



14.508 Practice of Structural Engineering

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2-Story Steel Framed Building

Take Home Exam #2

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Problem 1

In order to determine the typical forces for an earthquake it was necessary to calculate the floor weight per story in the building. Seismic Weight load calculations can be found in Section A-3 in Appendix A of this report. After determining the floor weight, equation 14.10 from Faraji and Connor's Practice of Structural Engineering book was applied in order to determine the building base shear. These values were then further used in order to determine the shear and overturning moment of each individual story studied. Calculations pertaining to this part of the problem can be found in section A-4 of this report. Figures 2-4 on page A-4 in appendix A of this report represent respectively: the force distribution per story, shear and overturning distribution obtained from this initial seismic analysis.

Problem 2

The Portal Method was applied to the N-S and E-W frames in order to determine an estimate of the axial, shear and moment forces of the beams and columns. Results can be found on section A-5 in Appendix A. Figure 5 and 6, show the column moment distribution for members and shear and axial force distribution, respectively for the frame in the N-S direction. Section A-6 and figures 7 and 8 show likewise results for braced frame in the E-W direction.

Problem 3

From the initial values obtained in part 2 of this project, additionally using Equations 11.11 and 11.17 from Faraji and Connor's Practice of Structural Engineering book, brace-forces were estimated and can be found in Tables 1 through 5 appended to part A of this report.

Problem 4

Application of the Muller-Breslau principle can be found in the hand-calculations appended in part B of this report.*

Problem 5

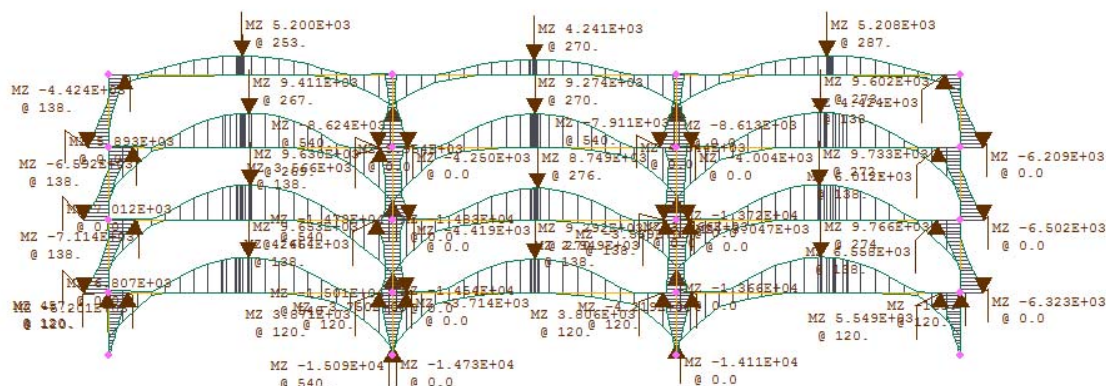


Figure 1. Moment diagram resulting from GTStrudl

Where maximum/minimum values are:

- **For Beams:**

Maximum axial = 71 k

Shear = 170 k

Maximum moment = 1258k.ft

- **For Columns:**

Maximum axial = 972.53k

Shear = 170k

Maximum moment = -587k

Problem 6

Given results above a W21x50 from p.6-89 AISC 14th

Problem 7

Given results above a W10x33 from p.6-89 AISC 14th

Appendix A: Calculations

Calculations used or complimentary to this project are attached to this report in Appendix A.

Appendix B: Hand-Calculations

Hand-Calculations used or complimentary to this project are attached to this report in Appendix B.

Appendix A

Appendix A: Calculations

Calculations used or complimentary to this project are attached to this report in Appendix A.

Appendix B

Appendix B: Hand-Calculations.

Hand-Calculations used or complimentary to this project are attached to this report in Appendix B.

References:

Connor, Jerome J. and Faraji, Susan, "Introduction to Structural Engineering."