Hakuna Resort

Swift Water, Pennsylvania

Technical Report 4

Young Jeon
Structural Option
Advisor: Prof. Heather Sustersic

Background Information

- Location: Swiftwater, PA
- Function – Hotel & Retail
- Number of Stories: 8
- Size: 395,938 Gross SF
- Architect: Architectural Design Consultant, Inc.
- Structural: Harwood Engineering Consultants

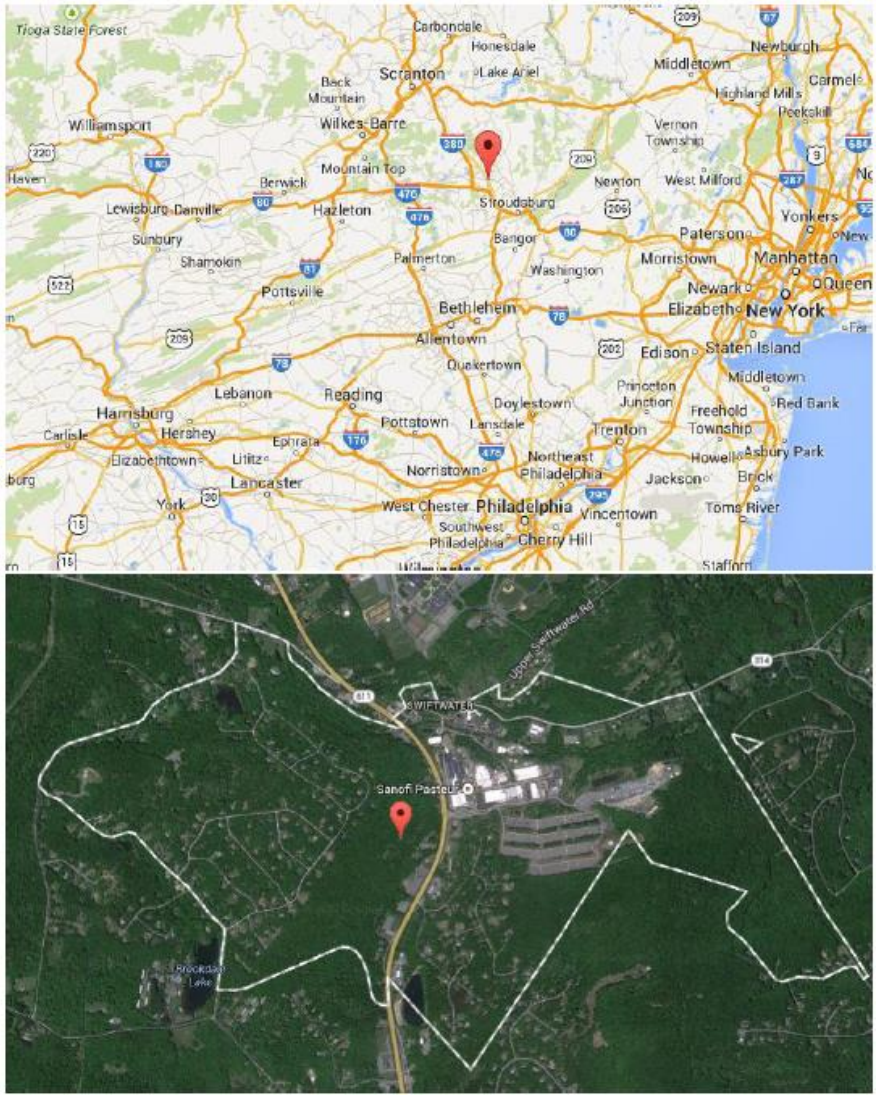
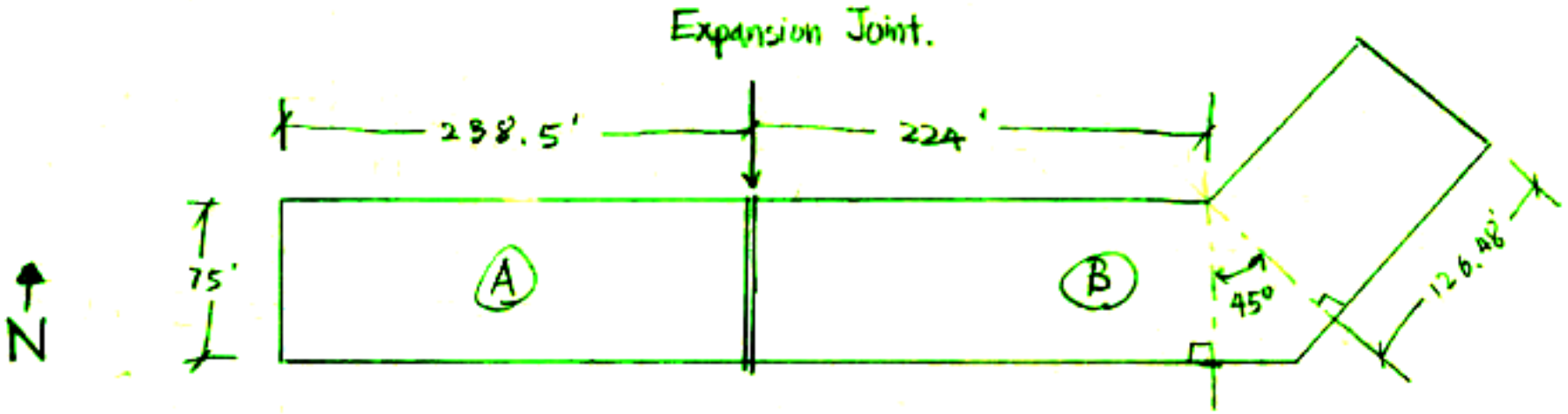


