



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2019

**CIVIL TECHNOLOGY: CONSTRUCTION
MARKING GUIDELINE**

MARKS: 200

This marking guideline consists of 12 pages.

QUESTION 1: SAFETY, OHSA AND MATERIAL (GENERIC)

- 1.1 3 m (1)
- 1.2 (1) By means of a chute or (2) conveyor belt (2)
- 1.3 Similar answer:
(1) Prevents unauthorised entry and (2) to protect the public. (2)
- 1.4 1.4.1 30° ✓
50° ✓ (2)
- 1.4.2 760 x 560 mm ✓
3,7 m ✓ (2)
- 1.5 1 : 4 = $\frac{2\text{ m}}{4}$ = 0,5 m ✓ (one meter horizontal to four metres vertical) (2)
- 1.6 (1) Not further than $\frac{2}{3}$ (2) of the extension length (2)
- 1.7 (1) The coating of a metal by means of electrolysis (2) with a thin layer of another metal. (2)
- 1.8 Any THREE advantages of electroplating of metals:
• Protects against corrosion
• Improves the engineering and mechanical properties of metal
• Increases the thickness of metal
• Resistant against wear and tear (3 x 1) (3)
- 1.9 Any TWO advantages of galvanising metals:
• Adds strength to the metal
• Increases the thickness of metal
• Prevents staining
• Protects against corrosion (2 x 1) (2)
- [20]**

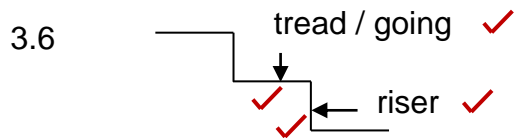
QUESTION 2: GRAPHICS, JOINING AND EQUIPMENT (GENERIC)

- 2.1 2.1.1 False (1)
 2.1.2 True (1)
 2.1.3 True (1)
 2.1.4 True (1)
 2.1.5 False (1)
- 2.2 FIGURE 2.2 on ANSWER SHEET A:
- 2.2.1 Outside door at 2.2.A (2)
 2.2.2 Window at 2.2.B (2)
 2.2.3 Water closet at 2.2.C (2)
 2.2.4 Washbasin at 2.2.D (2)
 2.2.5 Single sink unit at 2.2.E (2)
 2.2.6 One-way switch single pole at 2.2.F (2)
 2.2.7 Fluorescent light at 2.2.G (2)
 2.2.8 Socket outlet at 2.2.H (2)
 2.2.9 Grease trap at 2.2.I (2)
 2.2.10 Wall-mounted light at 2.2.J (2)
- 2.3 2.3.1 Trim hexagon
 2.3.2 Hex flange
 2.3.3 Square shoulder screws (3)
- 2.4 2.4.1 Dumpy level (1)
 2.4.2 Any ONE use of this instrument:
 • Determine the difference in levels
 • Determine levels and slopes
 • Setting out buildings
 • Transferring levels and heights (1 x 1) (1)
 2.4.3 A – Focussing knob
 B – Eye piece
 C – Foot piece
 D – Objective (4 x 1) (4)
 2.4.4 (1) To obtain a level / horizontal (2) sight line / reading (2)
- 2.5 (1) If the moisture inside the level freezes and later reaches normal operating temperature, the moisture can condense (2) inside the tool, where it may damage the circuit board (2)
- 2.6 M08 = Thread diameter
 25 = Thickness (2)

[40]**TOTAL SECTION A: 60**

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

- 3.1 3.1.1 Flat roof (1)
- 3.1.2 Mono-pitched roof (1)
- 3.1.3 1 400 mm / 1,4 m (1)
- 3.1.4 38 x 38 mm (1)
- 3.2 Any THREE requirements that roof trusses should meet:
- Sturdy enough to carry the roof covering safely
 - Able to withstand wind and other forces that act on them
 - Provide adequate height in rooms below the roof and ceiling assembly
 - Should not allow the accumulation of rainwater upon the roof surface
 - Neat and solid to enhance the appearance of the building
- (3)
- 3.3 Any THREE advantages with the use of roof underlays:
- Act 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
- (3)
- 3.4 3.4.1 South African roof / Howe roof (1)
- 3.4.2 A – Rafter (1)
B – Queen post (1)
C – King post (1)
D – Strut (1)
- 3.4.3 Span width more than 5 m (1)
- 3.4.4 114 (1) x 38 mm (1) (2)
- 3.5 Any TWO types of materials that staircases can be made from:
- Timber
 - Concrete
 - Bricks
 - Metal
- (2)



