

Peggy Ryan Williams Center

Ithaca, New York

Angela Mincemoyer | Structural
Dr. Boothby

General Information

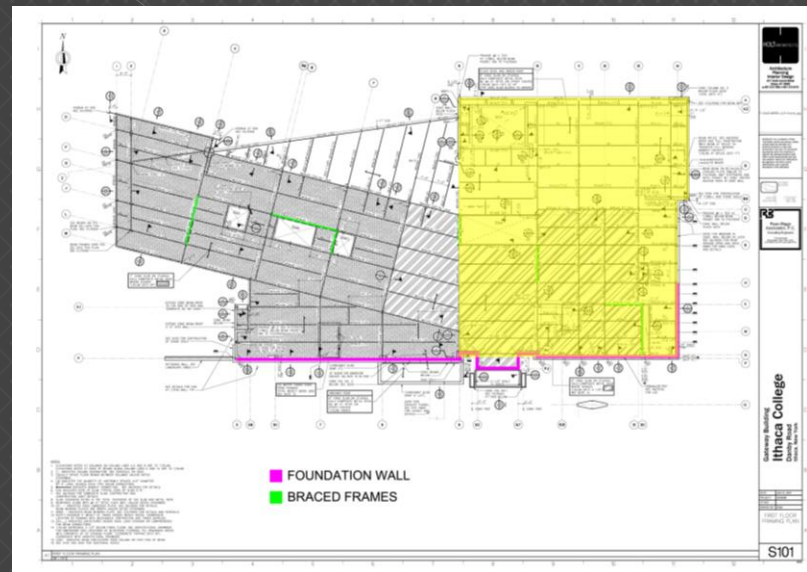
- Ithaca, New York
 - > Seismic Design Category A



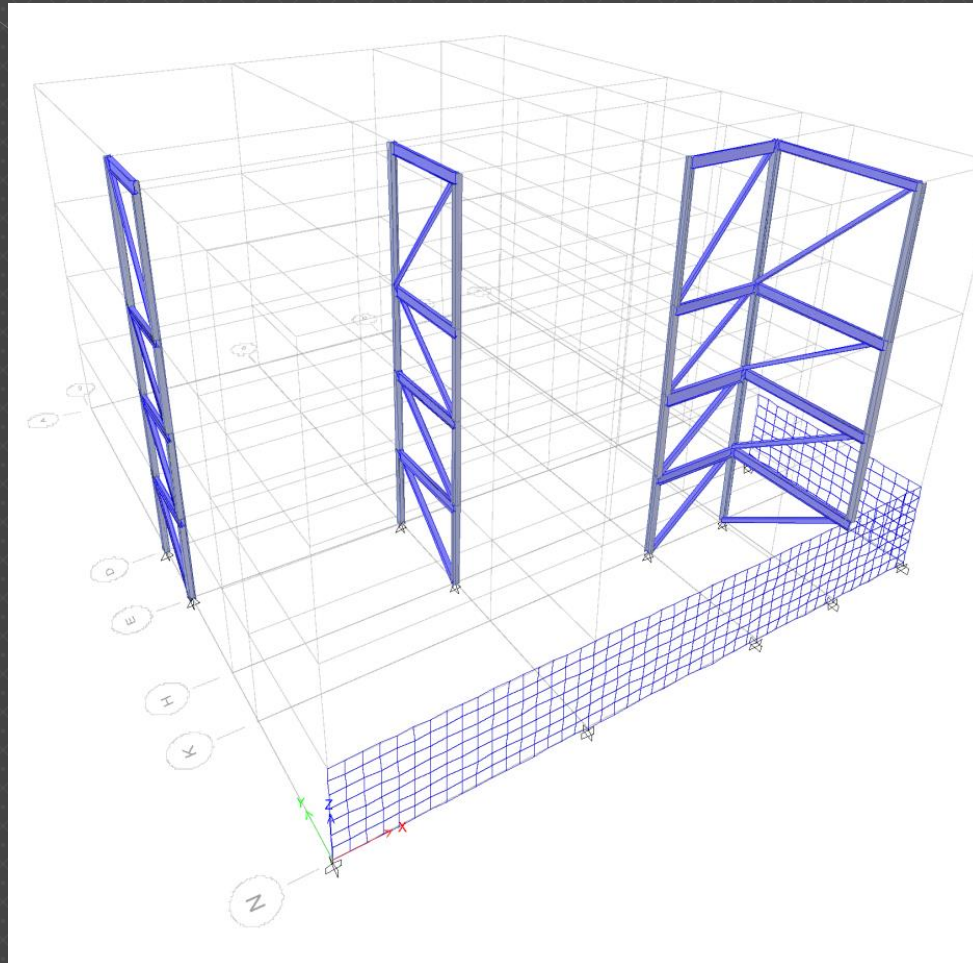
Photo provided courtesy of Holt Architects

