

Project Sample Project, Anytown  
 Job No. 202350.20  
 By AL  
 Date 11/28/23  
 Sheet \_\_\_ of \_\_\_

Company Name  
 Company Address  
 Company Tel/Fax  
 Company Website

NBSD-Software.com

**AXIAL OVERTURNING FORCES TO RC SHEAR ELEMENTS - LEVEL 2**  
**ASCE 7-10 SECTION 12.8 - EQUIVALENT LATERAL FORCE PROCEDURE - RIGID DIAPHRAGM ANALYSIS**  
**SAMPLE PROJECT, ANYTOWN - NEW DESIGN**

Floor Level : 2

**1. General Design Parameters**

Overturning Moments

$M_{ONS} = 94,815$  Kip-ft (N-S direction)  
 $M_{OWE} = 94,815$  Kip-ft (W-E direction)

LFRS resist Axial OT Loads both directions: **N** (Y or N)

Columns resist Shear Forces in both LFRS directions: **Y** (Y for Space or 3D LFR Frames, N for 2D LFR Frames)

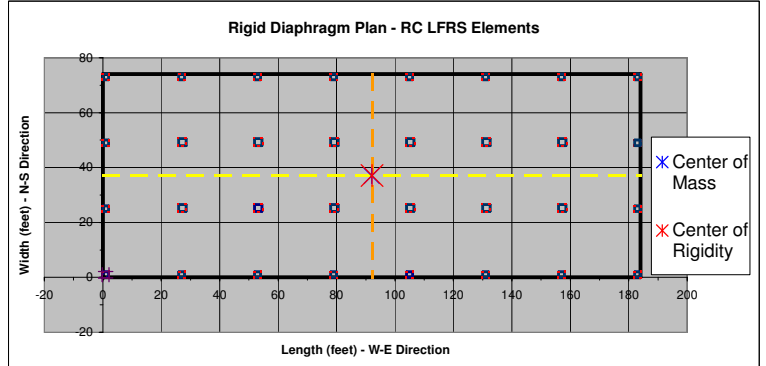
RC Diaphragm Dimensions					
Section	Length (feet)	Width (feet)	Thickness (inches)	x (feet)	y (feet)
1	184.00	74.00	12.00	-	-
2					
3					

Center of Mass:

$x_{CM} = 92.02$  feet  
 $y_{CM} = 37.02$  feet

Center of Rigidity:

$x_{CR} = 92.13$  feet  
 $y_{CR} = 37.11$  feet



Threshold Limit = **5.00** feet (Max distance from Perimeter Column to Edge of Slab)

**2. Determination of Axial Loads - Overturning**

Note: Axial loads are assumed distributed according to the following relationships:

$P_{WE} = \frac{M_{OWE} D_x}{\sum D_x^2}$  Where  $M_{OWE} = 94,815$  Kip-ft  
 $D_x =$  Element distance to Long COR

$P_{NS} = \frac{M_{ONS} D_y}{\sum D_y^2}$  Where  $M_{ONS} = 94,815$  Kip-ft  
 $D_y =$  Element distance to Vertical COR

**3. Distance to Center of Rotation for LFRS Elements and Resulting RDA Axial Loads**

LFRS Direction	RC Element ID	RC Shear Wall	LFRS Data					Coordinates		Centroids		Distance to CR		$D_x^2$	$D_y^2$	Axial Forces from Overturning				
			SMRF Column	$H_{below}$ (feet)	L (feet)	t (inches)	Fixity to Slab	x (feet)	y (feet)	$x_{wall}$ (ft)	$y_{wall}$ (ft)	$D_x$ (ft)	$D_y$ (ft)			$P_{WE}$ (Kips)	$P_{NS}$ (Kips)	$P_{OT}$ (Kips)		
N-S	1	x		14.00	2.00	24.00	F	0.00	0.00	1.00	1.00			36.11		1,304		165	165	
	2	x		14.00	2.00	24.00	F	26.00	0.00	27.00	1.00			36.11		1,304		165	165	
	3	x		14.00	2.00	24.00	F	52.00	0.00	53.00	1.00			36.11		1,304		165	165	
	4	x		14.00	2.00	24.00	F	78.00	0.00	79.00	1.00			36.11		1,304		165	165	
	5	x		14.00	2.00	24.00	F	104.00	0.00	105.00	1.00			36.11		1,304		165	165	
	6	x		14.00	2.00	24.00	F	130.00	0.00	131.00	1.00			36.11		1,304		165	165	
	7	x		14.00	2.00	24.00	F	156.00	0.00	157.00	1.00			36.11		1,304		165	165	
	8	x		14.00	2.00	24.00	F	182.00	0.00	183.00	1.00			36.11		1,304		165	165	
	9	x		14.00	2.00	24.00	F	0.00	24.00	1.00	25.00									
	10	x		14.00	2.50	30.00	F	26.00	24.00	27.25	25.25									
	11	x		14.00	2.50	30.00	F	52.00	24.00	53.25	25.25									
	12	x		14.00	2.50	30.00	F	78.00	24.00	79.25	25.25									
	13	x		14.00	2.50	30.00	F	104.00	24.00	105.25	25.25									
	14	x		14.00	2.50	30.00	F	130.00	24.00	131.25	25.25									
	15	x		14.00	2.50	30.00	F	156.00	24.00	157.25	25.25									
	16	x		14.00	2.00	24.00	F	182.00	24.00	183.00	25.00									
	17	x		14.00	2.00	24.00	F	0.00	48.00	1.00	49.00									
	18	x		14.00	2.50	30.00	F	26.00	48.00	27.25	49.25									
	19	x		14.00	2.50	30.00	F	52.00	48.00	53.25	49.25									
	20	x		14.00	2.50	30.00	F	78.00	48.00	79.25	49.25									
	21	x		14.00	2.50	30.00	F	104.00	48.00	105.25	49.25									
	22	x		14.00	2.50	30.00	F	130.00	48.00	131.25	49.25									
	23	x		14.00	2.50	30.00	F	156.00	48.00	157.25	49.25									
	24	x		14.00	2.00	24.00	F	182.00	48.00	183.00	49.00									
	25	x		14.00	2.00	24.00	F	0.00	72.00	1.00	73.00				-35.89	1,288		-164	-164	
	26	x		14.00	2.00	24.00	F	26.00	72.00	27.00	73.00				-35.89	1,288		-164	-164	
	27	x		14.00	2.00	24.00	F	52.00	72.00	53.00	73.00				-35.89	1,288		-164	-164	
	28	x		14.00	2.00	24.00	F	78.00	72.00	79.00	73.00				-35.89	1,288		-164	-164	
	29	x		14.00	2.00	24.00	F	104.00	72.00	105.00	73.00				-35.89	1,288		-164	-164	
	30	x		14.00	2.00	24.00	F	130.00	72.00	131.00	73.00				-35.89	1,288		-164	-164	
	31	x		14.00	2.00	24.00	F	156.00	72.00	157.00	73.00				-35.89	1,288		-164	-164	
	32	x		14.00	2.00	24.00	F	182.00	72.00	183.00	73.00				-35.89	1,288		-164	-164	

