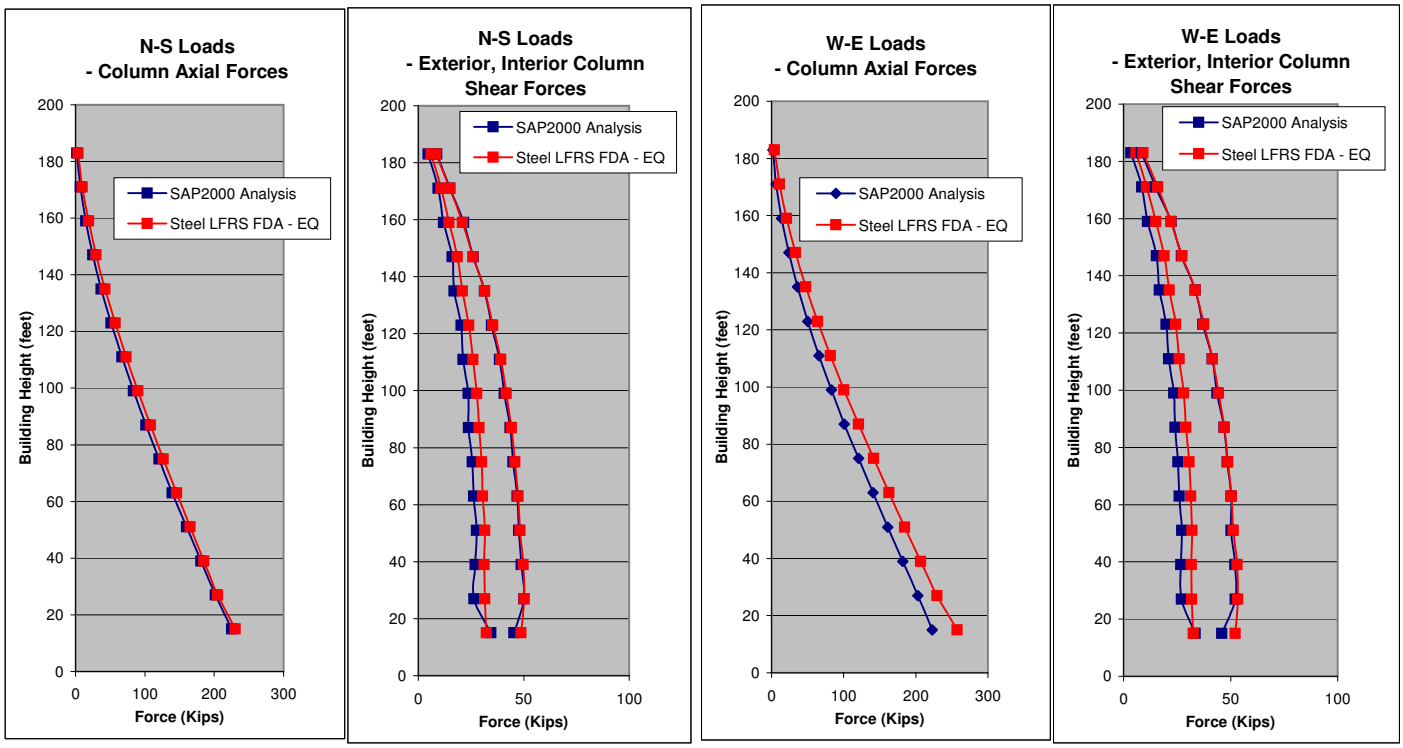
Project	CE 286 15 Story SMRF Example	Steel LFRS RDA - EQ Model	**Company Name**
Job No.		Case 2 Summary Check Results	**Company Adress**
By	AL	w/ SAP Model - nodes at Floors only	Company Tel/Fax
Date	03/15/24	w/ SAP Model - nodes at Floors and columns	Company Website
Sheet	_____ of _____	3/15/2024	NBSD-Software.Com

SMRF SEISMIC FORCES AND DISPLACEMENTS AT FLOOR LEVELS
SAP2000 2D FRAME MODEL VS STEEL LFRS RDA SOFTWARE TOOL
CASE STUDY 2 - 15 STORY SMRF BUILDING

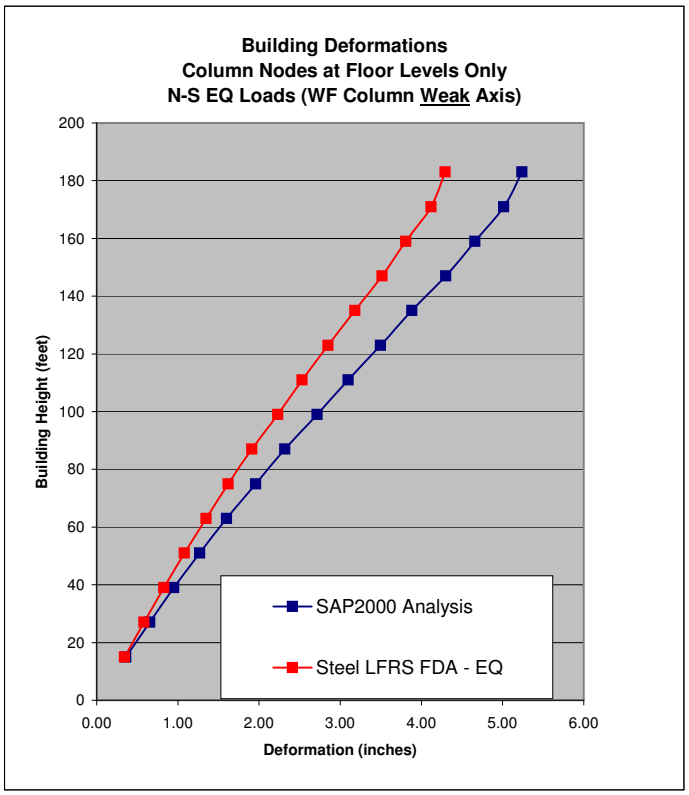


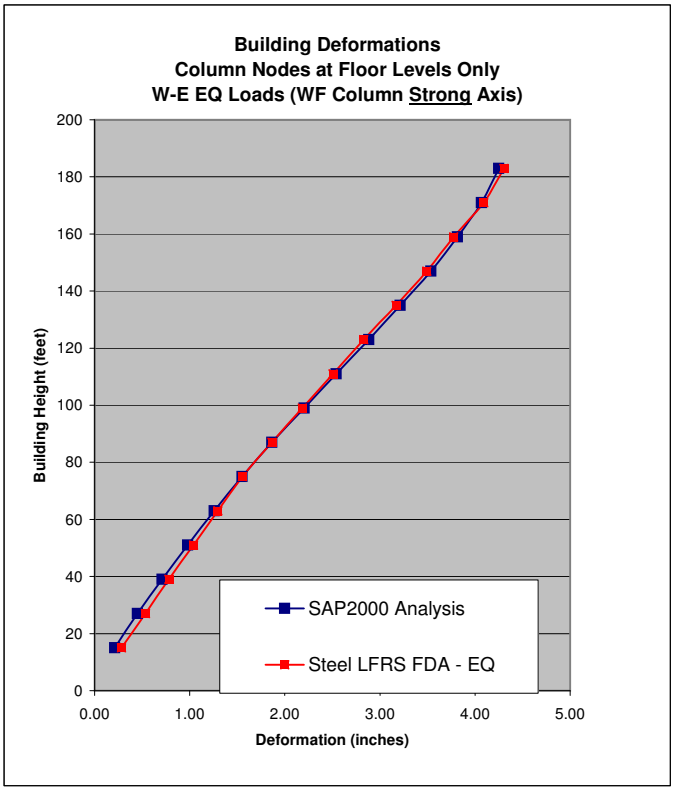
1. Results for Nodes only at Floor Levels.

