THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2013**

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 meant by the term “wall tie”?

A wall tie is a metal or plastic component used to connect the inner and outer leaves of a cavity wall. It ensures that both walls act together to support structural loads and maintain alignment.

Wall ties are placed across the cavity at regular intervals and are embedded in mortar joints during construction. They help improve strength and reduce movement between the two leaves.

(b) State four functions of wall ties in cavity wall construction.

Wall ties bind the inner and outer leaves of a cavity wall so they act as one structural unit, increasing stability.

They help transfer lateral loads, such as wind pressure, from the outer wall to the inner wall which is typically stronger.

Wall ties prevent bowing or separation of the two walls by keeping them connected and evenly spaced.

They reduce the risk of cracking by maintaining uniform movement between both parts of the wall under thermal changes.

(c) Describe the correct method for placing wall ties during masonry work.

Wall ties should be installed at horizontal intervals of about 750 mm and vertical intervals of about 450 mm, staggered in alternate courses.

Each tie is embedded at least 50 mm into the mortar of both leaves of the wall, sloping slightly downward toward the outer leaf to allow moisture to drain outward.

Additional ties must be placed around openings, such as windows and doors, within 300 mm from the edges at no more than 225 mm vertical spacing.

Wall ties must be free from rust or damage before installation to maintain their integrity over time.

2. (a) Define the term “mortar joint”.

A mortar joint is the space between bricks or blocks that is filled with mortar during construction. It bonds the masonry units together and helps distribute loads across the wall.

Mortar joints also help in aligning and leveling bricks and allow for expansion and contraction. The type and finish of the joint affect the appearance and weather resistance of the wall.

(b) Mention four types of mortar joints used in brickwork.

Flush joint is finished level with the brick surface, providing a simple and clean look, often used when the wall is to be plastered.

Weathered joint is sloped outward and downward to shed water and improve durability in external walls.

Recessed joint is pushed back from the face of the brick, offering a shadow effect and modern appearance, but less weatherproof.

Struck joint has a slope with the top edge recessed and the bottom edge flush or slightly projecting, combining visual appeal and weather protection.

(c) Explain how the choice of joint type affects the appearance and durability of a brick wall.

The joint type influences how the wall looks flush and weathered joints give a neat, formal appearance, while recessed joints provide a modern shadow-line effect.

Durability is also affected weathered and struck joints provide better water runoff, reducing the risk of water penetration and frost damage.

Recessed joints, though attractive, can trap moisture and may not be suitable for exposed external walls in wet climates.

Properly finished joints contribute to both the longevity and aesthetic value of the masonry wall.

3. (a) What is a coping on a wall?

A coping is the protective cap or covering placed on top of a wall to prevent the penetration of rainwater into the structure. It also enhances the appearance and finishes off the top of the wall.

Copings may be made of brick, stone, concrete, or metal and are often sloped or curved to drain water away from the wall surface.

(b) State three purposes of copings in masonry construction.

Copings protect the top of the wall from rainwater, which helps prevent dampness and decay in the masonry.

They provide a neat and finished appearance to the wall, enhancing the overall architectural look of a building or boundary.

They also help to prevent vegetation growth, staining, and erosion caused by water sitting on top of the wall.

(c) With the aid of a sketch, describe the construction of a brick coping with a concrete capping.

A brick coping is constructed by laying bricks across the wall top, often in two or more courses with sloping or overlapping patterns.

A concrete capping is cast on top of the coping, slightly wider than the wall, with a sloped surface and drip grooves under each edge to channel rainwater away.

The concrete capping is reinforced with light mesh and cured properly to avoid cracking. Mortar is used to secure the capping in place and seal joints.

4. (a) State four reasons for selecting clay bricks in wall construction.

Clay bricks are durable and resistant to weather, making them suitable for long-lasting external walls.

They have excellent thermal mass, helping regulate indoor temperatures and improve energy efficiency.

Clay bricks are fire-resistant and do not release toxic fumes, contributing to safety in buildings.

They offer aesthetic versatility with various textures, colors, and patterns for architectural appeal.

(b) Explain the differences between first class and second class clay bricks.

First class bricks are uniform in shape, size, and color, with sharp edges and smooth surfaces. They have high compressive strength and low water absorption.

Second class bricks are irregular in shape, have rough surfaces, and may contain cracks or chips. They are weaker and more porous than first class bricks.

First class bricks are suitable for exposed and load-bearing work, while second class bricks are used in internal or plastered walls where appearance is not a concern.

(c) Describe three methods used to test the quality of bricks on site.

The soundness test involves striking two bricks together. A clear ringing sound indicates good quality and proper firing.

The water absorption test checks porosity. A good brick should not absorb more than 20% of its dry weight when soaked in water for 24 hours.

The hardness test involves scratching the brick surface with a fingernail or a metal object. A high-quality brick should resist scratching and remain intact.

5. (a) What is a pier foundation?

A pier foundation consists of vertical columns or piers made of brick, stone, or concrete that support the load of a structure and transfer it to the ground.

It is used to support structures in areas with firm strata at a moderate depth or where load-bearing walls are spaced at intervals.

Pier foundations reduce the amount of excavation required and are economical for small buildings with concentrated loads.

(b) State three situations where pier foundations are preferred over strip foundations.

Pier foundations are suitable where soil is stable at deeper levels but weak near the surface.

They are used in areas prone to flooding or where it is desirable to raise the building above ground level.

Pier foundations are ideal for light structures such as sheds, verandahs, or elevated cabins where minimal ground disturbance is preferred.

(c) With the aid of a sketch, describe the layout of a brick pier foundation under a load-bearing wall.

Brick piers are built at regular intervals along the line of the load-bearing wall. Each pier supports a section of the wall above.

The piers are placed on concrete pads or footings below ground level and built upward using bonded brickwork.

Timber or steel beams may span across the tops of piers to support the wall evenly. The space between piers may be filled with compacted soil or left open.

6. (a) (i) Define the term “dampness” in buildings.

Dampness in buildings refers to the presence of unwanted moisture in walls, floors, or ceilings caused by water infiltration from external or internal sources.

It leads to damage of materials, reduces insulation efficiency, and contributes to health hazards like mold growth.

(ii) List three sources of dampness in masonry walls.

Rising damp from the ground occurs when water travels upward through capillary action in porous materials.

Penetrating damp results from water entering through cracks or unsealed joints in walls during rainfall.

Condensation damp happens when warm moist air meets cold wall surfaces, leading to moisture accumulation on the interior.

(b) Explain four effects of dampness on buildings.

Dampness weakens the mortar and bricks, leading to structural decay and loss of strength in masonry.

It damages internal finishes like plaster, paint, and wallpaper, resulting in peeling, staining, and poor aesthetics.

It creates a musty odor and promotes the growth of fungi, mold, and bacteria, which are harmful to health.

Dampness reduces thermal insulation and makes rooms colder, increasing energy costs for heating or cooling.

(c) Describe three methods used to prevent dampness in wall construction.

Installing a damp proof course (DPC) at the base of walls blocks moisture from rising into the structure.

Rendering or applying waterproof coatings to the external face of the wall protects against driving rain and water seepage.

Providing proper drainage around the building, including surface runoff management and proper roof overhangs, reduces water contact with wall surfaces.