



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

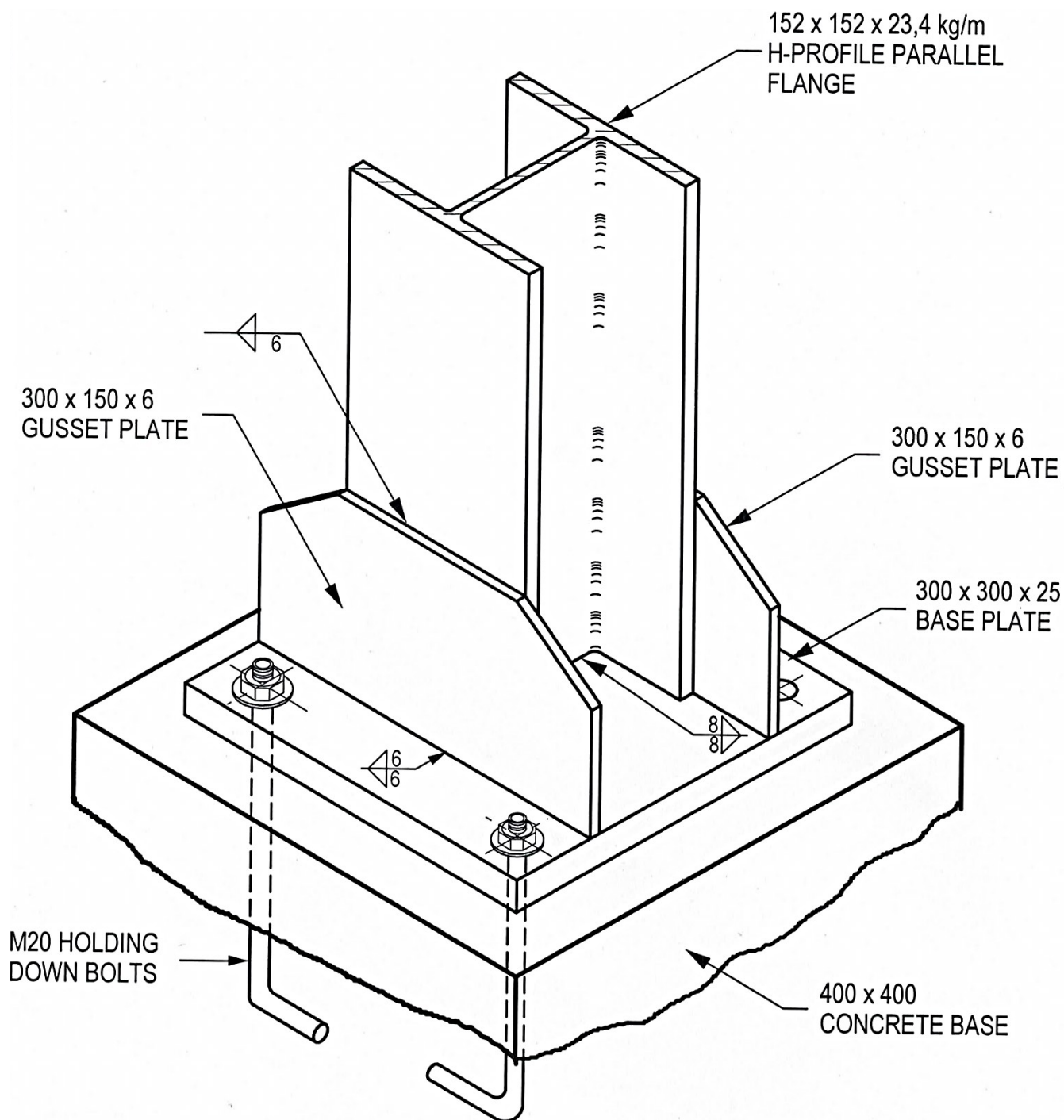
NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N5

17 April 2020

This marking guideline consists of 10 pages.

