

MATRIX ANALYSIS OF MULTIPLE HIGH TOWER FRAME WITH SIDESWAY

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INTRODUCTION

Matrix analysis in structures is convenient since it can be performed by a computer. To solve a structure with sidesway, first the degrees of freedom of sidesway must be determined, then the total degrees of freedom of the structure must be calculated, that is, including the degrees of freedom of rotation (1). The displacements of all joints due to sidesway can be figured out easily by sketching a joint-displacement diagram (2). An example is shown in Fig. 1.

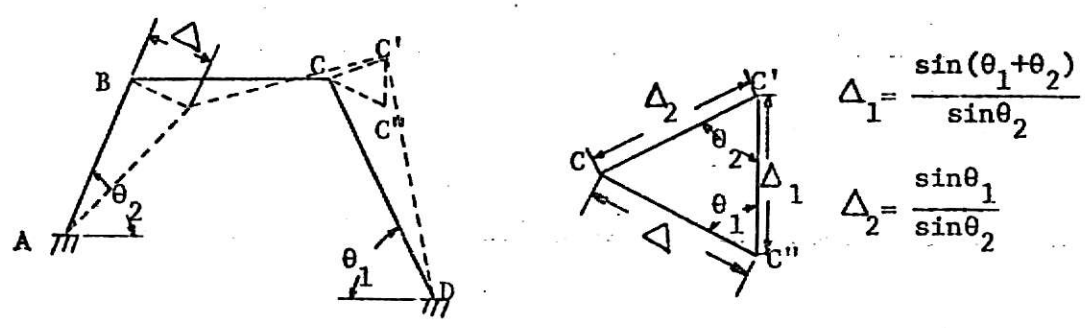


Fig. 1. Joint-displacement diagram

Since in matrix analysis, the loads are applied on nodes only, distributed loads cannot be handled directly.

"When distributed loads are involved, the alternative is to fix the loaded beam and to apply to its two ends the reverse of the fixed-end moment and shears (Fig. 2). The final moments and shears in the loaded member must be obtained by adding the internal forces of the fixed-end beam to those resulting from the nodal force analysis (3)."

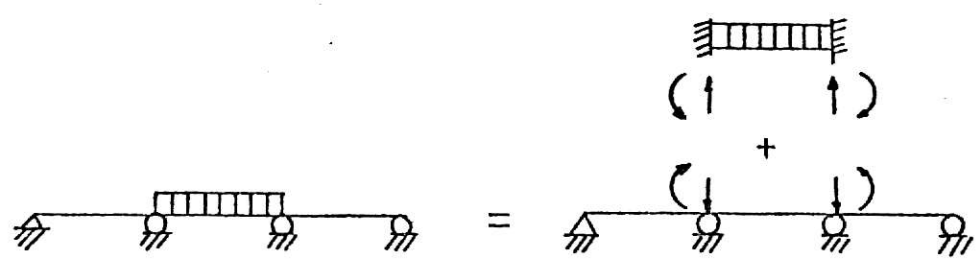


Fig. 2. Convert the distributed loads to nodal loads

After the deformation matrix and applied loads matrix have been established, the displacements and internal forces at every joint can be determined.

Solving a multiple sidesway high tower is based on analyzing a rigid frame. The most important step is to calculate the sidesway at each joint and establish the deformation matrix. Although the displacement method is tedious in computation, the basic theory of this method is simple and can be easily used to solve any complicated structure.

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