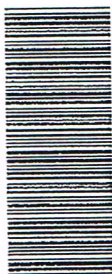


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**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

**T1680(E)(M28)T
APRIL 2012**

**NATIONAL CERTIFICATE: MULTI-DISCIPLINARY DRAWING
OFFICE PRACTICE**

STRUCTURAL STEEL DETAILING

(8090225)

**28 March (X-Paper)
09:00 – 13:00**

REQUIREMENTS: ONE A3-drawing paper.

Candidates will require drawing instruments.

CLOSED BOOK EXAMINATION

This question paper consists of 5 pages, 3 diagram sheets and a 1-page information sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE: MULTI-DISCIPLINARY DRAWING OFFICE
PRACTICE
STRUCTURAL STEEL DETAILING
TIME: 4 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
 2. Read the questions carefully.
 3. Use both sides of the drawing paper.
 4. A balanced layout is very important and candidates will be penalised for bad planning.
 5. A 15 mm border must be drawn around the drawing sheet (both sides).
 6. The question numbers must be clearly indicated.
 7. ALL drawing work, including candidate information, must be done in pencil.
 8. ALL the drawing work must comply with the SABS 10111-1990.
 9. Computers may be used as drawing aids.
-

QUESTION 1: INTRODUCTION

- 1.1 FIGURE 1, DIAGRAM SHEET 1 (attached), shows a typical section through a steel portal building.

Name the components numbered 1 to 6. Write only the answer next to the question number 1.1 in the ANSWER BOOK.

(6)

- 1.2 Draw a neat sketch of a typical fillet weld.
Indicate the welding symbol.

(4)

[10]

QUESTION 2: BEAMS

FIGURE 2, DIAGRAM SHEET 2 (attached), shows a view on a steel structure. Make fully, detailed drawings (SCALE 1:10) of the beams marked B1 and B3 and give enough information for the manufacturing of the beams in a structural steel workshop.

ALL end plates are 10 mm thick and ALL bolts are M20.

Show the following information:

- 2.1 The column centres
- 2.2 Lengths and sizes of beams
- 2.3 Dimensions of the beams over end plates
- 2.4 Dimensions for the drilling of the bolt holes
- 2.5 View with dimensions of end plates
- 2.6 Item marks, number of beams required and diameter of bolt holes
- 2.7 Top of beams

Information not given is left to your own discretion.

[25]

QUESTION 3: COLUMNS

Refer to FIGURE 2, DIAGRAM SHEET 2 (attached), and make fully detailed drawings (SCALE 1:10) of the columns marked C1 and C2 and give enough information for the manufacturing of the columns in a workshop.

ALL plates are 10 mm thick and bolts are M20.

Show the following information:

- 3.1 Lengths and sizes of columns
- 3.2 Dimensions of the columns over cap and base plates
- 3.3 Dimensions for the drilling of the bolt holes
- 3.4 View with dimensions of cap and base plates

[25]

QUESTION 4: LATTICED GIRDERS

FIGURE 3, DIAGRAM SHEET 3 (attached), shows a line diagram of a typical bolted latticed girder.

Draw, to scale 1:5, typical details of the following:

- 4.1 Detail A
- 4.2 Detail B
- 4.3 Detail C

SPECIFICATIONS:

Top and bottom booms: rolled steel angle profiles, $120 \times 120 \times 10$

ALL internal members: rolled steel angle profiles, $90 \times 90 \times 8$

ALL gusset plates: 10 mm thick.

Do NOT insert any dimensions.

Gusset plate sizes, as well as information not given, are left to your own discretion.

Print a suitable title and scale centrally below the details.

[15]

QUESTION 5: TRUSSES

- 5.1 Refer to FIGURE 1, DIAGRAM SHEET 1 (attached) and draw to scale 1:20 a line diagram of the bolted steel roof truss. (6)
- 5.2 Draw to scale 1:5 typical bolted details at A and B.
- Use the following specifications:
Top and bottom boom: 100 × 100 × 10 hot rolled steel angle profiles
ALL internal members: 70 × 70 × 8 hot rolled steel angle profiles
ALL gusset plates: 10 mm thick
Use bolt hole centres of minimum 100 mm and edge distances of 35 mm.
ALL bolt holes are drilled on the centre lines of the angles and ALL bolts are M20.
Insert suitable dimensions. (14)
[20]

QUESTION 6: MATERIAL LIST

Make a typical material list, 180 mm × 70 mm, that can be used to itemise the materials of a detail drawing.