QUESTION 1

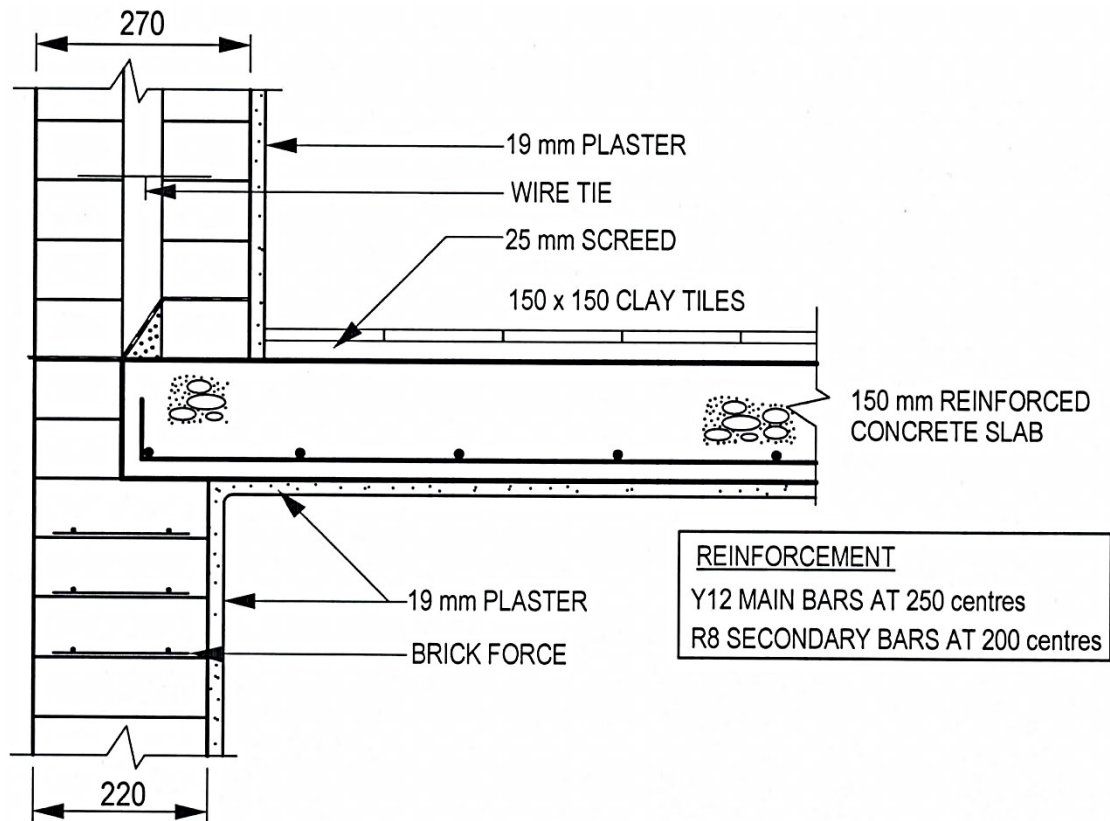


H-PROFILE STEEL STANCHION WELDED TO A BASE PLATE
SCALE 1:5

[18]

