



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**SEPTEMBER 2018**

**CIVIL TECHNOLOGY: CONSTRUCTION  
MARKING GUIDELINE**

**MARKS: 200**

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This marking guideline consists of 12 pages.

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**QUESTION 1: SAFETY, MATERIAL AND EQUIPMENT (GENERIC)**

- 1.1 1.1.1 True (1)  
 1.1.2 False (1)  
 1.1.3 False (1)  
 1.1.4 True (1)
- 1.2 Any THREE requirements to which a trestle scaffold must comply.  
 • Soundly constructed with a solid material  
 • Prevent spreading of supporting legs  
 • Not higher than 3 m  
 • Consists of not more than 2 tiers (3 x 1) (3)
- 1.3 Similar answer.  
 (1) Aluminium conducts (2) electricity / workers subjected to electrical shock (2)
- 1.4 Similar answer.  
 (1) Paint will cover (2) weaknesses (2)
- 1.5 1.5.2 Improves the durability of concrete. (1)  
 1.5.5 It improves the strength of concrete. (1)  
 1.5.7 It makes concrete more watertight. (1)  
 1.5.8 It improves the resistance to abrasion. (1)
- 1.6 (1) Plastic finish / coating (2) in powder form by (3) using a spray-gun (3)
- 1.7 Briefly describe any ONE use of the dumpy level.  
 • (1) Determine (2) height differences  
 • (1) Determine (2) levels and slopes  
 • (1) Setting out (2) of buildings  
 • (1) Transferring of (2) levels and heights  
 • (1) Determine horizontal (2) distances (1 x 2) (2)
- 1.8 1.8.1 1,5 m (1)  
 1.8.2  $1,535 - 1,47 \times 100 = 6,5 \text{ m}$  (4)
- 1.9 Any THREE materials which can be detected in walls by the multi-detector.  
 • Ferrous metals  
 • Non-ferrous metals  
 • AC wiring  
 • Wood  
 • Metal studs  
 • Steel bars  
 • Copper pipes (3 x 1) (3)
- 1.10 1.10.1 Dry, soft cloth / Not cleaning agents or solvents (1)  
 1.10.2 Remove battery (1)

**[30]**

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

- 2.1 Use the information on ANSWER SHEET A and complete the site plan on scale 1 : 200 according to the following requirements:
- 2.1.1 The site boundaries are measured from point A  
The site boundaries in front and back are 23 m long  
The site boundaries on the sides are 25 m long (2)
  - 2.1.2 The front building line is 4 m from the site boundary  
The back and side building lines are 2 m from the site boundaries (2)
  - 2.1.3 Show the site entrance, 3 m from the western site boundary (1)
  - 2.1.4 Show the datum level in the north-eastern corner of the site  
Complete the sewage lay-out and abbreviations of the sewage appliances according to the following requirements: (1)
  - 2.1.5 The main sewage from the bathroom to the municipal connection (2)
  - 2.1.6 The branch sewage to the bathroom and kitchen (2)
  - 2.1.7 Manhole on the site, before the municipal connection (2)
  - 2.1.8 Rodding eyes (4)
  - 2.1.9 Inspection eyes (4)
- 2.2
- Length of shank
  - Diameter
  - Type of thread
  - Head size (4 x 1) (4)
- 2.3 (1) When square shoulder is driven in (2) it resists rotation (2)
- 2.4
- 2.4 A – Nut
  - 2.4 B – Thread
  - 2.4 C – Runout
  - 2.4 D – Shank (4)

