



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**SEPTEMBER 2020**

**CIVIL TECHNOLOGY: CONSTRUCTION  
MARKING GUIDELINE**

**MARKS: 200**

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This marking guideline consists of 13 pages.

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**QUESTION 1: SAFETY AND MATERIALS (GENERIC)**

- 1.1 1.1.1 2 (1)
- 1.1.2 228 mm (1)
- 1.1.3 900 mm (1)
- 1.1.4 150 mm (1)
- 1.1.5 Non-slippery layer (1)
- 1.2 Similar answer:  
Prevents horizontal movement between the platform and structure (1)
- 1.3 Identify THREE of the following requirements that are applicable to the supplier of hazardous chemical substances:
- 1.3.1 First-aid measures must be shown
- 1.3.4 Fire-fighting measures must be shown
- 1.3.6 Storage instructions must be shown (3 x 1) (3)
- 1.4 Minimum = 30° (1) and maximum = 50° (1) (2)
- 1.5 Similar answer:  
Aluminium conducts electricity (1) and workers who use a ladder could be shocked (1) (2)
- 1.6 Describe the difference between the surface finish of a water-based paint and an oil-based paint:  
Water-based – provides an elastic, flexible finish (1)  
Oil-based – provides a hard, durable finish (1) (2)
- 1.7 Any THREE advantages of the curing of concrete:
- Increases strength
  - Decreases permeability
  - Improves durability
  - Reduces cracks
  - Makes concrete more watertight
  - Provides volume stability
  - Concrete can carry more weight (3 x 1) (3)
- 1.8 Briefly describe the powder-coating process:  
Plastic finish in powder form (1) is applied by means of a compressed air spray-gun (1) (2)

**[20]**

**QUESTION 2: GRAPHICS, JOINING AND EQUIPMENT (GENERIC)**

2.1 Answer the following questions with regard to the site plan on ANSWER SHEET A.

2.1.1 See ANSWER SHEET A (10)

2.1.2 See ANSWER SHEET A (6)

2.2 2.2.1  (2)

2.2.2  (2)

2.2.3  (2)

2.2.4  (2)

2.2.5  (2)

2.3 2.3.1 Unfinished wood (1)

2.3.2 Two-way switch  (1)

2.4 When driven into place (1) it cannot be turned (1) (2)

2.5 Prevents backing off **OR** it acts as a lock nut (1) (1)

2.6 18 mm (1)

2.7 2.7.1 1,35 m (1)

2.7.2  $1,412 - 1,285 = 0,127 \times 100 = 12,7 \text{ m}$  (0,1 m leeway allowed) (3)

2.7.3 Minimum = 30 m (1) and maximum = 200 m (1) (2)

2.8 It can affect the measuring function of the tool. (1)

2.9 Batteries must be removed. (1)

**[40]**

**TOTAL SECTION A: 60**

**QUESTION 3: ROOFS, STAIRS AND JOINING (SPECIFIC)**

3.1 Any FOUR types of roofs or roof trusses:

- South African roof truss
- Single Howe truss
- Lean-to-roof
- Couple roof
- Closed couple roof
- Collar-tie roof
- King post roof truss
- W-truss or Fink truss
- Fan truss
- Scissors truss
- Mono-pitched roof

(4 x 1) (4)

3.2 Any FOUR advantages of the use of roof underlays:

- Acts as a secondary roof
- A weather shield during construction
- Waterproof and weatherproof
- Condensation barrier
- Dustproof
- Protects the building/structure
- Protects thermal insulation material
- Protects ceiling boards
- Superior wind uplifting strength prevents lifting of tiles
- Vapour resistant
- High tensile resistance
- Cost effective
- High heat resistance

(4 x 1) (4)

3.3 3.3.1 A – Purlin / Batten

(1)

B – Rafter

(1)

C – Ridge tile / ridge plate

(1)

D – Nail plate

(1)

E – King post

(1)

3.3.2 38 mm (1) x 114 mm (1)

(2)

