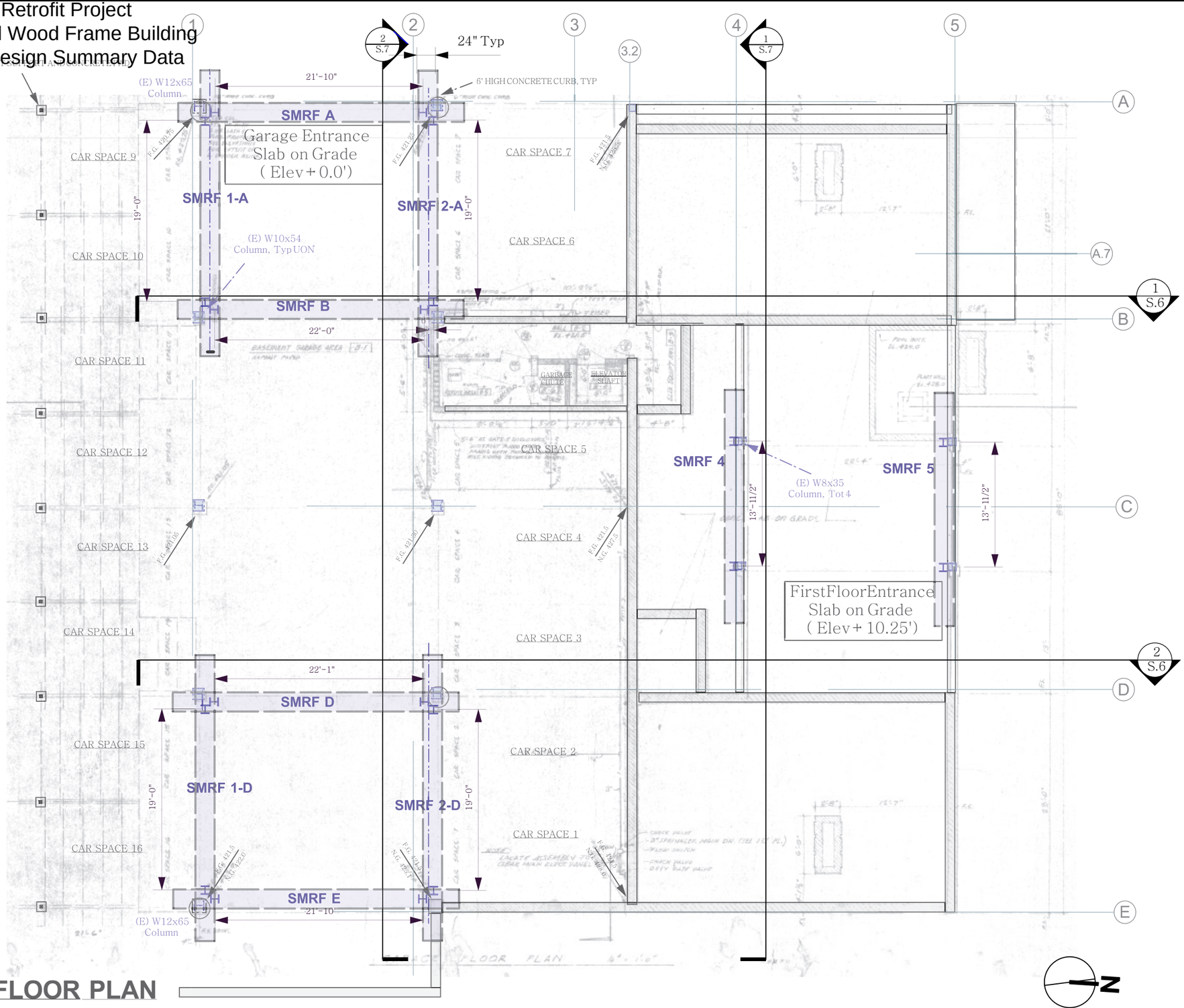
2024 Sample Retrofit Project - Berkeley, CA

Performed Seismic Retrofit (2024) of multi-family residential building in Berkeley (built in 1963) using Simpson Steel Special Moment Resisting Frames at two floor levels of egress into the building.