**[30]**

### QUESTION 3: CONCRETE, EXCAVATIONS, FOUNDATIONS & QUANTITIES (SPECIFIC)

- |     |       |   |             |
|-----|-------|---|-------------|
| 3.1 | 3.1.1 | Rib-and-block floor   | (1)         |
|     | 3.1.2 | 3.1.A – Concrete floor block  | (1)         |
|     |       | 3.1.B – Precast concrete rib  | (1)         |
|     | 3.1.3 | ONE instance where this type of floor construction will be used:  |             |
|     |       | <ul style="list-style-type: none"> <li>• Basements</li> <li>• First floors</li> <li>• Roof slabs</li> </ul>   | (1)         |
|     | 3.1.4 | 150 mm  | (1)         |
|     | 3.1.5 | 200 mm  | (1)         |
| 3.2 | 3.2.1 | Slump test  | (1)         |
|     | 3.2.2 | Any TWO purposes of the slump test:   |             |
|     |       | <ul style="list-style-type: none"> <li>• Test the density by determining the water content</li> <li>• Determine the workability and consistency of batches</li> <li>• Determine the slump of the mixture</li> </ul>                           | (2 x 1) (2) |
|     | 3.2.3 | 16 mm   | (1)         |
|     | 3.2.4 | 25 Times  | (1)         |
|     | 3.2.5 | On the building site  | (1)         |
| 3.3 |       | Any THREE – describe the purpose of curing concrete:  |             |
|     |       | <ul style="list-style-type: none"> <li>• That the hydration of cement can continue</li> <li>• Newly placed concrete must be protected against quick drying</li> <li>• Achieve optimal strength</li> <li>• Achieve optimal hardness</li> </ul> | (3 x 1) (3) |
| 3.4 |       | Any THREE methods of curing concrete:   |             |
|     |       | <ul style="list-style-type: none"> <li>• Sprinkling</li> <li>• Cover with water-retaining substances such as sand, hessian etc.</li> <li>• Cover with plastic membranes or plastic sheeting</li> <li>• Commercial seal compound</li> </ul>    | (3 x 1) (3) |
| 3.5 |       | Any THREE methods to make excavations safe at night:  |             |
|     |       | <ul style="list-style-type: none"> <li>• Fencing</li> <li>• Visible warning signs</li> <li>• Red or orange warning lights</li> <li>• Covering over excavations</li> </ul>   | (3 x 1) (3) |

3.6 Any FOUR causes for an excavation collapse:

- Heavy rains
- Poor soil strata, structure or composition
- Sides not dug at the correct angle
- Improper use of formwork or shoring to support the walls
- Vibration by machinery or heavy vehicles nearby
- Water seeping into the excavated area
- Contact with underground services
- Access to and exit from the excavation
- Soil slides due to cracks or loose soil

(4 x 1) (4)

3.7 3.7.1 False

(1)

3.7.2 True

(1)

3.7.3 False

(1)

3.7.4 True

(1)

3.8 Any FOUR advantages of using pile foundations:

- Can be used in poor soil
- Can be used anywhere, even in water
- The larger base ensures stability
- Relatively quick and easy to install if equipment is available
- If pre-fabricated piles are used, much time is saved
- Quick and less expensive to produce
- Resist tensile stress well
- Can be manufactured elsewhere and transported to the site
- Installation continue even if poor weather conditions hamper excavations
- Length of piles can be adjusted, depending on the circumstances
- It offers good resistance against moving soil

(4 x 1) (4)

3.9 Any TWO types of foundations (pile- / block foundation excluded):

- Strip foundation
- Stepped foundation
- Raft foundation

(2 x 1) (2)

3.10  $2 / 6\,000 = 12\,000\text{ mm } \checkmark$

$2 / 4\,000 = \underline{8\,000\text{ mm}} \checkmark$

$= 20\,000\text{ mm } \checkmark$

Corners:  $4 / 600 = \underline{- 2\,400\text{ mm}} \checkmark$

Centre line  $= 17\,600\text{ mm } \checkmark$

(5)