Elements Modeled

- Originally – Entire building
 - > Grid and Slab drafted in AutoCAD & imported to ETABS
 - Led to many problems and an incorrect model
- Final Model – Western portion only
 - > 4 concentrically braced structural steel frames
 - > East and South foundation walls



Elements Modeled



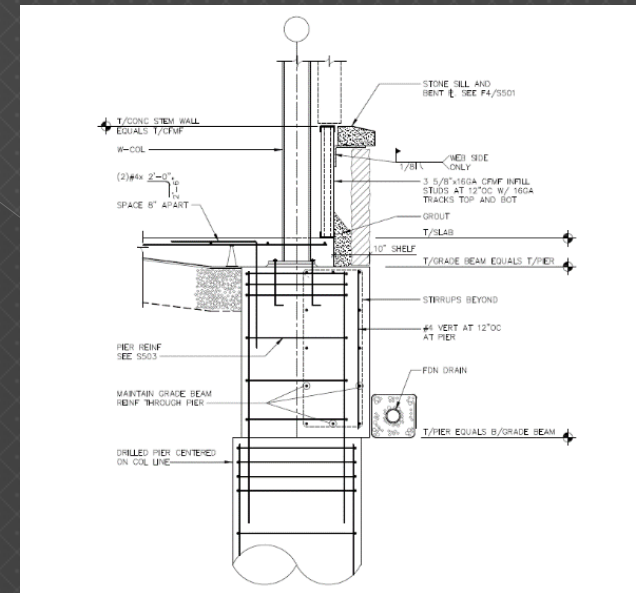
Properties of Model

● Base Conditions

- > Centrally braced structural steel frames
 - Pinned columns
- > Foundation walls
 - Fixed

● Diaphragm

- > Rigid

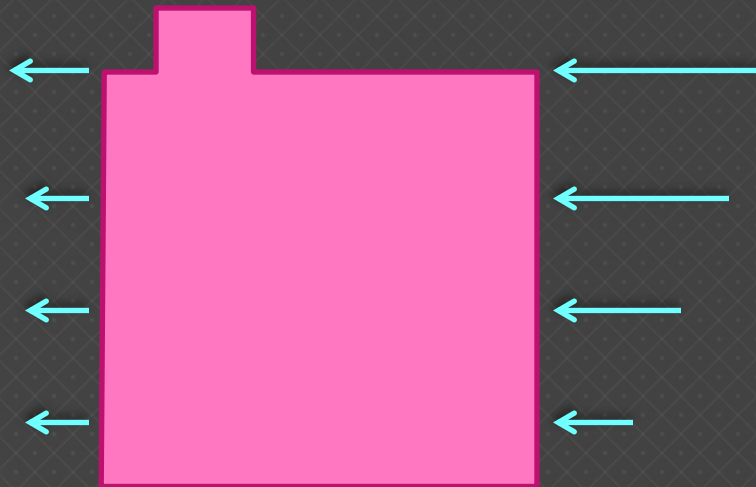


Illustrating Pinned Connection of Column

Distribution of Forces | Wind

Vertical Distribution

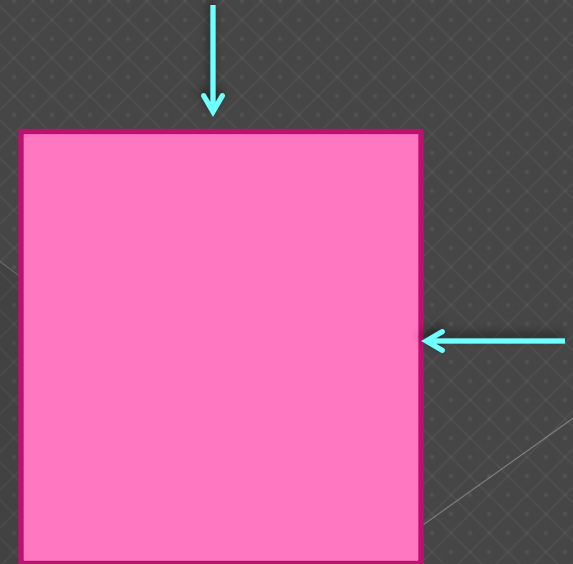
- > Pressures were multiplied by the tributary area of each level to obtain a point load at each level



