



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**CIVIL TECHNOLOGY: CONSTRUCTION**

**EXEMPLAR 2018**

**MARKING GUIDELINES**

**MARKS: 200**

**These marking guidelines consist of 17 pages.**

**QUESTION 1: OHSA, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)**

- |     |        |   |     |
|-----|--------|---|-----|
| 1.1 | 1.1.1  | H ✓   | (1) |
|     | 1.1.2  | A ✓   | (1) |
|     | 1.1.3  | E ✓   | (1) |
|     | 1.1.4  | C ✓   | (1) |
|     | 1.1.5  | D ✓   | (1) |
|     | 1.1.6  | J ✓   | (1) |
|     | 1.1.7  | I ✓   | (1) |
|     | 1.1.8  | G ✓   | (1) |
|     | 1.1.9  | B ✓   | (1) |
|     | 1.1.10 | F ✓   | (1) |
| 1.2 | 1.2.1  | A – Laser level ✓<br>B – Measuring staff ✓<br>C – Tripod ✓  | (3) |
|     | 1.2.2  | <ul style="list-style-type: none"> <li>• Place the laser level in its case after use. ✓</li> <li>• Do not bump the instrument against objects or drop it.</li> <li>• Never open the housing or attempt to disassemble the instrument.</li> <li>• Never store the laser level in hot or extremely cold areas.</li> </ul> <p><b>ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER</b></p>   | (1) |
