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INVERTED CHANNEL FLOOR SYSTEM UNDER UNIFORMLY DISTRIBUTED LOAD

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บทคัดย่อ

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ABSTRACT

A complete solution of stress resultants and displacements of inverted channel floor system, simply supported at the ends and subjected to uniformly distributed load, is presented. The problem is solved by the theory of thin plates under the assumption that the vertical and horizontal plates are thin plates subjected to combined bending and in-plane forces. Numerical examples are given and the results are shown in the form of figures to show the effect of various geometric parameters. Comparisons of the results between the proposed method and the simple bending theory are presented and the accuracy of the effective width criteria in conventional flexural analysis is evaluated.

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LIST OF SYMBOLS

- A = constant of integration for horizontal plate
- a = distant from mid-width of horizontal plate to mid-plane of vertical plate
- B = constant of integration for vertical plate
- b = span length
- C = constant of integration for horizontal plate
- c = distant from mid-width of vertical plate to mid-plane of horizontal plate
- D = flexural rigidity of plate
- E = modulus of elasticity
- K = load factor in bending analysis
- L = load factor in membrane analysis
- M_x = bending moment per unit length of section of a plate perpendicular to x-axis
- M_y = bending moment per unit length of section of a plate perpendicular to y-axis
- M_{xy} = twisting moment per unit length of section of a plate perpendicular to x-axis
- m = summation index
- N_x = normal force per unit length of section of a plate perpendicular to x-axis
- N_y = normal force per unit length of section of a plate perpendicular to y-axis
- N_{xy} = membrane shearing force per unit length of section of a plate perpendicular to x-axis

n = summation index

Q_x = shearing force parallel to z-axis per unit length of section of a plate perpendicular to x-axis

Q_y = shearing force parallel to z-axis per unit length of section of a plate perpendicular to y-axis

t = thickness of a plate

u = component of displacement in x-direction

V_x = supplemented shearing force parallel to z-axis per unit length of section of a plate perpendicular to x-axis

V_y = supplemented shearing force parallel to z-axis per unit length of section of a plate perpendicular to y-axis

v = component of displacement in y-direction

w = component of displacement in z-direction

$x, y, z,$ = rectangular coordinates

∇^4 = biharmonic operator

ν = Poisson's ratio

ϕ = Airy's stress function

The subscripts d and w refer to horizontal and vertical plates respectively.