higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N5

2 DECEMBER 2019

This marking guideline consists of 10 pages.

QUESTION 1

1.1 AREAS

$\text{Area 1: } 15 \times 90 = 1\,350$

$\text{Area 2: } 10 \times 20 = 200$

$\text{Area 3: } 10 \times 20 = 200$

$\underline{\text{Area 4: } 60 \times 8 = 480}$

$\text{Total area} = 2\,230$✓ (1)

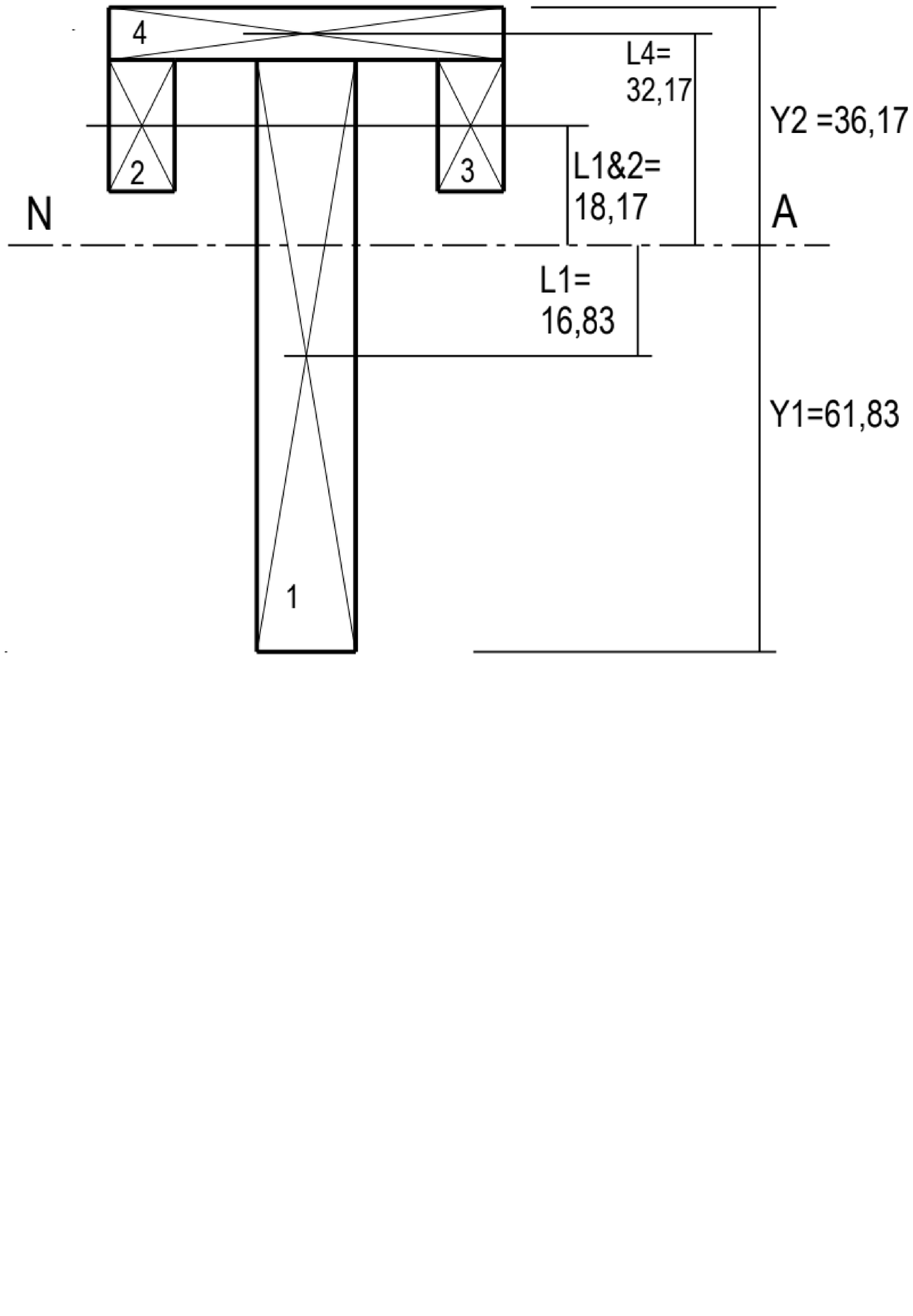
NEUTRAL AXIS FROM A-B

$2\,230 \text{ x } y_1 = (1\,350 \times 45) + 2(200 \times 80) + (480 \times 94)$ ✓✓

$Y_1 = \dfrac{60\,750 + 32\,000 + 45\,120}{2\,230}$ ✓

$Y_1 = \dfrac{137\,870}{2\,230}$

$Y_1 = 61{,}82 \text{ mm}$ ✓ (4)



1.2 SECOND MOMENT OF AREA

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

$$I_{xx\ 1} = \left(\frac{15\ x\ 90^3}{12} + 15 \times 90 \times 16{,}83^2\right)$$
$$= (911\ 250 + 382\ 386{,}02) = 1\ 293\ 636{,}02\ mm^4\ \checkmark\checkmark$$

$$I_{xx\ 2\&3} = 2\left(\frac{10\ x\ 20^3}{12} + 10 \times 20 \times 18{,}17^2\right)$$
$$= 2(6\ 666{,}67 + 66\ 029{,}78) = 145\ 392{,}89\ mm^4\ \checkmark\checkmark$$

$$I_{xx\ 4} = \left(\frac{60\ x\ 8^3}{12} + 60 \times 8 \times 32{,}17^2\right)$$
$$= (2\ 560 + 496\ 756{,}27) = 499\ 316{,}27\ mm^4\ \checkmark\checkmark$$

I_{xx} TOTAL $= 1\ 938\ 345{,}18\ mm^4\ \checkmark$ (7)

1.3 THE SECTION MODULUS (Z) ABOUT THE X-X AXIS

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

$$Z = \frac{1\ 938\ 345{,}18\ mm4}{61{,}83\ mm}\ \checkmark$$

$Z = 31\ 349{,}59\ mm^3\ \checkmark$ $31{,}349 \times 10^{-6}\ m^3$ (2)

1.4 BENDING MOMENT (Bending stress = 145 MPa)

$$\frac{m}{I} = \frac{f}{Y}$$

$$M = \frac{1\ 938\ 345{,}18\ x\ 145}{61{,}83\ mm}\ \checkmark$$

$M = 4\ 545\ 690{,}62$ Nmm

$M = 4{,}547$ kNm✓ (2)

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