A. Seismic Forces

			N- S Direction						W- E Direction					
			SAP2000 Analysis			Steel LFRS FDA - EQ			SAP2000 Analysis			Steel LFRS FDA - EQ		
Floor Level	Story Weight, W_x (kips)	Floor Elevation, H_x (feet)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)
R	1,702	183.0	1.9	4.6	8.7	3.5	6.0	8.4	1.9	3.5	8.3	4.0	5.9	9.1
15	1,500	171.0	6.8	9.4	15.0	9.9	10.7	14.9	6.2	8.5	14.9	11.0	10.8	16.0
14	1,500	159.0	14.7	12.0	21.5	18.7	14.6	20.9	13.8	11.2	22.3	20.9	15.1	22.1
13	1,500	147.0	25.0	16.1	26.1	29.7	18.5	25.9	23.9	15.3	27.1	33.2	19.0	27.4
12	1,500	135.0	37.1	17.1	31.4	42.6	21.0	31.6	35.8	16.8	33.5	47.6	21.4	33.5
11	1,500	123.0	51.3	20.3	34.8	57.1	24.0	35.4	50.2	19.9	37.0	63.8	24.3	37.5
10	1,500	111.0	66.9	21.2	38.6	73.0	25.9	39.1	65.8	21.1	41.5	81.5	26.0	41.6
9	1,500	99.0	83.6	23.6	40.9	90.0	27.7	41.8	83.1	23.5	43.7	100.5	28.1	44.4
8	1,500	87.0	101.4	23.9	43.6	107.9	28.9	44.2	100.7	24.0	47.0	120.6	29.2	47.1
7	1,500	75.0	120.3	25.6	45.0	126.5	30.0	45.8	120.6	25.4	48.5	141.5	30.7	48.7
6	1,500	63.0	139.5	26.2	46.9	145.8	30.5	47.3	140.6	26.0	50.2	162.9	31.4	50.3
5	1,500	51.0	160.1	27.6	47.6	165.3	31.6	48.2	161.3	27.2	50.2	184.8	32.0	51.3
4	1,500	39.0	180.8	27.0	48.8	185.0	31.3	49.8	182.2	26.7	52.0	207.0	31.7	53.0
3	1,500	27.0	201.6	26.4	50.0	205.1	31.5	50.2	202.7	27.1	52.2	229.3	31.9	53.4
2	1,500	15.0	225.2	34.4	45.4	230.2	32.3	48.7	223.0	33.5	45.9	257.5	32.6	52.2

SMRF SEISMIC FORCES AND DISPLACEMENTS AT FLOOR LEVELS
SAP2000 2D FRAME MODEL VS STEEL LFRS RDA SOFTWARE TOOL
CASE STUDY 2 - 15 STORY SMRF BUILDING

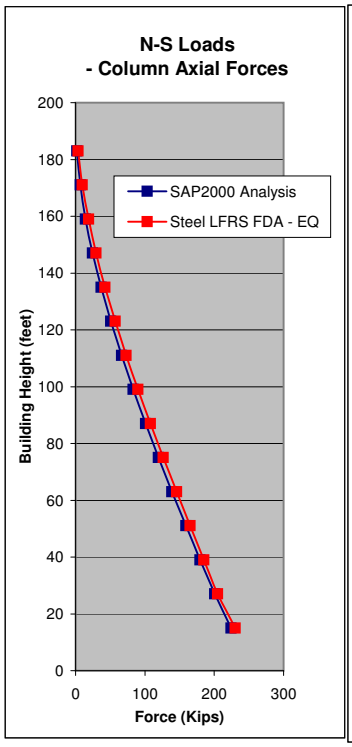


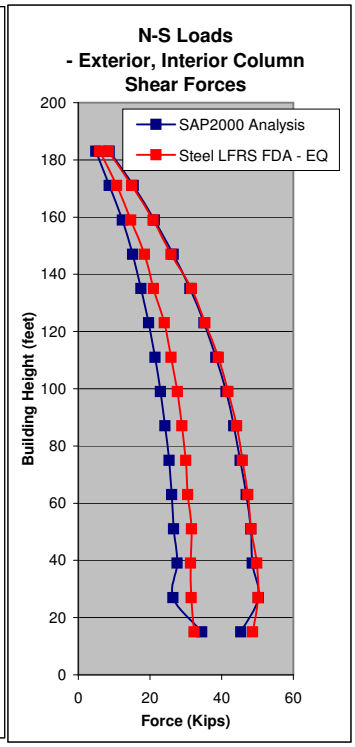


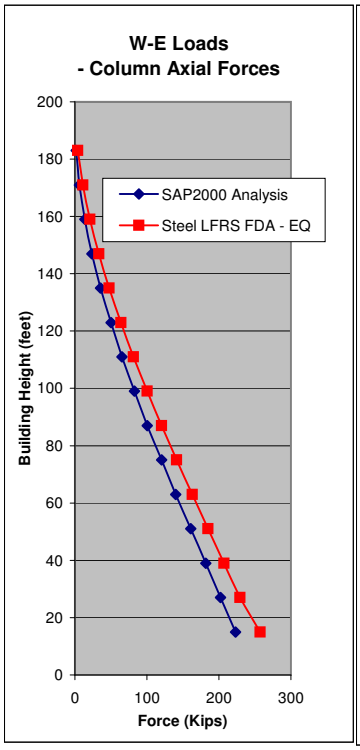
B. Displacements

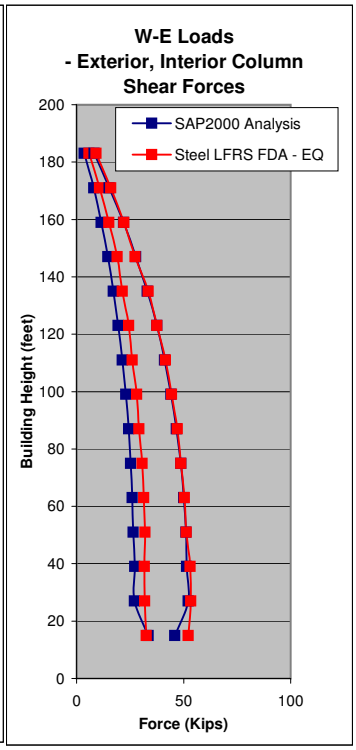
			N- S Direction						W- E Direction					
			SAP2000 Analysis			Steel LFRS FDA - EQ			SAP2000 Analysis			Steel LFRS FDA - EQ		
Floor Level	Story Weight, W_x (kips)	Floor Elevation, H_x (feet)	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio
R	1,702	183.0	5.24	0.226	0.0016	4.30	0.175	0.0012	4.25	0.180	0.0013	4.30	0.213	0.0015
15	1,500	171.0	5.01	0.353	0.0025	4.12	0.311	0.0022	4.07	0.253	0.0018	4.09	0.314	0.0022
14	1,500	159.0	4.66	0.361	0.0025	3.81	0.291	0.0020	3.82	0.278	0.0019	3.78	0.283	0.0020
13	1,500	147.0	4.30	0.415	0.0029	3.52	0.338	0.0023	3.54	0.324	0.0023	3.49	0.325	0.0023
12	1,500	135.0	3.88	0.387	0.0027	3.18	0.330	0.0023	3.21	0.328	0.0023	3.17	0.339	0.0024
11	1,500	123.0	3.50	0.400	0.0028	2.85	0.320	0.0022	2.89	0.343	0.0024	2.83	0.323	0.0022
10	1,500	111.0	3.10	0.382	0.0027	2.53	0.299	0.0021	2.54	0.338	0.0023	2.51	0.322	0.0022
9	1,500	99.0	2.72	0.396	0.0028	2.23	0.320	0.0022	2.20	0.341	0.0024	2.18	0.321	0.0022
8	1,500	87.0	2.32	0.359	0.0025	1.91	0.289	0.0020	1.86	0.311	0.0022	1.86	0.310	0.0022
7	1,500	75.0	1.96	0.359	0.0025	1.62	0.274	0.0019	1.55	0.294	0.0020	1.55	0.258	0.0018
6	1,500	63.0	1.60	0.332	0.0023	1.35	0.268	0.0019	1.26	0.278	0.0019	1.30	0.254	0.0018
5	1,500	51.0	1.27	0.318	0.0022	1.08	0.254	0.0018	0.98	0.271	0.0019	1.04	0.259	0.0018
4	1,500	39.0	0.95	0.297	0.0021	0.83	0.241	0.0017	0.71	0.257	0.0018	0.78	0.248	0.0017
3	1,500	27.0	0.65	0.297	0.0021	0.59	0.243	0.0017	0.45	0.241	0.0017	0.53	0.250	0.0017
2	1,500	15.0	0.36	0.357	0.0020	0.34	0.342	0.0016	0.21	0.211	0.0012	0.28	0.284	0.0015