| 1.3 | 1.3.1  | <ul style="list-style-type: none"> <li>• Do not throw any tools or materials from a scaffold. ✓</li> <li>• Never jump on a scaffold. ✓</li> <li>• Never overload a scaffold.</li> <li>• Remove or cover sharp edges or corners</li> <li>• Always attach free-standing scaffoldings to a building</li> <li>• Never jump on and off a scaffold.</li> <li>• Use a ladder to get on and off a scaffold.</li> </ul> <p><b>ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS</b></p> | (2) |
|     | 1.3.2  | <ul style="list-style-type: none"> <li>• It prevents workers from falling off the scaffold. ✓</li> <li>• To prevent materials from falling off the scaffold.</li> <li>• It is used as a hand rail.</li> <li>• It is used to strap on safety harnesses.</li> </ul> <p><b>ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER</b></p>   | (1) |

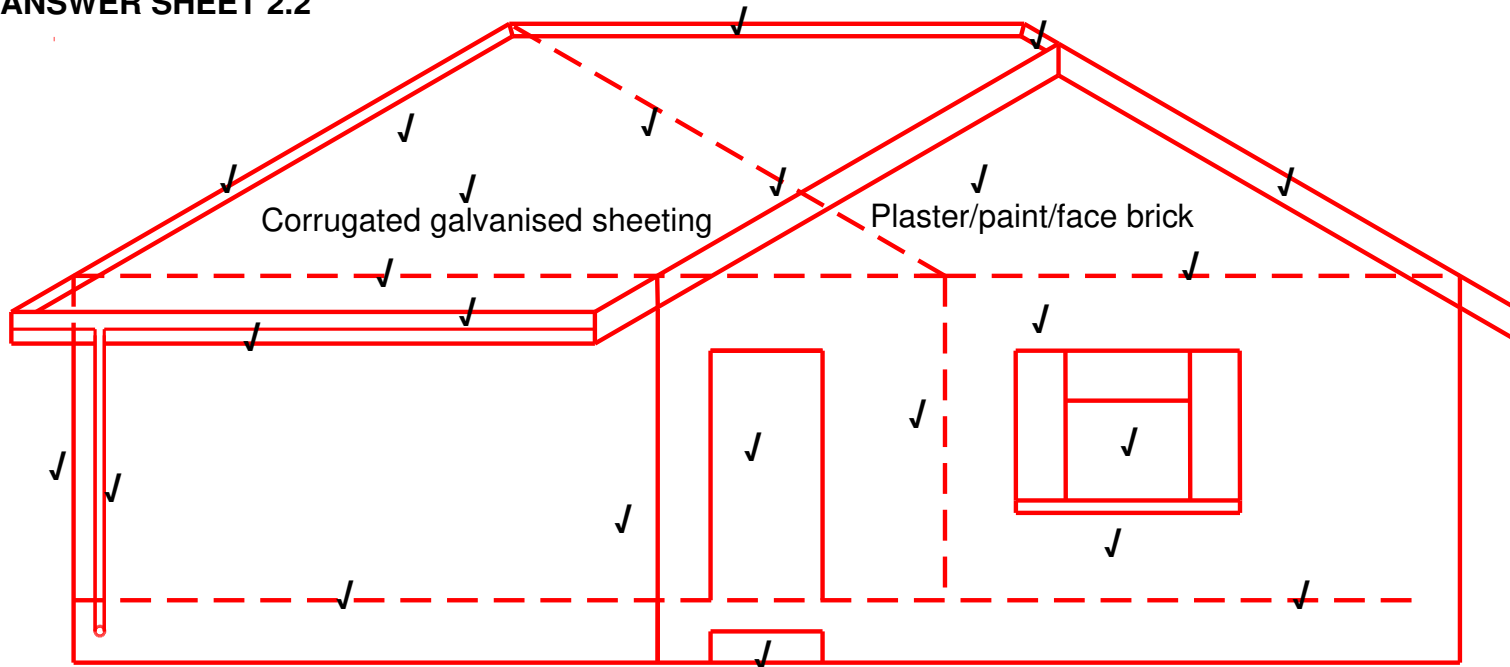
- 1.3.3
- The toe board will prevent tools from sliding of the scaffold. ✓
  - The toe board will prevent workmen from stepping off the scaffold.
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- (1)
- 1.3.4
- Vertical standards can sink into the ground. ✓
  - The scaffold may rock to and fro.
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- (1)
- 1.4            Bolts and nuts
- (1)  
**[20]**