3.3.3 Holds/fixes the different timber pieces together

(1)

- 3.4 3.4.1 Concrete tiles, clay or slate /heavy roofs (1)
- 3.4.2 Thatched roofs (1)
- 3.4.3 Iron sheeting/steel roof sheets/corrugated/IBR (1)
- 3.5 3.5.1 True (1)
- 3.5.2 False (1)
- 3.5.3 True (1)
- 3.5.4 True
- 3.6 3.6.1 Joining roof truss to brickwork (1)
- 3.6.2 A – Galvanized steel strap / hoop-iron strap (1)
- B – Wall plate (1)
- 3.6.3 600 mm (1)
- 3.6.4 Nailed / Bolted (1)
- 3.7 Any TWO types of cast-in anchors:
- Hex-head bolt with washer
  - L-bolt
  - J-bolt
  - Welded headed stud
- (2 x 1) (2)

**[30]**

**QUESTION 4: MATERIAL, EQUIPMENT AND TOOLS, EXCAVATIONS (SPECIFIC)**

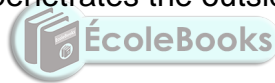
- 4.1 4.1.1 D hard, but brittle and breaks easily (1)
- 4.1.2 H pumps high volumes of concrete (1)
- 4.1.3 G alloy of copper and zinc (1)
- 4.1.4 C pumps smaller volumes of concrete (1)
- 4.1.5 A highly toxic (1)
- 4.1.6 E packaging material (1)
- 4.2 4.2.1 Slump test (1)
- 4.2.2 100 mm (1)
- 4.2.3 600 mm (1)
- 4.2.4 Any TWO reasons for the purposes of the slump test:  
 • To test the density of concrete (percentage water)  
 • To determine the workability and consistency of batches  
 • To determine the slump of the mixture (2 x 1) (2)
- 4.3 Any TWO ways of curing concrete:  
 • Water by means of hosepipe or sprinkling  
 • Cover with water-retaining substances such as damp sand, sacking, straw, hessian and canvas  
 • Plastic membrane and plastic sheets  
 • Commercial sealant  
 • Pool forming  
 • Similar answer (2 x 1) (2)
- 4.4 Ferrous (1) and non-ferrous metals (1) (2)
- 4.5 Any THREE types of cladding for buildings:  
 • Tile cladding  
 • Brick slip cladding  
 • Stone cladding  
 • Timber cladding  
 • Metal sheet cladding (3 x 1) (3)

- 4.6 4.6.1 Tamping rammer (1)
- 4.6.2 Any THREE ways of maintaining the tamping rammer:  
 • Lubricate and adjust according to manufacturer's instructions  
 • Clean after use and store in a safe, dry place  
 • Repair / replace damaged electrical cords  
 • Service regularly  
 • Remove loose dirt and soil after use (3 x 1) (3)
- 4.6.3 To keep control of the powerful machine (1)
- 4.7 Any FOUR causes for the collapse of an excavation:  
 • Heavy rains  
 • Poor soil strata, structure or composition  
 • Sides not dug at the correct angle  
 • Improper use of formwork or shoring to support walls  
 • Vibration by machinery or heavy vehicles nearby  
 • Water seeping into the excavated area  
 • Contact with underground service  
 • Access to and exit from the excavation  
 • Soil slides due to cracks or loose soil (4 x 1) (4)
- 4.8 Any THREE ways of making excavations safe during the night:  
 • Fencing  
 • Warning signs  
 • Warning lights (red or orange)  
 • Covering (3 x 1) (3)
- 4.9 4.9.1 With a ladder/scaffolding (1)
- 4.9.2 Avoid trench sides from collapsing (one metre away) (1)
- 4.9.3 Test for low oxygen, hazardous fumes and toxic gases (1)
- 4.10 4.10.1 False (1)
- 4.10.2 False (1)
- 4.10.3 False (1)
- 4.11 4.11.1 Firm soil/Hard soil/Stable soil (1)
- 4.11.2 A – Strut (1)
- B – Walling board (1)
- C – Wedge (1)