(4)

3.7 2 100 mm / 2,1 m

(1)

3.8 100 mm

(1)

3.9 3.9.1 Anchor / Galvanised steel straps / Hoop iron / Wires

(1)

3.9.2 Bolted / Nailed / Galv. steel straps / Hoop iron / Wires

(1)

3.9.3 Bolted / Welded / Glued


(1)

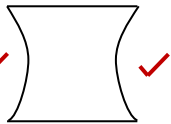
3.9.4 Cast-in anchors / Bolted

(1)

[30]

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

- 4.1 4.1.1 F (tested on site) (1)
- 4.1.2 G (high volume of concrete) (1)
- 4.1.3 E (ferrous metals) (1)
- 4.1.4 C (tested in a laboratory) (1)
- 4.1.5 A (small volume of concrete) (1)
- 4.1.6 B (non-ferrous metals) (1)
- 4.2 Any FOUR types of apparatus for the slump test:
- Slump test cone / mould
 - Base plate
 - Tamping rod
 - Ruler / Tape measure
 - Spirit level / Rod
- (4)
- 4.3 Any TWO – Discuss the purposes of the cube test:
- Determine the maximum compressive strength of cured concrete with load
 - Ensure concrete complies with requirements of project specifications
 - Indicate compressive strength in MPa, thus its ability to resist loads
- (2)
- 4.4 Draw a neat sketch of a normal failure of a cube test:
- 

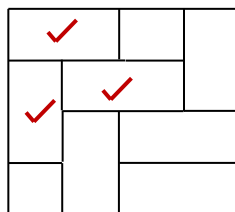
✓  ✓ Square ratio ✓
- (3)
- 4.5 Any TWO – Discuss the purposes of cladding to external surfaces of buildings:
- Aesthetic purposes
 - Functional purposes
 - Help to control weather elements (rain / wind)
 - Prevent runoff (water) from penetrating the building
- (3)
- 4.6 Any TWO methods of fixing cladding:
- Adhesive fixing
 - Face fixing
 - Proprietary fixing
- (2)

- 4.7 Any THREE safety factors and regulations that a site manager must have in place, before excavation commences:
- Ensure a competent person evaluates the stability of the ground
 - Draw up safety plan and take steps to ensure safe working conditions
 - Ensure that planned excavations / trenches be supported by a protective system (formwork / shoring) and are indicated on safety plan
 - Eliminate as many risks / hazards as possible
 - Erect fencing (at least one metre high) around perimeter of excavations
 - All excavations done under qualified supervision
 - Carry out inspections to determine position of services (cables, pipes etc.) (3)
- 4.8 4.8.1 Fencing / Warning signs / Warning lights / Covering (1)
- 4.8.2 All workers must wear protective clothing (1)
- 4.8.3 With a ladder / scaffolding (1)
- 4.8.4 Inspections must be done daily (1)
- 4.9 4.9.1 True (1)
- 4.9.2 True (1)
- 4.9.3 False (1)
- 4.9.4 False (1)
- 4.10 4.10.1 Firm ground / Hard ground (1)
- 4.10.2 A – Poling boards (1)
- B – Strut (1)
- C – Walling boards (1)
- D – Folding wedges (1)
- 4.11 4.11.1 Plate compactor (1)
- 4.11.2 Any THREE ways to care and maintain the plate compactor:
- Maintain – lubricate and adjust 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
 - Ensure that all parts are firmly attached (3)

