

**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**CONSTRUCTION PLANNING  
NQF LEVEL 2**

**NOVEMBER 2011**

**(12010042)**

**26 October (X-Paper)  
09:00 – 12:00**

**Calculators and drawing instruments may be used.**

**This question paper consists of 9 pages and 3 diagram sheets.**

<p><b>TIME: 3 HOURS</b> <b>MARKS: 100</b></p>
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## **INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions.
  2. Read ALL the questions carefully.
  3. Number the answers according to the numbering system used in this question paper.
  4. The drawings, sketches and diagrams must be done in pencil.
  5. The sketches and/or diagrams must be neat, reasonably large, in proportion and fully labelled.
  6. Rule off across the page after each completed question.
  7. ALL work you do NOT want to be marked must be clearly crossed out.
  8. ALL the abbreviations and symbols must comply with the latest National Building Regulations and all relevant SANS (SABS)-codes.
  9. Write neatly and legibly.
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**QUESTION 1: TERMINOLOGY AND COMPONENTS OF THE CONSTRUCTION INDUSTRY**

- 1.1 The use of proper and sound building materials can contribute to a safe and successful building. Natural materials and manufactured materials are TWO types of materials which are most commonly used during the erection of a building project. Answer the following question with regard to these types of materials using the following headings:
- 1.1.1 Describe the difference between *natural materials* and *manufactured materials*. (2)
- 1.1.2 Give ONE example of each of these types of materials. (2)
- 1.2 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A – C) next to the question number (1.2.1 – 1.2.2) in the ANSWER BOOK.
- 1.2.1 The Agreement Certificate can be described as:
- A A legally binding agreement between two or more people
  - B A certificate issued for non-conventional materials or for houses to confirm that it complies with the acceptable criteria
  - C Certificate issued by the National Home Builders Registration Council to a registered builder (1)
- 1.2.2 The Bill of Quantities can be described as:
- A A tender form stipulating the fixed price for a structure or building to be build
  - B A lump sum contract payment for the materials and work done by completion of a building structure
  - C A list of all the items of work required to construct a particular building (1)
- [6]**

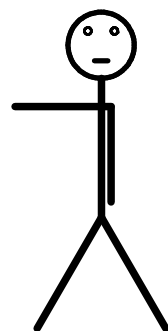
**QUESTION 2: MEASURING, SETTING OUT AND LEVELLING**

- 2.1 A steel tape is one of the most common measuring tools used on a building site.
- 2.1.1 State THREE advantages of a steel tape. (3)
- 2.1.2 State THREE different ways how you will take care of a steel tape. (3)
- 2.2 A common term used in the construction environment is that buildings must be set out before any construction work can begin. Explain the *term setting out a building*. (2)

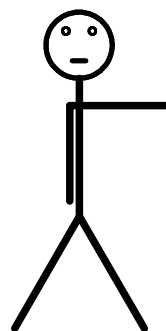
- 2.3 Explain the concept *error of parallax* and give ONE example how parallax can be avoided. (3)
- 2.4 During the setting out of a foundation, it is important that all corners and rooms are square. Complete the following sentences by using the words given in the list below. Write only the word(s) next to the question number (2.4.1 – 2.4.5) in the ANSWER BOOK.

diagonals; opposite corners; optical square; theodolite; pythagoros theorem  
/3:4:5

- The first corner is squared by applying the 2.4.1 ... method. The corner can also be squared by using a sighting instrument, called 2.4.2 ..., while the 2.4.3 ... is an optical instrument to measure horizontal and vertical angles on a site. After setting out the building outline, make sure the building is square by measuring the 2.4.4 ... of the structure between the two 2.4.5 ... . (5)
- 2.5 In estimating the horizontal distance with an automatic level, the following readings were found:  
Upper reading: 1,2 m (1 200 mm);  
Lower reading 0,8 m (800 mm).  
Use the readings to determine the horizontal distance to the point of reading. (3)
- 2.6 A chainman is a person who assists a surveyor by holding the staff. These two people are usually very far apart during this process. The surveyor has to communicate with the chainman using a variety of different hand signals. FIGURE 1(a) and FIGURE 1(b) below shows TWO such hand signals used by the surveyor to communicate with the chainman.