**[40]**

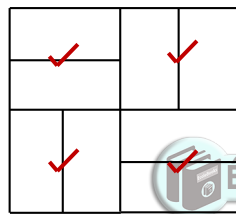
**QUESTION 5: BRICKWORK AND GRAPHICS (SPECIFIC)**

- 5.1 5.1.1 One brick wall / Outside wall (1)
- 5.1.2 220 mm (1)
- 5.1.3 Stretcher bond (1)
- 5.2 Any THREE advantages of cavity walls:  
 • Prevent rainwater from penetrating the interior wall surface  
 • Provide good thermal and sound insulation  
 • Cheaper materials can be used for internal walls  
 • Reduces / prevent expensive exterior finishes (3 x 1) (3)
- 5.3 See ANSWER SHEET B. (5)
- 5.4 5.4.1 50 mm (1)
- 5.4.2 8 m (1)
- 5.4.3 To remove wasted mortar (1)
- 5.4.4 Wall ties (1)
- 5.4.5 Allows water that penetrates the outside wall to drain (1)
- 5.5 Double triangular pattern (1)
- 5.6 5.6.1 A – Beam filling (1)  
 B – Fascia board (1)  
 C – Tie beam (1)  
 D – Plaster (1)
- 5.6.2 Open eave construction (1)
- 5.7 5.7.1 F (prepared layer beneath paving and bedding sand) (1)
- 5.7.2 C (best edge restraint for paving) (1)
- 5.7.3 A (natural soil on which the paving will be laid) (1)
- 5.7.4 D (final layer upon which paving is laid) (1)





- 5.8 Any TWO advantages of mortar-set paving:
- Little maintenance is required
  - Low life-cycle cost
  - Resistant to point loads
  - Resistant to fatigue and reflecting traffic patterns
  - Resistant to edge movement
  - User-friendly installation material is used
  - No weeds will be able to grow in between the joints
  - No off-gassing installation products used
  - Insects will not be able to ruin the appearance of the paved structure (2 x 1) (2)
- 5.9 Any TWO reasons for construction failure of paving:
- Concrete haunch too thin to support itself and cracks or crumbles under pressure
  - Too little weight to retain the structure and keep paving in place
  - Bond between haunch and edge units is weak and will easily crumble
  - Sub base is not contained and will be washed out by groundwater (2 x 1) (2)
- 5.10 Draw a neat sketch with EIGHT (8) bricks of the basket-weave paving:



Bricks drawn in good proportion = ✓

(5)

- 5.11 5.11.1 Segmental gauged arch (1)
- 5.11.2 A – Key brick (1)
- B – Skewback (1)
- C – Intrados (1)
- D – Extrados (1)

**[40]**

**QUESTION 6: FORMWORK, REINFORCEMENT, FOUNDATIONS,  
CONCRETE FLOORS AND QUANTITIES (SPECIFIC)**

- 6.1 Concrete is mixed / poured on site (1)
- 6.2 Any THREE properties of good formwork:
- Made accurately according to the dimensions indicated
  - Sturdy enough to bear the mass of wet concrete without collapsing
  - Able to bear the mass of workers and equipment
  - Must be strong enough to provide sufficient support, without too much deflection, until the concrete has set
  - Formwork should be easy to repair on site
  - Secured with wire nails, where some should protrude for easy extracting
  - Secured with bolts from 13 mm to 19 mm in diameter
  - Should be sealed properly so that the concrete does not leak and form honeycombs or fins
  - Should be free of dirt (sawdust or releasing agents)
  - Quick and simple to erect, mechanically or by hand
  - Ensure the correct cover depth for reinforcing, to prevent structural failure
  - Fit plywood onto laggings if a smooth finish is required
  - Remove when the concrete has cured and is able to support load on its own
  - Should be easy to remove without damaging the formwork or concrete
  - Close-fitting along seams and joints
  - Made from recyclable components (3 x 1) (3)
- 6.3 6.3.1 A – Soffit / Shutter board (1)
- B – Strut / Prop (1)
- C – Bearer / Head tree (1)
- D – Brace / Strut (1)
- E – Folding wedges (1)
- 6.3.2 Beam (1)
- 6.4 6.4.1 High-tensile steel (1)
- 6.4.2 250 mm (1)
- 6.4.3 16 mm (1)
- 6.5 6.5.1 Tensile stress / force (1)
- 6.5.2 Shear stress / force (1)