Image source: http://maps.google.com

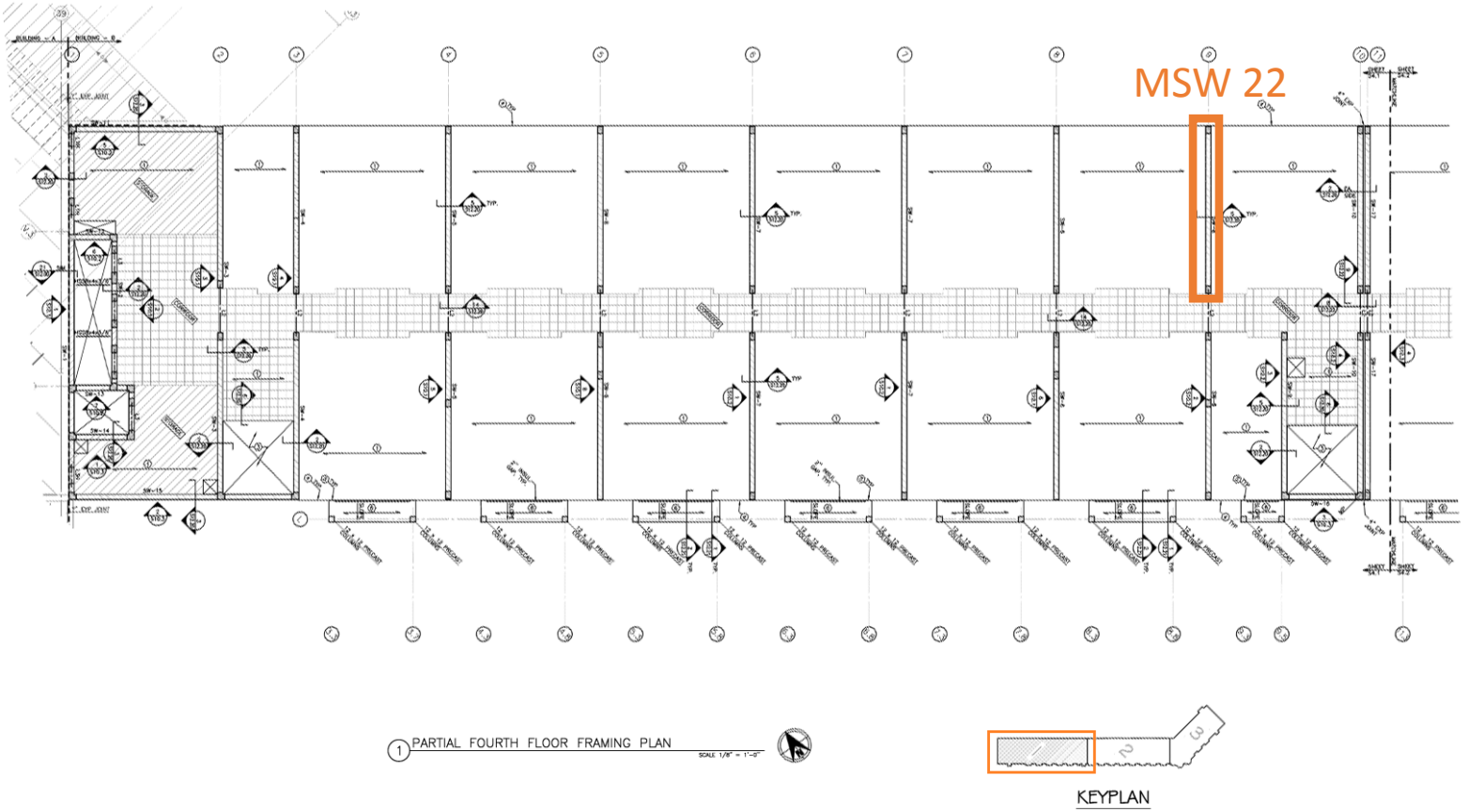
Existing Lateral Resisting System

- Masonry load bearing shear walls with piers
- Steel moment frames
- Reinforced concrete shear walls
- Concrete piers

