UNIVERSITY OF ASIA PACIFIC
Department of Civil Engineering

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CE 416: Structural Engineering Sessional III (Section-B)

Assignment

On

Topic: Design of Folded Plate

Submitted by

Reg. No	Student's Name	Remarks
20105084	Lamia Ahmed Sadia	

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Submitted to
Sadia Salam
Lecture, Dept. of Civil Engineering,
UAP

"Design of Folded Plate"

A folded plate with two folds AB and BC is subjected to moments in the plane of plates. Using the following data, calculate the stress in the folded plate.

Given Data

Thickness of plates = (75 + 84) = 159 mm

Depth of plates = (1.5 + 0.04 × 84) = 5.04 m = 5040 mm

Moment in plates = (200 + 5 × 84) = 620 KN-m

$$Z_1 = Z_2 = \frac{t \times h^2}{6} = \frac{159 \times 5040^2}{6} = 673.14 \times 10^6 \text{ mm}^3$$

$$A_1 = A_2 = t \times h = 159 \times 5060 = 804.54 \times 10^3 \text{ mm}^2$$

$$\frac{M_1}{Z_1} = \frac{M_2}{Z_2} = \frac{620 \times 10^6}{673.14 \times 10^6} = 0.92 \text{ N/mm}^2$$

Edge Shear force:

$$\frac{T_A}{A_1} + 2T_B \times \left[\frac{1}{A_1} + \frac{1}{A_2}\right] + \frac{T_C}{A_2} = -\frac{1}{2} \times \left[\frac{M_1}{Z_1} + \frac{M_2}{Z_2}\right]$$

$$\Rightarrow 2T_B \times \left[\frac{1}{A_1} + \frac{1}{A_2}\right] = -\frac{1}{2} \times \left[\frac{M_1}{Z_1} + \frac{M_2}{Z_2}\right]$$

$$\Rightarrow 2 \times T_B \times \left[\frac{1}{804.54 \times 10^3} + \frac{1}{804.54 \times 10^3}\right] = -\frac{1}{2} \times [0.92 + 0.92]$$

$$\therefore T_B = -185044.2 \text{ N}$$

Resultant Stresses:

$$\sigma_B = \frac{m_1}{z_1} + \frac{T_B}{A_1} + \frac{T_B \cdot h_1}{2 z_1}$$

$$= 0.92 + \frac{-185044.2}{804.54 \times 10^3} + \frac{-185044.2 \times 5040}{2 \times 673.44 \times 10^6}$$

$$= 0$$

$$\sigma_A = -\frac{m_1}{z_1} + \frac{T_B}{A_1} - \frac{T_B \cdot h_1}{2 z_1}$$

$$= -0.92 + \frac{-185044.2}{804.54 \times 10^3} - \frac{-185044.2 \times 5040}{2 \times 673.44 \times 10^6}$$

$$= -0.46 \text{ N/mm}^2 \text{ (tension)}$$

$$\sigma_C = \frac{m_2}{z_2} - \frac{T_B}{A_2} + \frac{T_B \cdot h_2}{2 z_2}$$

$$= 0.92 - \frac{-185044.2}{804.54 \times 10^3} + \frac{-185044.2 \times 5040}{2 \times 673.44 \times 10^6}$$

$$= 0.46 \text{ N/mm}^2 \text{ (compression)}$$