LATERAL FORCE RESISTING SYSTEM (LFRS) ELEMENTS :

SIMPSON STRONG FRAME

(N) FOOTINGS



LEGEND:

(E) STEEL COLUMN

TYP COL: STEEL WF W/ 3 HR LATHAND PLASTER PROTECTION

(E) CMU WALL ON CONCRETE FOOTING

NORTH BAY SEISMIC DESIGN
Structural Analysis and Design
PO Box 55, Inverness, CA 94937
Tel/Fax: (415) 663-8161
NBSD@Horizoncable.com

(E) GARAGE FLOOR PLAN

SEISMIC RETROFIT
2634 VIRGINIA STREET
BERKELEY, CA 94907

REV	DATE	DESCRIPTION
1		
2		
3		
4		
5		

REGISTERED PROFESSIONAL ENGINEER ALISTAIR LIZARAZU C 58550 Exp. 12/31/2024 CIVIL STATE OF CALIFORNIA

SIGN DATE:	
DATE:	7/22/2024
SCALE:	AS NOTED
DRAWN BY:	AML
CHK BY:	
PROJECT:	2024301.3
SHEET:	S.0R

COMPARISON OF FLEXIBLE VS RIGID DIAPHRAGM LOADS
SEISMIC LOADS TO LFRS ELEMENTS - MAXIMUM VALUES
2634 VIRGINIA STREET, BERKELEY - SEISMIC RETROFIT

Wall Direction	LFRS Gridline	SMRF	H (feet)	L (feet)	Rigid Diaphragms F_{RDA} (kips)	Flexible Diaphragms F_{FDA} (kips)	F_{MAX} (kips)
N-S	**A**	A	10.25	22.50	20.28	18.81	20.28
	B	B	10.25	22.50	24.59	36.58	36.58
	D	D	10.25	22.50	19.11	35.06	35.06
	E	E	10.25	22.50	10.95	13.67	13.67
W-E	1	1-A	10.25	20.50	15.73	18.96	18.96
		1-D	10.25	20.50	15.73	18.96	18.96
	2	2-A	10.25	20.50	10.94	17.69	17.69
		2-D	10.25	20.50	10.94	17.69	17.69
	4	4-B	9.5	13.75	25.78	29.61	29.61
	5	5-A	9.5	13.75	24.47	32.59	32.59

SHEARWALL LOAD DISTRIBUTION - MAXIMUM LATERAL LOADS (FDA VS RDA)
IBC 2012 SHEAR WALL CRITERIA
2634 VIRGINIA STREET, BERKELEY - SEISMIC RETROFIT

Wall Location: Gridline 1

Loading: EQ
Loading Direction: W-E

1. Diaphragm and Shear Wall Dimensions along Plane of Assembled Walls

Level	Story Forces: Strength Load (lbs)	Story Forces: **Service Load (lbs)**	Foundation: Offset (feet)	Foundation: Length (feet)	Foundation: Edge (feet)	Diaphragm: Offset (feet)	Diaphragm: Length (feet)	Diaphragm: Edge (feet)
R		**10,293**				0.00	85.00	85.00
3		**13,917**	0	0	0.00	0.00	85.00	85.00
2		**8,662**	0	0	0.00	0.00	85.00	85.00
1		**7,689**	0	0.00	0.00	0.00	85.00	85.00
LG	-			85.00	85.00		-	

