higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

CARPENTRY AND ROOF WORK
NQF LEVEL 3

(12030333)

16 November 2022 (X-paper)
09:00–12:00

This question paper consists of 6 pages.

367Q1N2216

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TIME: 3 HOURS
MARKS: 100

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. Write neatly and legibly.

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QUESTION 1

1.1 State THREE advantages of using a rational design in constructing a hipped roof. (3)

1.2 FIGURE 1 below illustrates the construction detail of a hipped roof construction with a span of 8.2 m. Different members of the construction are numbered from A – H. Study the construction detail in FIGURE 1 and answer the following questions next to the question number (1.2.1 – 1.2.5) in the ANSWER BOOK.

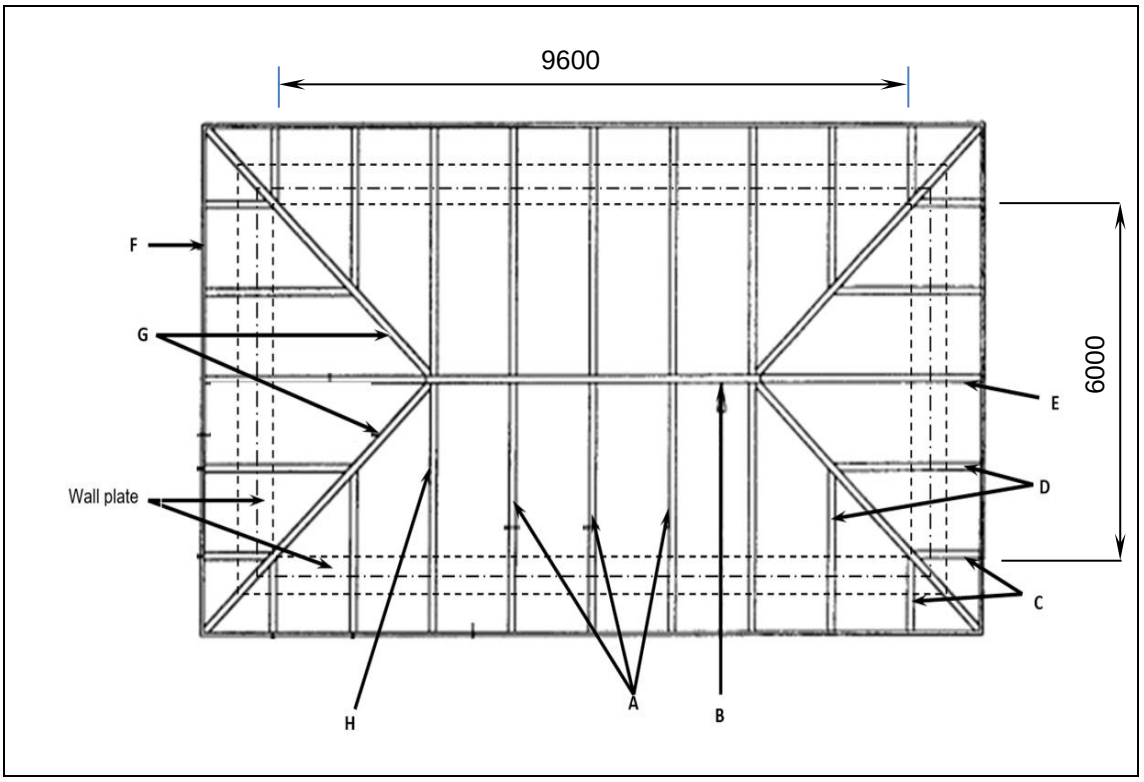


FIGURE 1

1.2.1 Indicate if the roof construction in FIGURE 1 is a deemed-to-satisfy construction or a rational design and give TWO reasons for your answer. (3)

1.2.2 Name the members (A – H) in FIGURE 1 by writing the correct name next to the letter (A – H) in your ANSWER BOOK. (8)

