

Canadian Wood Council	Conseil Canadien du bois
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WoodWorks® Shearwalls 11.4.1

Shearwalls-US.wswc

May. 1, 2025 11:58:49

Project Information

DESIGN SETTINGS

Design Code CSA 086-19 / NBC 2015			Wind Method NBC 4.1.7.5 – Other buildings	
Max Shearwall Offset [ft] Plan (within storey) 0.49		Elevation (between storeys) 0.83	Service Conditions Moisture Content Fabrication 19% dry Service 10% dry	
Max Height-to-length Ratio Blocked 3.5	Unblocked 2.0	Height Restrictions for Wind Loads Use mean roof height	Disable Gypsum Contribution for Design	
			Seismic No	Wind No
Shearline shearwalls can have dissimilar materials				
Shearwall relative rigidity: Deflection-based stiffness of wall segments				
Design shearwall force/length: Based on wall rigidity/length				
Hold-down forces based on: Applied loads				
Drag strut forces based on: Applied loads				
Linearize deflection equation: Never				
Dead load in chord force for overturning design				
Tension end Wall length / 2		Compression end Wall length / 2	When completely counteracts overturning Wall length / 2	

SITE INFORMATION

Importance Category Normal (all other buildings)					
Wind			Seismic		
Static Procedure NBC 4.1.7.3			Equivalent Static Force Procedure NBC 4.1.8.11		
Velocity Pressure q:	0.45 kPa		Importance Factor:	1.0	
Openings:	Non-uniform, resistant, closed		Site Class:	D: Stiff soil	
Int. Gust Factor Cgi:	2.0		PGA:	0.37	
Terrain:	Rough terrain		T =	0.2	0.5
			Sa (T):	0.848	0.751
			F (T):	0.959	1.159
				1.269	1.326
				1.326	1.382
Topographic Information [ft]			N-S		
Hill Shape	Height	Length	Period Ta Calculated:	0.255s	0.255s
-	-	-	Ta Used:	0.255s	0.255s
Site Location: -			Ductility Factor Rd:	3.00	3.00
			Overstrength Factor Ro:	1.70	1.70

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Structural Data

STOREY INFORMATION

	Storey Elev [ft]	Floor/Ceiling Depth [in]	Wall Height [ft]	Hold-down Length subject to shrinkage [in]	Bolt length [in]
Ceiling	32.85	0.0			
Level 3	23.83	10.0	9.02	13.75	13.78
Level 2	13.97	10.0	9.02	13.75	13.78
Level 1	4.11	10.0	9.02	13.74	13.78
Foundation	3.28				

BLOCK and ROOF INFORMATION

Block Dimensions [ft]			Face	Type	Roof Panels Slope	Overhang [ft]
Block 1	3 Storey	E-W Ridge				
Location X,Y =	-0.49	-0.82	North	Side	0.0	0.00
Extent X,Y =	60.12	40.27	South	Side	0.0	0.00
Ridge Y Location, Offset	19.32	0.00	East		0.0	0.00
Ridge Elevation, Height	32.85	0.00	West		0.0	0.00

SHEATHING MATERIALS by WALL GROUP [in]

Wall Grp	Surf	Sheathing: Material	Mark/ Ply	Thk	GU in	Or	Bv	Dia	Fasteners Len	Pen	Spacing Edg	Int	Bk	Jus	Note #
1	Ext	DF Plywood	3	5/16	-	Horz	26267	2.87	2	1.703	6	8	Y	1.0	1, 3
2	1	DF Plywood	7	23/32	-	Horz	55959	3.76	3	2.272	2	12	Y	1.0	
2	2	DF Plywood	0	23/32	-	Horz	0	0.00	0	0	?	12	N	0.6	
3	Ext	DF Plywood	5	1/2	-	Horz	39400	2.87	2	1.508	5	8	Y	1.0	
4	Ext	DF Plywood	5	1/2	-	Horz	39400	2.87	2	1.508	6	8	Y	1.0	
5	Ext	DF Plywood	6	5/8	-	Horz	47965	2.87	2	1.39	5	6	Y	1.0	
6	Ext	DF Plywood	5	1/2	-	Horz	39400	2.87	2	1.508	4	8	Y	1.0	
7	Ext	DF Plywood	5	1/2	-	Horz	39400	2.87	2	1.508	3	8	Y	1.0	
8	Ext	DF Plywood	7	23/32	-	Horz	55959	3.33	2-1/2	1.772	4	8	Y	1.0	

Legend:

Grp - Wall design group number, used to reference wall in other tables (created by program)

Surf - Exterior or interior surface when applied to exterior wall

Mark/Ply - No. of plywood plies (Tables 9.1-9.3) or OSB panel mark (9.3, shown in Note 4)

Thk - Sheathing thickness

GU - Gypsum underlay thickness

Or - Sheathing orientation

Bv - Shear-through-thickness rigidity of the sheathing in lb/in (Tables 9.1-9.3)

Dia - Fastener diameter (always in mm)

Len - Fastener length (always in inches)

Pen - Fastener penetration depth

Spacing - Edge and intermediate nail spacing

Bk - Sheathing is nailed to blocking at all panel edges. Y(es) or N(o)

Jus - Unblocked adjustment factor (Table 11.3)

- Number(s) of note(s) from below that apply to sheathing.