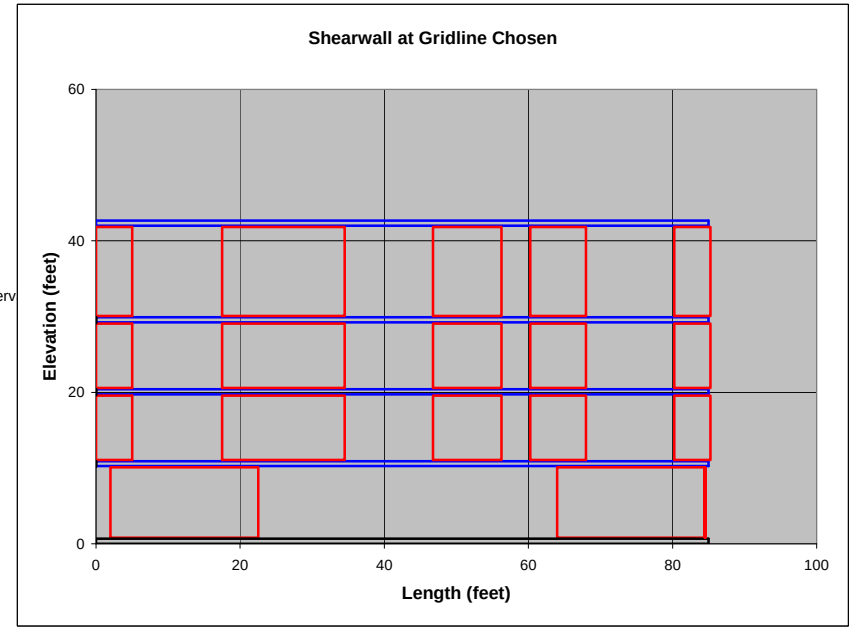
Wall Levels	Wall Height (feet)	Wall Segments: Wall 1 Offset* (feet)	Wall 1 Length (feet)	Wall 2 Offset (feet)	Wall 2 Length (feet)	Wall 3 Offset (feet)	Wall 3 Length (feet)	Wall 4 Offset (feet)	Wall 4 Length (feet)	Wall 5 Offset (feet)	Wall 5 Length (feet)	Summation of Segments: Wall Length (feet)	Floor Length (feet)	Tied to Foundation (feet)*
3 Level	12.75	0.00	5.00	12.50	17.00	12.25	9.50	4.00	7.75	12.25	5.00	44.25	85.00	0.00
Tied *														
2 Level	9.50	0.00	5.00	12.50	17.00	12.25	9.50	4.00	7.75	12.25	5.00	44.25	85.00	0.00
Tied *														
1 Level	9.50	0.00	5.00	12.50	17.00	12.25	9.50	4.00	7.75	12.25	5.00	44.25	85.00	0.00
Tied *														
LG Level	10.25	2.00	20.50	41.50	20.50							41.00	85.00	41.00
Tied *			x		x									

* Notes : 1. Wall segment offset defined from edge of diaphragm (Diaphragm offset).
2. Marked automatically with an X if Wall segment is tied to foundation.
3. After all data is complete , run macro w/ Crtl - w to update spreadsheet.

2. Vertical Wall Distribution and Shear Wall Loads

Level	Story Force (lbs)	Total Shear (lbs)	Story Shear: To Foundation (lbs)	Story Shear: To Walls (lbs)	Story Shear: Total Shear (lbs)	Wall Length (feet)	Diaphragm Length (feet)	Wall Shear (lbs/ft)	Diaphragm Shear (lbs/ft)
R	10,293						85.00		121
		10,293		10,293		44.25		233	
3	13,917		0		10,293		85.00		164
		24,210		24,210		44.25		547	
2	8,662		0		24,210		85.00		102
		32,872		32,872		44.25		743	
1	7,689		0		32,872		85.00		90
		40,561		40,561		41.00		989	
LG			40,561		40,561				

Notes: 1. Diaphragm connected to foundation transfers all load to shear walls; diaphragm connection to wall calculated separately (conserv
2. Load transferred to floor below is proportional to wall length over diaphragm/total wall length;