**FIGURE 1(A)**



**FIGURE 1(B)**

- 2.6.1 Explain what the surveyor is indicating to the chainman in FIGURE 1(A). (1)
- 2.6.2 Explain what the surveyor is indicating to the chainman in FIGURE 1(B). (1)

- 2.7 You are required to cut several lengths of timber to the same length to be used for a garden trellis. The foreman asks you to use the stop measure method. Explain the following with regard to this method:
- 2.7.1 What is meant by the stop method? (2)
- 2.7.2 State TWO advantages of using this method. (2)
- [25]**

### QUESTION 3: FOUNDATIONS

- 3.1 A building structure consists of a variety of structural elements which must interact with each other to ensure that the building remains stable. One key structural element is the foundation of the structure which is in direct contact with the ground on which the building must stand.
- 3.1.1 Name TWO important functions of a building foundation. (2)
- 3.1.2 Name the type of foundation which is used in swamps and on very soft soil. The foundation consists of a flat slab and floats on the water. (1)
- 3.1.3 Name the type of shallow foundation that supports single isolated piers or columns. (1)
- 3.2 Briefly explain the difference between the following TWO terms used to describe the consolidation of earth filling under a foundation.
- NOTE: You may use a sketch to illustrate your answer.
- 3.2.1 Settlement (2)
- 3.2.2 Differential settlement. (2)
- 3.3 Describe TWO types of investigations a geotechnical engineer would perform before any building work can commence. (2)
- [10]**

**QUESTION 4: BEHAVIOUR OF STRUCTURES**

4.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only the word true or false next to the question number (4.1.1 – 4.1.5) in the ANSWER BOOK.

- 4.1.1 A non-structural wall is expected to carry the weight of the roof. (1)
- 4.1.2 Live loads are permanent loads on a structure. (1)
- 4.1.3 Reinforcement steel is used to strengthen structural members. (1)
- 4.1.4 A column is a vertical member under compression. (1)
- 4.1.5 The springing point is the vertical member that supports the arch. (1)

4.2 The manner in which building structures are designed and constructed can be determined by two important principles of engineering and various terms are related to these principles. From the list below, choose the best principle or term that describes the statements made in 4.2.1 to 4.2.6.

force; strain; safety; cost-effective; load; stress.

- 4.2.1 Structures must be designed and developed to be strong enough to fit the purpose it is developed for. (1)
- 4.2.2 The structure should also not cost more than it needs to work safely, effectively and satisfactorily. (1)
- 4.2.3 A measure of how much physical power is used to move an object by pulling or pushing. (1)
- 4.2.4 A force applied to a structure. (1)
- 4.2.5 A force or pressure acting inside a structure. (1)
- 4.2.6 The force or pressure caused a change in the shape or dimension of a member. (1)

4.3 FIGURE 2, DIAGRAM SHEET 1 (attached) shows TWO rectangular shaped free opening gates which are securely hinged on either side to steel gate posts. The gates were constructed of horizontal and vertical members which were pinned to the corners.

It was later discovered that both the gates were sagging at the free end and that it has lost its rectangular shape. Answer the following questions:

- 4.3.1 Why did the gates sag at the free end? (2)
- 4.3.2 Since the gates were sagging would the gates be able to close freely? (1)

- 4.3.3 What preventative measures should be taken to ensure the gates will not sag in the future?
- NOTE: You may reinforce your answer (4.3.3) by using neat pencil sketches or drawings. (3)
- 4.4 FIGURE 3, DIAGRAM SHEET 1 (attached) illustrates the constructional structure of a masonry arch. Study the structure and answer the following questions:
- 4.4.1 Name the central, wedge-shaped stone 'A' at the top of the arch. (1)
- 4.4.2 What do we call the TWO points, marked 'B', at the bottom of the arch? (1)
- 4.4.3 The letter 'C' indicates the 4.4.3 ... of the arch. (1)
- 4.4.4 Name the bricks marked 'D' that forms the arch. (1)
- 4.4.5 Briefly explain what the term intrados of the arch means. (1)
- 4.5 Explain the concept *buckling* with reference to columns? (2)
- [24]**

#### QUESTION 5: INTERNATIONAL SYSTEM (SI) UNITS OF MEASUREMENTS

- 5.1 Define the following basic units of measurement. Also state the S.I unit for each.
- 5.1.1 Length (2)
- 5.1.2 Mass (2)
- 5.1.3 Time (2)
- 5.2 Arrange the following from the shortest to the longest:
- 1 centimetre; 1 hectometre; 1 decimetre; 1 metre. (2)
- 5.3 Convert and express 50 metres in terms of each of the following:
- 5.3.1 Millimetres (1)
- 5.3.2 Kilometres (1)
- [10]**

**QUESTION 6: AREAS AND VOLUME**

- 6.1 FIGURE 4, DIAGRAM SHEET 2 (attached) shows the top view (floor plan) of a simple building structure and its specifications. Study the drawing and the specifications below and answer the questions that follow. Ignore the door and window openings in your calculations.

