



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T130(E)(A7)T

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N4

(8060004)

**7 August 2019 (X-Paper)
09:00–13:00**

**REQUIREMENTS: ONE A2 drawing sheet
Hot-rolled structural steel sections (red book) (BOE8/6)**

This question paper consists of 5 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
BUILDING AND STRUCTURAL CONSTRUCTION N4
TIME: 4 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. Layout of answers is important.
 5. The following must be strictly applied:

Do QUESTIONS 1, 2 and 6 on the front of the DRAWING SHEET.
Do QUESTIONS 3, 4, 5 and 7 on the back of the DRAWING SHEET.
 6. Do NOT use an ANSWER BOOK.
 7. Do ALL drawings in pencil with bold outlines.
 8. Neatly print ALL written answers in pencil.
 9. Do drawings in accordance with National Standards and fully label them with descriptive notes and dimensions.
 10. Write neatly and legibly.
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QUESTION 1

A typical steel roof for a factory is to be constructed of rolled steel angles to form a W-pattern truss with a pitch of 30° .

Draw, to scale 1:5, a sectional front view of the detail at the ridge of the steel roof. The truss members will be made up of $100 \times 100 \times 12$ mm rolled steel (RS) angle rafters and TWO $50 \times 50 \times 6$ mm RS angle struts which will be connected to a 10 mm thick gusset plate.

The fibre-cement corrugated roofing sheets will be fixed to 75×50 mm timber purlins bolted to $70 \times 70 \times 12$ mm angles welded to the top of the rafters. The ridge of the roof will be closed using TWO fibre-cement ridge-capping pieces.

Use the following bolt specifications:

TWO rafters: 4M16 bolts spaced at 80 mm centres with an edge distance of 35 mm

TWO struts: 2M16 bolts spaced at 130 mm centres with an edge distance of 35 mm

FOUR purlins: M16 bolts

Do NOT draw the bolts but draw the bolt holes and centre lines.

The completed drawing must include ALL labels and key symbols.

[20]

QUESTION 2

Draw, to scale 1:10, the front view of a semicircular two-ringed rough brick arch that will be used in a wine-storage facility. The span of the arch is 1 000 mm. Ensure that the bricks are evenly spaced with the key brick at the crown of the arch. The drawing must be provided with ALL labels and dimensions.

[11]

QUESTION 3

A 330 mm wide foundation wall is supported on a 630 × 300 mm thick concrete foundation to form a sub-basement. The ground level is 525 mm above the top of the foundation and the damp-proof course level is 150 mm above the ground level. The basement wall is reduced to a 270 mm cavity wall SIX courses above the ground level by means of a plinth brick.

A 100 mm thick concrete floor is cast on top of the concrete foundation on the inside of the basement. The floor is finished off with a 25 mm screed and 100 mm cement skirting. The inside walls of the basement will be coated with 19 mm cement plaster. ◆

Draw, to scale 1:10, a vertical section through the basement wall. Show the position of the vertical and horizontal damp-proofing that would prevent any dampness from entering the basement. The completed drawing must include ALL labels, dimensions and key symbols.

[16]**QUESTION 4**

A domestic steel sash window must be built in the centre of a one-brick wall. ◆

Draw, to scale 1:2, a vertical section through the window to show the detail at the sill-level of the wall. The external sill consists of 150 × 150 × 25 mm thick quarry tiles with a 15 mm thick fibre-cement sill on the inside. The completed drawing must include the window frame, sash, glass and putty. Show the position of the fixing lug, damp-proof course and joint sealer. Include ALL labels, dimensions and key symbols.

[15]**QUESTION 5**

5.1 Draw neat sketches to show each of the following types of rivets. Each rivet must be drawn in a 50 mm × 500 mm square.

◆ 5.1.1 Pan head rivet

5.1.2 Conical head rivet

(2 × 3) (6)

5.2 Explain the difference between a *concealed gutter* and a *parapet gutter*. ◆

(2 + 2) (4)

5.3 Wall plates are used in conjunction with timber roofs.

State the purpose of a wall plate.

(1)
[11]

QUESTION 6

A one-brick wall supports a Howe-type timber roof truss with nail-plated joints across the span of a house. The roof truss is made up of 114 × 38 mm rafters and a 150 × 38 mm tie beam. The internal vertical strut is 114 × 38 mm. Fluted-steel roof sheeting is used as covering on 75 × 50 mm purlins. The closed eaves overhang is 250 mm wide with a 19 mm thick fibre-cement fascia attached at the ends of the rafter. The guttering consists of a 100 mm half-round plastic gutter with a Φ80 downpipe.

Draw, to scale 1:10, a vertical section through one of the eaves to show part of the roof and downpipe and brick wall. The completed drawing must include ALL labels and key symbols. Clearly show the positions of the nail plates at the roof-truss joints.

[17]**QUESTION 7**

A one-and-a half brick wide wall must be built in English bond to form a T-junction.

Draw, to scale 1:10, the alternate plan courses of the corner. The external dimensions for the vertical part is 566 mm and 1 550 mm for the horizontal section. Show stopped ends at the horizontal parts.

[10]**TOTAL: 100**