Focus: Hotel A

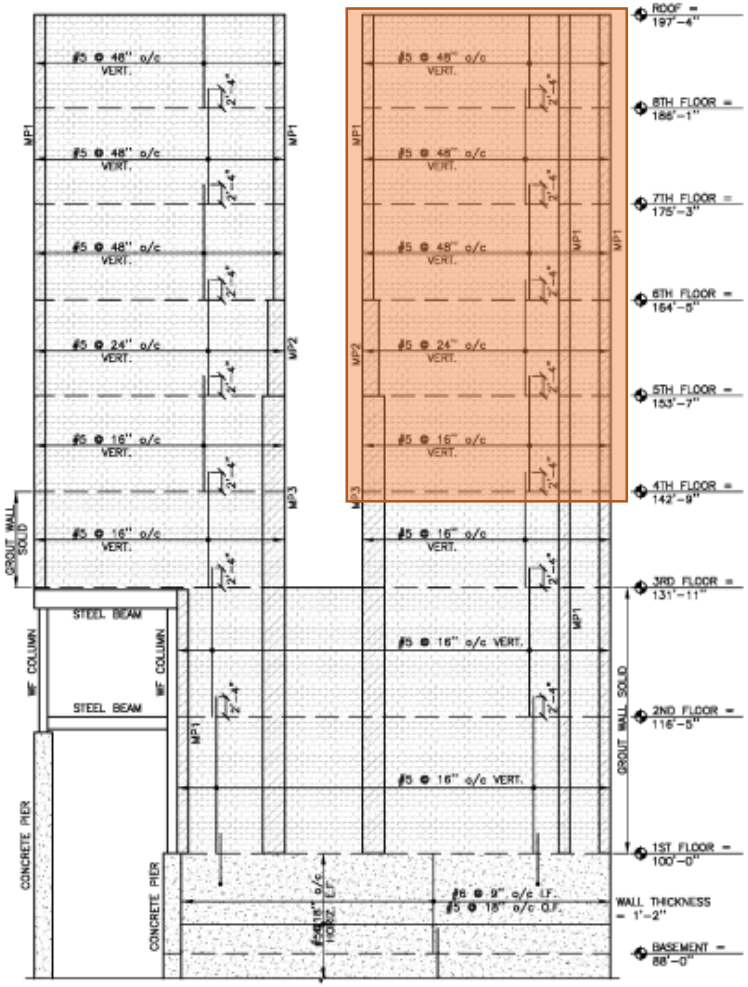


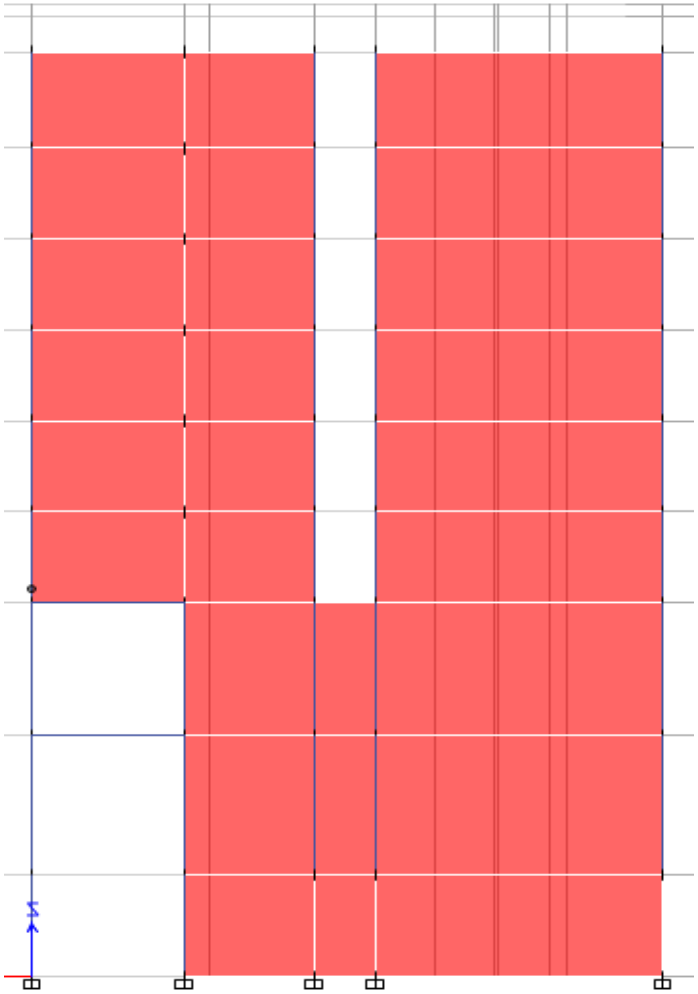
Typical System Studied

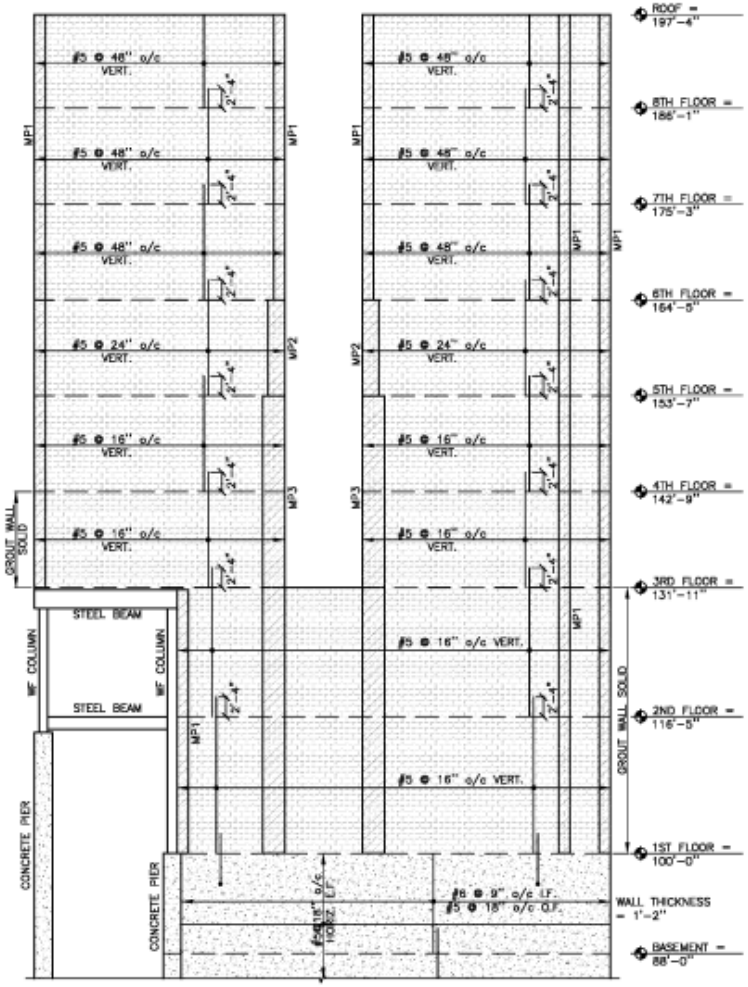


Lateral System Manual Calculation

- 4th floor
- Story Shear
  - 40 kips (seismic)
- Masonry Shear Strength
  - 54.15 kips
- Story Moment
  - 1200 ft-kips
- Flexural Strength
  - 11360 ft-kips

