higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1670**(E)**(J26)T

NATIONAL CERTIFICATE: MULTI-DISCIPLINARY DRAWING OFFICE PRACTICE

STRUCTURAL STEEL DETAILING

(8090225)

26 July 2018 (X-Paper)
09:00–13:00

CLOSED-BOOK EXAMINATION

REQUIREMENTS: A3 drawing sheets

Candidates need drawing instruments.

This question paper consists of 5 pages, 2 diagram sheets and 2 information sheets.

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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 ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use both sides of the DRAWING SHEETS.
5. Draw a 15 mm border around the DRAWING SHEETS (both sides).
6. Do ALL drawing work, including candidate information, in pencil.
7. ALL drawing work must comply with SABS 10111-1990.
8. A balanced layout is very important and candidates will be penalised for bad planning.
9. Computers may be used as drawings aids.
10. Write neatly and legibly.

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QUESTION 1: INTRODUCTION

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Welding symbols are developed by the Institute of Welding.

1.2 The reference line of a welding symbol identifies the side of the joint to be welded.

1.3 Welding symbols with a vertical line always show the vertical line on the right side.

1.4 If no length dimension is specified on the welding symbol, the welder may make the weld any length.

1.5 Welding and allied processes are abbreviated in the tail with letter designations.

1.6 The melt-through symbol is a supplementary symbol.

1.7 The arrow of the welding symbol always points to the joint member to be prepared if edge preparation is indicated.

1.8 Brazing symbols are similar to welding symbols.

1.9 A supplementary symbol is a symbol that further defines the welding operation to be completed.

1.10 The dimensions of a welding symbol specify the weld size, number and location.

(10 × 1) **[10]**

QUESTION 2: BEAMS

FIGURE 1, DIAGRAM SHEET 1 (attached), shows a view of a steel structure.

Draw, to scale 1 : 10, fully detailed drawings of the beams marked B1 and B2. Supply enough information for the manufacturing of the beams in a structural-steel workshop. ALL plates are 10 mm thick and ALL bolts are M20. Information NOT given is left to your discretion.

Show the following:

2.1 Column centres

2.2 Lengths and sizes of beams

2.3 Dimensions of the beams over end plates

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2.4 Dimensions for the drilling of 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 **[30]**

QUESTION 3: COLUMNS

Refer to FIGURE 1, DIAGRAM SHEET 1 (attached).

Draw, to scale 1 : 10, fully detailed drawings of the columns marked C2 and C4. Supply enough information for the manufacturing of the columns in a workshop. ALL plates are 10 mm thick and ALL bolts are M20.

Show the following:

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 bolt holes

3.4 View with dimensions of cap and base plates **[25]**

QUESTION 4: LATTICED GIRDERS

FIGURE 2, DIAGRAM SHEET 2 (attached), shows a line diagram of a typical welded 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: 120 × 120 × 10 rolled steel angle profiles
- ALL internal members: 90 × 90 × 10 rolled steel angle profiles
- ALL gusset plates: 10 mm thick

Do NOT insert any dimensions. Gusset plate sizes, as well as information NOT given, are left to your discretion. Print a suitable title and scale centred below the details. **[15]**

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QUESTION 5: TRUSSES

Refer to FIGURE 1, DIAGRAM SHEET 1 (attached).

5.1 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. (14)

Specifications:

- Top and bottom boom: 100 × 100 × 10 hot-rolled steel angle profiles
- ALL internal members: 80 × 80 × 10 hot-rolled steel angle profiles
- Gusset plates: 10 mm thick
- Bolt hole centres: 100 mm
- Edge distances: 35 mm

ALL bolt holes are drilled on the centre lines of the angles and ALL bolts are M20. Insert suitable dimensions. **[20]**