**[40]**

### QUESTION 4: REINFORCEMENT, FORMWORK, MATERIALS AND EQUIPMENT (SPECIFIC)

- 4.1 4.1.1 High-tensile or high yield steel (1)
- 4.1.2 200 mm (1)
- 4.1.3 6 Bars (1)
- 4.1.4 12 mm (1)
- 4.2 4.2.1 4.2.A – Anchor bar (1)  
 4.2.B – Stirrups (1)  
 4.2.C – Main bar (1)  
 4.2.D – Shear bar (1)
- 4.2.2 Any TWO describing the purpose of the stirrups:  
 • Support the shear bars  
 • Space and support the main bars  
 • Prevent the tearing of concrete (2)
- 4.3 Compression (1); Tensile (1); Lateral (1) forces (3)
- 4.4 Any TWO describing the purpose of cover depth for reinforced concrete:  
 • To protect steel against corrosion  
 • To ensure adequate bonding between the steel and concrete  
 • To ensure adequate protection of steel in the event of a fire (2)
- 4.5 Any THREE materials to line formwork – smoother finish:  
 • Plastic  
 • Metal sheeting  
 • Hard board  
 • Fibre-glass (3 x 1) (3)
- 4.6 Any TWO defects that can occur in concrete due to shuttering:  
 • Blowholes  
 • Uneven colour (discolouration)  
 • Weakening of structure or collapse (2 x 1) (2)
- 4.7 Any FOUR 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 (Any 4 x 1) (4)

4.8 Choose a description in COLUMN B that matches an item in COLUMN A.

- |       |   |                                   |     |
|-------|---|-----------------------------------|-----|
| 4.8.1 | C | (High volumes of concrete)        | (1) |
| 4.8.2 | J | (Used as awnings)                 | (1) |
| 4.8.3 | I | (30 MPa compressive strength)     | (1) |
| 4.8.4 | K | (High antibacterial properties)   | (1) |
| 4.8.5 | G | (Small volumes of concrete)       | (1) |
| 4.8.6 | A | (Hard, brittle and breaks easily) | (1) |
| 4.8.7 | B | (Low toxicity)                    | (1) |
| 4.8.8 | D | (Packing of equipment)            | (1) |

4.9 Identify the metals as FERROUS or NON-FERROUS:

- |       |             |     |
|-------|-------------|-----|
| 4.9.1 | Non-ferrous | (1) |
| 4.9.2 | Ferrous     | (1) |
| 4.9.3 | Non-ferrous | (1) |
| 4.9.4 | Ferrous     | (1) |
| 4.9.5 | Non-ferrous | (1) |

- |      |        |                            |     |
|------|--------|----------------------------|-----|
| 4.10 | 4.10.1 | Portable concrete vibrator | (1) |
|      | 4.10.2 | Concrete mixer             | (1) |
|      | 4.10.3 | Plate compactor            | (1) |

**[40]**

**QUESTION 5: ROOFS, BRICK WALLS AND GRAPHICS (SPECIFIC)**

- 5.1 5.1.1 Closed eave (1)
- 5.1.2 Any TWO advantages of the closed eave:
- Provides a more attractive appearance
  - Prevent animals from entering (insects, birds and vermin etc.)
  - No beam filling required (2 x 1) (2)
- 5.1.3 Any TWO types of material that can be used at the closed eave:
- Soffit board or fibre-cement board
  - Wire netting
  - Pegboard (2 x 1) (2)
- 5.2 Any THREE for discussing the purpose of beam filling:
- To keep out insects and vermin
  - Prevent wind / dust from blowing under the roof
  - Prevent birds from nesting in the roof
  - Improve the stability of the roofing rafters
  - Improve the insulation of the building (3 x 1) (3)
- 5.3 A Rafter (1)  
 B Queen post (1)  
 C King post (1)  
 D Strut (1)  
 E Tie beam (1)
- 5.4 5.4.1 50 mm (1)  
 5.4.2 3 m (1)
- 5.5 Any THREE disadvantages of cavity walls:
- Require expert designs / higher design standards
  - Require highly skilled workmanship
  - Constant supervision is needed during construction
  - Cavities are filled with vertical damp-proof course
  - More expensive than solid wall constructions
  - 50 to 100 mm of the internal space is lost (3 x 1) (3)
- 5.6 Any TWO types of wall ties that can be used in cavity walls:
- Butterfly pattern
  - Nylon wall tie
  - Twisted pattern
  - Double triangular pattern (2 x 1) (2)
- 5.7 A Weep hole (1)  
 B Concrete floor (1)  
 C Hard-core filling (1)  
 D Concrete filling (1)
- 5.8 See ANSWER SHEET B – Isometric view of pier on block foundation (6)