ELEVATION

Horizontal Distribution

- > Point loads were applied to center of pressure of each level



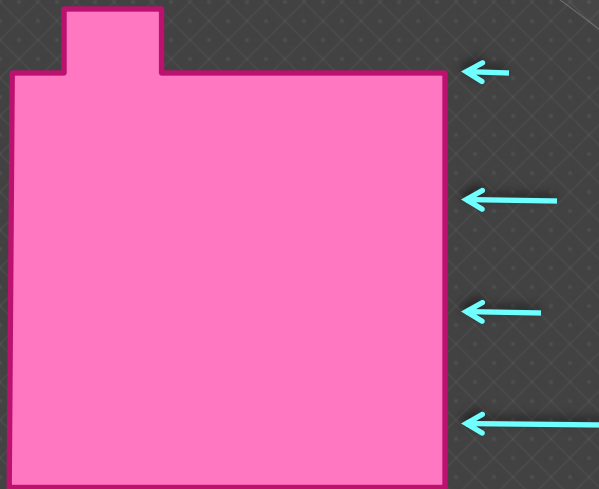
PLAN

NOTE: All four wind load cases were considered per ASCE 7-98

Distribution of Forces | Seismic

Vertical Distribution

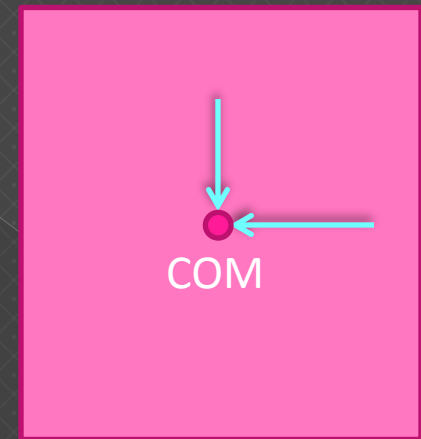
- > Force was found for each story based on mass