TOTAL: 100

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DIAGRAM SHEET 1

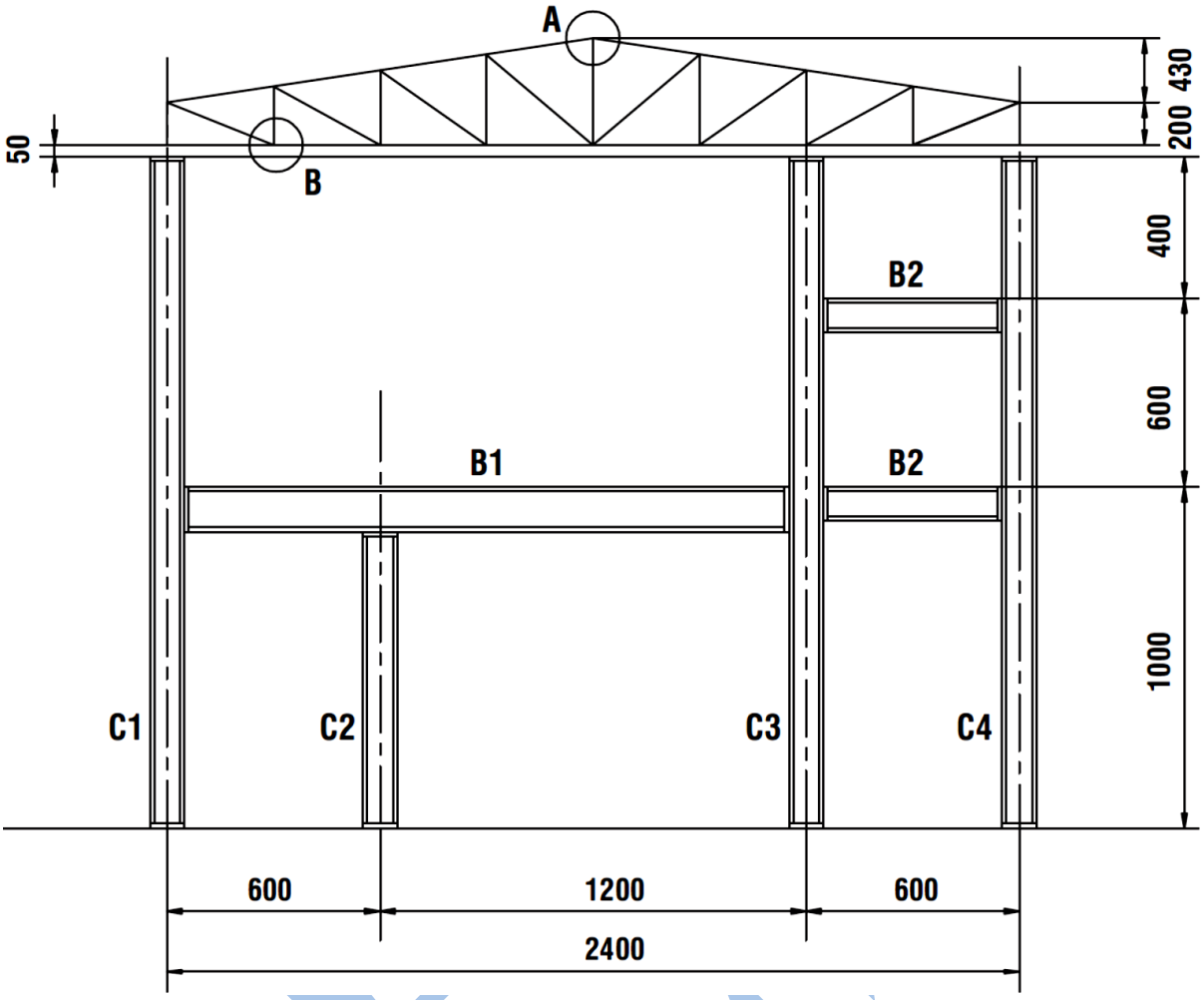


FIGURE 1

Beams	B1 – UB 254 × 146 × 31 kg/m	B2 – UB 254 × 146 × 31 kg/m
Columns	C1, C2, C3, C4 – UB 203 × 203 × 46 kg/m	
End plates	10 mm with 4 × M20 bolts	
Base plates	20 mm with 2 × M20 bolts	

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DIAGRAM SHEET 2

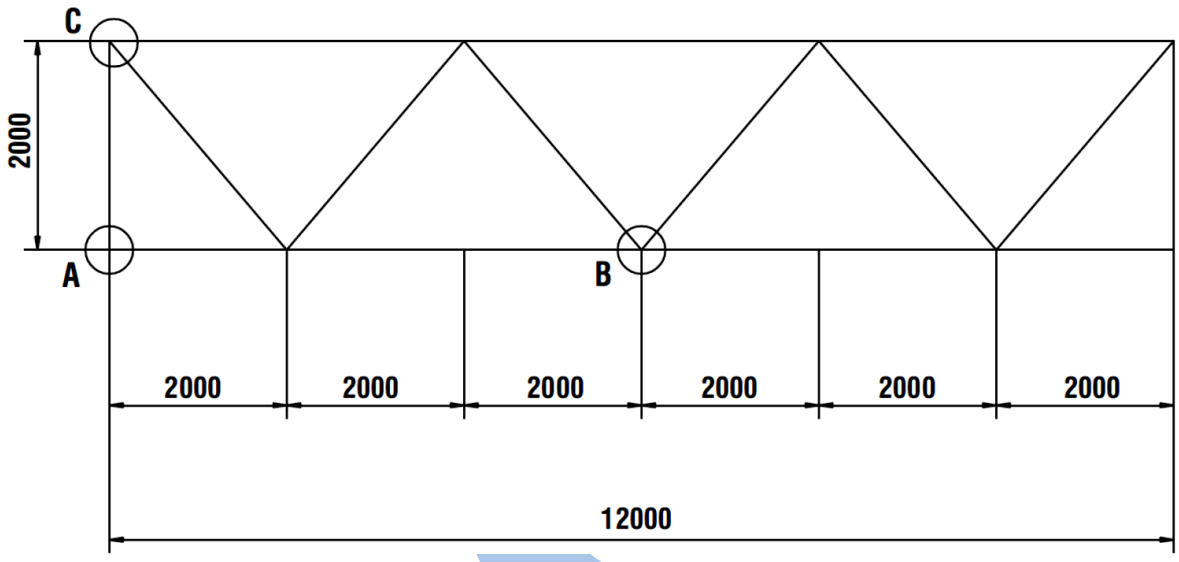
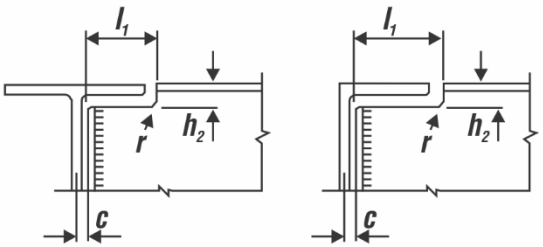


