THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2002**

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 "plumb rule" and explain its use in masonry.

A plumb rule is a vertical wooden or metallic tool used in bricklaying to check if a wall or structure is upright. It works by aligning with a plumb bob or spirit level to ensure that the wall is perfectly vertical, which is essential for stability and appearance.

(b) List three other alignment tools used in wall construction and describe their purposes.

A spirit level is used to check both horizontal and vertical surfaces to ensure proper alignment during laying.

A line and pins are used to maintain straightness along the length of a wall. The line is stretched between two fixed points as a visual guide for each course.

A try square is used to check for right angles, especially at corners or junctions of two walls, ensuring proper wall bonding.

(c) What are the possible effects of laying bricks without checking vertical alignment?

Failure to check vertical alignment can result in a wall that leans outward or inward, which weakens the structural integrity and can lead to collapse under load. It also creates visual defects and misalignment with openings like windows and doors, making installation difficult or impossible.

2. You are constructing a rectangular water tank with internal dimensions of 5 m by 3 m by 2.5 m (length × width × height):
(i) Calculate the internal surface area to be plastered (excluding base).

We will plaster the four vertical sides and the top only.

Area of two longer sides = $2 \times (5 \times 2.5) = 2 \times 12.5 = 25$ m²
Area of two shorter sides = $2 \times (3 \times 2.5) = 2 \times 7.5 = 15$ m²
Area of the top = $5 \times 3 = 15$ m²

Total area = $25 + 15 + 15 =$ **55 m²**

(ii) If 1 m² requires 1.2 kg of waterproofing compound, how many kilograms are needed in total?

Total compound = 55 m² × 1.2 kg/m² = **66 kg**

(iii) Suggest two materials used in the tank to prevent leakage and explain their functions.

Waterproofing admixtures are added to the mortar or plaster to make the mixture impermeable to water, reducing absorption through walls.

Bitumen-based waterproof coatings can be applied as a surface membrane after plastering to create a protective, flexible layer that blocks water penetration.

3. (a) Distinguish between damp-proof course (DPC) and water-repellent admixtures.

A damp-proof course (DPC) is a physical barrier, usually laid at the base of walls, to block rising damp from the ground. It acts as a shield between the foundation and the superstructure.

Water-repellent admixtures are chemical additives mixed into concrete or mortar to reduce water absorption. They improve moisture resistance throughout the wall but don't physically block rising damp.

(b) State three common materials used for DPC in block walls.

Bitumen felt is a flexible, waterproof sheet placed in mortar joints.

Polythene sheets are durable, plastic membranes resistant to moisture and decay.

Pre-cast concrete DPC blocks or slurry coats are applied to create a continuous moisture barrier.

(c) Describe how DPC is installed during wall construction and why placement level is critical.

DPC is typically installed 150 mm above ground level at the base of the wall, laid on top of the mortar course in a continuous strip. Its level must be uniform across the structure to ensure complete protection. Incorrect placement can allow water to bypass the barrier, leading to rising damp and internal wall damage.

4. You are managing the construction of a retaining wall in sloping terrain:
(i) Explain three site conditions that must be assessed before excavation.

The type of soil must be assessed because loose or clayey soils behave differently under pressure and influence the wall design.

The slope gradient determines the intensity of earth pressure and drainage needs. Steep slopes require stronger wall designs and better back drainage.

Subsurface water levels must be identified to prevent saturation and uplift pressure during rainy seasons, which can cause wall failure.

(ii) Identify two causes of retaining wall failure during construction.

Lack of proper drainage behind the wall leads to water pressure buildup and eventual wall bulging or collapse.

Overloading from construction equipment or nearby structures too close to the wall before curing or compaction is complete can cause sudden wall failure.

(iii) Recommend preventive solutions for each of the two causes mentioned above.

Install weep holes and perforated drainage pipes behind the wall with gravel backfill to relieve hydrostatic pressure.

Avoid placing heavy loads near the wall until curing and soil compaction are fully completed, and place temporary support if necessary.

5. (a) What is a cavity wall?

A cavity wall is a type of wall that consists of two separate brick or block walls (known as leaves) with a space (cavity) between them. The cavity acts as a barrier against moisture and provides insulation.

(b) List three advantages of cavity walls over solid walls.

Cavity walls have better thermal insulation since the air space reduces heat transfer between inside and outside.

They reduce the risk of moisture penetration because the cavity prevents water from moving from the outer to the inner wall.

Cavity walls are lighter in weight compared to solid walls of equivalent thickness, which can reduce foundation loads.

(c) Describe how cavity ties are used in construction and their placement guidelines.

Cavity ties are metal connectors placed between the inner and outer leaves of a cavity wall to maintain their structural connection. They are embedded in mortar joints and spaced horizontally every 450 mm and vertically every 600 mm. They are often made of galvanized steel or stainless steel to resist corrosion.

6. A contractor plans to plaster the internal walls of a single room measuring 4 m × 3 m × 3 m high:
(i) Calculate the total area to be plastered, excluding the floor and ceiling.

Wall area = $2 \times (4 \times 3) + 2 \times (3 \times 3) = 2 \times 12 + 2 \times 9 = 24 + 18 =$ **42 m²**

(ii) If the plaster is applied at a thickness of 15 mm, estimate the volume of plaster required in cubic meters.

Convert thickness to meters: 15 mm = 0.015 m
Volume = Area × Thickness = $42 \times 0.015 =$ **0.63 m³**

(iii) If 1 m³ of plaster mix requires 7 bags of cement, how many bags will be needed?

Bags = 0.63 × 7 = **4.41 bags ≈ 5 bags (rounded up)**