

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

APPROXIMATE ANALYSIS OF
TALL-FRAMED BUILDINGS

B.6 99555555

BY

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A THESIS

Submitted in partial fulfillment of
the requirements of the degree of Master in
Structural Engineering

2185
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CAIRO - 1989

S T A T E M E N T

This dissertation is submitted to Ain Shams University for the degree of Master in Structural Engineering.

The work included in this thesis was carried out by the author in the Department of Structural Engineering, Ain Shams University, from October 1985 to June 1989.

No part of this thesis has been submitted for a degree or a qualification at any other University or Institution.

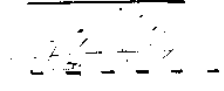
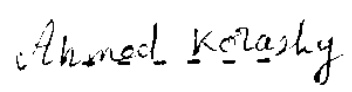
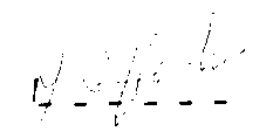
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ACKNOWLEDGEMENT

The author wishes to express his deepest appreciation and gratitude to Prof. Dr. Mahmoud Galal Hashish, Professor of Structural Engineering Department, Faculty of Engineering, Ain Shams University for his indispensable assistance and contributions during the course of development of the thesis.

The author also wishes to acknowledge the fruitful co-operation of the department of systems of the Engineering Consultant's Group. The author also extends his appreciation to Eng. Ashraf H. Allouba, President of the Engineering Consultant's Group for allowing the use of the computer facilities available at the company.

The author further wishes to thank Dr. Ahmed Abdel-Motaleb Hashish, Assistant Professor, Faculty of Engineering, Helwan University for his fruitful discussions during the early stages of this work.

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LIST OF NOTATIONS

A, A_c, A_{cn}	Cross-sectional area of a member.
A_p	The plate area in span (d).
AX_m, AY_m	The distances of joint (m) in X and Y directions, respectively, from the center of gravity of all columns as a whole.
$2b, 2c$	The lengths of the normal and side panels.
E	Modulus of elasticity.
$\{ f \}, \{ F \}$	The local and global forces vector, respectively.
F_n	The unknown vertical interactive force at corner joint (n).
G	Modulus of rigidity.
h_n	Height of floor (n).
H	The total tube height.
$I_{cxni}, I_{cyni}, I_{czni}$	The second moment of area of column (i) in floor (n) about X, Y, and Z axes, respectively.
IX_i, IY_i	The distances to column (i) from the center of rigidity of columns as a whole.
I_x, I_y, I_z	The second moment of area of the element about its local axes X, Y, and Z, respectively.
I_{bxn}, I_{bxzn}	Second moment of area of a beam in Y-direction about X and Z axes, respectively, in global coordinates.
I_{byn}, I_{byzn}	Second moment of area of a beam in X-direction about Y and Z axes, respectively, in global coordinates.
k_i	Stiffness of column (i).

k and k_g	The local and global stiffness matrix respectively.
L_i	Span of bay (i).
M	The total overturning moment at floor mid-height due to lateral loads above and include this floor.
$M_{\theta xn}, M_{\theta yn}$	The summation of the applied moments at each joint, in floor (n), about X and Y axes, respectively.
$M_{\theta xni}, M_{\theta yni}$	The applied moments at joint (i), in floor (n), about X and Y axes, respectively.
M_{bnk}	The bending moment in each end of beam (k), in floor (n).
M_{cnm}	The bending moment in each end of column (m), in floor (n).
M_{rn}	Applied torsional moment about axis parallel to Z axis and passing through the floor C.G. .
$M_{\theta xn}$	Applied flexural moment about X-axis.
$M_{\theta yn}$	Applied flexural moment about Y-axis.
N_c	The number of columns per floor.
N_b	Number of bays.
N_{nm}	The applied vertical force at node (m).
N_{cnm}	The normal force in each end of column (m), in floor (n).
N_{bx}, N_{by}	Total number of beams, per floor, in X and Y directions, respectively.
P_{xn}	Applied horizontal force in X-direction.
P_{yn}	Applied horizontal force in Y-direction.
Q_{bnk}	The shearing force in each end of beam (k), in

Q_{nm}	The shearing force at each end of column (m) in floor (n).
R_{nm}	The rotation about Z-axis of joint (m) in floor (n).
R_n	Single floor rotation about axis parallel to Z axis and passing through the floor C.G. .
t_1, t_2	The column length and the beam depth, respectively.
T_n	The rotation constant of floor (n), corresponding to floor rotation (R_n).
TM_n	Applied moment of the flexural moments.
T_{xn}	Applied overturning moment about X-axis.
T_{yn}	Applied overturning moment about Y-axis.
V_{nm}	The vertical displacement at joint (m) in floor (n).
x, y	The co-ordinates of the check point in (X) and (Y) directions, respectively, measured from center of geometry of the framed-tube.
X_n, Y_n	The equal lateral displacements in X and Y directions, respectively, for floor (n).
X_e, Y_e	The distances to the center of geometry of the floor plan from the center of gravity of the columns as a whole in X and Y directions, respectively.
$\{y\}, \{Y\}$	The local and global displacements vector, respectively
Z_{nm}	The vertical displacement at joint (m) in floor (n).

z	The height measured from top
$\theta_{xnm}, \theta_{ynm}$	The rotations about X and Y axes, respectively, of joint (m) in floor (n).
θ_{xn}, θ_{yn}	The equal floor joint rotation about X and Y axes, respectively.
δ_{1i_n}	The calculated vertical deflection at corner joint (n) in frame (1) due to applied vertical force at corner joint (i).
δ_{2i_n}	The calculated vertical deflection at corner joint (n) in frame (2) due to applied unit vertical force at corner joint (i).
δ_{2ip}	The calculated vertical deflection at corner joint (i) in frame (2) due to the applied lateral loads.
σ_b	The stress in the normal faces to load direction, assuming that the framed-tube behaves as a simple cantilevered beam.
σ_z, σ_z'	The vertical direct stresses in normal and side panels, respectively.
$\sigma_b (H)$	The stress (σ_b) at height equal (H).
γ_{yz}, γ_{xz}	The shear stresses in normal and side panels, respectively.
α_{xn}, α_{yn}	The single floor rotations about X and Y axes, respectively, for floor (n).
α_{xn}	Single floor rotation about X-axis.
α_{yn}	Single floor rotation about Y-axis.

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