ELEVATION

Horizontal Distribution

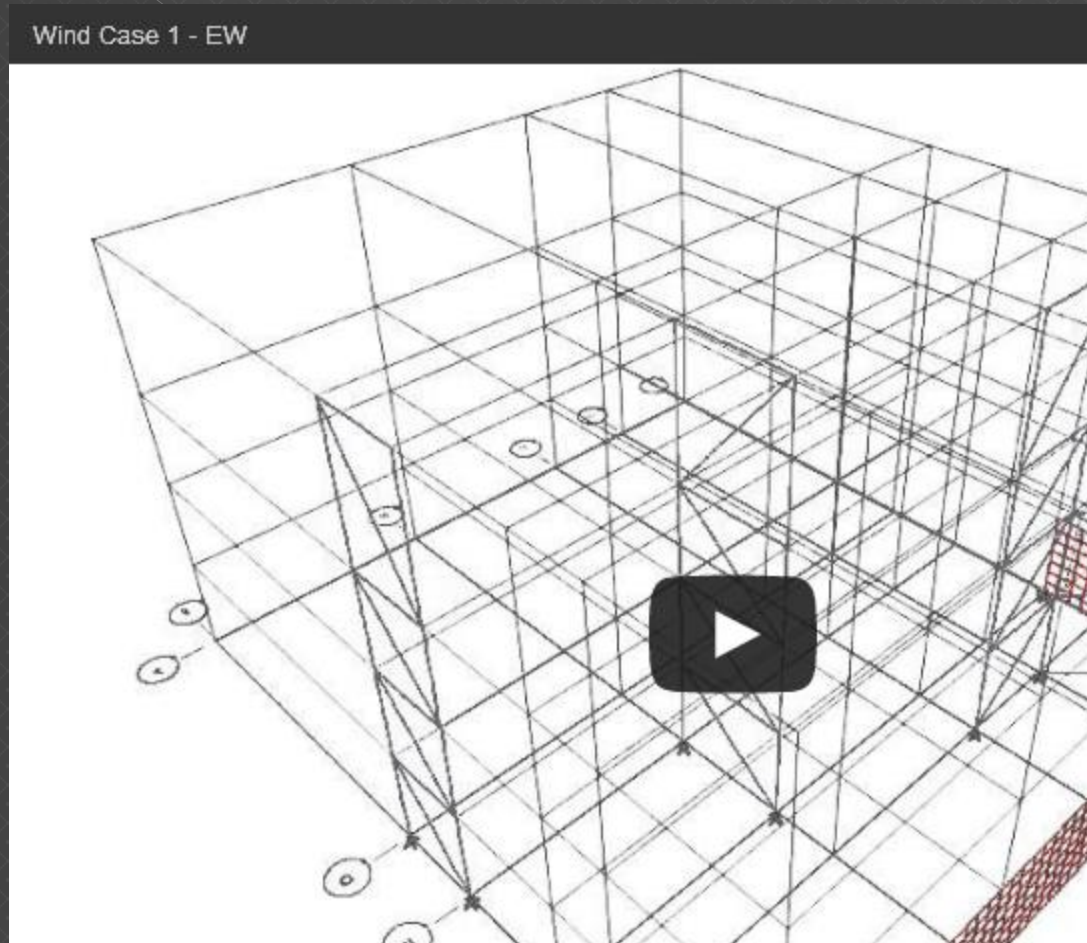
- > Point loads were applied to center of mass of each level



PLAN

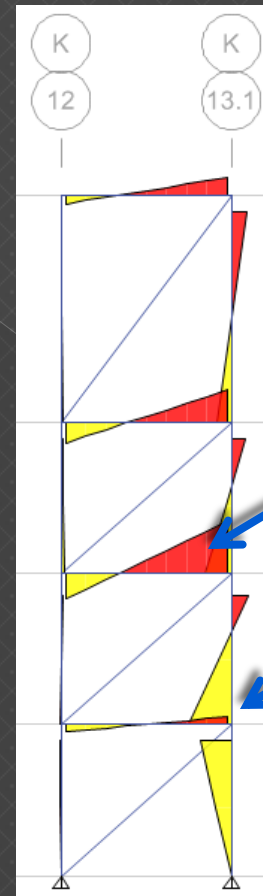
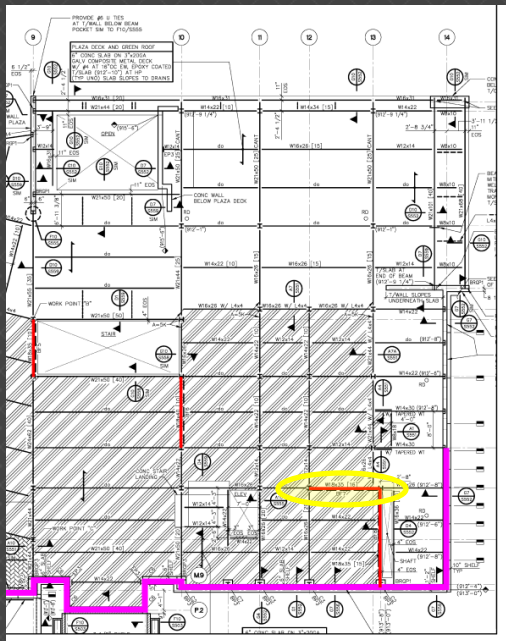
NOTE: Four seismic load cases were considered. Two for each the North-South direction and the East-West direction in order to account for accidental torsion.