Insert suitable headings. [5]

TOTAL: 100

DIAGRAM SHEET 1
DIAGRAMVEL 1

MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE
STRUCTURAL STEEL DETAILING N5
MULTIDISCIPLINERE TEKENKANTOORPRAKTYK
STRUKTUURSTAALDETAILLERING N5

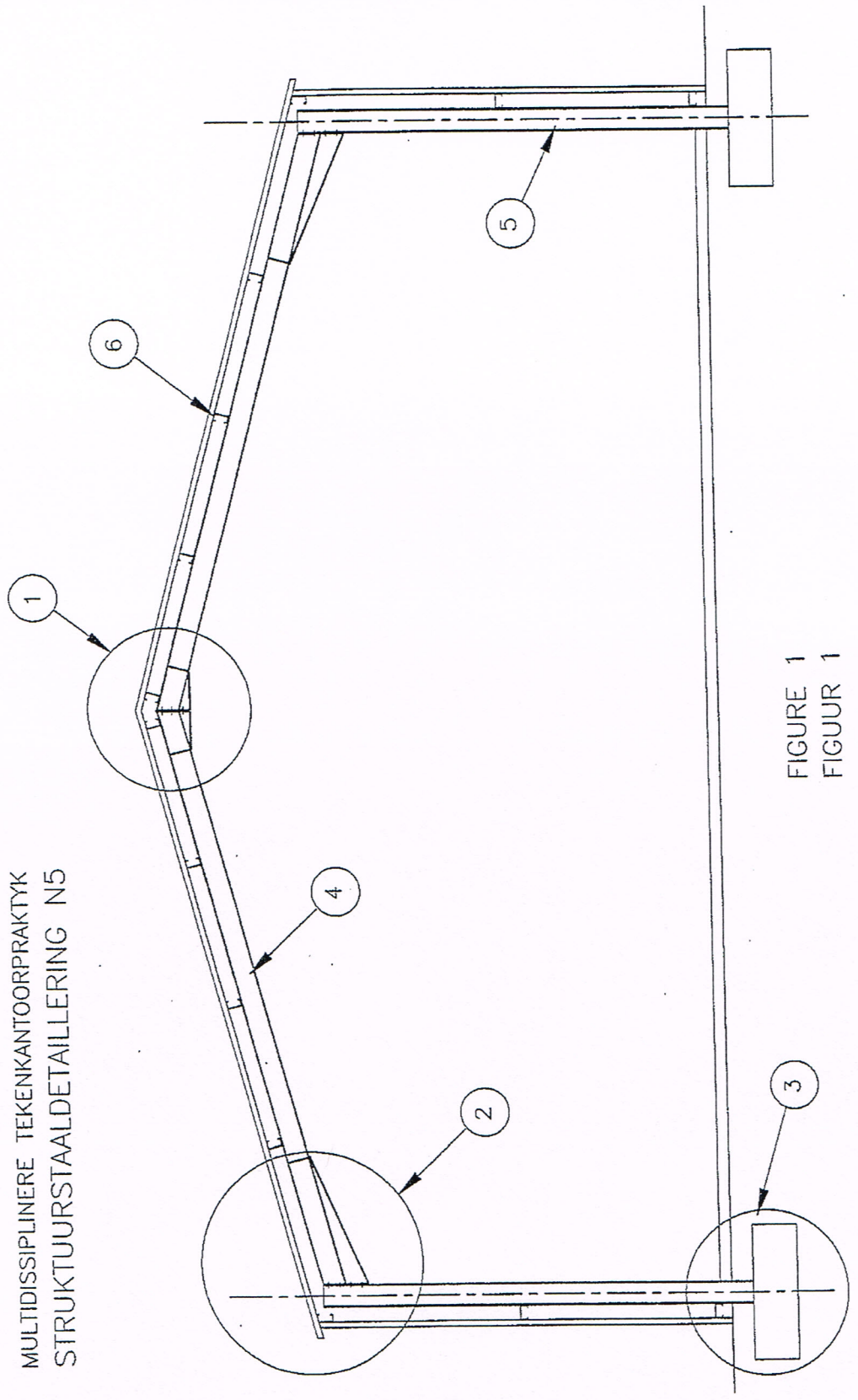


FIGURE 1
FIGUUR 1

MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE
STRUCTURAL STEEL DETAILING N5