SMRF SEISMIC FORCES AND DISPLACEMENTS AT FLOOR LEVELS
SAP2000 2D FRAME MODEL VS STEEL LFRS RDA SOFTWARE TOOL
CASE STUDY 2 - 15 STORY SMRF BUILDING







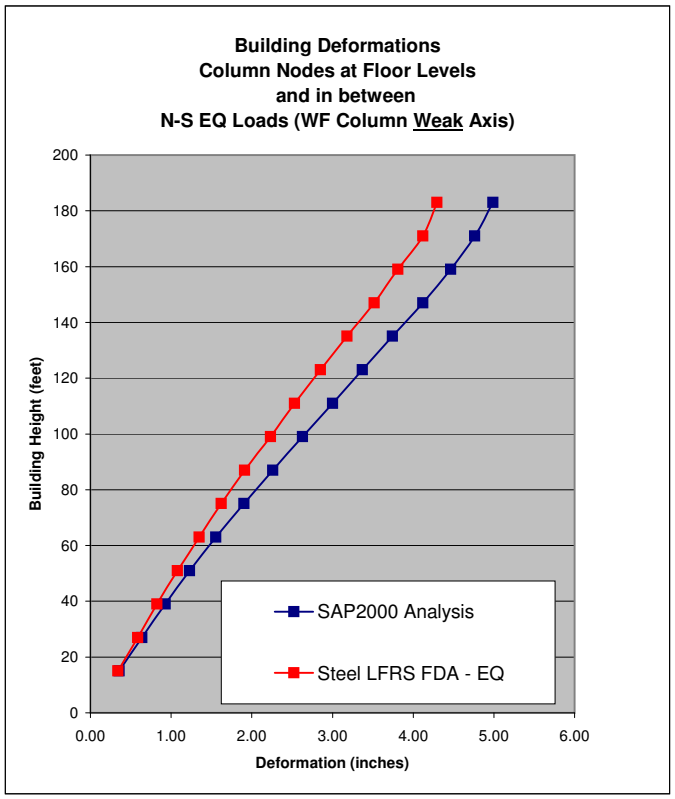


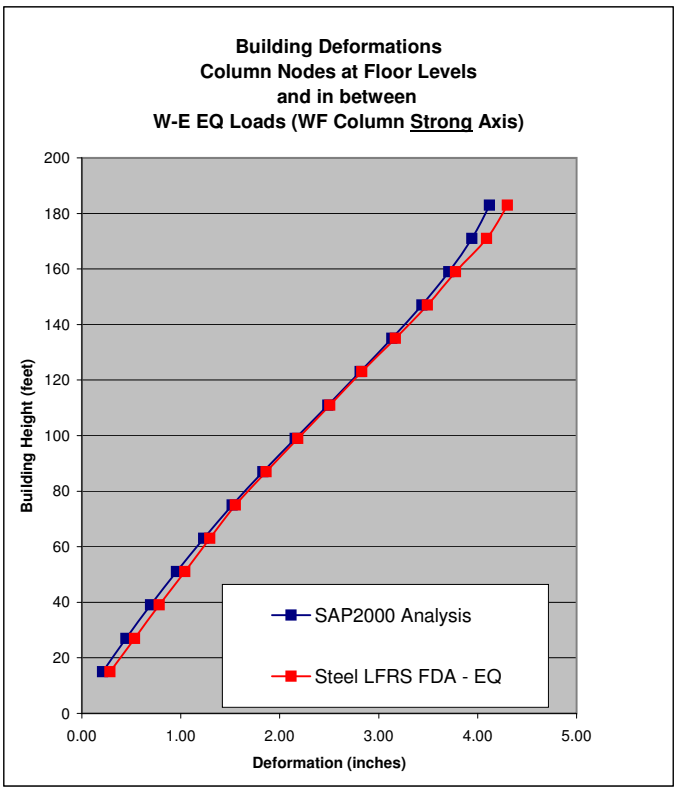
2. Results for Nodes at Floor Levels + Inter-Story Nodes.

A. Seismic Forces

			N- S Direction						W- E Direction					
			SAP2000 Analysis			Steel LFRS FDA - EQ			SAP2000 Analysis			Steel LFRS FDA - EQ		
Floor Level	Story Weight, W_x (kips)	Floor Elevation, H_x (feet)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)	Axial Load (kips)	Exterior Column Shear (kips)	Interior Column Shear (kips)
R	1,702	183.0	1.9	4.9	8.6	3.5	6.0	8.4	1.9	3.6	8.2	4.0	5.9	9.1
15	1,500	171.0	6.8	8.7	15.4	9.9	10.7	14.9	6.2	8.1	15.3	11.0	10.8	16.0
14	1,500	159.0	14.5	12.3	21.3	18.7	14.6	20.9	13.7	11.5	22.0	20.9	15.1	22.1
13	1,500	147.0	24.6	15.2	26.5	29.7	18.5	25.9	23.7	14.7	27.7	33.2	19.0	27.4
12	1,500	135.0	36.7	17.5	31.2	42.6	21.0	31.6	35.6	17.2	33.1	47.6	21.4	33.5
11	1,500	123.0	50.7	19.7	35.1	57.1	24.0	35.4	50.0	19.4	37.5	63.8	24.3	37.5
10	1,500	111.0	66.3	21.5	38.4	73.0	25.9	39.1	65.5	21.4	41.2	81.5	26.0	41.6
9	1,500	99.0	83.0	23.0	41.2	90.0	27.7	41.8	82.8	23.0	44.2	100.5	28.1	44.4
8	1,500	87.0	100.9	24.2	43.4	107.9	28.9	44.2	100.5	24.4	46.7	120.6	29.2	47.1
7	1,500	75.0	119.6	25.4	45.2	126.5	30.0	45.8	120.4	25.3	48.7	141.5	30.7	48.7
6	1,500	63.0	138.9	26.0	46.9	145.8	30.5	47.3	140.2	26.0	50.1	162.9	31.4	50.3
5	1,500	51.0	159.2	26.6	48.1	165.3	31.6	48.2	160.9	26.5	51.1	184.8	32.0	51.3
4	1,500	39.0	179.8	27.6	48.6	185.0	31.3	49.8	181.7	27.3	51.4	207.0	31.7	53.0
3	1,500	27.0	200.8	26.4	50.2	205.1	31.5	50.2	202.3	27.0	52.2	229.3	31.9	53.4
2	1,500	15.0	224.5	34.4	45.3	230.2	32.3	48.7	223.2	33.5	46.0	257.5	32.6	52.2