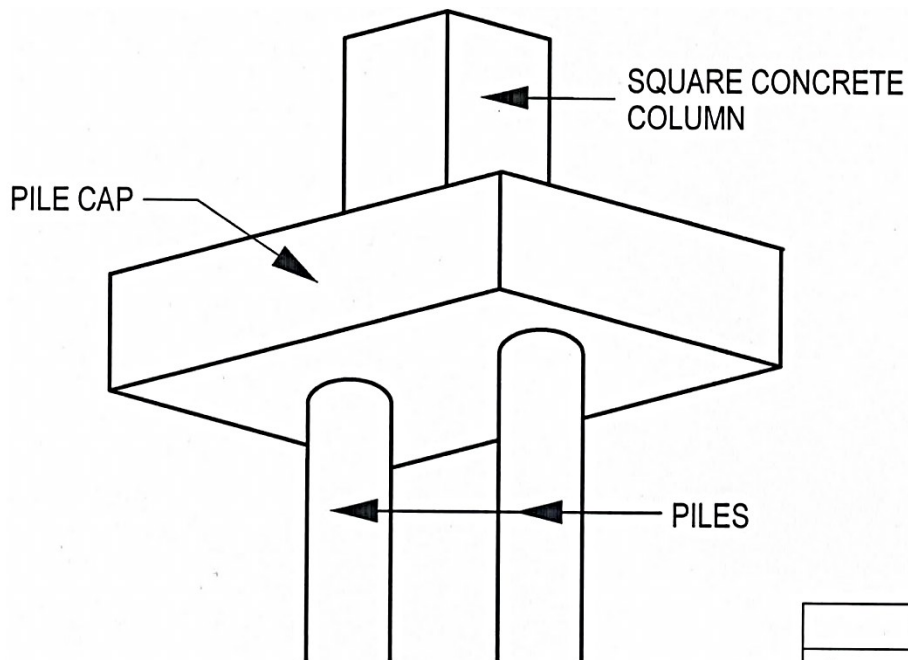
QUESTION 2

2.1



(12)