DIAGRAM SHEET 2
DIAGRAMVEL 2

MULTIDISSIPLINERE TEKENKANTOORPRAKTYK
STRUKTUURSTAALDETAILLERING N5

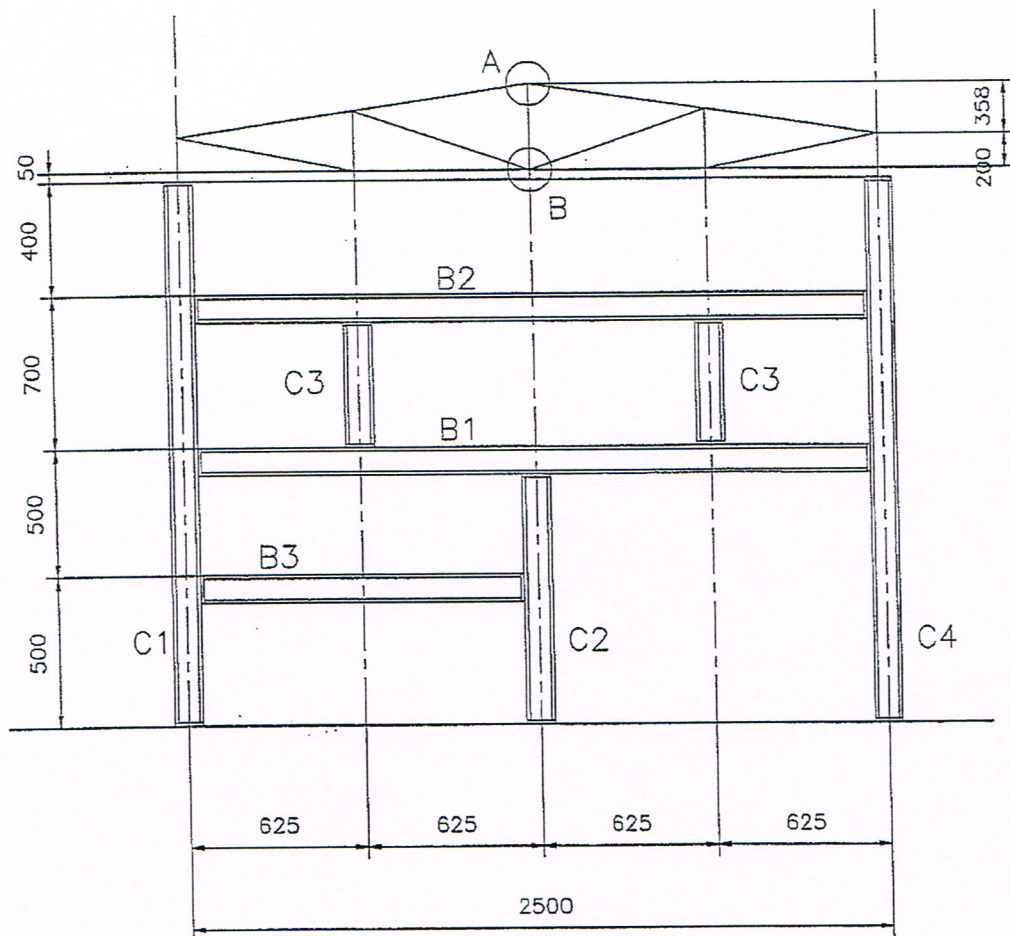


FIGURE 2

FIGUUR 2

B1 – UB 254 x 146 x 31 kg/m

B2 – UB 203 x 133 x 25 kg/m

C1, C2, C4 – UB 203 x 203 x 46 kg/m

C3 – UB 152 x 152 x 23 kg/m

END PLATES – 10 mm WITH 4 x M20 BOLTS

BASE PLATES – 20 mm WITH 2 x M20 BOLTS

ENDPLATE – 10 mm MET 4 x M20 BOUTE

VOETPLATE – 20 mm MET 2 x M20 BOUTE

MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE
STRUCTURAL STEEL DETAILING N5