SMRF SEISMIC FORCES AND DISPLACEMENTS AT FLOOR LEVELS
SAP2000 2D FRAME MODEL VS STEEL LFRS RDA SOFTWARE TOOL
CASE STUDY 2 - 15 STORY SMRF BUILDING

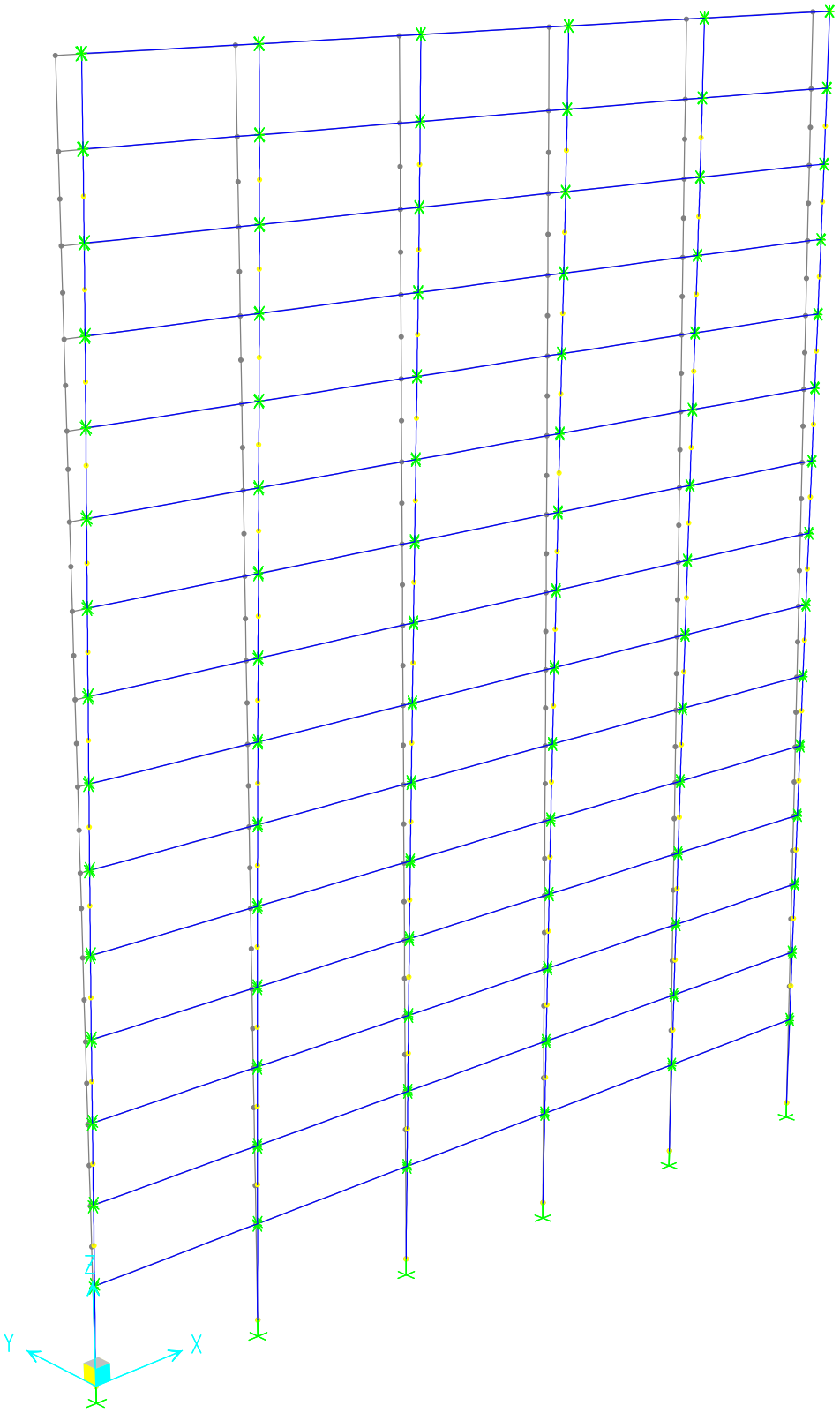




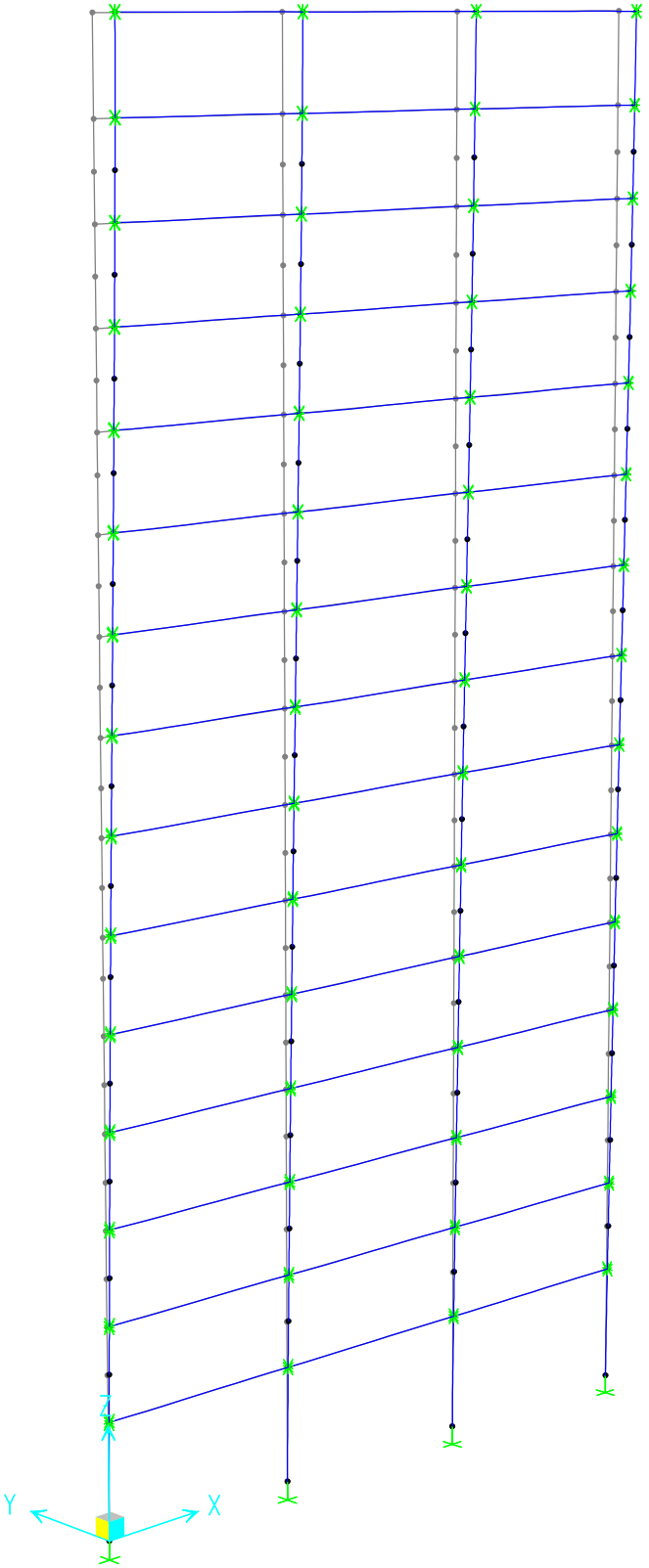
B. Displacements

			N- S Direction						W- E Direction					
			SAP2000 Analysis			Steel LFRS FDA - EQ			SAP2000 Analysis			Steel LFRS FDA - EQ		
Floor Level	Story Weight, W_x (kips)	Floor Elevation, H_x (feet)	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio	Building Deformation (inches)	Floor Deformation (inches)	Drift Ratio	Building Deformation (inches)	Floor Deformation (inches)	Story Drift Ratio
R	1,702	183.0	4.99	0.223	0.0016	4.30	0.175	0.0012	4.12	0.178	0.0012	4.30	0.213	0.0015
15	1,500	171.0	4.76	0.296	0.0021	4.12	0.311	0.0022	3.94	0.233	0.0016	4.09	0.314	0.0022
14	1,500	159.0	4.47	0.347	0.0024	3.81	0.291	0.0020	3.71	0.270	0.0019	3.78	0.283	0.0020
13	1,500	147.0	4.12	0.375	0.0026	3.52	0.338	0.0023	3.44	0.305	0.0021	3.49	0.325	0.0023
12	1,500	135.0	3.74	0.376	0.0026	3.18	0.330	0.0023	3.13	0.320	0.0022	3.17	0.339	0.0024
11	1,500	123.0	3.37	0.369	0.0026	2.85	0.320	0.0022	2.81	0.327	0.0023	2.83	0.323	0.0022
10	1,500	111.0	3.00	0.371	0.0026	2.53	0.299	0.0021	2.49	0.330	0.0023	2.51	0.322	0.0022
9	1,500	99.0	2.63	0.368	0.0026	2.23	0.320	0.0022	2.16	0.327	0.0023	2.18	0.321	0.0022
8	1,500	87.0	2.26	0.358	0.0025	1.91	0.289	0.0020	1.83	0.309	0.0021	1.86	0.310	0.0022