2.2



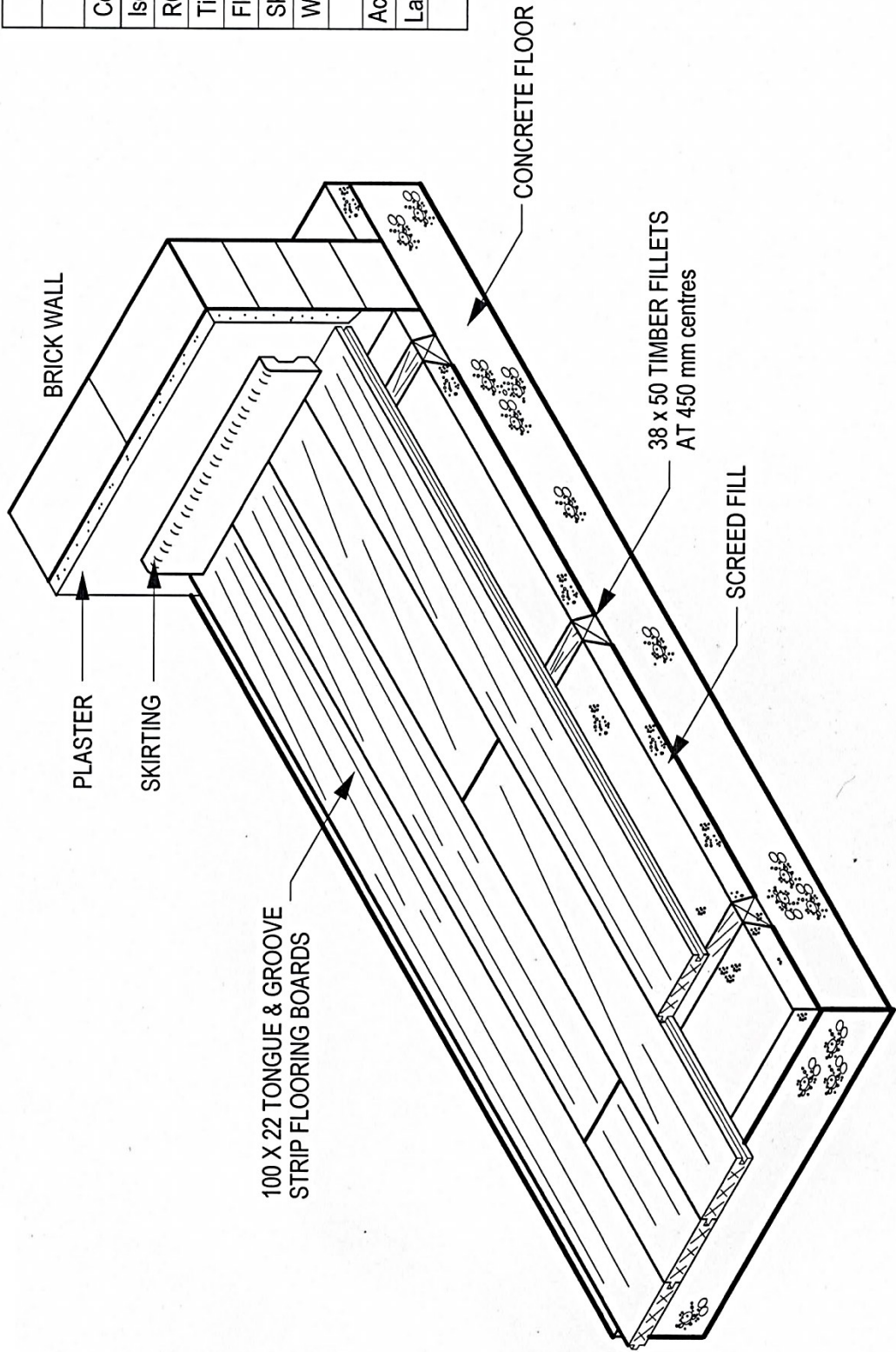
QUESTION 2.1

Accuracy:
All parts in place 3 marks

(3)
[15]