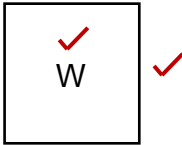

[40]

QUESTION 5: BRICKWORK, GRAPHICS, PLASTER AND SCREED (SPECIFIC)

- 5.1 5.1.1 Cavity wall (1)
- 5.1.2 270 mm (1)
- 5.1.3 Any THREE purposes of the gap in a cavity wall:
 • Ensures that no water will penetrate the inner wall
 • Provides insulation against heat
 • Provides insulation against cold
 • Provides insulation against sound (3)
- 5.2 5.2.1 Bedding sand (1)
- 5.2.2 Weep hole (1)
- 5.2.3 Pavements (1)
- 5.2.4 Air bricks (1)
- 5.2.5 Subgrade (1)
- 5.3 5.3.1 Butterfly pattern (1)
- 5.4 Any FOUR advantages of dry-laid paving:
 • Very economical / Cheap
 • Low initial installation cost
 • Designed to accommodate lifting of individual pavers
 • Can be easily repaired
 • User-friendly installation materials
 • Easy to repair underground utilities
 • Can also be designed as a permeable pavement
 • No off-gassing (harmful gasses) installation products are used (4)
- 5.5 Any TWO reasons for construction failure of paving:
 • Concrete haunch is too thin to support itself and cracks / crumble under pressure
 • Too little weight to retain the structure and keep paving in place
 • Bond between the haunch and edge units is weak and crumbles easily
 • Sub-base is not contained and will be washed out by groundwater (2)
- 5.6 Draw a neat partial sketch of the herringbone paving pattern:



(3)

- 5.7 Any THREE advantages of beam filling:
- Prevents wind from penetrating the building
 - Provides good insulation
 - Prevents the perching / breeding of birds (open eave)
 - Prevents insects from entering the roof and infesting the roof timber
 - Prevents dust from entering the building
 - Prevents small animals from entering the roof and ceiling (3)
- 5.8 5.8.1 True (1)
- 5.8.2 False (1)
- 5.8.3 True (1)
- 5.9 5.9.1 Semi-circular gauged arch (1)
- 5.9.2 A – Intrados (1)
- B – Extrados (1)
- C – Span (1)
- 5.10 Sand (1) and cement (1) (2)
- 5.11 Any ONE purpose of builder's lime in a plaster mixture:
- Improves / enhances the workability of the mixture
 - Improves the plasticity of the mixture
 - Reduces cracking / crazing in the plaster (1)
- 5.12 Any TWO uses / purposes of interior plasterwork:
- Covers uneven, rough walls
 - Improves sound insulation
 - Improves fire resistance
 - Prevents damage to the walls
 - Provides a neat, hygienic finish to a house (2)
- 5.13 Any ONE purpose of a screed layer:
- To ensure a fine, smooth surface (paint)
 - To ensure a flat, level surface (tiles) (1)
- 5.14 5.14.1  (2)
- 5.14.2  (2)

(2)
[40]

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

- 6.1 Any ONE material that can be used to line the formwork, to obtain a smoother finish:
- Plastic
 - Metal sheeting
 - Hardboard
 - Fibre-glass
- (1)
- 6.2 6.2.1 A – Bearer / head tree
- (1)
- B – Brace / strut
- (1)
- C – Prop / strut
- (1)
- D – Soleplate
- (1)
- 6.3 6.3.1 Soft / mild steel
- (1)
- 6.3.2 200 mm
- (1)
- 6.3.3 10 mm
- (1)
- 6.4 6.4.1 Compressive forces (Anchor bars)
- (1)
- 6.4.2 Shear forces (Stirrups)
- (1)
- 6.5 Any ONE method of joining steel bars with wire:
- Crosswise method
 - Hair knot method
 - Crown method
- (1)
- 6.6 Any TWO purposes of the cover depth at the reinforcing of concrete work:
- To protect steel against corrosion
 - To ensure adequate bonding between the steel and concrete
 - To ensure adequate protection of steel in event of a fire
- (2)
- 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)

6.8 Any THREE 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
- Pending 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)

(3)

6.9 6.9.1 A Hollow-core blocks / Concrete floor block

(1)

B Rib / Reinforced ribs / Pre-stressed ribs

(1)

6.9.2 Any ONE disadvantage of the rib-and-block floor construction:

- Mechanical handling for the ribs requires on site
- Manual labour required to place blocks between ribs

(1)

6.10 Foundation strip - outside room is 5 500 x 3 250 (outside measurements).
The foundation is 700 mm wide and 200 mm thick.

