การวิเคราะห์และทดลองคานรูปตัวเอสและรูปตัวแซดที่มีปลายทั้งสองข้างยึดแน่น

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ANALYTICAL AND EXPERIMENTAL INVESTIGATION

OF

S- AND Z-BEAMS WITH FIXED SUPPORTS

Mr. Khoollapath Vathanakhool

A Thesis Submitted in Partial Fulfillment of the Requirements

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บทคัดย่อ

ภาคแรกของวิทยานิพนธ์ฉบับนี้เสนอการวิเคราะห์คานคอนกรีตเสริมเหล็กทรวดทรงเอสและแซด โดยได้ดำเนินการสร้างสูตรปัจจัยลัพธ์ และได้แสดงตรรชนีสัมประสิทธิ์ปัจจัยลัพธ์สำคัญเพื่ออำนวยความรวดเร็วในการคำนวณออกแบบคานทรวดทรงดังกล่าว ตัวอย่างการคำนวณออกแบบที่จัดเสนอไว้อาศัยเกณฑ์ของสมาคมคอนกรีตอเมริกัน (ACI) ที่ว่าด้วยชิ้นส่วนโครงสร้างภายใต้อิทธิพลร่วมของโมเมนต์ดัด โมเมนต์บิด และแรงเฉือน

ภาคที่สองของเอกสารวิจัยฉบับนี้เสนอรายละเอียดการทดลองและผลการทดลองหุ่นจำลองมาตราส่วนกึ่งของคานที่คำนวณออกแบบไว้ในตัวอย่าง โดยให้วิจารณความและสรุปความไว้ด้วย

Thesis Title ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF S- AND Z-BEAMS WITH FIXED SUPPORTS

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SYNOPSIS

A structural enquiry, both analytical and experimental, into symmetric S- and Z-beams with fixed supports, of reinforced concrete, is conducted. Resultants governing each type of beam are formulated and graphical indices facilitating rapid analysis and design developed. Presented design examples assimilate the American Concrete Institute's criteria for proportioning of a member under the combined action of bending, torsion, and shear. A test of half-scale models representing the beams focussed in the design examples is delineated.

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NOTATION

b = width of beam section.

C = torsional constant for rectangular section.

E = modulus of elasticity of beam material.

G = modulus of rigidity of beam material.

I = moment of inertia of beam section.

J = polar moment of inertia of beam section.

k = Z-beam length ratio
$= \frac{L_1}{L_2}$.

L_1 = length of each longitudinal part of Z-beam.

L_2 = length of transverse part of Z-beam.

M = bending moment.

M_A = bending moment at support.

M_o = redundant bending moment at centre-span.

m = ratio of flexural rigidity to torsional rigidity
$= \frac{EI}{GJ}$.

P = fictitious vertical concentrated load.

R = radius of curve of S-beam.

T = torsional moment.

T_A = torsional moment at support.

T_o = redundant torsional moment at centre-span.

t = thickness of beam.

V_A = shearing force at support.

w = intensity of uniform line load.

NOTATION (Cont'd)

x = longitudinal variable distance.

y = transverse variable distance.

Δ_o = vertical deflection at centre-span.

α = variable angle.

θ = variable angle measured from centre-span.

ϕ = subtending angle measured from centre-span to support.

ψ_o = rotation at centre-span.

τ_o = angle of twist of beam section at centre-span.

μ = Poisson's ratio.

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