**[30]**



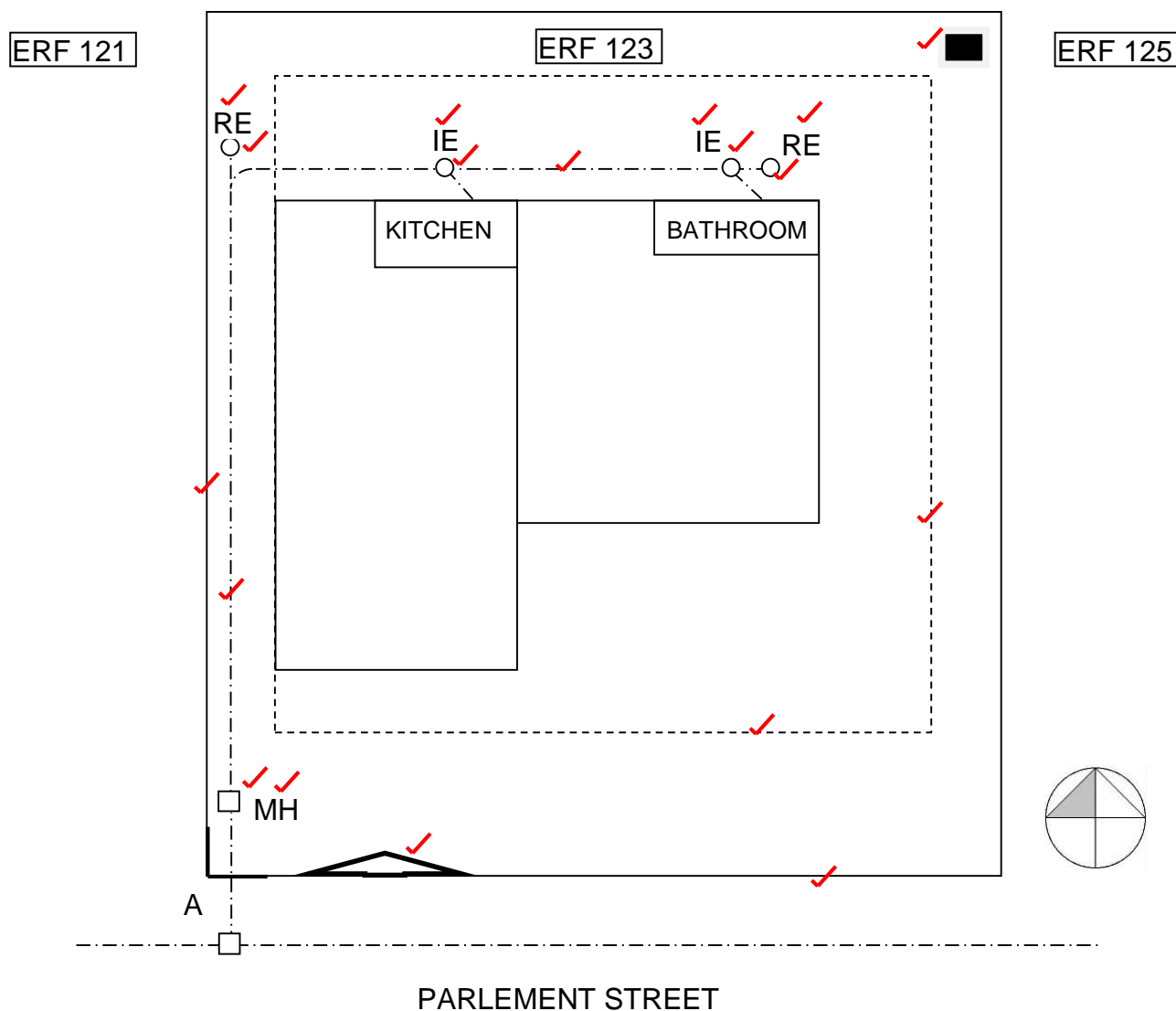
### QUESTION 6: SCREEDS, STAIRS, BRICKWORK AND QUANTITIES (SPECIFIC)