**QUESTION 2: GRAPHICS AS METHOD OF COMMUNICATION (GENERIC)**

<b>NO.</b>	<b>QUESTIONS</b>	<b>ANSWERS</b>	<b>MARKS</b>
1	Identify FIGURE A.	Floor plan of ground floor	1
2	Identify FIGURE B.	Floor plan of first floor	1
3	Identify FIGURE D.	Site plan	1
4	What do the short dashed lines in FIGURE B indicate?	The roof line of the building	1
5	What type of roof is used on this building?	Gable roof	1
6	Name the scale that was used to draw FIGURE B.	1 : 100	1
7	Name the scale that was used to draw FIGURE D	1 : 500	1
8	On what side of the building is the bathrooms situated?	South side	1
9	What is indicated by number 1?	Proposed building	1
10	What is indicated by number 2?	Gully	1
11	What is indicated by number 3?	Existing building	1
12	What is indicated by number 4?	North direction	1
13	What is indicated by number 5?	Gable wall	1
14	What is indicated by number 6?	Finished floor level of ground floor	1
15	What is indicated by number 7?	One-way switch double pole	1
		<b>TOTAL</b>	<b>15</b>

2.2 GRAPHICS AND COMMUNICATION (GENERIC)

ANSWER SHEET 2.2



Application of scale ✓ ✓ ✓

NOT TO SCALE: USE A MASK TO MARK THIS QUESTION

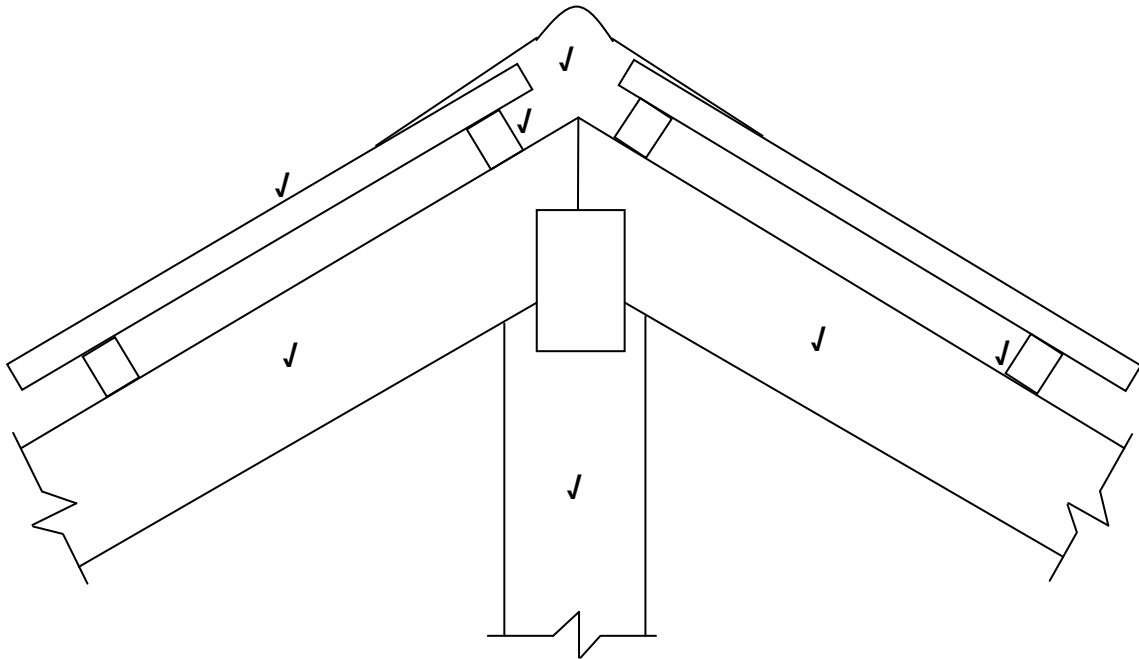
ASSESSMENT CRITERIA	MARKS	LM
External Walls	3	
NGL (correctly indicated)	1	
FFL (correctly indicated)	1	
Window	1	
Window sill	1	
Door opening	1	
Step	1	
Fascia board	1	
Barge board	2	
Roof (correctly drawn)	3	
Gutter	1	
Rain-water down pipe	1	
Ridge capping	1	
Determining roof height	2	
Any two labels	2	
Application of scale One or two incorrect = 3 Three or four incorrect = 2 More than five incorrect = 1 No measurement correct = 0	3	
<b>TOTAL</b>	<b>25</b>	

[40]

**QUESTION 3: ROOFS AND STAIRCASES (SPECIFIC)**

- 3.1 10°✓ (1)
- 3.2 If purlins are spaced too far apart the roof covering may bend under load. ✓  
A worker will not be able to walk safely on the roof covering.  
The roof covering may collapse if a worker walks on it. (1)  
**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- 3.3
- Lean-to roof ✓
  - Single Howe truss ✓
  - Mono pitch ✓
  - Howe truss
  - W truss/Fink truss
  - King post
  - Fan truss
  - Scissors truss
- (3)  
**ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- 3.4 Corrugated iron sheeting trusses can be spaced further apart, up to 1 400 mm. ✓ Clay tile roof trusses are spaced closer to each another, up to 650 mm/760 mm/766 mm apart. ✓ (2)
- 3.5
- It lowers the suction under the tiles and reduces the risk of the wind lifting the tiles. ✓
  - The permeable backing prevents condensation run-off.
  - Reduces wind noise in the roof
  - A good underlay will have excellent thermal properties.
  - It is a waterproof and dust-proof membrane that will prevent water and dust from entering the roof.
- (1)  
**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**