1.2.3 Explain the term girder trusses and give ONE application of a girder or a girder truss in the illustrated roof construction. Make use of the letters A – H for your explanation. (4)

1.2.4 The construction detail will require a certain number of girders or girder trusses. Write the letters of the applicable girder trusses as illustrated in FIGURE 1 in your ANSWER BOOK and indicate next to the letter the number of these trusses that will be required. (4)

1.2.5 Calculate the total length that you require for the wall plates. (4)

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1.3 State FOUR factors that can affect roof stability. (4)

[30]

QUESTION 2

2.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1.1–2.1.7) in the ANSWER BOOK. Correct the statement if it is FALSE.

2.1.1 An L-shape roof structure can be a deemed-to-satisfy design because the L-shape does not require any girder trusses.

2.1.2 Roof structures must withstand live loads and dead loads for example geysers, roof covering, wind and rain.

2.1.3 The slope angle of a valley is always higher than the intersecting roofs because the angle will increase as the bottom line gets longer.

2.1.4 Wall plates must be fixed on all the walls for a L-shape monopitch roof structure.

2.1.5 A monopitch roof structure is a single-sloping roof surface that is often not attached to other roof surfaces and is also called a lean-to roof.

2.1.6 Valleys can either be closed or open but preferably open to avoid blockage by leaves that can stop the flow of water.

2.1.7 The tilting batten is smaller than the other battens because it must compensate for the fascia.

(15)

2.2 Explain how you will install underlay for a tile roof structure excluding the valley. (7)

2.3 State TWO ways of fixing the pitched side of jack trusses to the wall of a monopitch roof. (2)

2.4 Explain how you will raise and erect the first set of standard trusses of a monopitch roof structure. (6)

[30]

QUESTION 3

3.1 A hip roof construction is completed and need to be inspected before the roof covering can commence.

Develop a checklist to check the correctness of the installation of the trusses and girders. (Checklist 3 × 1) (Checks 12 × ½) (9)

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3.2 Give THREE reasons why proper roof inspection is important. (3)

3.3 Name THREE South African National Standards (SANS) or regulations which regulate timber roof construction. (3)
[15]

QUESTION 4

4.1 Explain why it is NOT permissible to change the specified roofing material without the written consent of the roof designer? (2)

4.2 FIGURE 2 below and TABLE 1 on the next page shows the construction detail of a gable roof construction and an extract from the SANS 10243, which specifies the maximum centre-to-centre spacings of battens and purlins according to the roof covering material. The trusses have a span of 6 m measured from the inside of the 220 mm walls. The roof trusses are spaced 750 mm apart with a 300 mm eave measured from the outside skin of the wall. The pitch of the rafter beams is at 28° with a total length of 4 m measured from the apex of the roof truss to the lowest point of the eave. For the roof covering, *bold double roman concrete tiles* are used with an average mass of 48 kg/m^2 or 0.44 kN/m^2.

Study the construction detail in FIGURE 2 and answer the following questions next to the question number (4.2.1 – 4.2.5) in the ANSWER BOOK.