7	1,500	75.0	1.90	0.349	0.0024	1.62	0.274	0.0019	1.52	0.288	0.0020	1.55	0.258	0.0018
6	1,500	63.0	1.55	0.326	0.0023	1.35	0.268	0.0019	1.23	0.275	0.0019	1.30	0.254	0.0018
5	1,500	51.0	1.23	0.301	0.0021	1.08	0.254	0.0018	0.96	0.262	0.0018	1.04	0.259	0.0018
4	1,500	39.0	0.93	0.289	0.0020	0.83	0.241	0.0017	0.70	0.252	0.0017	0.78	0.248	0.0017
3	1,500	27.0	0.64	0.281	0.0020	0.59	0.243	0.0017	0.44	0.233	0.0016	0.53	0.250	0.0017
2	1,500	15.0	0.36	0.358	0.0020	0.34	0.342	0.0016	0.21	0.212	0.0012	0.28	0.284	0.0015

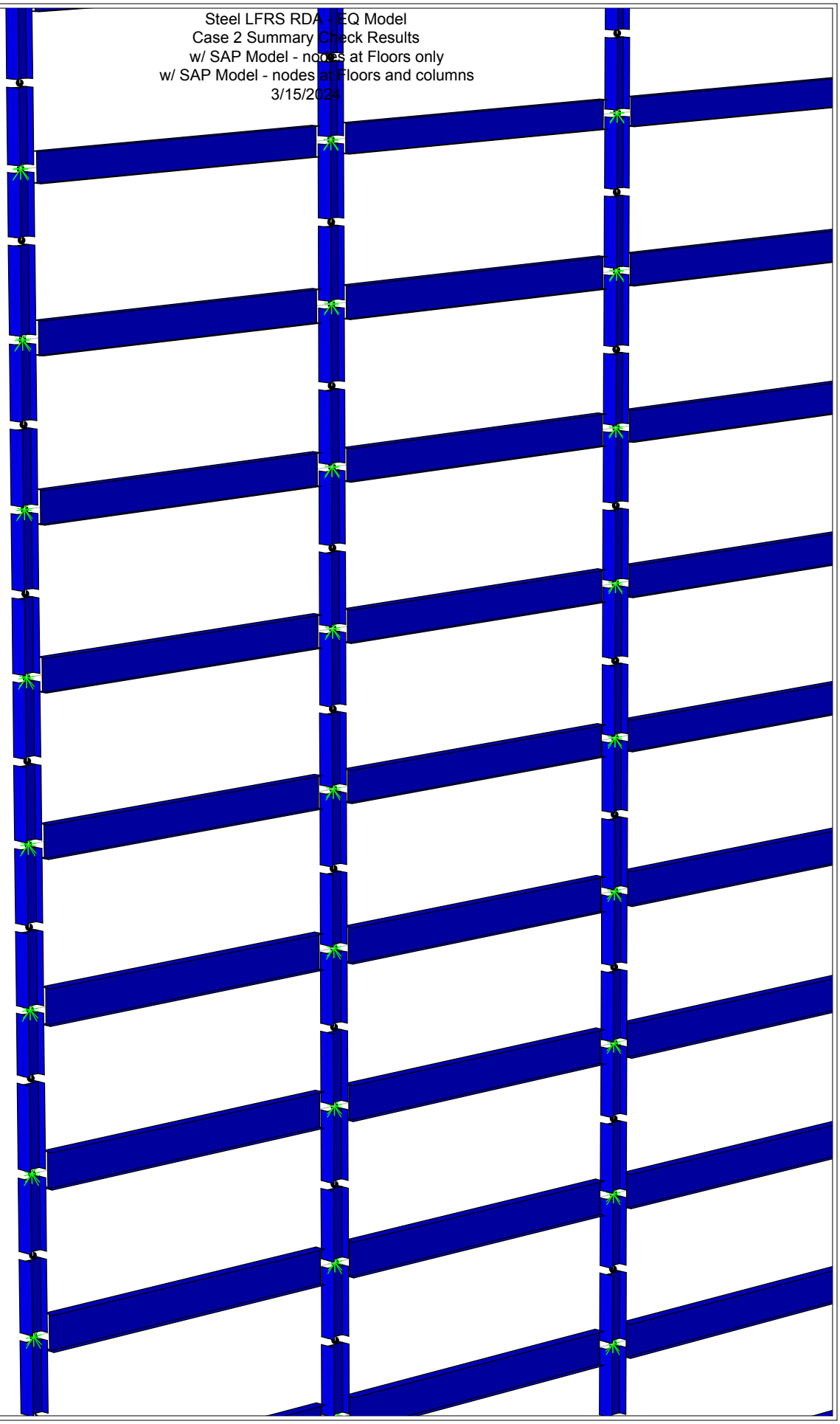
Case 2 Summary Check Results
w/ SAP Model - nodes at Floors only
w/ SAP Model - nodes at Floors and columns
3/15/2024



Case 2 Summary Check Results
w/ SAP Model - nodes at Floors only
w/ SAP Model - nodes at Floors and columns
3/15/2024



Steel LFRS RDA - EQ Model
Case 2 Summary Check Results
w/ SAP Model - nodes at Floors only
w/ SAP Model - nodes at Floors and columns
3/15/2024



Project	15 Story SMRF Example	Steel LFRS RDA - EQ Model	**Company Name**
Job No.	202130.20	Case 2 Summary Check Results	**Company Adress**
By	AL	w/ SAP Model - nodes at Floors only	Company Tel/Fax
Date	08/26/21	w/ SAP Model - nodes at Floors and columns	Company Website
Sheet	_____ of _____	3/15/2024	NBSD-Software.Com

CODE LEVEL SEISMIC FORCES AND SHEARS AT FLOOR LEVELS - STEEL BUILDING
ASCE 7-10 CHAPTER 12 - SEISMIC REQUIREMENTS FOR BUILDING STRUCTURES
CASE STUDY 2 - CE 286 15-STORY SMRF EXAMPLE