General Notes:

Nail diameter is in mm.

Blocking is defined as providing framing members at all edges of the shearwall panel. Unblocked panels must be staggered as shown in O86 Figure 11.6.

Nails shall be placed not less than 9 mm from panel edge and over-driven no more than 15% of panel thickness (O86 11.3.2.3). Framing members are at least 1.5" thick (O86 11.3.2.1), and panel edges separated by at least 2 mm (11.3.2.2).

Material-specific Notes:

1. Install minimum 3-by or double 2-by studs at panel edges because edge nail spacing is 2" (O86 11.3.2.4 a).

3. Ensure that panel edges on either side of wall fall on different studs (O86 11.3.2.4).

FRAMING MATERIALS and STANDARD WALL by WALL GROUP

Wall Grp	Species	Grade	b in	d in	Spcg in	E psi^6	fcp	Standard Wall
1	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
2	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
3	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
4	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
5	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
6	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
7	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	
8	S-P-F	No.1/No.2	1.50	5.51	1'-4.0	1.38	769	

Legend:

Wall Grp - Wall design group number, used to reference wall in other tables

b - Stud breadth (thickness)

d - Stud depth (width)

Spcg - Maximum on-centre spacing of studs for design, actual spacing may be less

E - Modulus of elasticity

Standard Wall - Standard wall designed as group.

Notes:

Check manufacturer requirements for stud size, species and grade, for all shearwall hold-downs.

The following factors are applied to fcp for compressive design and deformation under wall segment end studs : phi = 0.8 (O86 6.5.6.2), load duration factor KD = 1.15 (5.3.2.1), size factor Kzcp = 1.15 (6.5.6.4), bearing length factor KB under window openings(6.5.6.5), wet service factor Kscp = 1.00(Table 6.10)

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SHEARLINE, WALL and OPENING DIMENSIONS

North-south Shearlines	Hold downs	Wall Group	Location X [ft]	Extent [ft] Start	Extent [ft] End	Length [ft]	FHS [ft]	Aspect Ratio	Height [ft]	Studs S N
Line 1										
Level 3										
Line 1	-	5	0.00	0.00	40.03	40.03	10.25	-	9.02	- -
Wall 1-1	NSW		-	0.00	15.75	15.75	0.00	1.00	-	2 2
Wall 1-2	WR	5	-	15.75	26.25	10.50	10.25	0.86	-	2 2
Wall 1-3	NSW		-	26.25	40.03	13.78	0.00	1.00	-	2 2
Level 2										
Line 1	-	4	0.00	0.00	40.03	40.03	10.25	-	9.02	- -
Wall 1-1	NSW		-	0.00	15.75	15.75	0.00	1.00	-	2 2
Wall 1-2	All	4	-	15.75	26.25	10.50	10.25	0.86	-	2 2
Wall 1-3	NSW		-	26.25	40.03	13.78	0.00	1.00	-	2 2
Level 1										
Line 1	-	3	0.00	0.00	40.03	40.03	10.25	-	9.02	- -
Wall 1-1	NSW		-	0.00	15.75	15.75	0.00	1.00	-	2 2
Wall 1-2	All	3	-	15.75	26.25	10.50	10.25	0.86	-	2 2
Wall 1-3	NSW		-	26.25	40.03	13.78	0.00	1.00	-	2 2
Line 2										
Level 3										
Line 2	All	2	10.01	0.00	40.03	40.03	10.90	-	9.02	- -
Wall 2-1	All	2	-	15.09	26.25	11.15	10.90	0.81	-	2 2
Level 2										
Line 2	All	2	10.01	0.00	40.03	40.03	10.90	-	9.02	- -
Wall 2-1	All	2	-	15.09	26.25	11.15	10.90	0.81	-	2 2
Level 1										
Line 2	All	2	10.01	0.00	40.03	40.03	10.90	-	9.02	- -
Wall 2-1	All	2	-	15.09	26.25	11.15	10.90	0.81	-	2 2
Line 3										
Level 3										
Line 3	All	2	30.02	0.00	40.03	40.03	14.51	-	9.02	- -
Wall 3-1	All	2	-	11.48	26.25	14.76	14.51	0.61	-	2 2
Level 2										
Line 3	All	2	30.02	0.00	40.03	40.03	14.51	-	9.02	- -
Wall 3-1	All	2	-	11.48	26.25	14.76	14.51	0.61	-	2 2
Level 1										
Line 3	All	2	30.02	0.00	40.03	40.03	14.51	-	9.02	- -
Wall 3-1	All	2	-	11.48	26.25	14.76	14.51	0.61	-	2 2
Line 4										
Level 3										
Line 4	All	2	50.03	0.00	40.03	40.03	10.90	-	9.02	- -
Wall 4-1	All	2	-	15.09	26.25	11.15	10.90	0.81	-	2 2
Level 2										
Line 4	All	2	50.03	0.00	40.03	40.03	10.90	-	9.02	- -
Wall 4-1	All	2	-	15.09	26.25	11.15	10.90	0.81	-	2 2
Level 1										
Line 4	All	2	50.03	0.00	40.03	40.03	10.90	-	9.02	- -
Wall 4-1	All	2	-	15.09	26.25	11.15	10.90	0.81	-	2 2
Line 5										
Level 3										
Line 5	-	8	60.04	0.00	40.03	40.03	10.58	-	9.02	- -
Wall 5-1	NSW		-	0.00	15.42	15.42	0.00	1.00	-	2 2
Wall 5-2	WR	8	-	15.42	26.25	10.83	10.58	0.83	-	2 2
Wall 5-3	NSW		-	26.25	40.03	13.78	0.00	1.00	-	2 2
Level 2										
Line 5	-	7	60.04	0.00	40.03	40.03	10.58	-	9.02	- -
Wall 5-1	NSW		-	0.00	15.42	15.42	0.00	1.00	-	2 2
Wall 5-2	All	7	-	15.42	26.25	10.83	10.58	0.83	-	2 2
Wall 5-3	NSW		-	26.25	40.03	13.78	0.00	1.00	-	2 2
Level 1										
Line 5	-	6	60.04	0.00	40.03	40.03	10.58	-	9.02	- -
Wall 5-1	NSW		-	0.00	15.42	15.42	0.00	1.00	-	2 2
Wall 5-2	All	6	-	15.42	26.25	10.83	10.58	0.83	-	2 2
Wall 5-3	NSW		-	26.25	40.03	13.78	0.00	1.00	-	2 2
East-west Shearlines	Hold downs	Wall Group	Location Y [ft]	Extent [ft] Start	Extent [ft] End	Length [ft]	FHS [ft]	Aspect Ratio	Height [ft]	Studs W E
Line A										
Level 3										
Line A	NSW		0.00	0.00	60.04	60.04	0.00	-	9.02	- -
Wall A-1	NSW		-	0.00	60.04	60.04	0.00	1.00	-	2 2