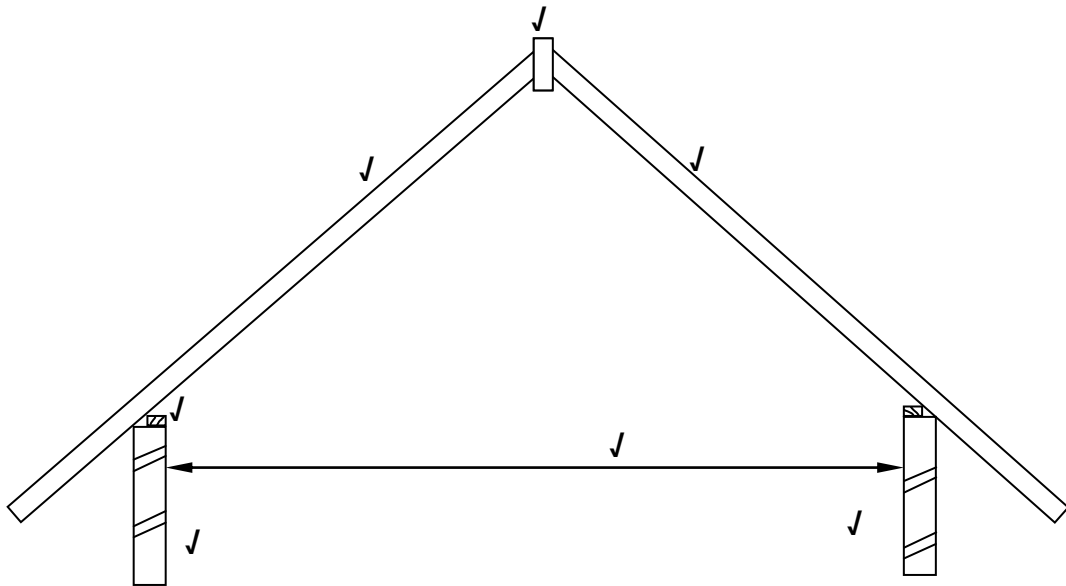
3.6



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MAR
Rafters	2	
King post	1	
Galvanised roof sheet	1	
Purlins	2	
Ridge capping	1	
<b>TOTAL:</b>	<b>7</b>	

(7)

3.7



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Span indicated correctly	1	
Walls	2	
Wall plates	1	
Rafters	2	
Ridge beam drawn correctly	1	
<b>TOTAL:</b>	<b>7</b>	

(7)

3.8

- 3.8.1 A- Handrail ✓  
 B- Baluster ✓  
 C- Rise ✓  
 D- Hole filled with grout ✓  
 E- Concrete ✓

(5)

3.8.2 850/850 mm ✓

(1)

3.8.3 If there is no intermediate support under the handrail it can bend/break if a load is applied to it ✓

(1)

3.8.4 A portable concrete vibrator ✓

(1)

**[30]**



**QUESTION 4: CONCRETE FLOOR, EXCAVATIONS AND FORMWORK (SPECIFIC)**

- 4.1
- Use concrete that has a strength of 25 MPa after 28 days. ✓
  - Do not place plumbing or electrical conduits on the ribs or mesh. ✓
  - Place enough props under the ribs to carry the weight of the slab. ✓
  - Concrete slab must be poured in a continuous unit to ensure a sturdy surface. ✓
  - Cast concrete must be vibrated to ensure all voids are filled.
  - Avoid piling or stacking of material on top of the floor during construction.
  - Keep the joist and bearer propped up.
  - Allow minimum workers on top of rib and block floor when casting takes place.
  - Workers must wear safety harnesses when casting takes place. (4)
- ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- 4.2
- Hollow blocks ✓
  - Pre-stressed ribs ✓
  - Wire mesh ✓
  - In situ concrete. (3)
- ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- 4.3
- A half-brick wall for 2–3 layers must be built around the perimeter of the wall ✓.
  - The half-brick must be steady enough to withstand the pressure of the concrete as well as the vibration after pouring. ✓
  - Insert 16–19 mm soft board as expansion between the ribs. ✓
  - Insert double layer of DPC to allow for movement.
  - Ensure the load-bearing wall is a 220 mm wall.
  - All openings must be filled to prevent loss of concrete.
  - Make sure that the walls are dry enough before the load of the rib and block floors is placed on them (3)
- ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- 4.4
- 4.4.1 Makes the block lighter/area for conduit and water pipes ✓ (1)
- 4.4.2 Reinforcing for strength and to bond with in situ concrete ✓ (1)
- 4.4.3 Polystyrene blocks/concrete blocks ✓ (1)