- 6.1 Any ONE type of sand that can be used as bedding sand for pavers:
- River sand
  - Crusher dust
- (1)
- 6.2 Any FOUR advantages of mortar set pavers:
- 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
- (4 x 1) (4)
- 6.3 6.3.1 True (1)
- 6.3.2 False (1)
- 6.3.3 True (1)
- 6.3.4 False (1)
- 6.4 See ANSWER SHEET C – Determine the amount of bricks needed (12)
- 6.5 Any THREE types of materials that can be used for cladding:
- Tile cladding
  - Brick slip cladding
  - Stone cladding
  - Timber cladding
  - Metal sheet cladding
- (3 x 1) (3)
- 6.6 Any TWO types of screeds:
- Dry screed
  - Monolithic screed
  - Bonded screed
- (2)
- 6.7 A Hand rail (1)
- B Baluster (1)
- C Thread or going (1)
- D Riser (1)
- [30]**

**TOTAL: 200**

<b>ANSWER SHEET</b>	<b>A</b>	<b>CIVIL TECHNOLOGY (GENERIC)</b>	<b>NAME:</b> _____
			_____

2.1 Use the information on ANSWER SHEET A and complete the site plan to scale 1 : 200.

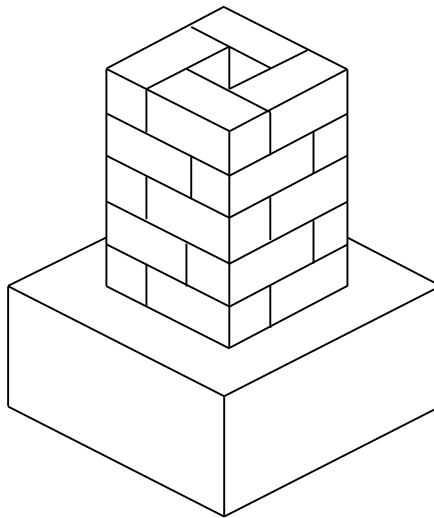


Site boundaries	2	
Building lines	2	
Site entrance	1	
Datum level	1	
Main sewerage	2	
Branch sewerage	2	
Manhole	2	
Rodding eyes	4	
Inspection eyes	4	
<b>TOTAL</b>	<b>20</b>	

**ANSWER SHEET B****CIVIL TECHNOLOGY  
CONSTRUCTION****NAME:** \_\_\_\_\_

5.8 Use ANSWER SHEET B and draw an isometric view of a pier on a block foundation. Use own scale.

One-and-a-half brick pier	2	
Stretcher bond	1	
5 Brick layers	1	
Block foundation	2	
<b>TOTAL</b>	<b>6</b>	



PIER ON BLOCK FOUNDATION

NOT TO SCALE

ANSWER SHEET <b>C</b>	CIVIL TECHNOLOGY CONSTRUCTION	NAME: _____
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**QUESTION 6.4**

A	B	C	D
			<b>Brick calculation:</b>
1/	6.5 m		
	<u>2.8 m</u> √	<u>18,2 m<sup>2</sup></u> √	Total wall area
√			
			<u>Bricks:</u>
1/	18.2		
	<u>100</u> √	<u>1820</u> √	Total number of bricks
			<u>Deductions:</u>
1/	0.9 m		Opening A
	<u>2.1 m</u> √	<u>1,89 m<sup>2</sup></u> √	Total area
√			
1/	1.89		
	<u>100</u> √	<u>189</u> √	Total number of bricks for opening A
			<u>Total number of bricks needed:</u>
			1 820 - 189 √ = 1631 bricks √

(12)