**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATION COUNCIL**

**DIPLOMA IN TECHNICAL EDUCATION EXAMINATION**

**784** **BRICKWORK AND MASONRY**

**Time: 3 Hour.** **ANSWERS** **Year: 2009**

---

**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) What is a cavity tray in wall construction?

A cavity tray is a damp-proof barrier installed in a cavity wall to collect and redirect any moisture that enters the outer leaf of the wall. It is typically made of plastic, lead, or bituminous felt and is placed above openings such as doors and windows, or over vulnerable junctions.

The cavity tray helps ensure that moisture does not seep into the inner leaf, where it could cause dampness or damage to the interior of the building.

(b) State three functions of a cavity tray.

A cavity tray prevents water that enters the outer wall leaf from reaching the inner leaf by directing it back out through weep holes.

It protects vulnerable areas above windows, doors, or roof abutments where moisture infiltration is likely.

It ensures the durability of internal finishes by maintaining dryness within the wall cavity and supporting the damp-proofing system.

(c) With the help of a sketch, describe how a cavity tray is installed above a window opening.

The cavity tray is inserted into the outer leaf of a cavity wall, at least one course above the window or door lintel.

The tray slopes slightly toward the outside of the wall to ensure water flows toward the outer face.

Weep holes are provided at regular intervals along the tray line to allow moisture to escape.

The tray extends across the full width of the opening and at least 150 mm beyond each side to direct water away from vulnerable junctions.

**2.** (a) Define the term “batter” in walling.

Batter in walling refers to the intentional backward sloping of a wall’s face, typically in retaining walls or boundary walls. It is measured as the horizontal offset per unit of height and helps improve stability against overturning forces.

Battered walls lean into the retained material or slope backward from the base to the top, improving both structural and visual performance.

(b) Mention three reasons for providing batter in walls.

Batter increases the structural stability of walls by improving their resistance to lateral earth or wind pressure.

It enhances the appearance of tall or retaining walls by providing a more solid and balanced visual profile.

Battered walls reduce the risk of water accumulation and improve drainage, which helps extend the wall's life.

(c) Describe the method of setting out and constructing a battered masonry wall.

First, the angle or slope of the batter is calculated based on wall height and design requirements.

A vertical guide or string line is set up using a template or spacing blocks to mark the inward offset per course.

Bricks or blocks are laid with each successive course slightly set back from the course below, following the batter line.

The plumb bob and spirit level are used in conjunction with the angled guide to maintain a consistent slope throughout construction.

**3.** (a) What is a quoin in masonry construction?

A quoin is the external corner or end unit of a masonry wall, often distinguished by size, material, or finish from the main body of the wall. It serves both decorative and structural purposes in masonry work.

Quoins are usually formed with stronger or more precisely laid bricks or blocks to strengthen corners and improve aesthetics.

(b) State two advantages of using quoins in wall corners.

Quoins provide additional structural strength and stability at wall corners, which are more prone to impact and stress.

They enhance the appearance of buildings by creating a visually appealing contrast or emphasis at the corners.

(c) Explain the correct procedure for laying bricks to form external corner quoins.

Begin by marking the corner location on the foundation and lay the first corner brick square and level.

Alternate headers and stretchers in successive courses to maintain bonding and tie the two wall faces together.

Use a builder's square and plumb line to check that each quoin course remains perpendicular and aligned.

Continue building upward in lifts, checking plumb, level, and squareness regularly to ensure corner accuracy.

**4.** (a) Mention four factors that cause uneven settlement in masonry structures.

Variations in soil type beneath different sections of the building can cause some areas to settle more than others.

Uneven foundation loads occur when structural loads are not distributed uniformly across the base.

Changes in moisture content, such as drying or saturation of clay soils, lead to expansion or shrinkage.

Poor compaction of backfill or foundation soil results in voids that collapse over time, causing movement.

(b) Explain how each factor affects the wall's structural integrity.

Uneven soil strength causes differential settlement, leading to cracks in walls, particularly near corners and openings.

Unequal foundation loads stress certain parts of the wall more than others, which can lead to structural imbalance and damage.

Moisture fluctuations in clay-rich soils cause cyclical movement, leading to repeated stress and fatigue in wall elements.

Poorly compacted fill fails to support the wall uniformly, leading to tilting or sagging of walls over time.

(c) Suggest three ways to reduce the risk of differential settlement in masonry buildings.

Conduct a proper geotechnical investigation to design foundations based on actual soil conditions.

Distribute loads evenly across foundations by aligning structural elements and avoiding overloading specific points.

Use reinforced foundations such as raft slabs or ring beams to tie the entire structure together and minimize relative movement.

**5.** (a) Define the term “backing wall” in cavity wall construction.

A backing wall is the inner leaf of a cavity wall, typically constructed from blocks or structural masonry. It carries the majority of the load from floors, roofs, and the building structure.

The backing wall works with the outer facing wall to provide thermal insulation, structural support, and weather protection.

(b) State three differences between a backing wall and a facing wall.

The backing wall is load-bearing, while the facing wall mainly serves to protect the structure from weather and enhance appearance.

The backing wall is usually built with blocks for strength and cost-efficiency, while the facing wall may use bricks or decorative materials.

The backing wall is often hidden inside the building, while the facing wall is visible externally and requires better finishes.

(c) Describe the construction process of a cavity wall, including positioning of the cavity and ties.

Both leaves (facing and backing walls) are built simultaneously, maintaining a gap (cavity) of about 50 to 100 mm between them.

Wall ties are inserted at regular intervals (typically every 450 mm vertically and 750 mm horizontally) to connect the two leaves securely.

The cavity is kept clear of mortar droppings using cavity brushes or proprietary barriers to avoid bridging that can lead to dampness.

Insulation batts or boards may be inserted into the cavity as the wall progresses. Weep holes and DPCs are added to manage moisture.

**6.** (a) (i) What is a control joint in masonry work?

A control joint is a deliberate, planned gap between sections of masonry to allow for movement due to shrinkage, temperature changes, or material expansion.

It helps minimize cracking by absorbing stresses that occur as the structure moves or settles over time.

(ii) State three differences between a control joint and an expansion joint.

Control joints are primarily used to manage shrinkage and contraction, while expansion joints are used to accommodate actual expansion of materials.

Control joints are typically narrow and placed at regular intervals in straight walls, while expansion joints may be wider and located at structural transitions.

Expansion joints may include compressible fillers and sealants, whereas control joints are often formed by raking out mortar or using preformed inserts.

(b) Explain two problems that may occur if control joints are not included in large masonry walls.

Cracking may develop at random and uncontrolled locations due to internal stresses, reducing the aesthetic and structural quality of the wall.

Moisture can enter through these cracks, leading to dampness, staining, or even structural deterioration if left unrepaired.

(c) Suggest three best practices for placing control joints in concrete masonry construction.

Place control joints at intervals not exceeding 6 to 8 meters in straight masonry walls or as recommended by design standards.

Locate joints near changes in wall height, at corners, and at junctions with different structural materials to manage stress.

Ensure joints are properly detailed, using bond breaks and sealants to maintain weather resistance while allowing for movement.