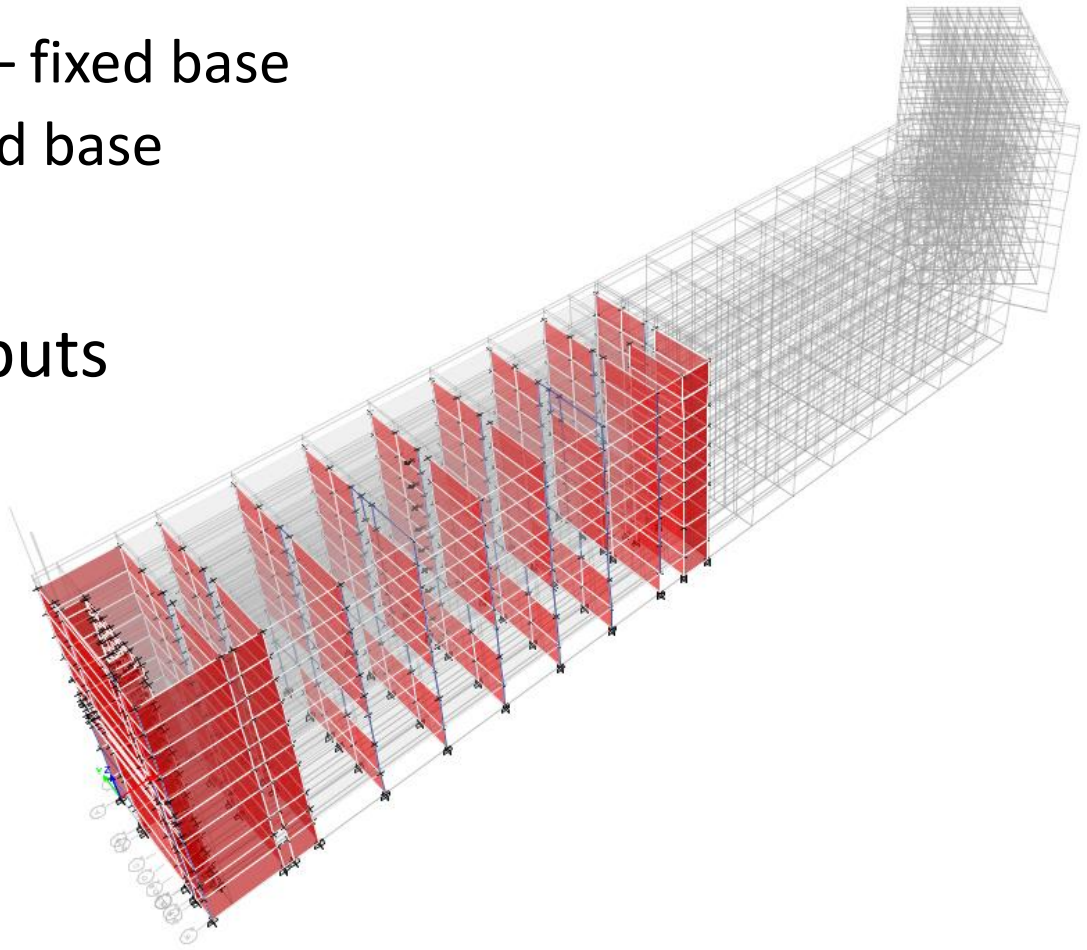




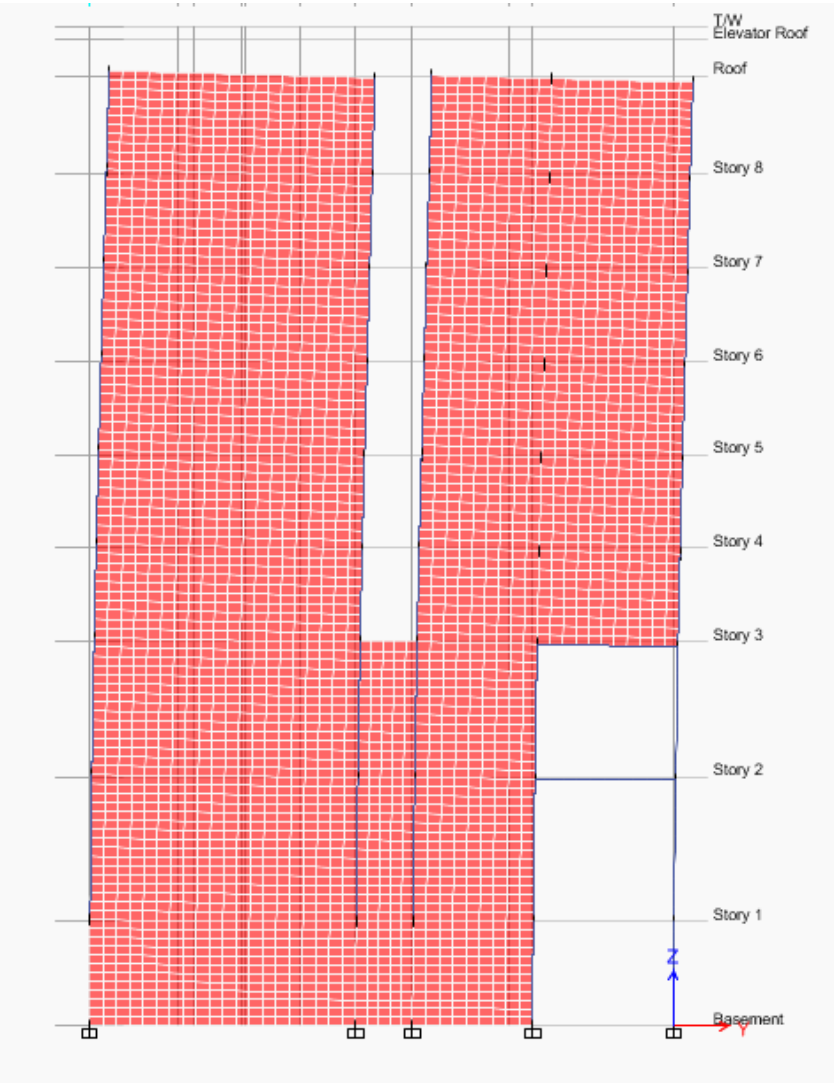

#5 @ 48" o/c VERT.
#5 @ 24" o/c VERT.
#5 @ 16" o/c VERT.
MP1
MP2
MP3
GROUT WALL SOLID
STEEL BEAM
WF COLUMN
CONCRETE PIER
#5 @ 9" o/c LF.
#5 @ 18" o/c CLF.
#5@16" o/c HORZ. LF.
WALL THICKNESS = 1'-2"
ROOF = 197'-4"
8TH FLOOR = 186'-1"
7TH FLOOR = 175'-3"
6TH FLOOR = 164'-5"
5TH FLOOR = 153'-7"
4TH FLOOR = 142'-9"
3RD FLOOR = 131'-11"
2ND FLOOR = 116'-0"
1ST FLOOR = 100'-0"
BASEMENT = 88'-0"