- 6.6 Any THREE properties (requirements) for reinforced steel bars:
- Free of salt spray, mud, splinters and any oiliness
  - Completely covered in concrete to protect it against rust and fire hazards
  - Resistant to tensile stress
  - Easy to bend into shape
  - Able to bind firmly with concrete
  - Of limited expansion prevent tension when temperature fluctuates
  - Readily available and affordable
  - Must be rustproof, otherwise it will impair binding (3 x 1) (3)
- 6.7 Any TWO types of pile foundations:
- Precast concrete piles / prefabricated piles
  - Steel tube caisson piles
  - In-situ (driven) foundation piles
  - Short-bored (auger) piles (2 x 1) (2)
- 6.8 Any TWO reasons for using pile foundations:
- Ground conditions not stable / solid enough
  - Distribute the load to more stable ground (underground / water supports)
  - Provides stability when raft / floating foundation is used
  - When structures are subjected to horizontal forces, resist pile foundations bending stress while still lending vertical support
  - Soils prone to swelling and shrinking (clay soil)
  - Superstructure is exposed to uplifting forces (offshore platforms)
  - Where soil erosion is possible (bridges) (2 x 1) (2)
- 6.9 Foundation strips for a store-room is 5 650 x 3 375 (inside measurements)  
The foundation is 750 mm wide and 250 mm deep (thick)
- 6.9.1 Calculate the centre line of the foundation: (5)
- $$\begin{array}{r} 2 / 5\,650 = 11\,300 \quad \checkmark \\ 2 / 3\,375 = \underline{6\,750} \quad \checkmark \\ \phantom{2 / 3\,375} = 18\,050 \quad \checkmark \\ \text{Plus corners: } 4 / 750 = \underline{3\,000} \quad \checkmark \\ \phantom{Plus corners: } = 21\,050 \quad \checkmark \end{array}$$
- 6.9.2 Calculate the volume of concrete needed (3)
- Volume = length x width x depth
- $$= 21,05 \text{ m} \times 0,75 \text{ m} \times 0,25 \text{ m}$$
- $$= 3,947 \text{ m}^3 \quad \checkmark$$

(3)  
[30]**TOTAL: 200**

<b>ANSWER SHEET A</b>	<b>CIVIL TECHNOLOGY GENERIC</b>	<b>NAME:</b> _____
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2.1 Answer the following questions in regard to the site plan on ANSWER SHEET A:

2.1.1 Any TEN particulars that are not shown according to the checklist:

- Plot no. 31 is not shown
- Plots depth measurement is not shown
- Street name is not shown
- Branch sewage at S is not shown
- Connecting manhole (1,5m inside plot boundary) is not shown
- Measurements of southern building boundary is not shown
- Structure measurements are not shown
- RE (rodding eye) symbol is not shown
- IE symbols are not shown
- VP and symbol are not shown at WC
- Entrance to plot is not shown
- No datum level is shown

(10)

2.1.2 Identify SIX particulars that are shown incorrectly on the site plan:

- Construction is over the building boundary on the west side
- North arrow must be on the right-hand side, at the bottom of the page
- Scale is wrongly shown
- Corner of branch sewage at WB is wrong
- RE and symbol missing at the change of direction in sewage line
- House depth measurements are not shown

(6)

<b>ANSWER SHEET B</b>	<b>CIVIL TECHNOLOGY CONSTRUCTION</b>	<b>NAME:</b> _____
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5.3 Draw in the damp-proof course (DPC).

(5)