1. Seismic Parameter Data

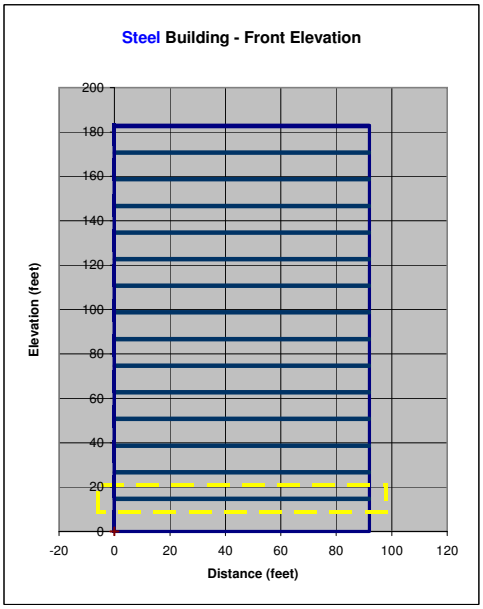
h_n = **183.0** feet (Building Height)

	N-S Direction	W-E Direction
LFRS	SMRF	SMRF
C_t	0.028	0.028
x	0.80	0.80

ASCE 7-10 Table 12.8-2		
System	**C_t**	**x**
Steel MRF	0.028	0.80
Concrete MRF	0.016	0.90
EBF	0.030	0.75
All other systems	0.020	0.75

$T_a = C_t\ h_n^x$ (12.8-7)

T_a	1.81	1.81	Seconds (Approximate Fundamental Period)
R	8.0	8.0	Response Modification Factor (Table 12.2-1)
K =	1.65	1.65	(Exponent factor for Floor Levels - Sect 12.8.3)
C_S =	0.044	0.044	g's (Seismic Coefficient - Sect 12.8.1)
ρ =	1.000	1.000	Redundancy Factor (Section 12.3.4)



2. Vertical Distribution of Seismic Forces (Section 12.8.3)

Note: $F_x = \rho\ C_S\ W_x H^K_X$

for ρ = Redundancy Factor each side

C_S = Seismic Coefficient each side

$W_x H^k_x$ = Product each floor level, each side

			N-S and E-W Directions											
Floor Level	**Story Weight, W_x (kips)**	**Floor Elevation, H_x (feet)**	**$W_x H^k_x$**	**Lateral Force, F_x (kips)**	**Story Shear, V_x (kips)**	**$F_x * h_x$ (kip-ft)**	**Overturning Moment about Roof, M_{OTR} (kip-ft)**	**Overturning Moment about Base, M_{OTB} (kip-ft)**	**$W_x H^k_x$**	**Lateral Force, F_x (kips)**	**Story Shear, V_x (kips)**	**$F_x * h_x$ (kip-ft)**	**Overturning Moment about Roof, M_{ot} (kip-ft)**	**Overturning Moment about Base, M_{ot} (kip-ft)**
R	1,702	183.0	9,391,728	176	176	32,144	2,108	32,144						
15	1,500	171.0	7,396,525	138	314	23,655	5,876	55,800						
14	1,500	159.0	6,557,952	123	437	19,502	11,115	75,302						
13	1,500	147.0	5,759,780	108	544	15,835	17,648	91,137						
12	1,500	135.0	5,003,123	94	638	12,632	25,303	103,769						
11	1,500	123.0	4,289,226	80	718	9,867	33,921	113,636						
10	1,500	111.0	3,619,491	68	786	7,514	43,351	121,151						
9	1,500	99.0	2,995,519	56	842	5,546	53,454	126,697						
8	1,500	87.0	2,419,166	45	887	3,936	64,099	130,633						
7	1,500	75.0	1,892,617	35	923	2,655	75,169	133,288						
6	1,500	63.0	1,418,513	27	949	1,671	86,558	134,960						
5	1,500	51.0	1,000,139	19	968	954	98,171	135,913						
4	1,500	39.0	641,770	12	980	468	109,928	136,382						
3	1,500	27.0	349,350	7	986	176	121,764	136,558						
2	1,500	15.0	132,155	2	989	37	136,595	136,595						

$\sum_{i=1}^{n} w_i\ h_i^k$ = 52,867,053

$\sum_{i=1}^{n} w_i\ h_i^k$ = 0

Weight = 22,699 kips

V = 989 kips

M_{ot} = 136,595 kip-ft

V = 0 kips

M_{ot} = 0 kip-ft

LOCATION OF TYPICAL WF SHAPES AND SPLICE LOCATIONS - SPECIAL MOMENT RESISTING FRAMES
ASCE 7 SECTION 12.8 - EQUIVALENT LATERAL FORCE PROCEDURE - RIGID DIAPHRAGM ANALYSIS
SAMPLE PROJECT, ANYTOWN - NEW DESIGN

	N-S Direction	W-E Direction
LFRS	SMRF	SMRF
	OK	OK

Note: Splice Location is located below the Floor Level chosen.

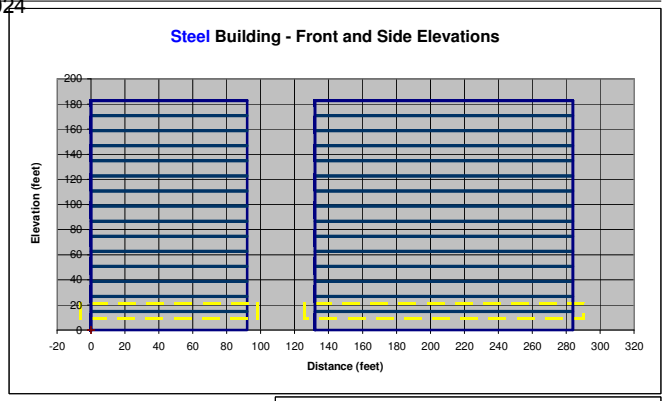
			N-S SMRF										W-E SMRF								
			WF Beam Shape			Exterior/Perimeter Columns			Interior Columns				WF Beam Shape			Exterior/Perimeter Columns			Interior Columns		
Floor Level	Story Weight, W_x (kips)	Floor Elevation, H_x (feet)	WF Shape	I_{XX} (in^4)	Splice Location	WF Shape	I_{XX} (in^4)	I_{YY} (in^4)	WF Shape	I_{XX} (in^4)	I_{YY} (in^4)		WF Shape	I_{XX} (in^4)	Splice Location	WF Shape	I_{XX} (in^4)	I_{YY} (in^4)	WF Shape	I_{XX} (in^4)	I_{YY} (in^4)
R	1,702	183.0	W24X76	2,100		W14X120	1,380	495	W14X120	1,380	495		W24X55	1,350		W14X120	1,380	495	W14X120	1,380	495
15	1,500	171.0	W24X76	2,100	x	W14X120	1,380	495	W14X120	1,380	495		W24X68	1,830	x	W14X120	1,380	495	W14X120	1,380	495
14	1,500	159.0	W27X84	2,850		W14X159	1,900	748	W14X159	1,900	748		W27X84	2,850		W14X159	1,900	748	W14X159	1,900	748
13	1,500	147.0	W27X94	3,270	x	W14X159	1,900	748	W14X159	1,900	748		W27X94	3,270	x	W14X159	1,900	748	W14X159	1,900	748
12	1,500	135.0	W27X102	3,620		W14X193	2,400	931	W14X211	2,660	1,030		W27X94	3,270		W14X193	2,400	931	W14X211	2,660	1,030
11	1,500	123.0	W30X108	4,470	x	W14X193	2,400	931	W14X211	2,660	1,030		W30X99	3,990	x	W14X193	2,400	931	W14X211	2,660	1,030
10	1,500	111.0	W30X116	4,930		W14X233	3,010	1,150	W14X257	3,400	1,290		W30X99	3,990		W14X233	3,010	1,150	W14X257	3,400	1,290
9	1,500	99.0	W30X116	4,930	x	W14X233	3,010	1,150	W14X257	3,400	1,290		W30X108	4,470	x	W14X233	3,010	1,150	W14X257	3,400	1,290
8	1,500	87.0	W30X124	5,360		W14X283	3,840	1,440	W14X311	4,330	1,610		W30X108	4,470		W14X283	3,840	1,440	W14X311	4,330	1,610
7	1,500	75.0	W33X118	5,900	x	W14X283	3,840	1,440	W14X311	4,330	1,610		W33X118	5,900	x	W14X283	3,840	1,440	W14X311	4,330	1,610
6	1,500	63.0	W33X118	5,900		W14X311	4,330	1,610	W14X342	4,900	1,810		W33X118	5,900		W14X311	4,330	1,610	W14X342	4,900	1,810
5	1,500	51.0	W33X130	6,710	x	W14X311	4,330	1,610	W14X342	4,900	1,810		W33X118	5,900	x	W14X311	4,330	1,610	W14X342	4,900	1,810
4	1,500	39.0	W33X130	6,710		W14X342	4,900	1,810	W14X398	6,000	2,170		W33X118	5,900		W14X342	4,900	1,810	W14X398	6,000	2,170
3	1,500	27.0	W33X130	6,710	x	W14X342	4,900	1,810	W14X398	6,000	2,170		W33X118	5,900	x	W14X342	4,900	1,810	W14X398	6,000	2,170
2	1,500	15.0	W33X141	7,450		W14X426	6,600	2,360	W14X455	7,190	2,560		W33X130	6,710		W14X426	6,600	2,360	W14X455	7,190	2,560