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SHEARLINE, WALL and OPENING DIMENSIONS (continued)

Level 2											
Line A	NSW		0.00	0.00	60.04	60.04	0.00	-	9.02	-	-
Wall A-1	NSW		-	0.00	60.04	60.04	0.00	1.00	-	2	2
Level 1											
Line A	NSW		0.00	0.00	60.04	60.04	0.00	-	9.02	-	-
Wall A-1	NSW		-	0.00	60.04	60.04	0.00	1.00	-	2	2
Line B											
Level 3											
Line B	-	2	26.25	0.00	60.04	60.04	52.17	-	9.02	-	-
Wall B-1	All	2	-	1.97	18.04	16.08	15.83	0.56	-	2	2
Wall B-2	All	2	-	20.01	40.03	20.01	19.76	0.45	-	2	2
Wall B-3	All	2	-	41.99	58.07	16.08	15.83	0.56	-	2	2
Level 2											
Line B	-	2	26.25	0.00	60.04	60.04	52.17	-	9.02	-	-
Wall B-1	All	2	-	1.97	18.04	16.08	15.83	0.56	-	2	2
Wall B-2	All	2	-	20.01	40.03	20.01	19.76	0.45	-	2	2
Wall B-3	All	2	-	41.99	58.07	16.08	15.83	0.56	-	2	2
Level 1											
Line B	-	2	26.25	0.00	60.04	60.04	52.17	-	9.02	-	-
Wall B-1	All	2	-	1.97	18.04	16.08	15.83	0.56	-	2	2
Wall B-2	All	2	-	20.01	40.03	20.01	19.76	0.45	-	2	2
Wall B-3	All	2	-	41.99	58.07	16.08	15.83	0.56	-	2	2
Line C											
Level 3											
Line C	NSW		40.03	0.00	60.04	60.04	0.00	-	9.02	-	-
Wall C-1	NSW		-	0.00	60.04	60.04	0.00	1.00	-	2	2
Level 2											
Line C	NSW		40.03	0.00	60.04	60.04	0.00	-	9.02	-	-
Wall C-1	NSW		-	0.00	60.04	60.04	0.00	1.00	-	2	2
Level 1											
Line C	NSW		40.03	0.00	60.04	60.04	0.00	-	9.02	-	-
Wall C-1	NSW		-	0.00	60.04	60.04	0.00	1.00	-	2	2

Legend:

Hold downs – All: All locations, WR: Where required, S&E: Start and end, NSW: Non-shearwall, NW: Non-wood/Proprietary, ND: Not designed

Location – Dimension perpendicular to wall

Length – Shear line: Distance between exterior perpendicular walls defining the shear line extent. Wall, segment, or opening: End-to-end length of the element

FHS – For shearlines and walls with multiple segments: Total shear-resisting full-height sheathing.

For individual wall segments : Distance between hold - down and compression force locations

Aspect Ratio – Ratio of wall height to segment length (Hs/Ls)

Wall Group – Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall

Studs: Number of end studs at the south and north or west and east ends of a wall segment.