- 4.5 4.5.1
- Ensure that a competent person evaluates the stability of the soil. ✓
  - Draw up a safety plan and take sufficient steps to ensure safe working conditions. ✓
  - Ensure that any planned trench or excavation will be supported by a protective system (formwork or shoring), and this should be indicated on the safety plan. ✓
  - Eliminate as many risks and hazards as possible (e.g. risk of a person being buried or trapped by collapsing or dislodgement of material).
  - Erect fencing (at least one metre high) around the perimeter of the excavation site.
  - Ensure that all excavations take place under the supervision of a qualified person whose appointment has been confirmed in writing.
  - Carry out inspections to determine whether there are electric cables, water pipes, gas lines or any other service pipes in the area to be excavated, since this may affect the excavation
- ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS** (3)
- 4.5.2
- Trenches should be inspected at the start of each shift. ✓
  - Trenches should also be inspected after a rainstorm or any other water intrusion, or any other occurrence that could have changed the conditions in the trench. ✓
- (2)
- 4.5.3 The vibration from heavy plant equipment can cause the side of the excavation to collapse. ✓ (1)
- 4.5.4
- Low oxygen ✓
  - Hazardous fumes ✓
  - Toxic gases
- ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS** (2)
- 4.5.5
- Cutting ✓
  - Filling ✓
  - Cutting and filling ✓
- (3)
- 4.6
- 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 service
  - Access to exit from the excavation
  - Soil slides due to cracks or loose soil
- ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS** (3)

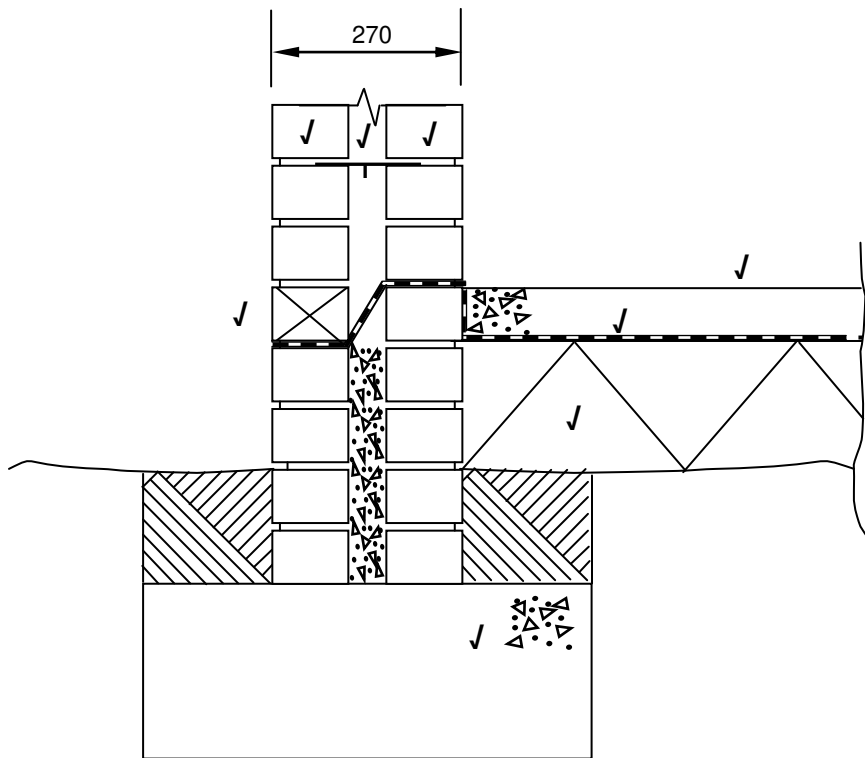
- 4.7
- Plastic ✓
  - Metal sheeting ✓
  - Hardboard ✓
  - Plywood ✓
  - Fibre-glass
- ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS** (4)
- 4.8
- Determine the height of the formwork ✓
  - Place the soleplates that support the props in an even part of the ground. ✓
  - Place the props on the wedges supported by the soleplates. ✓
- (3)
- 4.9
- 4.9.1 A- Shutter board ✓  
B- Bearer/Head tree ✓ (2)
- 4.9.2
- No adjustment can be made to the height of the formwork. ✓
  - The formwork will not be rigid. ✓
  - The props will not be secured under the formwork. ✓
- ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 4.9.3 There is no reinforcement indicated in the floor slab, ✓ and as a result the floor will collapse/crack. ✓ (2)
- [40]**

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

Start this question on a NEW page.