Project	15 Story SMRF Example
Job No.	202130.20
By	AL
Date	08/26/21
Sheet	_____ of _____

Steel LFRS RDA - EQ Model
Case 2 Summary Check Results
w/ SAP Model - nodes at Floors only
w/ SAP Model - nodes at Floors and columns
3/15/2024

Company Name
Company Adress
Company Tel/Fax
Company Website
NBSD-Software.com

SUMMARY OF RDA RESULTS TO STEEL ELEMENTS - LEVEL 2
ASCE 7 SECTION 12.8 - EQUIVALENT LATERAL FORCE PROCEDURE - RIGID DIAPHRAGM ANALYSIS
CASE STUDY 2 - CE 286 15-STORY SMRF EXAMPLE



Floor Level : 2

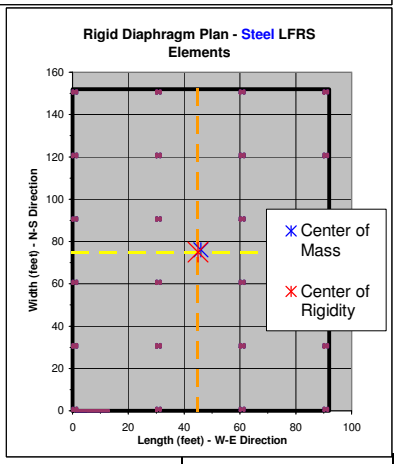
1. General Design Parameters

H_A = 12.00 feet (Height of Floor Level Above)
H_B = 15.00 feet (Height of Floor Level Below)

Story Shear - **N-S Direction (Y)** for Loading Direction = **+** (+/-)
LFRS System: SMRF V_S = 989 kips (Story Shear)
C_S = 0.044 g's (Seismic Coefficient)

Story Shear - **W-E Direction (X)** for Loading Direction = **+** (+/-)
LFRS System: SMRF V_S = 989 kips (Story Shear)
C_S = 0.044 g's (Seismic Coefficient)

Moment Frame Beams - **N-S Direction (Y)** WF Shape = **W33X141**
Moment Frame Beams - W-**E Direction (X)** WF Shape = **W33X130**



RC Diaphragm Dimensions						
Section	Length (feet)	Width (feet)	Thickness (inches)	x (feet)	y (feet)	Weight (kips)
1	92.00	152.00	7.00	-	-	1,224
2						
3						

for ρ = 150 pcf (Unit Weight)

Accidental Eccentricity (ASCE (Section 12.8.4.2):

e_{MIN} = 5.00 % (accidental eccentricity)
= > e_{AX} A_{XY} = 7.60 feet for A_{XY} = 1.00 (N-S Amplification of Accidental Torsional Moment)
e_{AY} A_{YX} = 4.60 feet A_{YX} = 1.00 (W-E Amplification of Accidental Torsional Moment)

Material Data: E_m = 29,000 ksi

2. RDA Load Distribution to Steel Elements - Summary of Results

			Steel Element Dimensions and Data													
			LFRS Option Data					Coordinates[1]		Stiffness			Deformation		Axial Forces from Overturning		
LFRS Direction	**Steel** Element ID	H (feet)	**Braced Frame**	AISC Shape	Strong / Weak Axis	L or d (feet)	t or b_f (inches)	x (feet)	y (feet)	K (kip/in)	Relative Stiffness	**V_c (kips)**	**Total Drift Ratio**	δ_{xe} (inches)	P_{WE} (Kips)	P_{NS} (Kips)	P_{OT} (Kips)
N-S	1	15.00		W14X426	W	1.56	16.70	0.00	0.00	106	1.00	33.3	0.0019	0.379		225.3	225.3
	2	15.00		W14X426	W	1.56	16.70	30.00	0.00	106	1.00	31.2	0.0018	0.355		225.3	225.3
	3	15.00		W14X426	W	1.56	16.70	60.00	0.00	106	1.00	29.1	0.0017	0.331		225.3	225.3
	4	15.00		W14X426	W	1.56	16.70	90.00	0.00	106	1.00	27.0	0.0016	0.307		225.3	225.3
	5	15.00		W14X426	W	1.56	16.70	0.00	30.00	160	1.51	50.5	0.0019	0.412			
	6	15.00		W14X455	W	1.58	16.80	30.00	30.00	166	1.57	49.1	0.0018	0.382			
	7	15.00		W14X455	W	1.58	16.80	60.00	30.00	166	1.57	45.8	0.0017	0.357			
	8	15.00		W14X426	W	1.56	16.70	90.00	30.00	160	1.51	40.9	0.0016	0.334			
	9	15.00		W14X426	W	1.56	16.70	0.00	60.00	160	1.51	50.5	0.0019	0.412			
	10	15.00		W14X455	W	1.58	16.80	30.00	60.00	166	1.57	49.1	0.0018	0.382			
	11	15.00		W14X455	W	1.58	16.80	60.00	60.00	166	1.57	45.8	0.0017	0.357			
	12	15.00		W14X426	W	1.56	16.70	90.00	60.00	160	1.51	40.9	0.0016	0.334			
	13	15.00		W14X426	W	1.56	16.70	0.00	90.00	160	1.51	50.5	0.0019	0.412			
	14	15.00		W14X455	W	1.58	16.80	30.00	90.00	166	1.57	49.1	0.0018	0.382			
	15	15.00		W14X455	W	1.58	16.80	60.00	90.00	166	1.57	45.8	0.0017	0.357			
	16	15.00		W14X426	W	1.56	16.70	90.00	90.00	160	1.51	40.9	0.0016	0.334			
	17	15.00		W14X426	W	1.56	16.70	0.00	120.00	160	1.51	50.5	0.0019	0.412			
	18	15.00		W14X455	W	1.58	16.80	30.00	120.00	166	1.57	49.1	0.0018	0.382			
	19	15.00		W14X455	W	1.58	16.80	60.00	120.00	166	1.57	45.8	0.0017	0.357			
	20	15.00		W14X426	W	1.56	16.70	90.00	120.00	160	1.51	40.9	0.0016	0.334			
	21	15.00		W14X426	W	1.56	16.70	0.00	150.00	106	1.00	33.3	0.0019	0.379		-230.0	-230.0
	22	15.00		W14X426	W	1.56	16.70	30.00	150.00	106	1.00	31.2	0.0018	0.355		-230.0	-230.0
	23	15.00		W14X426	W	1.56	16.70	60.00	150.00	106	1.00	29.1	0.0017	0.331		-230.0	-230.0
	24	15.00		W14X426	W	1.56	16.70	90.00	150.00	106	1.00	27.0	0.0016	0.307		-230.0	-230.0
	25																
	26																
	27																
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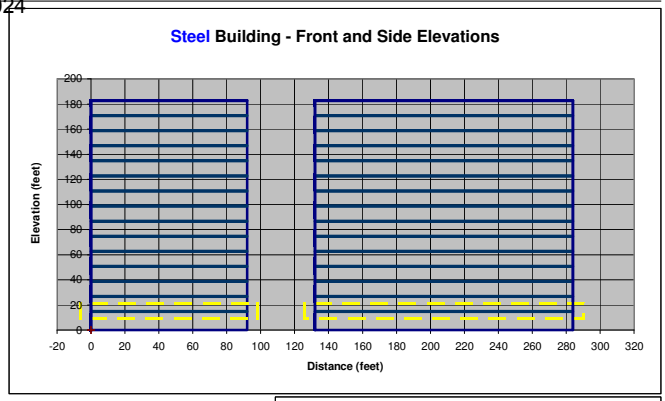
SUMMARY OF RDA RESULTS TO STEEL ELEMENTS - LEVEL 2
ASCE 7 SECTION 12.8 - EQUIVALENT LATERAL FORCE PROCEDURE - RIGID DIAPHRAGM ANALYSIS
CASE STUDY 2 - CE 286 15-STORY SMRF EXAMPLE