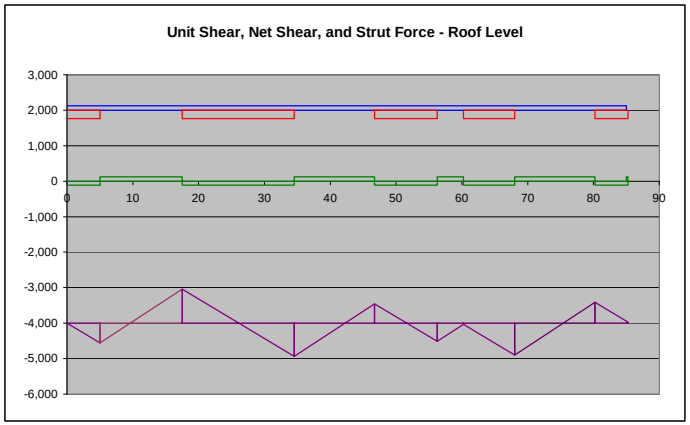


SHEARWALL LOAD DISTRIBUTION - MAXIMUM LATERAL LOADS (FDA VS RDA)
IBC 2012 SHEAR WALL CRITERIA
2634 VIRGINIA STREET, BERKELEY - SEISMIC RETROFIT

Wall Location: Gridline 1

Loading: EQ
Loading Direction: W-E

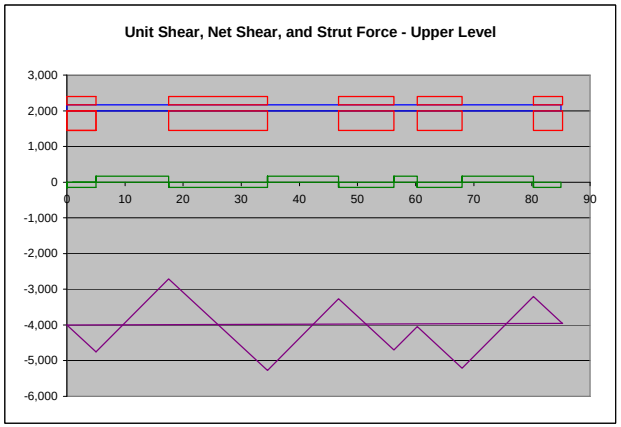
3. Plots of Unit and Net Shears and Strut Force at Wall Levels



R Level Demands:

Vsw = 233 lb/ft

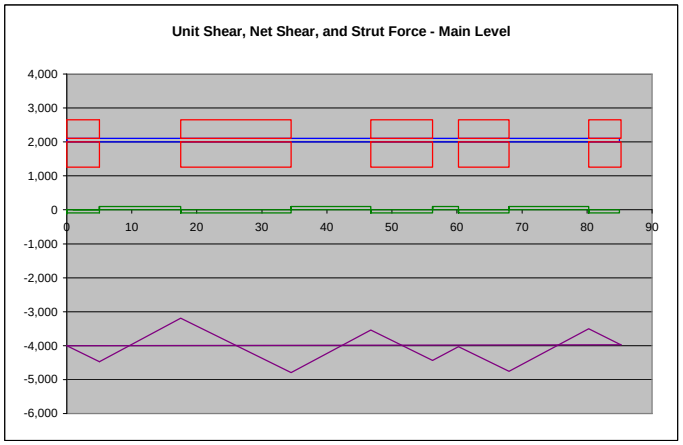
F_{strut} = 956 lbs



3 Level Demands:

Vsw = 547 lb/ft

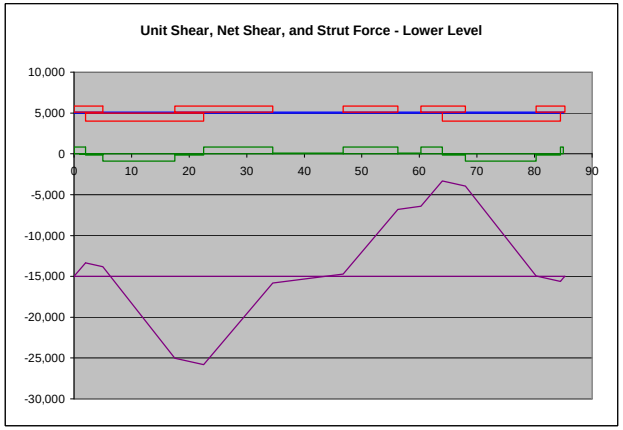
F_{strut} = 1,293 lbs



2 Level Demands:

Vsw = 743 lb/ft

Fstrut = 805 lbs



1 Level Demands:

Vsw = 989 lb/ft

Fstrut = 11,695 lbs

Project	2634 Virgina Street, Berkeley
Job No.	2024301.20
By	AL
Date	9/25/2024
Sheet	_____ of _____