Loads

WIND SHEAR LOADS (as entered or generated)

Level 3			Load Case	Wnd Dir	Surf Dir	Prof	Location [ft]		Magnitude [lbs,plf,psf]		Trib Ht [ft]
Block	BF	Element					Start	End	Start	End	
Block 1	W	Wall		W->E	Wind	Line	0.00	40.03	40.8		
Block 1	E	Wall		W->E	Lee	Line	0.00	40.03	22.9		
Block 1	W	Wall		E->W	Lee	Line	0.00	40.03	22.9		
Block 1	E	Wall		E->W	Wind	Line	0.00	40.03	40.8		
Block 1	S	Wall		S->N	Wind	Line	0.00	60.04	45.2		
Block 1	N	Wall		S->N	Lee	Line	0.00	60.04	27.3		
Block 1	S	Wall		N->S	Lee	Line	0.00	60.04	27.3		
Block 1	N	Wall		N->S	Wind	Line	0.00	60.04	45.2		
Level 2			Load Case	Wnd Dir	Surf Dir	Prof	Location [ft]		Magnitude [lbs,plf,psf]		Trib Ht [ft]
Block	BF	Element					Start	End	Start	End	
Block 1	W	Wall		W->E	Wind	Line	0.00	40.03	40.8		
Block 1	E	Wall		W->E	Wind	Line	0.00	40.03	48.4		
Block 1	E	Wall		W->E	Lee	Line	0.00	40.03	27.1		
Block 1	E	Wall		W->E	Lee	Line	0.00	40.03	22.9		
Block 1	W	Wall		E->W	Lee	Line	0.00	40.03	22.9		
Block 1	W	Wall		E->W	Lee	Line	0.00	40.03	27.1		
Block 1	E	Wall		E->W	Wind	Line	0.00	40.03	48.4		
Block 1	E	Wall		E->W	Wind	Line	0.00	40.03	40.8		
Block 1	S	Wall		S->N	Wind	Line	0.00	60.04	53.6		
Block 1	S	Wall		S->N	Wind	Line	0.00	60.04	45.2		
Block 1	N	Wall		S->N	Lee	Line	0.00	60.04	27.3		
Block 1	N	Wall		S->N	Lee	Line	0.00	60.04	32.3		
Block 1	S	Wall		N->S	Lee	Line	0.00	60.04	27.3		
Block 1	S	Wall		N->S	Lee	Line	0.00	60.04	32.3		
Block 1	N	Wall		N->S	Wind	Line	0.00	60.04	53.6		
Block 1	N	Wall		N->S	Wind	Line	0.00	60.04	45.2		
Level 1			Load Case	Wnd Dir	Surf Dir	Prof	Location [ft]		Magnitude [lbs,plf,psf]		Trib Ht [ft]
Block	BF	Element					Start	End	Start	End	
Block 1	W	Wall		W->E	Wind	Line	0.00	40.03	48.4		
Block 1	W	Wall		W->E	Wind	Line	0.00	40.03	40.8		
Block 1	E	Wall		W->E	Lee	Line	0.00	40.03	22.9		
Block 1	E	Wall		W->E	Lee	Line	0.00	40.03	27.1		
Block 1	W	Wall		E->W	Lee	Line	0.00	40.03	22.9		
Block 1	W	Wall		E->W	Lee	Line	0.00	40.03	27.1		
Block 1	E	Wall		E->W	Wind	Line	0.00	40.03	48.4		
Block 1	E	Wall		E->W	Wind	Line	0.00	40.03	40.8		
Block 1	S	Wall		S->N	Wind	Line	0.00	60.04	53.6		
Block 1	S	Wall		S->N	Wind	Line	0.00	60.04	45.2		
Block 1	N	Wall		S->N	Lee	Line	0.00	60.04	27.3		
Block 1	N	Wall		S->N	Lee	Line	0.00	60.04	32.3		
Block 1	S	Wall		N->S	Lee	Line	0.00	60.04	32.3		
Block 1	S	Wall		N->S	Lee	Line	0.00	60.04	27.3		
Block 1	N	Wall		N->S	Wind	Line	0.00	60.04	53.6		
Block 1	N	Wall		N->S	Wind	Line	0.00	60.04	45.2		

Legend:

Block - Block used in load generation, Accum: loads from one block combined with another, Manual: user-entered loads (no block)

BF - Building face (north, south, east, west)

Element - Building surface on which loads generated or entered

Load Case: From NBC Figure 4.1.7.6.-A, low building windward corner and load case A or B

Surf Dir - Windward or leeward side of the building

Prof - Profile (distribution)

Location - Start and end points on building element

Magnitude - Start: Intensity of uniform and point loads or leftmost intensity of trapezoidal load, End: Right intensity of trapezoidal load; Trib Ht - Tributary height of user-applied area loads only

Notes:

All loads entered by user or generated by program are specified (unfactored) loads, except they include ULS importance factor.

The program applies a load factor of 1.4 to wind loads before distributing them to the shearlines.