Wind Case 1 - EW



Critical LFRS Frame Moment Diagram

- Frame K
- Load Case
 - > Wind Case 1
 - > East-West Direction

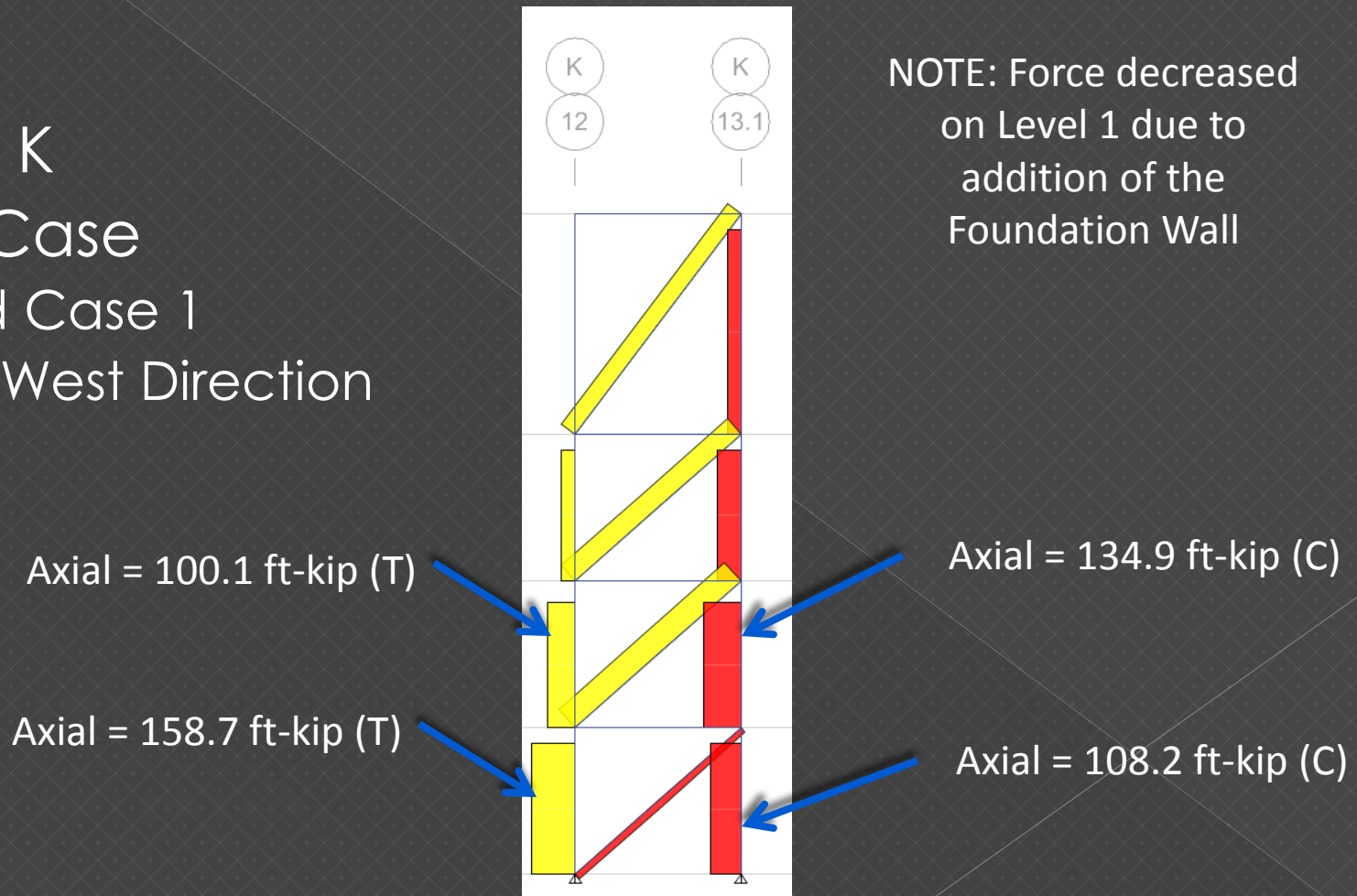


Moment = 15.1 ft-kip

Moment = 12.8 ft-kip

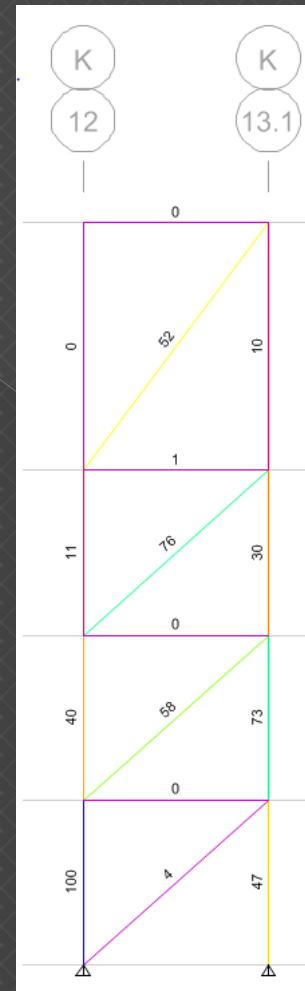
Critical LFRS Frame Axial Force Diagram

- Frame K
- Load Case
 - > Wind Case 1
 - > East-West Direction



Relative Work Diagram

- Frame K
- Load Case
 - > Wind Case 1
 - > East-West Direction



NOTE: Work decreased at Level 1 due to addition of the Foundation Wall

Is the Building's Lateral System Acceptable for Strength?

- Controlling Load Combination

- $1.2 D + 1.6 W + 0.5 L + 0.5 S$

- Checks:

- Columns

- Beam-column interaction equation



- Beams

- Moment Capacity



- Braces