- 5.1
- Water ✓
  - Cement ✓
  - Sand/Plaster sand
- ANY TWO OF THE ABOVE** (2)
- 5.2
- 1 : 6 (1 bag of cement to 3 wheelbarrows of sand) ✓
- OR**
- 1 : 5 (1 bag of cement to 2½ wheelbarrows of sand)
- ANY ONE OF THE ABOVE** (1)
- 5.3
- 5.3.1
- A - Straight edge ✓
  - B - Clamps ✓
  - C - Plaster ✓
- (3)
- 5.3.2
- The plastering ✓ of a stopped end (1)
- 5.4
- Plaster skimming refers to the application of a smooth, ✓ buttery compound onto surfaces ✓ to achieve a high quality, smooth surface. ✓ (3)
- 5.5
- Volume = Length x breadth x thickness
- $$= 6,0 \text{ m } \checkmark \times 4,0 \text{ m } \checkmark \times 0,02 \text{ m } \checkmark$$
- $$= 0,48 \text{ m}^3 \checkmark$$
- (4)
- 5.6
- Chip the surface with a sharp tool to remove the surface skin and expose the hard skin, clean concrete. ✓
  - Remove all debris. ✓
  - Test the concrete for absorptiveness by pouring a cup of water onto the surface the day before. If the water is absorbed within five minutes the surface suction is good. ✓
  - If the water is not absorbed by the concrete, apply grout to the dry concrete. ✓
  - Make the grout by adding a half litre of water per kilogram of cement and mix well.
  - Stir continuously and use within 30 minutes.
- ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (4)

5.7



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Concrete foundation	1	
Cavity walls	2	
Damp-proofing under concrete floor	1	
Weep hole	1	
Concrete Floor	1	
Hard core filling	1	
Wall tie	1	
<b>TOTAL:</b>	<b>8</b>	

(8)

5.8 To join the inner and outer wall ✓

(1)

- 5.9
- Birds and rodents can enter the roof space ✓
  - There will be an opening between the wall plate and the roof covering ✓
  - Dust may enter the roof space ✓
  - Hot air that is trapped in the roof space will escape

(3)

**ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**

**[30]**

**QUESTION 6: REINFORCEMENT IN CONCRETE AND FOUNDATIONS (SPECIFIC)**

- 6.1      6.1.1      C ✓ (1)
- 6.1.2      B ✓ (1)
- 6.1.3      D ✓ (1)
- 6.1.4      B ✓ (1)
- 6.1.5      D ✓ (1)
- 6.1.6      A ✓ (1)
- 6.2      • Ground conditions are not stable or solid enough to support ordinary, shallow foundations. ✓
- Foundation piles distribute the load to more stable ground and can be used as underground or underwater supports. ✓
- Piles provide stability when a raft or floating foundation is used. ✓
- When structures are subjected to horizontal forces, pile foundations resist bending stress while still lending vertical support, e.g. multi-storey buildings.
- Where soils are prone to swelling and shrinking according to the moisture content, e.g. clay soil, shallow foundations cannot be used.
- When the superstructure is exposed to uplifting forces, e.g. offshore platforms, pile foundations are needed.
- Where soil erosion is possible, piles should be used to carry the load of the superstructure, e.g. for bridges and piers. (3)
- ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS**
- 6.3      6.3.1      Precast (preformed) piling ✓ (1)
- 6.3.2      A – Steel cable ✓  
                    B – Hammer ✓  
                    C – Steel cap ✓  
                    D – Undisturbed earth ✓  
                    E – Pile ✓  
                    F – Steel tip ✓ (6)
- 6.3.3      • If C is not used during installation the concrete at the top of the pile will disintegrate ✓
- If the concrete breaks the drop hammer can deflect and cause injury or damage ✓
- The drop hammer may be less effective due to deflection (2)
- ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS**

- 6.3.4
- It can be used on unstable soil or ground ✓
  - Where the soil is loose ✓
  - Non-cohesive soil
  - Where there is soil movement
  - It can be used in constantly wet areas
- (3)

**ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS**

- 6.3.5
- It can be used in poor soil. ✓
  - It can be used anywhere, even in water.
  - The larger base ensures stability.
  - It is relatively quick and easy to install if the equipment is available.
  - If pre-fabricated piles are used, much time is saved.
  - It resists tensile stress well.
  - It is quick and less expensive to produce.
  - It can be manufactured elsewhere and transported to the site.
  - The installation can continue even when poor weather conditions hamper excavations.
  - The length of the piles can easily be adjusted, depending on the circumstances.
  - It offers good resistance against moving soil.
- (1)

**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS**

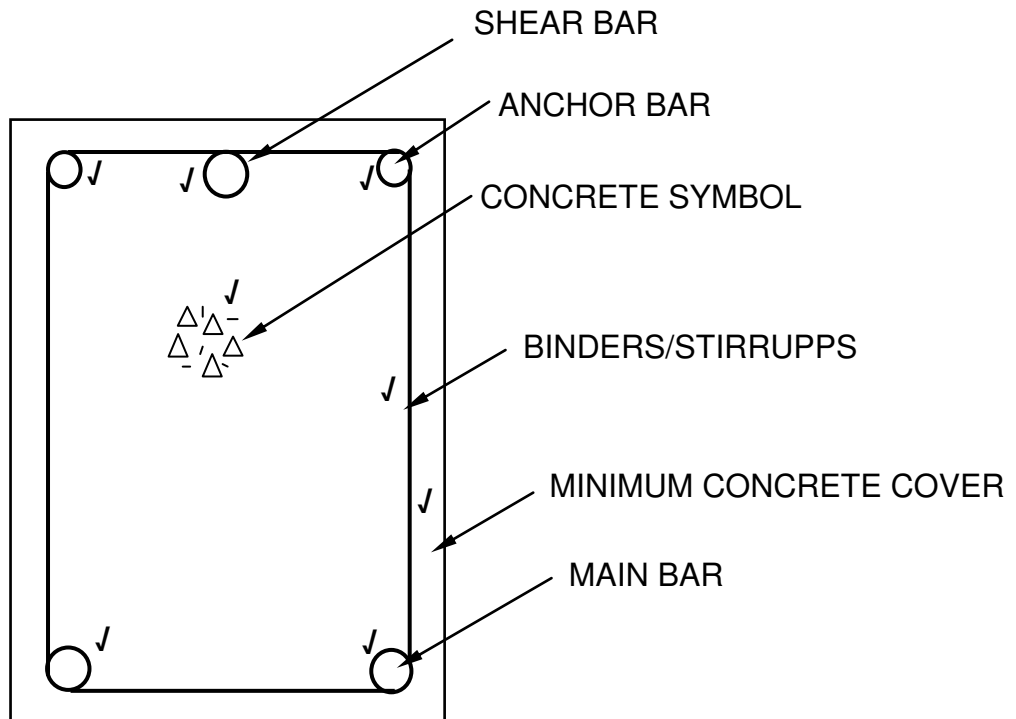
- 6.4.1
- Tensile force ✓  
Compression force ✓  
Shear force ✓
- (3)

- 6.4.2
- Tensile force - a force that is inclined to stretch a beam. ✓  
Compression force - a force that is inclined to shorten a beam or column. ✓  
Shear force - a horizontal and vertical shear stress that acts at an angle and is inclined to cause diagonal stress fractures. ✓
- (3)

- 6.5
- Resistant to tensile stress. ✓
  - Easy to bend into shape. ✓
  - Able to bind firmly with the concrete in order to provide tensile strength.
  - Of limit expansion ability in order to prevent unnecessary tension when the temperature fluctuates.
  - Rust proof
- (2)

**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS**

6.6



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Shear bar	1	
Anchor bars	2	
Binders/Stirrups	1	
Minimum concrete cover	1	
Main bars	2	
Concrete symbol	1	
<b>TOTAL</b>	<b>8</b>	

6.7

Mild steel ✓  
High-yield steel ✓

(2)

[40]