WIND C&C LOADS

Block	Building Face	Wind Direction	Level	Magnitude [psf]	
				Interior	End Zone
Block 1	West	Windward	3	20.7	20.7
Block 1	East	Leeward	3	18.7	23.7
Block 1	West	Leeward	3	18.7	23.7
Block 1	East	Windward	3	20.7	20.7
Block 1	South	Windward	3	20.7	20.7
Block 1	North	Leeward	3	18.7	23.7
Block 1	South	Leeward	3	18.7	23.7
Block 1	North	Windward	3	20.7	20.7
Block 1	West	Windward	2	20.7	20.7
Block 1	East	Leeward	2	18.7	23.7
Block 1	West	Leeward	2	18.7	23.7
Block 1	East	Windward	2	20.7	20.7
Block 1	South	Windward	2	20.7	20.7
Block 1	North	Leeward	2	18.7	23.7
Block 1	South	Leeward	2	18.7	23.7
Block 1	North	Windward	2	20.7	20.7
Block 1	West	Windward	1	20.7	20.7
Block 1	East	Leeward	1	18.7	23.7
Block 1	West	Leeward	1	18.7	23.7
Block 1	East	Windward	1	20.7	20.7
Block 1	South	Windward	1	20.7	20.7
Block 1	North	Leeward	1	18.7	23.7
Block 1	South	Leeward	1	18.7	23.7
Block 1	North	Windward	1	20.7	20.7

Mag - Load magnitude, unfactored except that it includes ULS importance factor.

DEAD LOADS (for hold-down calculations)

Applied to	Shear Line	Level	Profile	Tributary Width [ft]	Location [ft]		Mag [lbs,psf,psi]	
					Start	End	Start	End
Wall A-1	A	3	Line		0.00	60.04	94.2*	
Wall B-1	B	3	Line		1.97	18.04	56.5*	
Wall B-2	B	3	Line		20.01	40.03	56.5*	
Wall B-3	B	3	Line		41.99	58.07	56.5*	
Wall C-1	C	3	Line		0.00	60.04	94.2*	
Wall 1-1	1	3	Line		0.00	15.75	94.2*	
Wall 1-2	1	3	Line		15.75	26.25	94.2*	
Wall 1-3	1	3	Line		26.25	40.03	94.2*	
Wall 2-1	2	3	Line		15.09	26.25	56.5*	
Wall 3-1	3	3	Line		11.48	26.25	56.5*	
Wall 4-1	4	3	Line		15.09	26.25	56.5*	
Wall 5-1	5	3	Line		0.00	15.42	94.2*	
Wall 5-2	5	3	Line		15.42	26.25	94.2*	
Wall 5-3	5	3	Line		26.25	40.03	94.2*	
Wall A-1	A	2	Line		0.00	60.04	94.2*	
Wall B-1	B	2	Line		1.97	18.04	56.5*	
Wall B-2	B	2	Line		20.01	40.03	56.5*	
Wall B-3	B	2	Line		41.99	58.07	56.5*	
Wall C-1	C	2	Line		0.00	60.04	94.2*	
Wall 1-1	1	2	Line		0.00	15.75	94.2*	
Wall 1-2	1	2	Line		15.75	26.25	94.2*	
Wall 1-3	1	2	Line		26.25	40.03	94.2*	
Wall 2-1	2	2	Line		15.09	26.25	56.5*	
Wall 3-1	3	2	Line		11.48	26.25	56.5*	
Wall 4-1	4	2	Line		15.09	26.25	56.5*	
Wall 5-1	5	2	Line		0.00	15.42	94.2*	
Wall 5-2	5	2	Line		15.42	26.25	94.2*	
Wall 5-3	5	2	Line		26.25	40.03	94.2*	
Wall A-1	A	1	Line		0.00	60.04	94.2*	
Wall B-1	B	1	Line		1.97	18.04	56.5*	
Wall B-2	B	1	Line		20.01	40.03	56.5*	
Wall B-3	B	1	Line		41.99	58.07	56.5*	

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DEAD LOADS (for hold-down calculations) (continued)

Wall C-1	C	1	Line	0.00	60.04	94.2*
Wall 1-1	1	1	Line	0.00	15.75	94.2*
Wall 1-2	1	1	Line	15.75	26.25	94.2*
Wall 1-3	1	1	Line	26.25	40.03	94.2*
Wall 2-1	2	1	Line	15.09	26.25	56.5*
Wall 3-1	3	1	Line	11.48	26.25	56.5*
Wall 4-1	4	1	Line	15.09	26.25	56.5*
Wall 5-1	5	1	Line	0.00	15.42	94.2*
Wall 5-2	5	1	Line	15.42	26.25	94.2*
Wall 5-3	5	1	Line	26.25	40.03	94.2*

* Wall dead load.