**SPECIFICATIONS:**

Foundation concrete:	650 mm x 230 mm
Width of foundation wall:	220 mm
Height of foundation wall:	450 mm
Bricks per metre square:	Assume 104 bricks/m <sup>2</sup>

- 6.1.1 Calculate the volume of the concrete foundation. (6)
- 6.1.2 Calculate how many bricks will be required to build the one-brick (double-skin) foundation wall. Ignore any waste. (1)
- 6.2 FIGURE 5, DIAGRAM SHEET 2 (attached) shows the side view of a house. Calculate the volume of plaster needed to plaster the gable wall area as indicated by the hatched area. The thickness of the plaster is 15 mm. (3)

NOTE: The house has TWO gable walls.

[10]

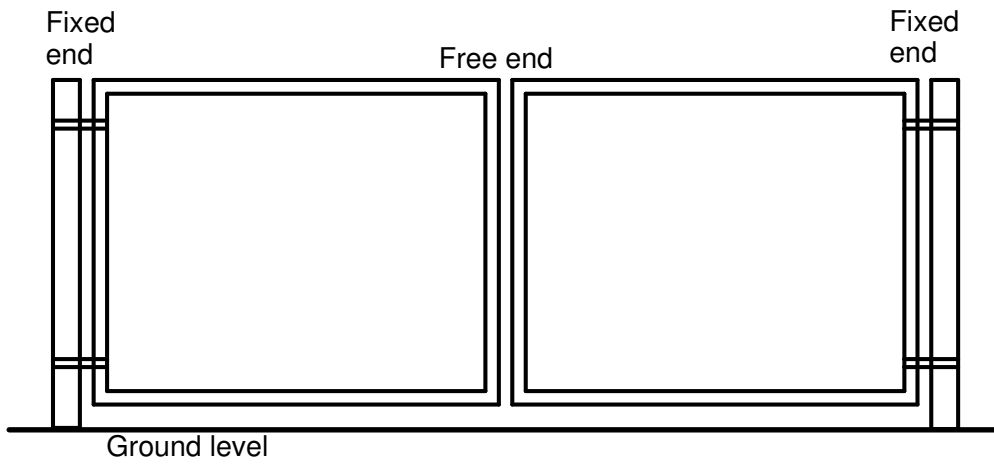
**QUESTION 7: TECHNICAL DRAWINGS**

- 7.1 FIGURE 6, DIAGRAM SHEET 3 (attached) shows a drawing of a residential building. Study the drawing and answer the following questions.
- 7.1.1 What is the name of the given drawing? (1)
- 7.1.2 Name any TWO other drawings or views that must accompany this drawing. (2)
- 7.1.3 Calculate the missing dimensions as indicated by 'A' and 'B'. (4)
- 7.1.4 Are there any other missing dimensions on the drawing? (2)
- 7.1.5 In which direction is the side of the house, with no windows, orientated? (1)

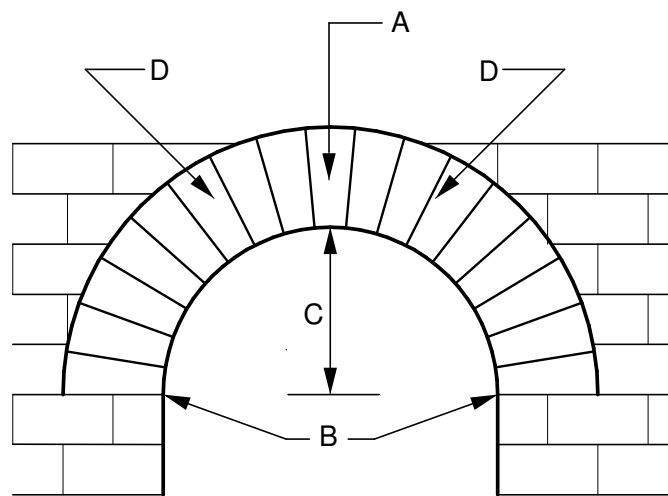


- 7.2 The National Building Regulations requires drawings be coloured in to show the different types of materials. Name the colours to be used to indicate the following materials:
- 7.2.1 New wood (1)
- 7.2.2 New steel or iron (1)
- 7.3 What is the size of the windows marked W1, W3 and W8.  
(Use the attached window schedule.) (3)
- [15]**
- TOTAL: 100**