Modeling Considerations

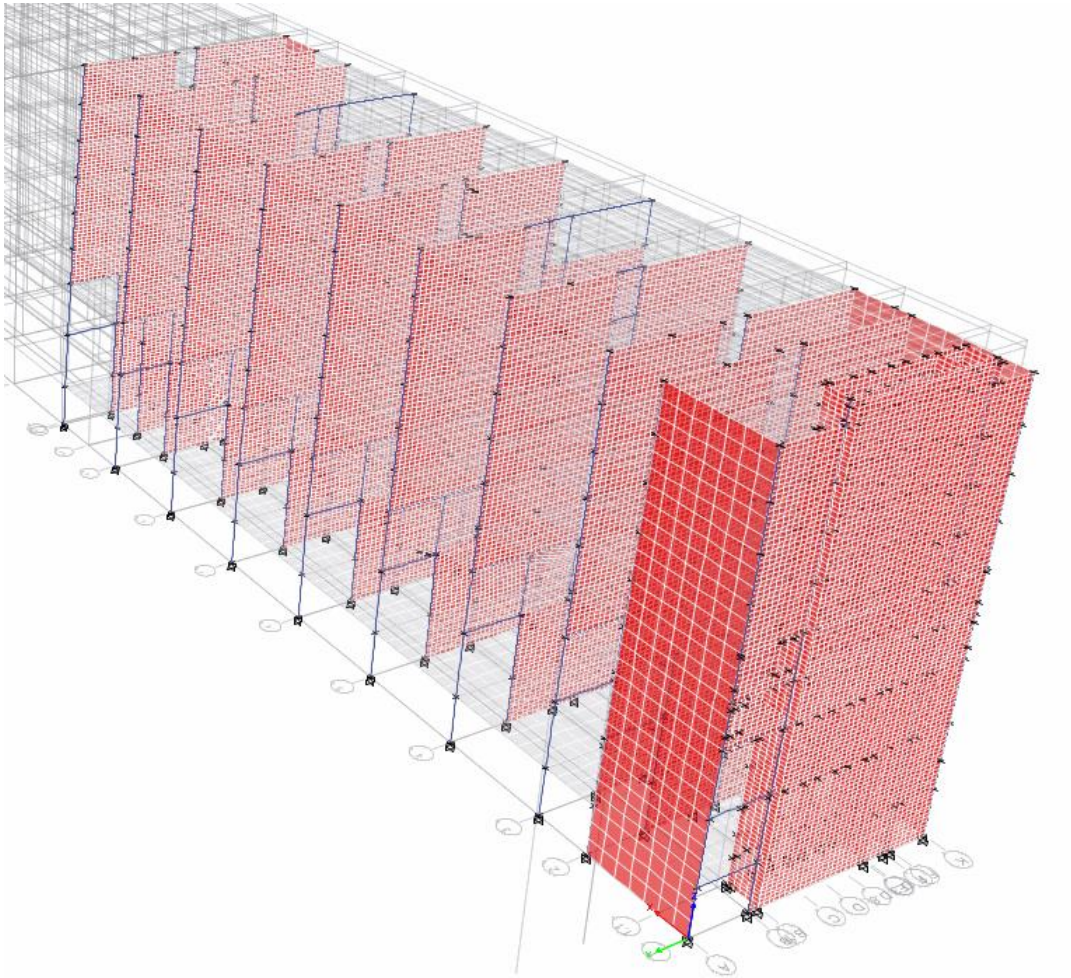
- Base Conditions
  - Moment Frames – fixed base
  - Shear Walls – fixed base
- Rigid Diaphragm