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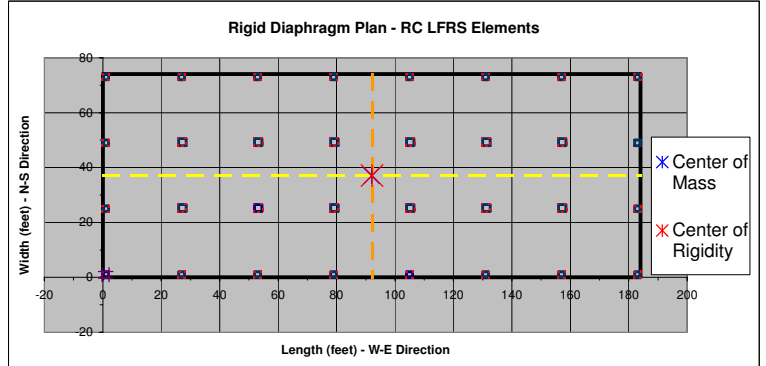
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Threshold Limit = **5.00** feet (Max distance from Perimeter Column to Edge of Slab)

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LFERS Direction	RC Element ID	RC Shear Wall	SMRF Column	LFERS Data				Coordinates		Centroids		Distance to CR		Axial Forces from Overturning				
				$H_{below}$ (feet)	L (feet)	t (inches)	Fixity to Slab	x (feet)	y (feet)	$x_{wall}$ (ft)	$y_{wall}$ (ft)	$D_x$ (ft)	$D_y$ (ft)	$D_x^2$	$D_y^2$	$P_{WE}$ (Kips)	$P_{NS}$ (Kips)	$P_{OT}$ (Kips)
W-E	1		x	14.00	2.00	24.00	F	0.00	0.00	1.00	1.00	91.13		8,305		130		130
	2		x	14.00	2.00	24.00	F	26.00	0.00	27.00	1.00							
	3		x	14.00	2.00	24.00	F	52.00	0.00	53.00	1.00							
	4		x	14.00	2.00	24.00	F	78.00	0.00	79.00	1.00							
	5		x	14.00	2.00	24.00	F	104.00	0.00	105.00	1.00							
	6		x	14.00	2.00	24.00	F	130.00	0.00	131.00	1.00							
	7		x	14.00	2.00	24.00	F	156.00	0.00	157.00	1.00							
	8		x	14.00	2.00	24.00	F	182.00	0.00	183.00	1.00	-90.87		8,257		-130		-130
	9		x	14.00	2.00	24.00	F	0.00	24.00	1.00	25.00	91.13		8,305		130		130
	10		x	14.00	2.50	30.00	F	26.00	24.00	27.25	25.25							
	11		x	14.00	2.50	30.00	F	52.00	24.00	53.25	25.25							
	12		x	14.00	2.50	30.00	F	78.00	24.00	79.25	25.25							
	13		x	14.00	2.50	30.00	F	104.00	24.00	105.25	25.25							
	14		x	14.00	2.50	30.00	F	130.00	24.00	131.25	25.25							
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	17		x	14.00	2.00	24.00	F	0.00	48.00	1.00	49.00	91.13		8,305		130		130
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	24		x	14.00	2.00	24.00	F	182.00	48.00	183.00	49.00	-90.87		8,257		-130		-130
	25		x	14.00	2.00	24.00	F	0.00	72.00	1.00	73.00	91.13		8,305		130		130
	26		x	14.00	2.00	24.00	F	26.00	72.00	27.00	73.00							
	27		x	14.00	2.00	24.00	F	52.00	72.00	53.00	73.00							
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	32		x	14.00	2.00	24.00	F	182.00	72.00	183.00	73.00	-90.87		8,257		-130		-130