

CE/BOS/ CE 632/0412

K L UNIVERSITY
DESIGN OF TALL STRUCTURES (11 – CE 632)

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SYLLABUS

Introduction

Why Tall Buildings, Factors affecting growth, Height and structural form

The Tall Building Structure: Design process, Philosophy, scope and content; **Design Criteria:**

Design philosophy, Loading, Sequential loading, Strength and Stability, Stiffness and drift limitations, Human Comfort criteria, Creep, Shrinkage and temperature effects, Fire, Foundation settlement and soil structure interaction.

Loading On Tall Structures

Gravity loading:-Methods of live load reduction, Impact gravity loading, Construction loading, Wind loading:-Simple static loading, Dynamic loading, Earthquake loading:-Equivalent lateral force procedure, Model analysis procedure, Combination of loading:-Working stress design, Limit State design; **Structural Form:** Structural form:-Braced frame structures, Rigid Frame structures, In filled-Frame structures, Flat plate- Flat slab structures, Shear wall structures, Wall frame structures, Framed tube structures, Suspended structures, Floor systems :-(Reinforced concrete):-One-way slabs on beams or walls, One-way pan joints and Beams, One-way slab on beams and girders, Two-way Flat plate, Twoway flat slab, Waffle flat slabs, Two-way slab and beam, Floor systems :- (Steel framing):-Oneway beam system, Two-way beam system, Three way beam system, Composite Steel-Concrete floor system

Modeling For Analysis

Approaches to analysis:-Preliminary analyses, Intermediate and final analysis, Assumptions:- Materials, Participating components, Floor slabs, Negligible stiffnesses, Negligible deformations, Cracking, High-Rise Behavior, Modeling for Approximate analyses:- Approximate Representation Bents, Approximate modeling of slabs, Modeling for continuum analyses, Modeling for Accurate analyses:-Plane frames, Plane shear walls, Three dimensional frame and wall structures, P-Delta effects, The assembled model; **Braced Frames:** Types of bracings, Behavior of bracings, Behavior of bracing bents, Methods of analysis:-member force analysis, Drift analysis, Worked example for calculating drift by approximate methods, use large scale bracing.

Rigid-Frame Structures

Rigid frame behavior, Approximate determination of member forces caused by Gravity loading:- Girder forces-Code recommended values, two cycle moment distribution, and Column forces, Approximate Analysis of member forces caused by horizontal loading:-Allocation of loading between bents, member force analysis by portal frame method, Approximate method by cantilever method, Approximate analysis of rigid frames with setbacks, Approximate analysis for drift:- Components of drift, correction of excessive drift, Effective shear rigidity (GA), Flat plate structures:-Analogues rigid frame, Worked examples, Computer analysis of rigid frames,

Reduction of rigid frames for analysis:-Lumped girder frame, single-bay substitute frame; **Shear Wall Structures:** Behavior of shear wall structures, Analysis of proportionate wall systems:- Proportionate Non twisting structures, Proportionate twisting structures, Non Proportionate structures:-Non proportionate Non twisting structures, Non proportionate twisting structures, Behavior of nonproportionate structures, Effects of discontinuities at base, Stress analysis of shear wall:- Membrane finite element analysis, Analogous frame analysis

Tubular Structures

Structural behavior of tubular structures:-Framed- tube structures, Bundled Tube structures, Braced-Tube structures, General three dimensional structural analysis, Simplified Analytical models for symmetrical Tubular structures:-Reduction of three dimensional frame tube to an equivalent plane frame, Bundled-Tube structures, Diagonally braced frame tube structures;

Dynamic Analysis: Dynamic Response to Wind Loading:-Sensitivity of structures wind forces, Dynamic structural response due to wind forces, Along wind response, Cross wind response, worked examples, Dynamic response to Earthquake motions:-Response of Tall buildings to ground accelerations, response spectrum analysis, Empirical relations for fundamental natural frequency, Structural damping ratios, Comfort criteria: Human response to building motions:- Human perception of building motion, Perception thresholds, Use of comfort criteria in design

Text Books:

1. Tall Building Structures Analysis and Design by Bryan Stafford Smith & Alex Coull; A Wiley-Interscience Publications, Newyork,1991

Reference Books:

1. Tall Building Structures on Elastic Subgrade and Research of Semi-Analytical. Method [D] by Gong Yaoqing. Beijing: Tsinghua University, 2006
2. ETABS, Three Dimensional Analysis of Building Systems. Computers and Structures inc., Berkeley, California, 1989.