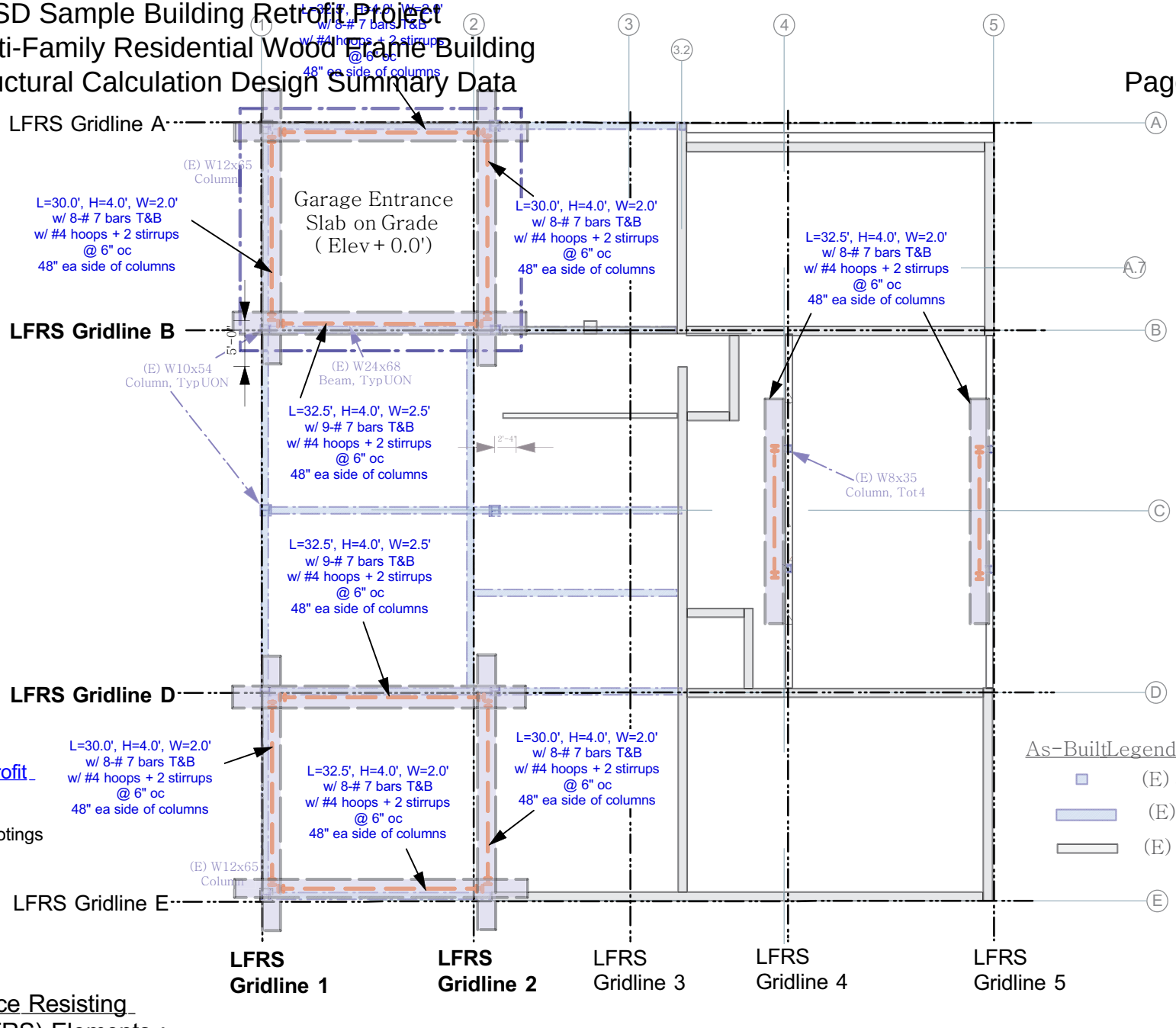
Company Name
Company Adress
Company Tel/Fax
Company Website

