THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2003**

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.

1. (a) Define the term "bedding" in bricklaying.

Bedding in bricklaying refers to the horizontal layer of mortar placed between courses of bricks or blocks. It forms the base upon which bricks rest and helps distribute loads evenly while providing adhesion between units.

(b) Mention three types of bedding used in construction.

Flat or full bedding involves placing mortar uniformly across the entire surface of the brick or block. It is the most common type used in load-bearing walls.

Frog bedding is used when bricks have indentations (frogs); mortar is filled into the frog, and bricks are laid frog-up or frog-down depending on specification.

Face shell bedding is commonly used with hollow blocks, where mortar is applied only along the outer edges of the block, leaving the cores empty until grouting.

(c) Explain the importance of proper bedding in wall strength and stability.

Proper bedding ensures full contact between bricks or blocks, reducing voids that weaken the wall. It evenly distributes load and prevents localized stresses that can lead to cracks or failure. It also improves bonding and water resistance of the wall.

2. You are supervising a site where hollow concrete blocks are used:
(i) List four quality checks you would perform before allowing blocks to be used.

Check for uniform dimensions to ensure consistent joints and proper alignment during laying.

Verify surface finish — blocks should be free of cracks, honeycombing, or exposed aggregates.

Tap the blocks lightly to listen for hollow or dead sounds, which indicate internal weaknesses or poor compaction.

Test a few random blocks for weight; unusually light blocks may indicate under-compacted concrete or excessive porosity.

(ii) How would you verify the uniformity and strength of the blocks?

Select random samples and subject them to a compressive strength test using a block-testing machine. The results are compared to the minimum standard (e.g., 3.5 to 7 N/mm² depending on type).

Also, measure and record dimensions of multiple blocks and compare to standard specifications. Tolerances should be within ±5 mm for height and ±3 mm for length/width.

(iii) What steps would you take if a batch of blocks fails inspection?

Isolate the rejected batch and mark it clearly to prevent accidental use. Notify the supplier for replacement.

Conduct a site meeting to identify the cause, poor mix, insufficient curing, or handling damage, and document the findings.

Ensure corrective actions are taken before accepting new deliveries, including sampling and retesting.

3. (a) Define the term "retaining wall".

A retaining wall is a structure built to hold back or retain soil, especially on sloped terrain, to prevent erosion or collapse. It allows vertical or near-vertical grade changes by resisting the lateral pressure of soil or water.

(b) Differentiate between gravity and cantilever retaining walls.

Gravity retaining walls rely on their own weight (usually from stone, concrete, or masonry) to resist the earth pressure behind them. They are typically thicker at the base and suitable for low walls.

Cantilever retaining walls are reinforced concrete walls with a base slab. The slab and vertical wall work together to resist pressure using bending strength rather than weight alone.

(c) List and explain three factors that must be considered when constructing a brick retaining wall.

Soil type must be considered because cohesive soils exert different pressures compared to loose granular soils. The design should match the soil behavior.

Drainage behind the wall is crucial to prevent water pressure buildup. Weep holes or drainage pipes should be included to relieve hydrostatic pressure.

Wall thickness and reinforcement should be adequate to withstand lateral forces, especially for taller walls. Brick alone may not be sufficient without reinforcement.

4. A three-storey office block is to be constructed using masonry infill:
(i) Discuss three functions of the infill walls in the building.

Infill walls divide interior spaces and provide enclosure, offering privacy and protection from weather.

They contribute to lateral stability of the structure when properly bonded with the frame or tied into the columns.

Infill walls also serve to insulate the building against heat, noise, and fire when appropriate materials are selected.

(ii) Identify two risks associated with unreinforced masonry infill in seismic zones.

Unreinforced walls may collapse during an earthquake because they lack ductility and tensile strength to absorb lateral movement.

Cracking or detachment from the frame can occur, posing danger to occupants and damaging adjacent structural elements.

(iii) Recommend reinforcement strategies to improve infill wall performance.

Use vertical and horizontal reinforcement bars within the infill wall at intervals to improve ductility.

Anchor the infill to structural columns using steel ties or reinforcement mesh to prevent separation during shaking.

5. (a) What is meant by the term “grouting” in blockwork?

Grouting is the process of filling the hollow cores or spaces in masonry units with a fluid cementitious mixture to improve strength and bond, especially when reinforcement bars are embedded in the cores.

(b) Describe how grouting is done in hollow block walls.

Once a few courses of hollow blocks are laid, grout (a mix of cement, sand, water, and sometimes gravel) is poured or pumped into the vertical and horizontal cavities. It surrounds the rebar and solidifies to create a monolithic structural unit.

(c) Explain two benefits of grouting in reinforced block construction.

Grouting ensures that embedded reinforcement is fully encased, preventing corrosion and improving structural strength.

It converts hollow blocks into partially solid units, increasing their load-bearing capacity and resistance to impact or seismic forces.

6. (a) Define the term "course" in brick masonry.

A course is a single horizontal layer of bricks or blocks laid in mortar in a wall or structure. It is the basic building unit of masonry construction and determines the bond pattern and alignment.

(b) Mention four types of courses used in decorative brickwork.

String course is a horizontal band that projects slightly from the wall, often used for visual appeal.

Cornice course is placed near the top of the wall, often shaped to form a decorative ledge or crown.

Sill course is laid beneath windows to support the sill and provide continuity in appearance.

Plinth course is found at the base of the wall, often thicker or made of a different material to protect against ground moisture.

(c) Briefly describe how brick orientation affects the visual pattern and structural bonding.

The orientation of bricks such as laying headers, stretchers, or soldiers creates different bond patterns (e.g., English, Flemish, stack). Proper orientation ensures that vertical joints are staggered and load is evenly distributed, improving both aesthetics and structural integrity.