BUILDING MASSES

Level 3				Profile	Location [ft]		Magnitude [lbs,plf,psf]		Trib Width [ft]
Force Dir	Building Element	Block	Wall Line		Start	End	Start	End	
E-W	Snow	n/a	1	Line	0.00	40.03	78.4	78.4	
E-W	Snow	n/a	5	Line	0.00	40.03	78.4	78.4	
E-W	Roof F1	n/a	1	Line	0.00	40.03	313.5	313.5	
E-W	Roof F1	n/a	5	Line	0.00	40.03	313.5	313.5	
N-S	Snow	n/a	A	Line	0.00	60.04	52.2	52.2	
N-S	Snow	n/a	C	Line	0.00	60.04	52.2	52.2	
N-S	Roof F1	n/a	A	Line	0.00	60.04	209.0	209.0	
N-S	Roof F1	n/a	C	Line	0.00	60.04	209.0	209.0	
Both	Wall 1-1	n/a	1	Line	0.00	15.75	47.1	47.1	
Both	Wall 1-2	n/a	1	Line	15.75	26.25	47.1	47.1	
Both	Wall 1-3	n/a	1	Line	26.25	40.03	47.1	47.1	
Both	Wall 2-1	n/a	2	Line	15.09	26.25	28.3	28.3	
Both	Wall 3-1	n/a	3	Line	11.48	26.25	28.3	28.3	
Both	Wall 4-1	n/a	4	Line	15.09	26.25	28.3	28.3	
Both	Wall 5-1	n/a	5	Line	0.00	15.42	47.1	47.1	
Both	Wall 5-2	n/a	5	Line	15.42	26.25	47.1	47.1	
Both	Wall 5-3	n/a	5	Line	26.25	40.03	47.1	47.1	
Both	Wall A-1	n/a	A	Line	0.00	60.04	47.1	47.1	
Both	Wall B-1	n/a	B	Line	1.97	18.04	28.3	28.3	
Both	Wall B-2	n/a	B	Line	20.01	40.03	28.3	28.3	
Both	Wall B-3	n/a	B	Line	41.99	58.07	28.3	28.3	
Both	Wall C-1	n/a	C	Line	0.00	60.04	47.1	47.1	
Level 2				Profile	Location [ft]		Magnitude [lbs,plf,psf]		Trib Width [ft]
Force Dir	Building Element	Block	Wall Line		Start	End	Start	End	
Both	Wall 1-1	n/a	1	Line	0.00	15.75	47.1	47.1	
E-W	Floor F1	n/a	1	Line	0.00	40.03	313.5	313.5	
Both	Wall 1-2	n/a	1	Line	15.75	26.25	47.1	47.1	
Both	Wall 1-3	n/a	1	Line	26.25	40.03	47.1	47.1	
Both	Wall 2-1	n/a	2	Line	15.09	26.25	28.3	28.3	
Both	Wall 3-1	n/a	3	Line	11.48	26.25	28.3	28.3	
Both	Wall 4-1	n/a	4	Line	15.09	26.25	28.3	28.3	
Both	Wall 5-1	n/a	5	Line	0.00	15.42	47.1	47.1	
E-W	Floor F1	n/a	5	Line	0.00	40.03	313.5	313.5	
Both	Wall 5-2	n/a	5	Line	15.42	26.25	47.1	47.1	
Both	Wall 5-3	n/a	5	Line	26.25	40.03	47.1	47.1	
N-S	Floor F1	n/a	A	Line	0.00	60.04	209.0	209.0	
Both	Wall A-1	n/a	A	Line	0.00	60.04	47.1	47.1	
Both	Wall B-1	n/a	B	Line	1.97	18.04	28.3	28.3	
Both	Wall B-2	n/a	B	Line	20.01	40.03	28.3	28.3	
Both	Wall B-3	n/a	B	Line	41.99	58.07	28.3	28.3	
N-S	Floor F1	n/a	C	Line	0.00	60.04	209.0	209.0	
Both	Wall C-1	n/a	C	Line	0.00	60.04	47.1	47.1	
Both	Wall 1-1	n/a	1	Line	0.00	15.75	47.1	47.1	
Both	Wall 1-2	n/a	1	Line	15.75	26.25	47.1	47.1	
Both	Wall 1-3	n/a	1	Line	26.25	40.03	47.1	47.1	
Both	Wall 2-1	n/a	2	Line	15.09	26.25	28.3	28.3	
Both	Wall 3-1	n/a	3	Line	11.48	26.25	28.3	28.3	
Both	Wall 4-1	n/a	4	Line	15.09	26.25	28.3	28.3	
Both	Wall 5-1	n/a	5	Line	0.00	15.42	47.1	47.1	
Both	Wall 5-2	n/a	5	Line	15.42	26.25	47.1	47.1	
Both	Wall 5-3	n/a	5	Line	26.25	40.03	47.1	47.1	
Both	Wall A-1	n/a	A	Line	0.00	60.04	47.1	47.1	
Both	Wall B-1	n/a	B	Line	1.97	18.04	28.3	28.3	
Both	Wall B-2	n/a	B	Line	20.01	40.03	28.3	28.3	
Both	Wall B-3	n/a	B	Line	41.99	58.07	28.3	28.3	
Both	Wall C-1	n/a	C	Line	0.00	60.04	47.1	47.1	
Level 1				Magnitude					Trib