- Lateral Loading Inputs
  - ETABS generated
  - Hand calculated



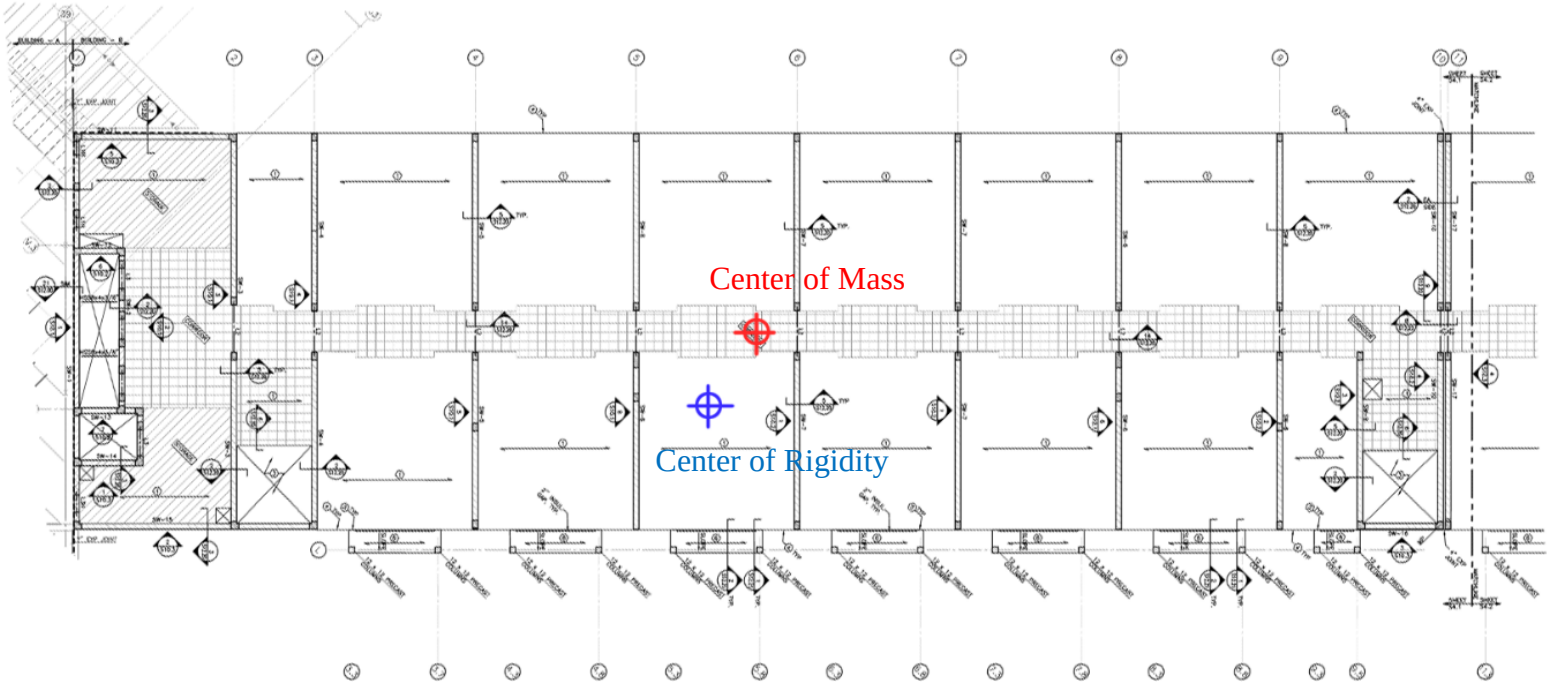
Animation (Seismic N-S Direction)



