

53:134 Structural Design II (Steel Structures)
Spring 2006 (Lecture Summary)
Week 4 (2/6 - 2/10/06)

2-6-06

- ◆ Review of analysis of indeterminate beams, frames and trusses using the force method - two redundant case.
- ◆ **Slope-deflection method:** for indeterminate beams and frames.
- ◆ **Basic assumption:** no axial deformation and no shear deformation are considered.
- ◆ **Basic Idea of Slope-Deflection Method:** Write equilibrium equation for each joint in terms of rotations and deflections (generalized displacements). All the loads applied between the nodes (joints) must be transferred to the nodes (joints).
- ◆ **Concept of fixed end moments (FEM).** Derivation of FEMs for some typical loads - examples in the text.
 - Example 5.1.11: Uniformly distributed load
 - Example 5.1.12: Point load.
- ◆ **Read: Section 5.2.1; Read examples 5.1.11, 5.1.12, 5.1.5, 5.1.13.**

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- ◆ **Slope-deflection method:** Basic idea is to solve for deflections and rotations first and then determine the forces in the members. This is reverse of the force-method where redundant forces are determined first and then the deflections if required.

- ◆ **Concept of fixed end moments (FEM).** Derivation of FEMs for some typical loads - examples in the text.
 - Example 5.1.11: Uniformly distributed load
 - Example 5.1.12: Point load.
- ◆ Derivation of the basic moment-rotation equations.
 - End A is free to rotate; end B is fixed. Example 5.1.5.
 - End A is free to rotate; end B is fixed.
 - End B displaces by δ relative to end A. Example 5.1.13.
- ◆ General slope-deflection equations.
- ◆ General Procedure for the slope-deflection method.
- ◆ Example 5.2.1.
- ◆ **Read: Section 5.2.1**
- ◆ **HW#6:** P5.2.1.

2-10-06

- ◆ Discuss HW#6: 5.2.1 - slope-deflection method applied to a beam with a point load.
- ◆ Slope-deflection method applied to continuous beams. Note the sign convention for the moments for the free-body diagram of a support. Examples 5.2.2, 5.2.3 (discuss chord deflection).
- ◆ **Read: Section 5.2.1**
- ◆ **HW#7:** P5.2.2.
- ◆ **Midterm Exam:** Monday 20th; Force method, slope-deflection method - closed book.