DIAGRAM SHEET 3
DIAGRAMVEL 3

MULTIDISSIPLINERE TEKENKANTOORPRAKTYK
STRUKTUURSTAALDETAILLERING N5

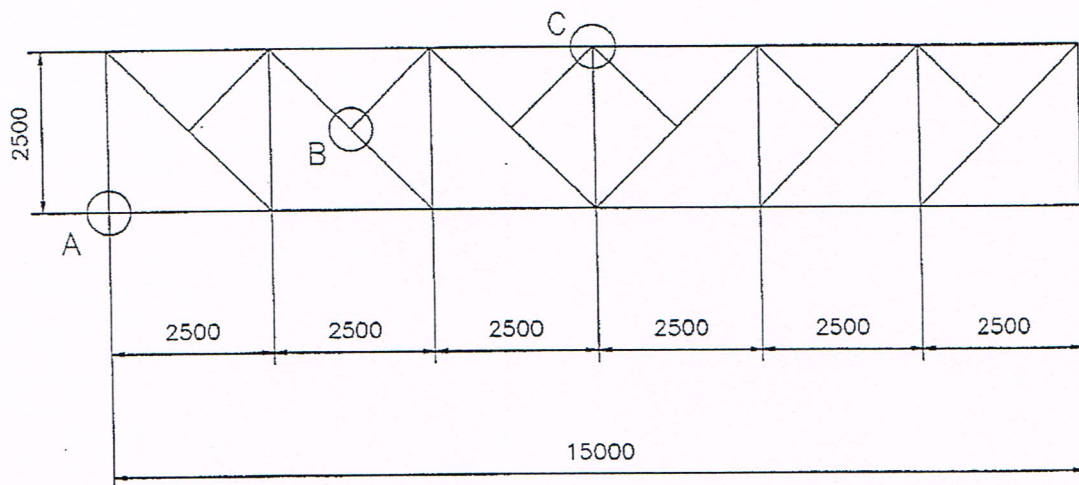


FIGURE 3
FIGUUR 3

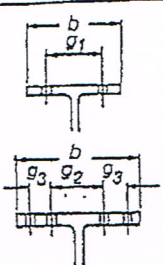
MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE STRUCTURAL STEEL DETAILING N5

MULTIDISSIPLINÈRE TEKENKANTOORPRAKTYK STRUKTUURSTAALDETAILLERING N5

information sheet / inligtingsvel

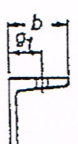
VOORGESTELDE BOUTGATPOSISIES

Table 1.12: Recommended gauges and backmarks



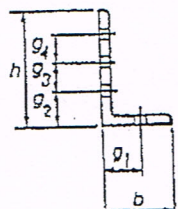
Recommended gauges, I and H-sections

b (mm)	Gauge (mm)			phi max (mm)
	g ₁	g ₂	g ₃	
64	32			11
73-82	40			12
89-91	50			12
102	54			16
133-146	70			20
152	90			20
165-191	90			24
203-254	140			24
305	140	120	60	24
368-406	140	140	75	24



Recommended backmarks, channels
BOUTGATPOSISIES
KANAALPROFIELE

b (mm)	g ₁ (mm)	phi max (mm)
38	22	8
45	25	10
50	28	12
54,55	28	16
60	35	16
64,65	35	20
70	40	20
75-85	45	20
90	50	24
95-110	55	24



Recommended backmarks, angles
BOUTGATPOSISIES HOEKPROFIELE

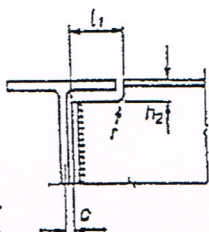
h or b (mm)	Backmark g ₁ (mm)	phi max. (mm)	h or b (mm)	Backmark (mm)				phi max. (mm)
				g ₁	g ₂	g ₃	g ₄	
25	15		90	50				24
30	17		100	50				24
35	20		120	60				24
40	33	8	120		45	50	—	16
45	25	10	125	65				24
50	28	12	125		45	50	—	20
60	35	16	150	75				24
65	35	20	150		55	55	—	20
70	40	20	200	—	75	75	—	24
75	45	20	200		55	55	55	20
80	45	20	200					

phi max. = maximum diameter of bolt or rivet.

phi maks = maksimum diameter van bout of klinknael

AFMETINGS VAN BALKKEPE

Table 1.14: Dimensions of Beam Notches



Dimension c is to face of end plate or angle cleat.
r = 10 mm minimum.
Afmeting c is tot teen endplaat of hoekyster klos.

Section	c	Notch	
		l ₁	l ₂
100 x 55 x 8	4	33	15
120 x 64 x 10	4	37	15
140 x 73 x 13	4	42	20
160 x 82 x 16	5	47	20
180 x 91 x 19	5	51	20
200 x 100 x 22	5	56	25
203 x 133 x 25	5	74	20
	30	74	20
254 x 146 x 31	5	81	20
	37	81	25
	43	81	25
305 x 102 x 25	5	57	20
	29	57	20
	33	57	25
305 x 165 x 41	5	91	25
	46	91	25
	64	81	25
356 x 171 x 45	5	94	25
	51	94	25
	57	94	30
	67	94	30
406 x 140 x 39	5	78	25
	46	78	25
406 x 178 x 54	6	97	25
	60	97	30
	67	97	30
457 x 191 x 67	6	103	25
	75	103	30
	82	103	30
	90	103	30
	98	103	35

I-sections (parallel flange)
I-profiel (parallel flens)