

**THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATION COUNCIL
DIPLOMA IN TECHNICAL EDUCATION EXAMINATION**

784

BRICKWORK AND MASONRY

Time: 3 Hour.

ANSWERS

Year: 2014

Instructions

1. This paper consists of sections **six (6)** questions.
2. Answer question number **one (1)** and any other **four (4)** questions.
3. Question 1 carries **thirty-two (32)** marks and the rest carries **seventeen (17)** marks each.
4. Non-programmable calculators may be used.
5. Communication devices and any unauthorized materials are **not** allowed in the examination room
6. Write your **Examination Number** on every page of your answer booklet.

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1. (a) Define the term "reinforced masonry".

Reinforced masonry is a type of construction where steel reinforcement, such as bars or mesh, is incorporated into brick or block walls to improve their strength and durability. It is especially useful in resisting tensile, shear, and lateral forces that plain masonry cannot handle effectively.

This technique is commonly used in earthquake-prone areas and for structures requiring higher structural performance, such as retaining walls, tall boundary walls, and multistorey buildings.

(b) State four reasons for reinforcing masonry walls.

Reinforcement increases the tensile strength of masonry walls, allowing them to resist cracking caused by tension and lateral forces.

It enhances the overall stability of the structure, especially in areas prone to earthquakes or strong winds.

Reinforced masonry can carry heavier loads, making it suitable for high-rise construction or retaining walls.

It helps control shrinkage cracks caused by temperature changes, moisture variation, and settlement.

(c) Describe the process of placing horizontal reinforcement in a block wall during construction.

First, block units with horizontal cores or channels are laid in courses as the wall is raised. These channels provide space to insert reinforcement.

Steel reinforcement bars or mesh are placed inside the horizontal grooves, usually at every third or fourth course depending on design.

Mortar or concrete grout is then poured into the grooves to embed and secure the reinforcement. The surface is leveled before continuing with upper courses.

Care is taken to maintain continuity of reinforcement and proper overlap at joints. The reinforcement must be kept clean and rust-free before placement.

2. (a) Explain the function of a lintel in wall construction.

A lintel is a horizontal structural element placed over door and window openings in masonry walls to carry the load from the wall above.

It distributes the weight to the surrounding wall sections, preventing cracks or collapse of the wall over the opening.

Lintels also provide support during construction and act as a base for continued brickwork or blockwork above the opening.

(b) State four types of lintels commonly used in masonry.

Reinforced concrete lintels are widely used due to their strength and ease of construction on site.

Steel lintels, such as angle iron or rolled steel joists, are used where space or weight is a concern.

Timber lintels are used in light construction, especially in interior walls or temporary structures.

Brick or block lintels are constructed by arranging bricks or blocks with reinforcement and mortar, suitable for small spans.

(c) With the help of a sketch, describe the construction of a reinforced concrete lintel over a window opening.

The width of the lintel matches the wall thickness, and the span covers the entire opening plus bearing ends on both sides.

A formwork is built below the opening to support the concrete during casting. Steel reinforcement bars are placed inside, with main bars running longitudinally and stirrups for shear strength.

Concrete is poured and compacted in the formwork, and the lintel is cured for several days. Once cured, the formwork is removed and brickwork continues above the lintel.

3. (a) Define the term “partition wall”.

A partition wall is a non-load-bearing wall built within a structure to divide internal spaces into rooms or sections.

It may be made from bricks, blocks, timber, metal studs, or drywall and serves to provide privacy, insulation, and functionality without supporting structural loads.

(b) State four functions of partition walls in buildings.

They separate spaces to create different rooms or functional areas within a building.

Partition walls help reduce the transmission of sound between rooms, enhancing acoustic privacy.

They provide thermal insulation by reducing heat transfer between rooms with different temperature needs.

They may serve as fire barriers, limiting the spread of fire from one section of a building to another.

(c) Explain three differences between load-bearing and non-load-bearing partition walls.

Load-bearing walls support structural loads such as floors and roofs, while non-load-bearing partitions only divide space.

Load-bearing walls are thicker and made with stronger materials like reinforced concrete or solid brick, whereas partitions may be thinner and lighter.

