



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE **BUILDING AND STRUCTURAL CONSTRUCTION N5**

(8060015)

30 November 2022 (X-paper)
09:00–13:00

REQUIREMENTS: Answer book (8/13)
A2 drawing sheet
Hot-rolled steel sections (BOE 8/2)

Nonprogrammable calculators may be used.

This question paper consists of 5 pages, 2 diagram sheets, an annexure, and a formula sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
BUILDING AND STRUCTURAL CONSTRUCTION N5
TIME: 4 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
Questions 1, 2 and 3 must be answered in the ANSWER BOOK.
Questions 4, 5 and 6 must be answered on the supplied drawing paper.
 2. Read all the questions carefully.
 3. Number the answers according to the numbering system used in this question paper.
 4. All drawings must be done in pencil with bold outlines.
 5. The drawings must be done in accordance with National Standards and must be fully labelled with descriptive notes and dimensions (where applicable).
 6. All calculations must conform to the relevant SABS/SANS Code of Practice.
 7. Write neatly and legibly.
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QUESTION 1

FIGURE 1, DIAGRAM SHEET 1 (attached) shows a TWO-pitch steel truss supported on TWO I-section parallel steel beams. The roof truss must support THREE point loads and ONE 30 kN wind load.

Use the graphical or analytical method to obtain the magnitude and direction of the forces in each of the members to distinguish between the tie and the strut forces.

Tabulate your answers.

The graphical method must be done on the supplied A2 drawing paper.

Use the following scales : Space diagram: 120 mm = 3 m
(Graphical method) Vector diagram: 1 mm = 1 kN

[18]**QUESTION 2**

FIGURE 2 shows a bolted connection between a tie-bar and a gusset plate consisting of SIX M12 Grade-4 bolts. Calculate the following:

- 2.1 The resistance of the bolts to shearing. (4)
- 2.2 The resistance of the bolts to crushing. (3)
- 2.3 The resistance of the tie to tearing. (4)
- 2.4 The maximum force that the connection can safely withstand. (1)

Specifications:

Maximum shear stress of the bolts : 150 MPa
Maximum tensile stress of the tie : 200 MPa
Maximum compressive stress of the bolts : 260 MPa

[12]**QUESTION 3**

FIGURE 3, DIAGRAM SHEET 1 (attached) shows a steel beam supported on TWO reactions, 9 metres apart, with overhangs at both sides of the steel beam.

Select a suitable I-section parallel flange steel beam to ensure that the building is safe. Give the following:

- 3.1 The values of the reactions at RL and RR. (4)
- 3.2 Determine the values of the shear forces and bending-moment values of the loaded beam. (7)
- NOTE: Do not draw the TWO diagrams.