- Compression Strength





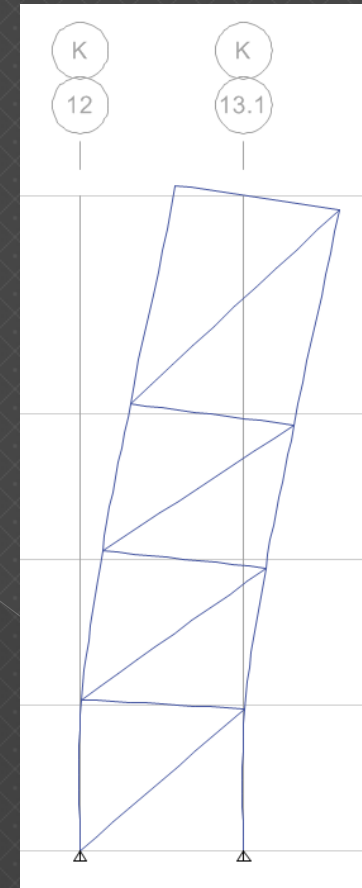
- Overtopping Moment

- $M_{\text{resisting}} > M_{\text{overtopping}}$



Is the Building's Lateral System Acceptable for Serviceability?

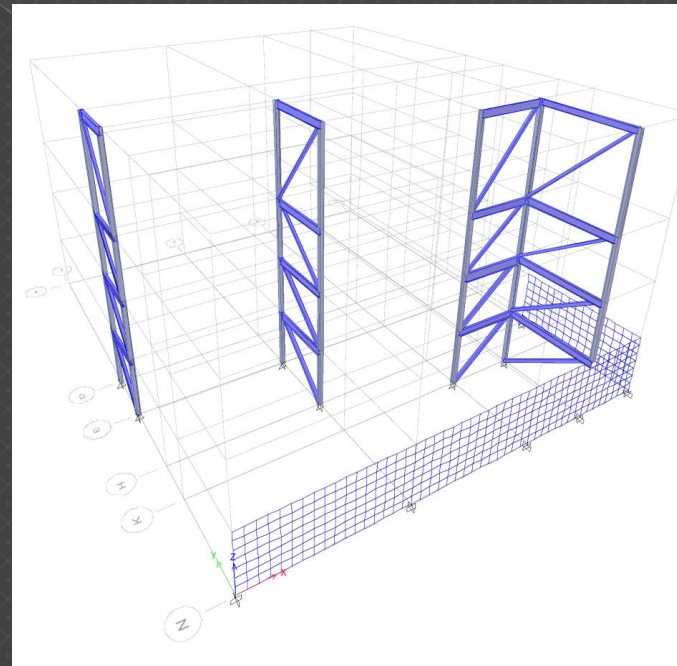
- Seismic Story Drift 
 - Per ASCE7-98 allowable story drift – $0.015h_{sx}$
- Drift Due to Wind 
 - Per industry accepted standard – $H/400$



Note: Because the building is classified as Seismic Design Category A, torsional irregularities did not need to be considered.

Conclusion

- The Lateral System of the Peggy Ryan Williams Center is acceptable according to industry standard serviceability and strength considerations.



Thank You



Photo provided courtesy of Holt Architects