Removing a load-bearing wall requires structural reinforcement or redesign, while non-load-bearing partitions can be removed or repositioned easily.

4. (a) What is meant by “plumb and level” in masonry work?

"Plumb" refers to vertical alignment, ensuring that walls or columns are perfectly upright. It is checked using a plumb bob or spirit level.

"Level" refers to horizontal alignment, ensuring that surfaces such as floors, courses of bricks, or lintels are flat and even. It is verified using a spirit level or straightedge.

Maintaining both plumb and level is essential to the safety, strength, and appearance of masonry structures.

(b) Explain the effects of ignoring plumb and level checks during wall construction.

Walls that are not plumb may lean or bulge, compromising their stability and safety. This can lead to collapse under load or wind pressure.

Lack of level courses causes uneven load distribution, which may result in cracking or settlement in parts of the structure.

Irregular alignment affects the appearance of the wall, making it look poorly built and unprofessional.

It also creates difficulties in fitting doors, windows, and other fixtures accurately, leading to operational problems and extra finishing work.

(c) Describe how to use a spirit level and straightedge to check the level of a wall.

Place a straightedge or long flat board horizontally along the course of bricks or blocks being laid.

Position the spirit level on top of the straightedge and observe the bubble in the level tube.

If the bubble is centered between the marked lines, the surface is level. If not, adjustments are made by adding or removing mortar until the correct level is achieved.

Repeat this process at regular intervals during construction to ensure consistent leveling of the wall.

5. (a) Mention four causes of mortar failure in bricklaying.

Use of incorrect mix proportions can weaken the mortar and cause premature cracking or loss of bonding strength.

Contaminated or dirty sand and water introduce impurities that reduce the durability of the mortar.

Insufficient mixing results in uneven distribution of materials, leading to weak and inconsistent mortar.

Rapid drying due to hot weather or failure to cure the mortar properly can cause shrinkage cracks and poor bonding.

(b) Explain how poor workmanship contributes to mortar failure.

Improper joint filling or inconsistent application can lead to weak or hollow joints that fail under pressure.

Failure to clean and moisten the surfaces before laying bricks can prevent proper adhesion between bricks and mortar.

Neglecting to compact the mortar or over-troweling the joints can weaken the bond and result in surface cracks or detachment.

(c) Describe three measures that can be taken on site to improve mortar quality.

Ensure accurate measuring and proportioning of cement, sand, and water according to the required mix ratio for the work.

Use clean, well-graded sand and potable water free from salts, oil, or organic matter.

Mix mortar thoroughly using either hand tools or mechanical mixers until a uniform consistency is achieved, and use the mortar within two hours of mixing.

6. (a) (i) Define the term “fire-resistance” as applied in walls.

Fire-resistance refers to the ability of a wall to resist the passage of fire, heat, and smoke for a specified period under standard test conditions.

Fire-resistant walls help contain the spread of fire, providing occupants time to evacuate and limiting damage to other parts of the building.

(ii) State four factors that affect the fire-resistance of masonry walls.

The thickness of the wall plays a major role the thicker the wall, the longer it can resist fire penetration.

The type of materials used, such as fire-rated bricks, blocks, or plaster, directly influences the wall's fire-resisting capacity.

The presence of reinforcement or steel can reduce fire resistance if not protected by sufficient concrete cover.

Openings like doors and windows weaken fire resistance unless fitted with fire-rated components.

(b) Explain the importance of fire-resistant walls in public buildings.

Fire-resistant walls help protect lives by containing the spread of fire, allowing people more time to escape and reducing the risk of fatalities.

They protect property and critical infrastructure within the building by preventing fire from spreading rapidly through compartments.

In hospitals, schools, and offices, they are essential for maintaining fire safety codes and complying with legal requirements.

Fire-resistance also aids firefighting efforts by isolating the fire to a specific area, reducing overall damage and hazards.

(c) Suggest three wall construction methods that improve fire-resistance.

Using solid bricks or fire-rated concrete blocks increases the wall's mass and resistance to heat.

Applying fire-resistant plaster or cladding materials enhances the surface resistance to flame and heat.

Constructing cavity walls with fire barriers between layers can limit the transfer of heat and flame through the wall system.