NBSD-Software.Com

MAXIMUM OF FLEXIBLE OR RIGID (FDA - RDA) DIAPHRAGM EARTHQUAKE LOADS
SIMPSON SPECIAL MOMENT RESISTING FRAME (SMRF) - DESIGN SUMMARY TABLE
2634 VIRGINIA STREET, BERKELEY - SEISMIC RETROFIT

Note: Redundancy factor Rho = 1.3 used
for Simpson Results (not reflected in loads shown)

Loading Direction	LFRS Gridline	Floor Level	Normal Gridline	Maximum Dimensions Height H (feet)	Maximum Dimensions Width B (feet)	F_{MAX} (kips) ASD	F_{MAX} (kips) LRFD	Collector Force (Kips) ASD	Collector Force (Kips) LRFD	Lateral Force Resisting System (LFRS) Element	Simpson SMRF Link	Simpson SMRF M_{link} (kip-in)
N-S	A	0	1 - 2	10.25	22.50	20.28	28.39	7.63	10.68	Simpson **FB SMRF A** **(W12x45 Beam + W10x77 Columns)**	YLMC4-4	1,966
	B	0	G - J	10.25	22.50	36.59	51.22	20.08	28.11	Simpson **FB SMRF B** **(W16x67 Beam + W10x100 Columns)**	YLMC6-3.5	3,491
	D	0	G - J	10.25	22.50	35.73	50.02	22.12	30.96	Simpson **FB SMRF D** **(W16x67 Beam + W10x100 Columns)**	YLMC6-3.5	3,491
	E	0	G - J	10.25	22.50	13.68	19.15	4.21	5.89	Simpson **FB SMRF E** **(W12x45 Beam + W10x77 Columns)**	YLMC4-4	1,966
W-E	1	0	A - B	10.25	20.50	18.96	26.55	11.03	15.44	Simpson **FB SMRF 1A** **(W12x45 Beam + W10x68 Columns)**	YLMC4-3.5	1,720
	1	0	D - E	10.25	20.50	18.96	26.55	11.03	15.44	Simpson **FB SMRF 1D** **(W12x45 Beam + W10x68 Columns)**	YLMC4-3.5	1,720
	2	0	A - B	10.25	20.50	17.69	24.77	10.25	14.35	Simpson **FB SMRF 2A** **(W12x45 Beam + W10x68 Columns)**	YLMC4-3.5	1,720
	2	0	D - E	10.25	20.50	17.69	24.77	10.25	14.35	Simpson **FB SMRF 2D** **(W12x45 Beam + W10x68 Columns)**	YLMC4-3.5	1,720
	4	1	B.5 - C.5	9.50	13.75	29.62	41.46	10.51	14.71	Simpson **FB SMRF 4** **(W12x50 Beam + W10x88 Columns)**	YLMC4-4	1,981
	5	1	B.5 - C.5	9.50	13.75	32.59	45.63	15.58	21.81	Simpson **FB SMRF 5** **(W12x50 Beam + W10x88 Columns)**	YLMC4-4	1,981



Foundation Retrofit Elements:

(N) Footings

As-Built Legend:

(E) Steel Column

(E) Steel Beam

(E) CMU Wall on RC Footing

Lateral Force Resisting System (LFRS) Elements :

Simpson Strong Frame

FOUNDATION RETROFIT PLAN - LOWER GARAGE AND FIRST FLOOR