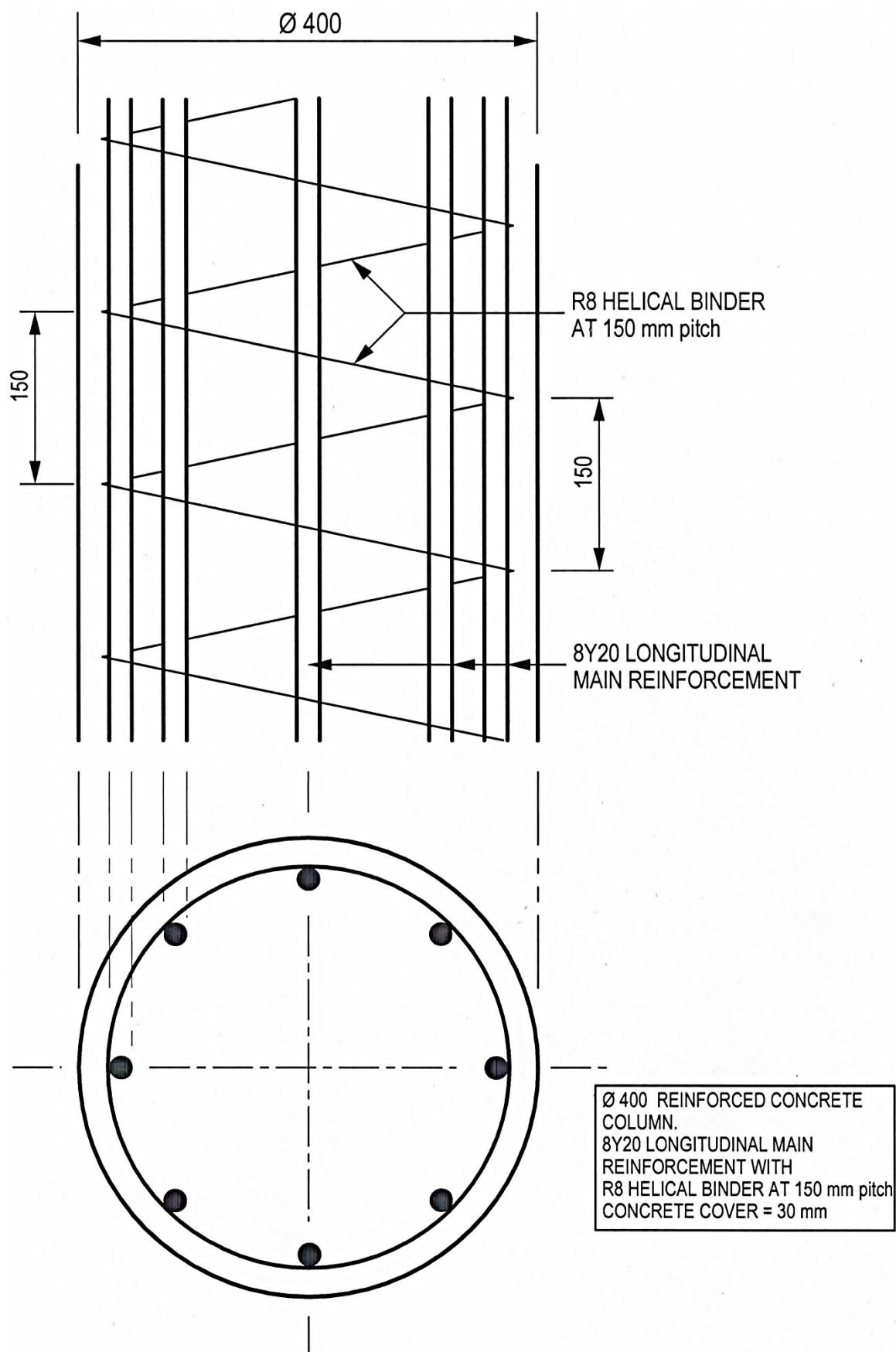
QUESTION 3

QUESTION 3		
MARK ALLOCATION		
Correctness		9
Iso view	1	
RC floor	1	
Timber fillets	2	
Floor boards	2	
Skirting	1	
Wall & plaster	2	
Accuracy		2
Labels		1
Total		12



[12]

QUESTION 4



SECTIONAL FRONT VIEW AND TOP VIEW OF A CIRCULAR COLUMN
SCALE 1:5

[12]

QUESTION 5

5.1 Diameter of the bolt

$$\text{Stress} = \text{Load} / \text{Area} \times n$$

$$315 \text{ N/mm}^2 = \frac{96 \times 10^3}{(d \times t)3} \checkmark$$

$$D = \frac{96 \times 10^3}{315 \times 8 \times 3} \checkmark \checkmark$$

$$\text{Diameter of bolt} = 12,7 \text{ mm} - \text{use M16 bolts} \checkmark \quad (4)$$

5.2 Bearing stress

$$\text{Stress} = \text{Load} / \text{Area} \times n$$

$$\text{Bearing stress} = \frac{210 \times 10^3}{(d \times t)3} \checkmark$$

$$= \frac{210 \times 10^3}{12 \times 8 \times 3} \checkmark \checkmark$$

$$= 729,17 \text{ MPa} \checkmark \quad (4)$$

5.3 Force in tearing

$$\text{Load} = \text{area} \times \text{stress}$$

$$F_s = A_t \times f_t \times n$$

$$\text{Force in tearing} = [(B \times T) - n (d \times t)] \times f_t$$

$$= [(144 \times 8) - 3(18 \times 6)] \times 160 \text{ N/mm}^2 \checkmark \checkmark$$

$$= [(1\ 152) - 3(108)] \times 160 \text{ N/mm}^2$$

$$= [1\ 152 - 324] \times 160 \text{ N/mm}^2$$

$$= 828 \times 160 \text{ N/mm}^2 \checkmark$$

$$= 132,48 \text{ kN} \checkmark \quad (4)$$

[12]

QUESTION 6**6.1 Areas**

$$\text{Area 1: } 30 \times 50 = 1\,500$$

$$\text{Area 2: } 30 \times 50 = 1\,500$$

$$\text{Area 3: } 120 \times 40 = 4\,800$$

$$\text{Area 4: } \frac{1}{2} 60 \times 69 = 2\,070$$

$$\text{Total area} = 9\,870$$

Neutral axis from A-B

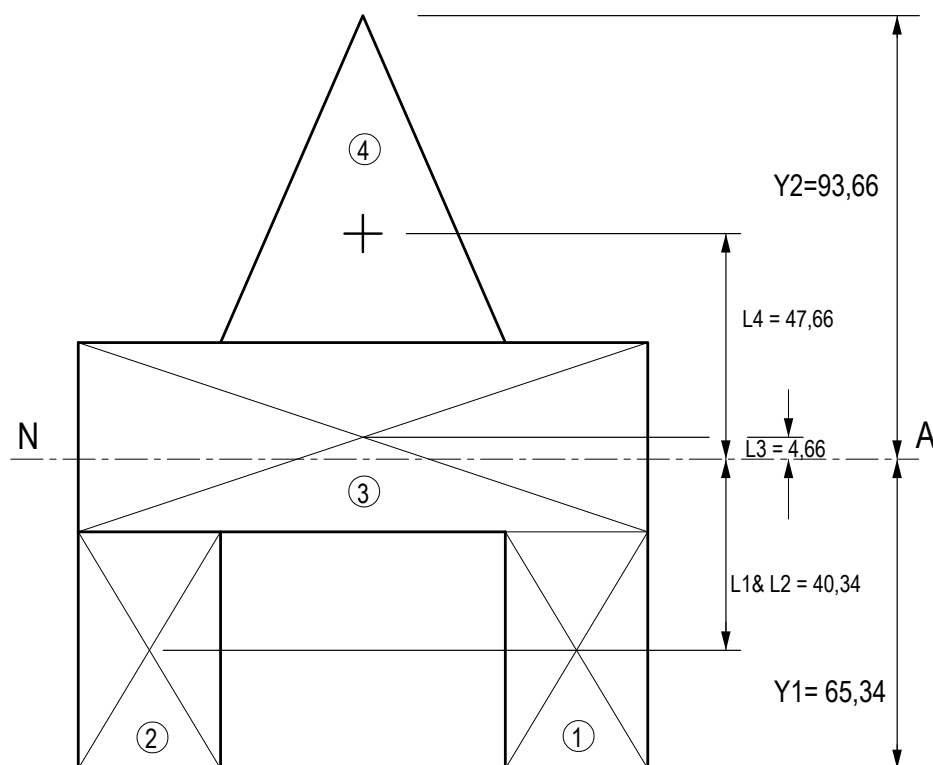
$$9\,870 \times y_1 = 2(1\,500 \times 25) + (4\,800 \times 70) + (2\,070 \times 113)$$