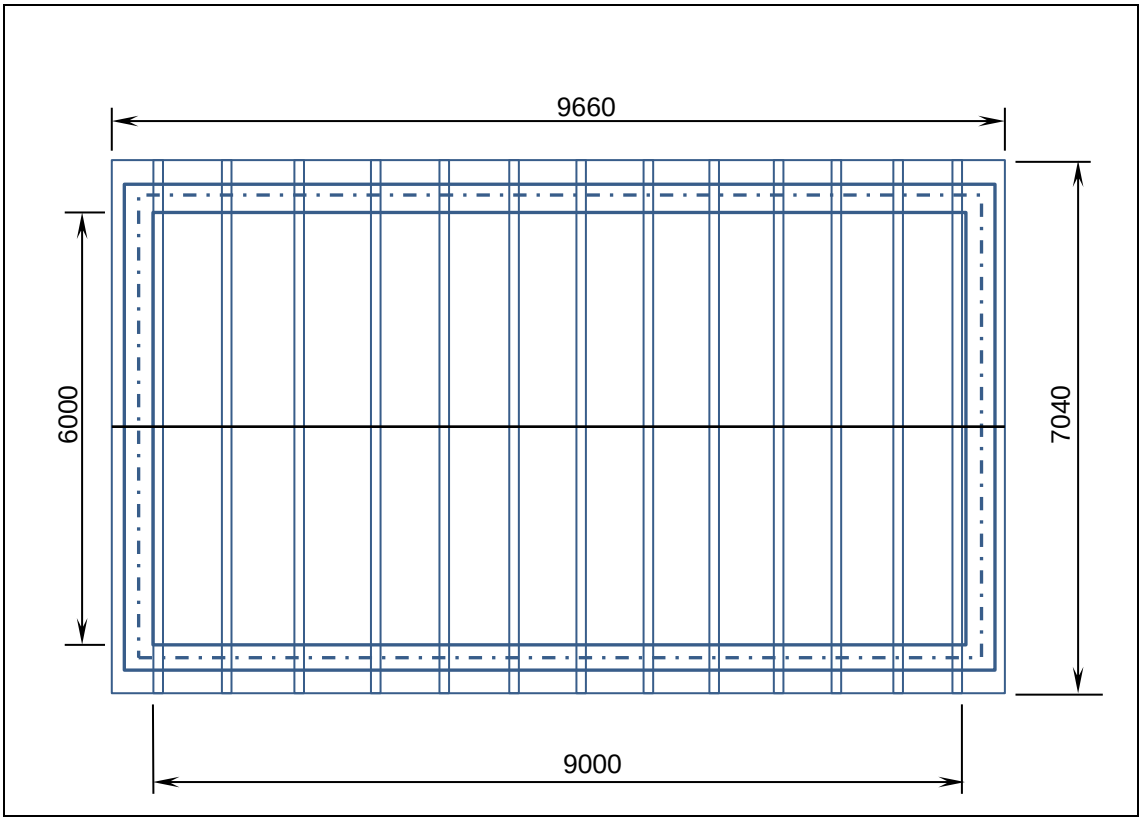


FIGURE 2

Maximum centre -to-centre spacing of battens and purlins				
Trusses and purlin/batten spacing – Empirical rules for SA pine				
1	2	3	4	5
Roof cover	Maximum self-weight load (kN/m^2)	Maximum truss centres (mm)	Maximum purlin/batten centres (mm)	Size of purlin/batten (mm × mm)
Concrete tiles	0.65 0.55 0.55 0.55	760 760 900 1000	250 350 350 350	38 x 38 38 x 38 38 x 50 on flat 38 x 50 on edge

TABLE 1

4.2.1 From the information and data provided, determine if you will use purlins or battens for the construction in FIGURE 2 and motivate your answer. (4)

4.2.2 Indicate what should be the maximum centre-to-centre spacing for the battens/purlins for this roof structure according to TABLE 1. (1)

4.2.3 Calculate the maximum centre-to-centre spacing of the purlins/battens according to the construction detail provided in FIGURE 2. The spacings must be calculated from the apex of the rafter to the lowest point of the eave. (4)

4.2.4 Determine, according to your calculation in question 4.2.2, how many purlins/battens will be required for the one side of the roof structure excluding the ridge and tilting batten/purlin (2)

4.2.5 Calculate how many *bold double roman* concrete tiles will be needed to cover the entire roof structure if you need 10 tiles per m^2. (4)

4.3 Name TWO parts of a roof which is vulnerable to wind damage. (2)

4.4 Give a brief explanation of the term *roof cladding*. (2)

4.5 Explain the purpose of waterproof plastic that is placed under the battens before laying the roof tiles? (2)

4.6 State TWO important properties of the material used for roof covering. (2)

[25]

TOTAL: 100

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