6.10.1 Calculate the centre-line of the foundation:

$$\begin{array}{rcl}
 2 / 5\,500 & = & 11\,000 \quad \checkmark \\
 2 / 3\,250 & = & \underline{6\,500} \quad \checkmark \\
 & & 17\,500 \quad \checkmark \\
 \text{Min corners:} \quad 4 / 700 & = & \underline{2\,800} \quad \checkmark \\
 & & 14\,700 \quad \checkmark
 \end{array}$$

(5)

6.10.2 Calculate the volume of concrete required:

Volume = length x width x thickness

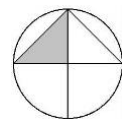
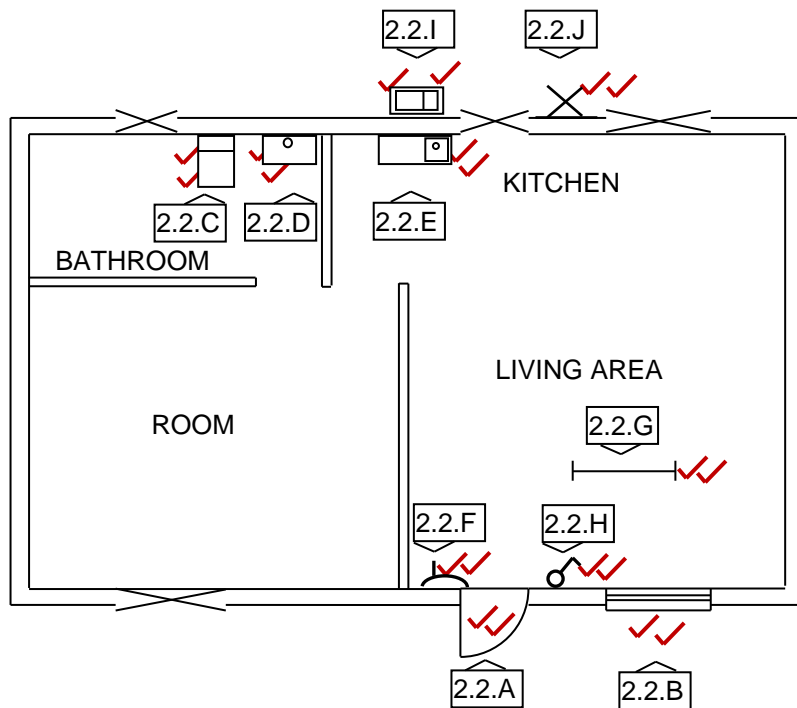
$$\begin{aligned}
 &= 14,7 \text{ m} \times 0,7 \text{ m} \times 0,2 \text{ m} \\
 &= 2,058 \text{ m}^3
 \end{aligned}$$

(4)

[30]**TOTAL: 200**

ANSWER SHEET A	CIVIL TECHNOLOGY GENERIC	NAME: _____
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2.2 Use the information on sheet A and complete the floorplan to scale 1 : 100.



Outside door at 2.2.A	2	
Window at 2.2.B	2	
Water closet at 2.2.C	2	
Wash basin at 2.2.D	2	
Single sink unit at 2.2.E	2	
One-way switch single pole at 2.2.F	2	
Fluorescent light at 2.2.G	2	
Socket outlet at 2.2.H	2	
Grease trap at 2.2.I	2	
Wall-mounted light at 2.2.J	2	
TOTAL:	20	