Animation (Seismic)



Center of Rigidity



	d_{Ry} (ft)	d_{Ry} (ft)
Hand Calculation	22.65	112.29
ETABS	15.57	109.04

Story Forces and Drifts

Story Forces and Drifts - Wind by ETABS				
Story	VX kip	VY kip	Drift	ASCR7-05 Drift Limit
Roof	-9.996	-45.372	0.000032	0.145
Story 8	-24.085	-109.515	0.000033	0.107
Story 7	-37.536	-171.017	0.000034	0.107
Story 6	-50.703	-231.505	0.000034	0.107
Story 5	-63.551	-290.86	0.000032	0.107
Story 4	-76.037	-348.923	0.000029	0.107
Story 3	-90.737	-417.954	0.00022	0.107
Story 2	-107.53	-498.093	0.000224	0.155
Story 1	-121.37	-565.511	0.000008	0.164

Story Forces and Drifts - Seismic by ETABS				
Story	VX kip	VY kip	Drift	ASCR7-05 Drift Limit
Roof	-154.942	-203.835	0.00012	0.145
Story 8	-295.487	-388.732	0.000134	0.107
Story 7	-420.804	-553.597	0.000144	0.107
Story 6	-531.246	-698.89	0.000151	0.107
Story 5	-627.367	-825.345	0.000156	0.107
Story 4	-707.884	-931.271	0.000157	0.107
Story 3	-776.846	-1022	0.00016	0.107
Story 2	-832.336	-1095	0.000164	0.155
Story 1	-854.212	-1123.78	0.000058	0.164

Story Forces and Drifts - Wind by Hand Calculation				
Story	VX kip	VY kip	Drift	ASCR7-05 Drift Limit
Roof	-11.36	-44.8	0.00003	0.145
Story 8	-30.21	-119.64	0.000031	0.107
Story 7	-45.47	-180.55	0.000031	0.107
Story 6	-60.34	-240.28	0.000031	0.107
Story 5	-74.77	-298.66	0.000029	0.107
Story 4	-88.67	-355.45	0.000026	0.107
Story 3	-104.79	-422.11	0.001683	0.107
Story 2	-122.39	-497.01	0.001625	0.155
Story 1	-131.44	-535.54	0.00001	0.164

Story Forces and Drifts - Seismic by Hand Calculation				
Story	VX kip	VY kip	Drift	ASCR7-05 Drift Limit
Roof	-87.031	-243.73	0.0001	0.145
Story 8	-145.901	-415.92	0.000101	0.107
Story 7	-195.091	-565.03	0.000101	0.107
Story 6	-235.061	-691.29	0.000098	0.107
Story 5	-266.321	-794.97	0.000092	0.107
Story 4	-289.441	-876.39	0.00008	0.107
Story 3	-305.091	-935.95	0.000773	0.107
Story 2	-311.531	-965.19	0.000839	0.155
Story 1	-311.531	-965.19	0.000023	0.164

Roof Displacement Check

	Displacement (in)	H/600 (in)	
Wind – ETABS	0.02249	0.16833	OK
Wind – Hand Calc.	0.01976	0.16833	OK
Seismic – ETABS	0.16172	0.16833	OK
Seismic – Hand Calc.	0.07674	0.16833	OK

Thank you