**DIAGRAM SHEET 1**

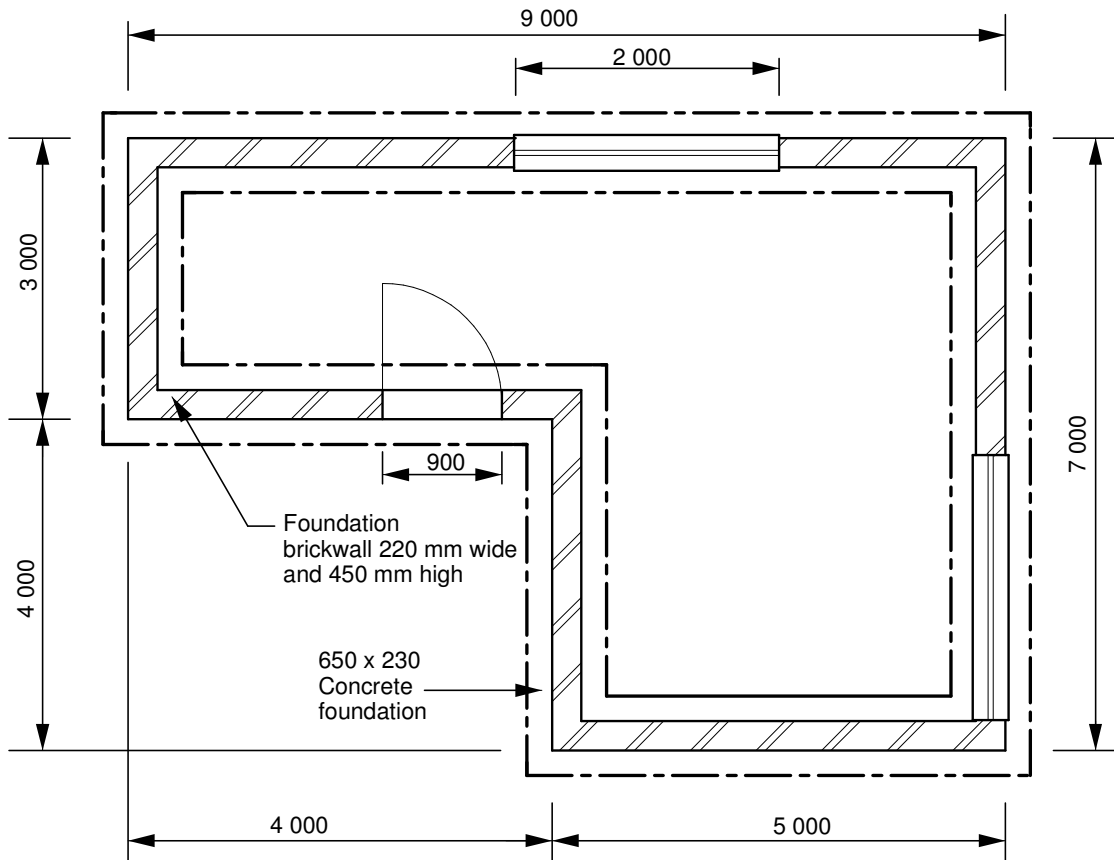


**FIGURE 2**

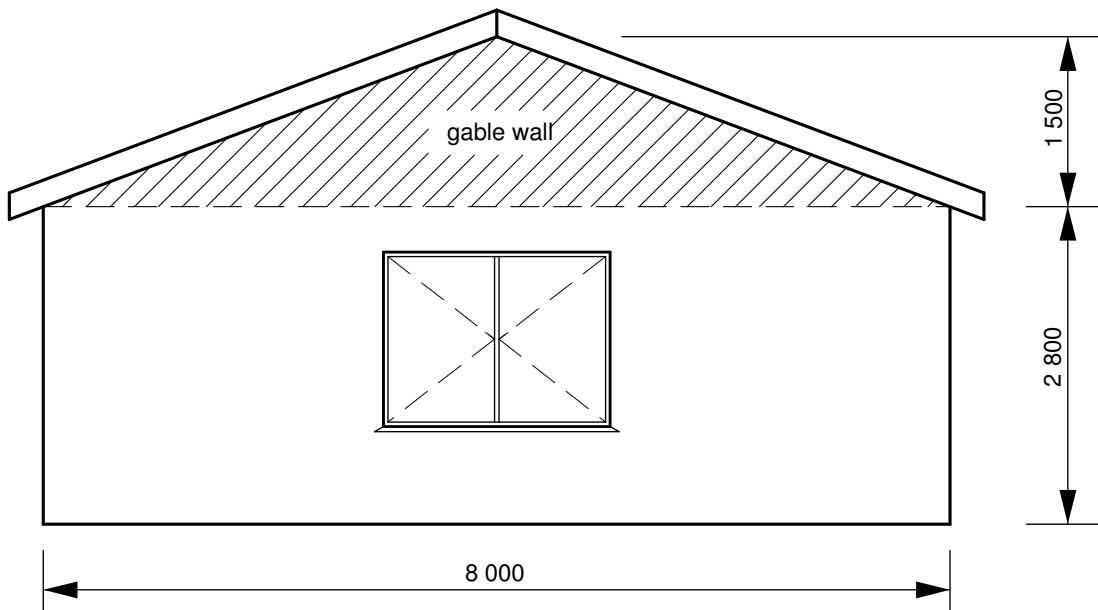


**FIGURE 3**

**DIAGRAM SHEET 2**



**FIGURE 4**



**FIGURE 5**

DIAGRAM SHEET 3

