THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2005**

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. You are assigned to inspect a newly built two-bedroom house before final rendering:
(a) Identify four critical aspects you would check on the wall surfaces.

First, I would inspect the straightness and plumbness of the walls using a spirit level and plumb bob. Any uneven or bowed surfaces must be corrected before rendering.

Second, I would check the mortar joints for uniformity, proper bonding, and full filling. Gaps or inconsistent joints indicate poor workmanship.

Third, I would examine the alignment around openings like doors and windows. Misaligned corners or uneven reveals affect both aesthetics and frame fittings.

Fourth, I would look for cracks or movement signs, especially at wall junctions and beam connections, as they may indicate structural problems or poor expansion control.

(b) Explain two common problems that may be discovered during this inspection.

One common issue is hairline cracks along mortar joints or around lintels, caused by shrinkage or thermal movement. These may expand after rendering.

Another issue is uneven blockwork surfaces due to inconsistent mortar thickness or poor block alignment. This results in thick rendering layers and more material wastage.

(c) Suggest appropriate remedies for each problem identified.

Cracks should be opened up, cleaned, and filled with non-shrink grout or polymer-modified mortar before rendering. Control joints may be introduced if movement is expected.

Uneven surfaces should be patched and leveled using a backing coat of mortar. If necessary, high spots may be chipped off to reduce render thickness and ensure uniformity.

2. (a) Define the term "pointing" in masonry.

Pointing is the process of finishing the surface joints of masonry after the initial laying. It involves removing some mortar from the joints and refilling them neatly with fresh mortar to improve appearance and protect against water penetration.

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

Flush pointing involves filling joints level with the wall surface and is common in plastered walls.

Recessed pointing is done by pressing the mortar back from the face of the brick, giving a neat, shaded look suitable for exposed walls.

Weathered pointing is sloped outward at the top to drain rainwater away, reducing the risk of moisture retention in joints.

(c) Describe step-by-step how pointing is carried out on a wall and state two advantages of pointing over plastering.

First, joints are raked to a uniform depth of about 10–15 mm using a joint raker after the initial setting of mortar. Loose particles are cleaned with a brush.

Fresh mortar of appropriate mix is then pressed into the raked joints with a pointing trowel or tool, ensuring tight packing and neat finish.

Finally, the joints are finished using the desired pointing style (flush, recessed, or weathered) and cured by light water spraying.

Pointing uses less material and maintains the natural look of the masonry while still sealing joints. It also allows moisture to escape more easily, reducing the chance of wall dampness.

3. (a) List four methods of improving bonding between a new masonry wall and an existing one.

Toothing involves leaving alternate bricks or blocks protruding from the existing wall to interlock with the new wall.

Using metal reinforcement ties, like stainless steel straps, helps connect the two walls firmly.

Applying epoxy-based bonding agents between old and new surfaces improves adhesion, especially on smooth finishes.

Mechanical keying, such as roughening or cutting grooves in the existing wall, provides a physical grip for the new masonry.

(b) With the aid of sketches, explain how a toothing technique is applied practically.

Toothing involves leaving half-bricks projecting at intervals from the end of the existing wall, creating a stepped profile. These projections are spaced to match the brick course height and are tied into the new wall courses, restoring continuous bonding. This ensures no vertical joint lines align.

(c) State two disadvantages of poor bonding in joint walls.

Poor bonding can lead to vertical cracks along the junction line, allowing water penetration and compromising aesthetics.

It also results in differential movement between the two wall sections, weakening the structural integrity and potentially causing detachment or failure under load.

4. You are building a water storage tank using brickwork:
(i) What type of bricks and mortar mix would you recommend?

Use first-class clay bricks or concrete blocks with low water absorption and no soluble salts. The mortar mix should be strong, such as 1:3 cement to sand, and can include waterproofing additives to enhance impermeability.

(ii) Describe three waterproofing techniques applicable during and after wall construction.

During construction, water-resistant additives like integral waterproofers can be mixed into mortar. Also, cavity walls or multiple layers can be built to reduce water seepage.

After construction, internal plastering with waterproof cement-sand render is applied to seal joints. Then, bitumen-based or acrylic waterproof coatings are applied over the plastered surface.

Finally, external backfilling should include proper drainage or filter layers to reduce hydrostatic pressure against tank walls.

(iii) Explain how you would test the tank for leakages after completion.

Fill the tank gradually with water over 2 to 3 days, marking water levels. Observe for drops in level or dampness on outer surfaces.

Leave it full for at least 72 hours. If no leakage is observed or water levels remain constant (after evaporation adjustments), the tank is considered watertight.

5. (a) Define the term "wall rendering failure".

Wall rendering failure refers to the breakdown, cracking, detachment, or discolouration of the applied render layer on walls. This weakens the protective and aesthetic qualities of the finish.

(b) Give three causes of rendering failure in external walls.

Applying render on a poorly prepared surface with dust or loose particles prevents proper adhesion.

Rendering in extreme weather (too hot or cold) causes improper curing, leading to shrinkage cracks or delamination.

Using weak or incorrect mortar mixes, or excessive water in the mix, results in weak bonds and rapid deterioration over time.

(c) Explain how each cause can be prevented through proper construction practices.

Always clean the wall surface thoroughly and dampen it slightly before rendering to ensure good bond formation.

Render should be applied in favorable weather conditions, or protected using shade nets and curing sheets during curing.

Follow standard mortar mix ratios, using clean water and proper mixing tools. Apply in layers if needed to prevent sagging or cracks from thick coats.

6. A contractor used ordinary clay bricks for a warehouse in a saline coastal area:
(i) Discuss three potential problems that may arise.

Salt-laden air and soil can cause efflorescence, leaving white powder on wall surfaces and eventually weakening the mortar joints.

Moisture and salts react with clay bricks, leading to spalling or surface flaking, especially in unplastered walls.

The humid saline environment promotes corrosion of embedded metal components like wall ties, lintels, and reinforcement, which can expand and crack the brickwork.

(ii) What alternative materials should have been used for durability?

Concrete blocks with low permeability and treated aggregates are better suited for coastal regions.

Fly ash bricks or stabilized soil blocks with waterproof additives are also more durable in salty conditions.

Where clay bricks must be used, they should be high-quality, dense, and water-resistant varieties tested for saline resistance.

(iii) Recommend how to protect existing walls from further damage in such an environment.

Apply waterproof rendering or cladding over the exterior wall to create a barrier against moisture and salt ingress.

Install damp proof courses and water drainage systems around the foundation to minimize moisture rise from the ground.

Use breathable, salt-resistant coatings or paints that allow moisture evaporation without trapping salts beneath the surface.