BUILDING MASSES (continued)

Force Dir	Building Element	Block	Wall Line	Profile	Location [ft]		[lbs,plf,psf]		Width [ft]
					Start	End	Start	End	
E-W	Floor F1	n/a	1	Line	0.00	40.03	313.5	313.5	
Both	Wall 1-1	n/a	1	Line	0.00	15.75	47.1	47.1	
Both	Wall 1-2	n/a	1	Line	15.75	26.25	47.1	47.1	
Both	Wall 1-3	n/a	1	Line	26.25	40.03	47.1	47.1	
Both	Wall 2-1	n/a	2	Line	15.09	26.25	28.3	28.3	
Both	Wall 3-1	n/a	3	Line	11.48	26.25	28.3	28.3	
Both	Wall 4-1	n/a	4	Line	15.09	26.25	28.3	28.3	
E-W	Floor F1	n/a	5	Line	0.00	40.03	313.5	313.5	
Both	Wall 5-1	n/a	5	Line	0.00	15.42	47.1	47.1	
Both	Wall 5-2	n/a	5	Line	15.42	26.25	47.1	47.1	
Both	Wall 5-3	n/a	5	Line	26.25	40.03	47.1	47.1	
N-S	Floor F1	n/a	A	Line	0.00	60.04	209.0	209.0	
Both	Wall A-1	n/a	A	Line	0.00	60.04	47.1	47.1	
Both	Wall B-1	n/a	B	Line	1.97	18.04	28.3	28.3	
Both	Wall B-2	n/a	B	Line	20.01	40.03	28.3	28.3	
Both	Wall B-3	n/a	B	Line	41.99	58.07	28.3	28.3	
Both	Wall C-1	n/a	C	Line	0.00	60.04	47.1	47.1	
N-S	Floor F1	n/a	C	Line	0.00	60.04	209.0	209.0	
Both	Wall 1-1	n/a	1	Line	0.00	15.75	47.1	47.1	
Both	Wall 1-2	n/a	1	Line	15.75	26.25	47.1	47.1	
Both	Wall 1-3	n/a	1	Line	26.25	40.03	47.1	47.1	
Both	Wall 2-1	n/a	2	Line	15.09	26.25	28.3	28.3	
Both	Wall 3-1	n/a	3	Line	11.48	26.25	28.3	28.3	
Both	Wall 4-1	n/a	4	Line	15.09	26.25	28.3	28.3	
Both	Wall 5-1	n/a	5	Line	0.00	15.42	47.1	47.1	
Both	Wall 5-2	n/a	5	Line	15.42	26.25	47.1	47.1	
Both	Wall 5-3	n/a	5	Line	26.25	40.03	47.1	47.1	
Both	Wall A-1	n/a	A	Line	0.00	60.04	47.1	47.1	
Both	Wall B-1	n/a	B	Line	1.97	18.04	28.3	28.3	
Both	Wall B-2	n/a	B	Line	20.01	40.03	28.3	28.3	
Both	Wall B-3	n/a	B	Line	41.99	58.07	28.3	28.3	
Both	Wall C-1	n/a	C	Line	0.00	60.04	47.1	47.1	

Legend:

Force Dir - Direction in which the mass is used for seismic load generation, E-W, N-S, or Both

Building element - Roof, gable end, wall or floor area used to generate mass, wall line for user-applied masses, Floor F# - refer to Plan View for floor area number