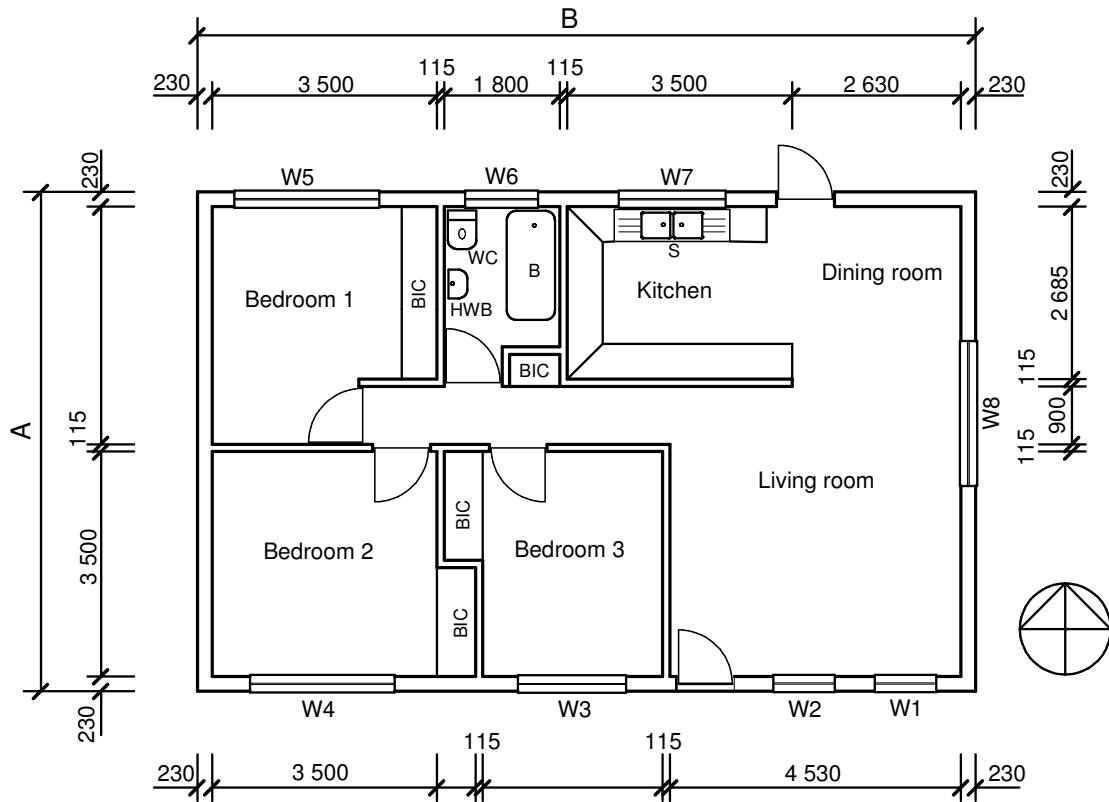


FIGURE 6

Window schedule	
Timber window code	Timber window size
W1	990 x 2 133
W2	990 x 2 133
W3	1 702 x 1 274
W4	2 255 x 1 274
W5	2 255 x 1 274
W6	1 150 x 990
W7	1 702 x 990
W8	2 255 x 1 733