FIGURE 2

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INFORMATION SHEET 1



Dimension c is to face of end plate or angle cleat.
r = 10mm minimum
Dimensions are in mm.

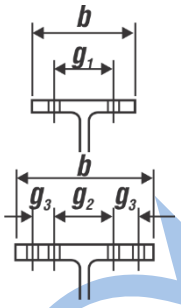
	Section	c	Notch			Section	c	Notch	
			l_1	h_1				l_1	h_1
I - Sections (parallel flange)	100 x 55 x 8	4	33	15	I - Sections (parallel flange)	533 x 210 x 82	4	33	15
	120 x 64 x 19	4	37	15		93	4	37	15
	140 x 73 x 13	4	42	20		101	4	42	20
	160 x 82 x 16	5	47	20		109	5	47	20
	180 x 91 x 19	5	51	20		122	5	51	20
	200 x 100 x 22	5	56	25		610 x 229 x 101	5	56	25
	203 x 133 x 25	5	74	20		113	5	74	20
	30	5	74	20		125	5	74	20
	254 x 146 x 31	5	81	20		140	5	81	20
	37	5	81	25	I - Sections (taper flange)	127 x 76 x 13	5	81	25
	43	6	81	25		152 x 89 x 17	6	81	25
	305 x 102 x 25	5	57	25		178 x 102 x 22	5	57	25
	29	5	57	20		203 x 102 x 25	5	57	20
	33	5	57	20		52	5	57	20
	41	5	91	25		254 x 152 x 59	5	91	25
	46	5	91	25		305 x 152 x 66	5	91	25
	54	6	91	25	Channels	100 x 50 x 11	6	91	25
	356 x 171 x 45	5	94	25		120 x 55 x 13	5	94	25
	51	5	94	25		140 x 60 x 16	5	94	25
	57	6	94	30		160x 65 x 19	6	94	30
	67	7	94	30		180 x 70 x 22	7	94	30
	104 x 140 x 39	5	78	25		200 x 75 x 25	5	78	25
	46	5	78	25		220 x 80 x 29	5	78	25
	54	6	97	25		240 x 85 x 32	6	97	25
	60	6	97	30		260 x 90 x 38	6	97	30
	67	6	97	30		280 x 95 x 42	6	97	30
	457 x 191 x 67	6	103	25		300 x 100 x 46	6	103	25
	75	7	103	30		76 x 38 x 7	7	103	30
	82	7	103	30		127 x 64 x 15	7	103	30
	90	7	103	30		152 x 75 x 18	7	103	30
	98	8	103	35		178 x 54 x 15	8	103	35
H - Sections	152 x 152 x 23	5	84	20		381 x 102 x 55	5	84	20
	30	5	84	20	H - Sections	254 x 254 x 107	5	84	20
	37	6	84	20		132	6	84	20
	203 x 203 x 45	6	111	25		167	6	111	25
	52	6	111	25		305 x 305 x 97	6	111	25
	60	7	111	30		118	7	111	30
	72	7	111	30		137	7	111	30
	86	8	111	35		158	8	111	35
	254 x 254 x 73	6	138	30		198	6	138	30
	89	7	138	35		240	7	138	35

DIMENSIONS OF BEAM NOTCHES

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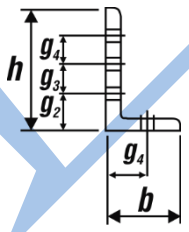
INFORMATION SHEET 2

Recommended gauges and back marks for I- and H-sections



b (mm)	Gauge (mm)			Ø max. (mm)
	g1	g2	g3	
64	32	120	60	12
73–82	40	140	75	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			24
368–406	140			24

Recommended gauges and back marks for angles



h or *b* (mm)	Back mark *g1* (mm)	Ø max. (mm)	*h* or *b* (mm)	Back mark (mm)				*h* or *b* (mm)
				g1	g2	g3	g4	
25	15	8	90	50	45	45		24
30	17	10	100	50				24
35	20		120	60				24
40	22		120					16
45	25		125	65				24

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