Floor Level : 2

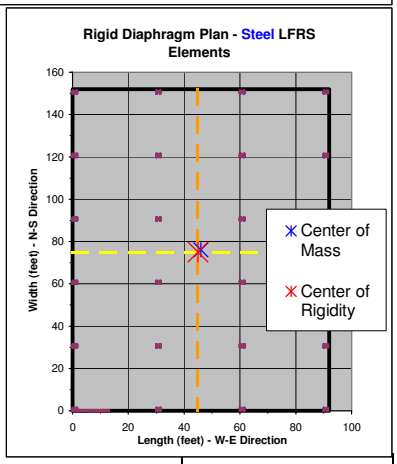
1. General Design Parameters

H_A = 12.00 feet (Height of Floor Level Above)
H_B = 15.00 feet (Height of Floor Level Below)

Story Shear - **N-S Direction (Y)** for Loading Direction = + (+/-)
LFRS System: SMRF V_S = 989 kips (Story Shear)
C_S = 0.044 g's (Seismic Coefficient)

Story Shear - **W-E Direction (X)** for Loading Direction = + (+/-)
LFRS System: SMRF V_S = 989 kips (Story Shear)
C_S = 0.044 g's (Seismic Coefficient)

Moment Frame Beams - **N-S Direction (Y)** WF Shape = **W33X141**
Moment Frame Beams - W-**E Direction (X)** WF Shape = **W33X130**



RC Diaphragm Dimensions						
Section	Length (feet)	Width (feet)	Thickness (inches)	x (feet)	y (feet)	Weight (kips)
1	92.00	152.00	7.00	-	-	1,224
2						
3						

for ρ = 150 pcf (Unit Weight)

Accidental Eccentricity (ASCE (Section 12.8.4.2):

e_{MIN} = 5.00 % (accidental eccentricity)

=> e_{AX} A_{XY} = 7.60 feet for A_{XY} = 1.00 (N-S Amplification of Accidental Torsional Moment)

e_{AY} A_{YX} = 4.60 feet A_{YX} = 1.00 (W-E Amplification of Accidental Torsional Moment)

Material Data: E_m = 29,000 ksi

2. RDA Load Distribution to Steel Elements - Summary of Results

			Steel Element Dimensions and Data														
			LFRS Option Data					Coordinates[1]		Stiffness			Deformation		Axial Forces from Overturning		
LFRS Direction	Steel Element ID	H (feet)	Braced Frame	AISC Shape	Strong / Weak Axis	L or d (feet)	t or b_f (inches)	x (feet)	y (feet)	K (kip/in)	Relative Stiffness	V_c (kips)	Total Drift Ratio	δ_{xe} (inches)	P_{WE} (Kips)	P_{NS} (Kips)	P_{OT} (Kips)
W-E	1	15.00		W14X426	S	1.56	16.70	0.00	0.00	108	1.02	34.4	0.0020	0.342	248.5		248.5
	2	15.00		W14X426	S	1.56	16.70	30.00	0.00	176	1.66	56.0	0.0020	0.357			
	3	15.00		W14X426	S	1.56	16.70	60.00	0.00	176	1.66	56.0	0.0020	0.357			
	4	15.00		W14X426	S	1.56	16.70	90.00	0.00	108	1.02	34.4	0.0020	0.342	-257.3		-257.3
	5	15.00		W14X426	S	1.56	16.70	0.00	30.00	108	1.02	33.0	0.0019	0.328	248.5		248.5
	6	15.00		W14X455	S	1.58	16.80	30.00	30.00	181	1.72	55.5	0.0019	0.341			
	7	15.00		W14X455	S	1.58	16.80	60.00	30.00	181	1.72	55.5	0.0019	0.341			
	8	15.00		W14X426	S	1.56	16.70	90.00	30.00	108	1.02	33.0	0.0019	0.328	-257.3		-257.3
	9	15.00		W14X426	S	1.56	16.70	0.00	60.00	108	1.02	31.6	0.0018	0.314	248.5		248.5
	10	15.00		W14X455	S	1.58	16.80	30.00	60.00	181	1.72	53.1	0.0018	0.326			
	11	15.00		W14X455	S	1.58	16.80	60.00	60.00	181	1.72	53.1	0.0018	0.326			
	12	15.00		W14X426	S	1.56	16.70	90.00	60.00	108	1.02	31.6	0.0018	0.314	-257.3		-257.3
	13	15.00		W14X426	S	1.56	16.70	0.00	90.00	108	1.02	30.2	0.0017	0.301	248.5		248.5
	14	15.00		W14X455	S	1.58	16.80	30.00	90.00	181	1.72	50.8	0.0017	0.312			
	15	15.00		W14X455	S	1.58	16.80	60.00	90.00	181	1.72	50.8	0.0017	0.312			
	16	15.00		W14X426	S	1.56	16.70	90.00	90.00	108	1.02	30.2	0.0017	0.301	-257.3		-257.3
	17	15.00		W14X426	S	1.56	16.70	0.00	120.00	108	1.02	28.8	0.0016	0.287	248.5		248.5
	18	15.00		W14X455	S	1.58	16.80	30.00	120.00	181	1.72	48.4	0.0016	0.297			
	19	15.00		W14X455	S	1.58	16.80	60.00	120.00	181	1.72	48.4	0.0016	0.297			
	20	15.00		W14X426	S	1.56	16.70	90.00	120.00	108	1.02	28.8	0.0016	0.287	-257.3		-257.3
	21	15.00		W14X426	S	1.56	16.70	0.00	150.00	108	1.02	27.4	0.0016	0.273	248.5		248.5
	22	15.00		W14X426	S	1.56	16.70	30.00	150.00	176	1.66	44.6	0.0016	0.285			
	23	15.00		W14X426	S	1.56	16.70	60.00	150.00	176	1.66	44.6	0.0016	0.285			
	24	15.00		W14X426	S	1.56	16.70	90.00	150.00	108	1.02	27.4	0.0016	0.273	-257.3		-257.3
	25																
	26																
	27																
	28																
	29																
	30																
	31																
	32																