$$Y_1 = \frac{75\,000 + 336\,000 + 233\,910}{9\,870}$$

$$Y_1 = \frac{644\,910}{9\,870}$$

$$Y_1 = 65,34 \text{ mm}$$

(5)



6.2 Second moment of area

$$I_{xx \text{ Total}} = 2 \left(\frac{bd^3}{12} + AL^2 \right) + \left(\frac{bd^3}{12} + AL^2 \right) + \left(\frac{bd^3}{36} + AL^2 \right)$$

$$I_{xx \text{ 1\&2}} = 2 \left(\frac{30 \times 50^3}{12} + 30 \times 50 \times 40,34^2 \right)$$

$$= 2 (312\,500 + 2\,440\,973,3)$$

$$= 5\,506\,946,8 \text{ mm}^4 \checkmark\checkmark$$

$$I_{xx \text{ 3}} = \left(\frac{120 \times 40^3}{12} + 120 \times 40 \times 4,66^2 \right)$$

$$= (640\,000 + 104\,234,88)$$

$$= 744\,234,88 \text{ mm}^4 \checkmark\checkmark$$

$$I_{xx \text{ 4}} = \left(\frac{60 \times 69^3}{36} + \frac{1}{2} 60 \times 69 \times 47,66^2 \right)$$

$$= (547\,515 + 4\,701\,954,49)$$

$$= 5\,249\,469,49 \text{ mm}^4 \checkmark\checkmark$$

$$I_{xx \text{ Total}} = 11\,500\,651,17 \text{ mm}^4 \checkmark$$

(7)

6.3 Profile modulus (Z)

$$Z = \frac{I}{Y}$$

$$= \frac{11\,500\,651,17 \text{ mm}^4}{65,34 \text{ mm}} \checkmark$$

$$= 176\,012,41 \text{ mm}^3 \checkmark$$

$$= 176,01 \times 10^{-6} \text{ m}^3$$

(2)

