for measuring lengths

5.Pencil: Used for marking and drawing

6.Spirit level: Is used for leveling the horizontal plane of masonry works and to stretch the verticality of masonry work piece.

7.Building line: This is used for horizontal leveling and setting out of the building

8.Bolster: Used for cutting bricks

9.Steel square: This is used for controlling right angles when building walls and setting out

10.Plumb bob: Is used for stretching vertically

11.Bucket: Used for carrying water

12.Spade/shovel: Is used for mixing sand, cement, collecting the materials loading on and off loading

13.Wheelbarrow: Is used for carrying materials

14.Gauge box: Is used for measuring the proportion of materials and to control the ratio by volume

15.Pan: Is used for carrying materials

16.Straight edge: Used to check the flatness of the wall and to ensure that all bricks are laid to the same level in each course

17.Pointed trowel: Is used for jointing, pointing and for scraping the excess mortar

18 Jointers: They are used for jointing and pointing

19.Brick bat gauge: Used when cutting bricks to maintain the regular size to the cuts

20.Corner shaper (angle tool): Used for making corners

Inside: for inside corner shaping

Outside: for inside corner shaping

21. Hoe: Is used for digging

REFERENCE L O 1: Select tools, equipment and materials on indicative content
1.1.Identification of tools used to erect brick and block masonry

SECTION C Choose only one question

Q23. A brick wall with dimensions 10 meters long, 3 meters high, and 0.2 meters thick is to be constructed using standard bricks of size 190 mm × 90 mm × 90 mm (with 10 mm mortar thickness). The mortar mix ratio is 1:5 (cement: sand). Calculate:
(15marks)

1. Number of bricks required
2. Quantity of cement (in bags)
3. Quantity of sand (in cubic meters)
4. Quantity of water required (Assume water-cement ratio = 0.5)

ANSWER:

Given Data:

- **Wall dimensions:**

Length = **10 m**

Height = **3 m**

Thickness = **0.2 m**

Volume of wall = **$10 \times 3 \times 0.2 = 6 \text{ m}^3$**

Brick dimensions (including mortar thickness):

- Brick size = **190 mm × 90 mm × 90 mm**
- Mortar thickness = **10 mm**
- Brick with mortar = **200 mm × 100 mm × 100 mm** (or **0.2 m × 0.1 m × 0.1 m**)
- Volume of one brick with mortar = **$0.2 \times 0.1 \times 0.1 = 0.002 \text{ m}^3$**

1.Number of bricks required

$$\text{NUMBER OF BRICKS} = \frac{\text{TOTAL WALL VOLUME}}{\text{VOLUME OF ONE BRICKS WITH MORTAR}}$$

$$\text{NUMBER OF BRICKS} = \frac{6\text{m}^3}{0.002\text{m}^3} = 3000 \text{ bricks}$$

Assuming **5% wastage**, the total number of bricks required:

$$3000 + (5\% \text{ of } 3000) = 3000 + 150 = 3150 \text{ bricks}$$

$$3000 + (5\% \text{ of } 3000) = 3000 + 150 = 3150 \text{ bricks}$$

2. Volume of Mortar Required

Total mortar volume = Total wall volume - Total brick volume

$$\text{Total mortar volume} = \text{Total wall volume} - \text{Total brick volume}$$

Volume of bricks without mortar:

$$\text{Volume of one brick} = 0.19 \times 0.09 \times 0.09 = 0.001539 \text{ m}^3$$

$$0.19 \times 0.09 \times 0.09 = 0.001539 \text{ m}^3$$

$$\text{Volume of one brick} = 0.19 \times 0.09 \times 0.09 = 0.001539 \text{ m}^3$$