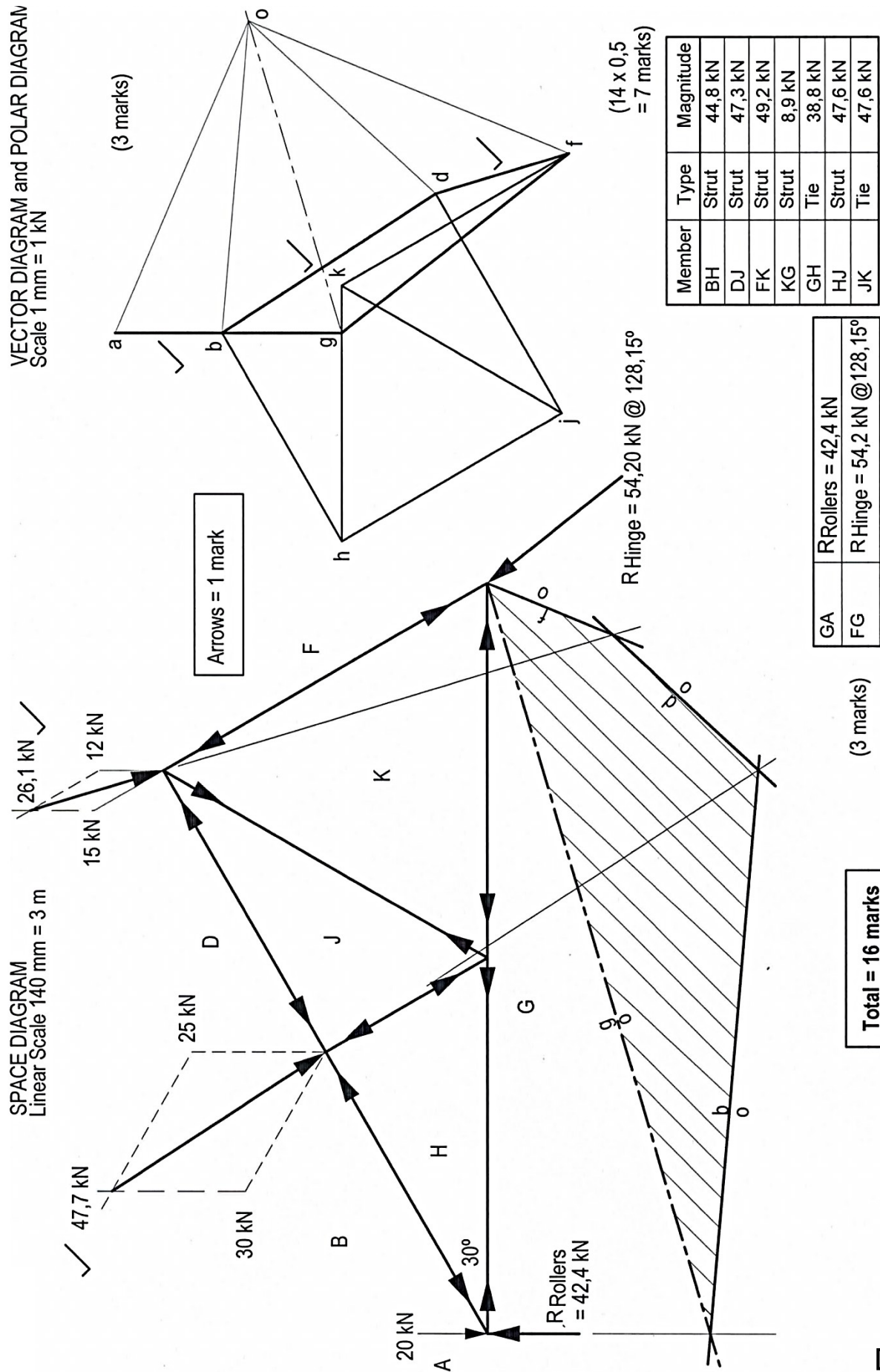
6.4 Select suitable I-Taper flange beam

$$\text{Use } 203 \times 102 \times 25,3 \text{ kg/m } (Z_e = 226,1 \times 10^{-6} \text{ m}^3) \checkmark$$

(1)

[15]

QUESTION 7



MARK SHEET

BUILDING AND STRUCTURAL CONSTRUCTION N5

QUESTION 1		
MARK ALLOCATION		
Correctness:		9
Iso view corr.	1	
Column	2	
Base Plate	1	
Gussets	2	
2 Bolts	2	
Concrete base	1	
Accuracy		4
Weld symbols		2
Labels		2
Title		1
Total		18

NOTE:

Column and base plate
must be centralised
on the concrete base

QUESTION 2.1		
MARK ALLOCATION		
CORRECTNESS:		9
Brick walls corr.	2	
RC Slab	1	
Reinforcement	2	
Floor finishes	2	
Plaster	2	
Accuracy		2
Labels		1
Total		12

QUESTION 4		
MARK ALLOCATION		
Correctness:		7
Top view	1	
Sectional view	2	
All reinforcement	4	
Accuracy		
Dimensions		2
Labels		2
Total		1
		12

TOTAL: 100