Total volume of bricks:

$$3150 \times 0.001539 = 4.85 \text{ m}^3$$

$$3150 \times 0.001539 = 4.85 \text{ m}^3$$

Volume of mortar:

$$6 - 4.85 = 1.15 \text{ m}^3$$

$$6 - 4.85 = 1.15 \text{ m}^3$$

Considering **30% dry volume increase**:

$$1.15 + (30\% \text{ of } 1.15) = 1.15 + 0.345 = 1.495 \text{ m}^3$$

$$1.15 + (30\% \text{ of } 1.15) = 1.15 + 0.345 = 1.495 \text{ m}^3$$

3. Quantity of Cement and Sand Required

- Mortar mix ratio = 1:5 (cement: sand)
- Total parts = 1 + 5 = 6
- Cement volume = $1.495 \times \frac{1}{6} = 0.249 \text{ m}^3$
- Sand volume = $1.495 \times \frac{5}{6} = 1.246 \text{ m}^3$

Convert Cement Volume to Bags

- Density of cement = 1440 kg/m³
- 1 bag of cement = 50 kg
- 1 bag of cement = 0.0347 m³

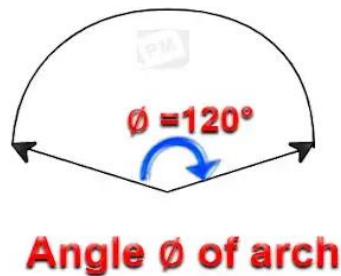
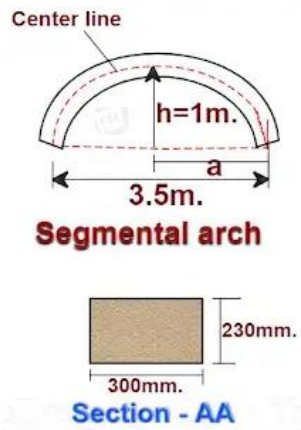
$$\text{Number of cement bags} = \frac{0.249}{0.0347} = 7.18 \approx 8 \text{ bags}$$

Final Materials Calculation

- Bricks required = 3150 bricks
- Mortar volume = 1.495 m^3
- Cement required = 8 bags
- Sand required = 1.246 m^3

REFERENCE L.O.3. Prepare mortar on indicative content 3.3. Precise ingredients are quantified according to the mix ratio.

Q24. A segmental brick arch with a span of 3.5m and a rise of 1m is built using a 1:5 mortar mix, water cement ratio a 0.45. If the thickness of the arch is 230mm and width of the arch is 300mm, and central angle equal 120° . determine the quantity of arch work.
(15marks)



ANSWER:

To determine the quantity of arch work, we need to calculate the **volume of the arch** using the given parameters:

Given Data:

- Span (L): 3.5 m
- Rise (h): 1.0 m
- Thickness of arch (t): 230 mm = 0.23 m
- Width of arch (b): 300 mm = 0.30 m
- Central angle (θ): 120° (converted to radians: $120^\circ \times \frac{\pi}{180} = \frac{2\pi}{3}$ radians)

Step 1: Calculate the Radius of the Arch

The formula to determine the **radius (R)** of a segmental arch is:

$$R = \frac{(h^2 + \frac{L^2}{4})}{2h}$$

Substituting the values:

$$R = \frac{(1^2 + \frac{3.5^2}{4})}{2(1)}$$

$$R = \frac{(1 + \frac{12.25}{4})}{2}$$

$$R = \frac{(1 + 3.0625)}{2} = \frac{4.0625}{2} = 2.03125 \text{ m}$$

Step 2: Calculate the Length of the Arc (Chord Length)

The arc length (S) is given by:

$$S = R\theta$$

Substituting values:

$$S = 2.03125 \times \frac{2\pi}{3}$$

$$S = 2.03125 \times 2.094$$

$$S \approx 4.26 \text{ m}$$

Step 3: Calculate the Volume of the Arch Work

The volume V of the arch work is given by:

$$V = \text{Arc Length} \times \text{Thickness} \times \text{Width}$$

$$V = 4.26 \times 0.23 \times 0.30$$

$$V \approx 0.294 \text{ m}^3$$

Final Answer:

The quantity of arch work is 0.294 m^3 of brickwork.

REFERENCE:L.O.4. Elevate brickwalls on indicative content 4.4.Systematic construction of lintels, Arches, piers and pillars according to the standards