Wall line - Shearline that equivalent line load is assigned to

Location - Start and end points of equivalent line load on wall line

Trib Width. - Tributary width; for user applied area loads only

SEISMIC LOADS

Level 3					
Force Dir	Profile	Location [ft]		Mag [lbs,plf,psf]	
		Start	End	Start	End
E-W	Point	0.00	0.00	727	727
E-W	Line	0.00	11.48	225.8	225.8
E-W	Line	11.48	15.09	233.1	233.1
E-W	Line	15.09	15.42	247.6	247.6
E-W	Line	15.42	15.75	247.6	247.6
E-W	Line	15.75	26.25	247.6	247.6
E-W	Point	26.25	26.25	379	379
E-W	Line	26.25	40.03	225.8	225.8
E-W	Point	40.03	40.03	727	727
N-S	Point	0.00	0.00	485	485
N-S	Line	0.00	1.97	158.6	158.6
N-S	Line	1.97	18.04	165.9	165.9
N-S	Point	10.01	10.01	81	81
N-S	Line	18.04	20.01	158.6	158.6
N-S	Line	20.01	40.03	165.9	165.9
N-S	Point	30.02	30.02	107	107
N-S	Line	40.03	41.99	158.6	158.6
N-S	Line	41.99	58.07	165.9	165.9
N-S	Point	50.03	50.03	81	81
N-S	Line	58.07	60.04	158.6	158.6
N-S	Point	60.04	60.04	485	485
Level 2					
Force Dir	Profile	Location [ft]		Mag [lbs,plf,psf]	
		Start	End	Start	End
E-W	Point	0.00	0.00	998	998
E-W	Line	0.00	11.48	143.9	143.9
E-W	Line	11.48	15.09	153.8	153.8
E-W	Line	15.09	15.42	173.8	173.8
E-W	Line	15.42	15.75	173.8	173.8
E-W	Line	15.75	26.25	173.8	173.8
E-W	Point	26.25	26.25	520	520
E-W	Line	26.25	40.03	143.9	143.9
E-W	Point	40.03	40.03	998	998
N-S	Point	0.00	0.00	665	665
N-S	Line	0.00	1.97	107.0	107.0
N-S	Line	1.97	18.04	117.0	117.0
N-S	Point	10.01	10.01	111	111
N-S	Line	18.04	20.01	107.0	107.0
N-S	Line	20.01	40.03	117.0	117.0
N-S	Point	30.02	30.02	147	147
N-S	Line	40.03	41.99	107.0	107.0
N-S	Line	41.99	58.07	117.0	117.0
N-S	Point	50.03	50.03	111	111
N-S	Line	58.07	60.04	107.0	107.0
N-S	Point	60.04	60.04	665	665
Level 1					
Force Dir	Profile	Location [ft]		Mag [lbs,plf,psf]	
		Start	End	Start	End
E-W	Point	0.00	0.00	499	499
E-W	Line	0.00	11.48	71.9	71.9
E-W	Line	11.48	15.09	76.9	76.9
E-W	Line	15.09	15.42	86.9	86.9
E-W	Line	15.42	15.75	86.9	86.9
E-W	Line	15.75	26.25	86.9	86.9
E-W	Point	26.25	26.25	260	260
E-W	Line	26.25	40.03	71.9	71.9
E-W	Point	40.03	40.03	499	499
N-S	Point	0.00	0.00	333	333
N-S	Line	0.00	1.97	53.5	53.5
N-S	Line	1.97	18.04	58.5	58.5
N-S	Point	10.01	10.01	56	56
N-S	Line	18.04	20.01	53.5	53.5

SEISMIC LOADS (continued)

N-S	Line	20.01	40.03	58.5	58.5
N-S	Point	30.02	30.02	74	74
N-S	Line	40.03	41.99	53.5	53.5
N-S	Line	41.99	58.07	58.5	58.5
N-S	Point	50.03	50.03	56	56
N-S	Line	58.07	60.04	53.5	53.5
N-S	Point	60.04	60.04	333	333

Legend:

Loads in table can be accumulation of loads from several building masses, so they do not correspond with a particular building element.

Location - Start and end of load in direction perpendicular to seismic force direction

Design Summary

SHEARWALL DESIGN

Wind Shear Loads, Flexible Diaphragm

All shearwalls have sufficient design capacity.

Storey drift (NBC 4.1.3.5.(3)): Limit exceeded on at least one level. Refer to Storey Drift table.

Wind Shear Loads, Rigid Diaphragm

All shearwalls have sufficient design capacity.

Storey drift (NBC 4.1.3.5.(3)): Limit exceeded on at least one level. Refer to Storey Drift table.

Components and Cladding Wind Loads, Out-of-plane Sheathing

All shearwalls have sufficient design capacity.

Components and Cladding Wind Loads, Nail Withdrawal

All shearwalls have sufficient design capacity.

Seismic Loads, Flexible Diaphragm

The following under-capacity shear walls were found:

Level 1: B-3, B-2, B-1

Level 2: B-3, B-2, B-1

Level 3: B-3, B-2, B-1

The following walls fail because panel buckling or a non-ductile nail strength mode governs for design:

Level 1: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 2: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 3: B-1, B-2, B-3, 2-1, 3-1, 4-1

Storey drift (NBC 4.1.8.13.(3)): Limit exceeded on at least one level. Refer to Storey Drift table.

Over-capacity ratio (O86 11.8.3.2): Outside of allowable range. Refer to Seismic Information table.

Irregularities (NBC 4.1.8.6): No violations of design code provisions due to irregularities. Refer to Seismic Irregularities table.

Seismic Loads, Rigid Diaphragm

All shearwalls have sufficient design capacity.

The following walls fail because panel buckling or a non-ductile nail strength mode governs for design:

Level 1: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 2: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 3: B-1, B-2, B-3, 2-1, 3-1, 4-1

Storey drift (NBC 4.1.8.13.(3)): Limit exceeded on at least one level. Refer to Storey Drift table.

Over-capacity ratio (O86 11.8.3.2): Outside of allowable range. Refer to Seismic Information table.

Irregularities (NBC 4.1.8.6): At least one irregularity violates design code provisions. Refer to Seismic Irregularities table.

HOLD-DOWN DESIGN

Wind Loads, Flexible Diaphragm

Under-capacity hold-downs were found on the following walls:

Level 1: B-1, B-2, B-3, 1-2, 2-1, 3-1, 4-1, 5-2

Level 2: B-2, 2-1, 3-1, 4-1

Wind Loads, Rigid Diaphragm

Under-capacity hold-downs were found on the following walls:

Level 1: B-1, B-2, B-3, 1-2, 2-1, 3-1, 4-1, 5-2

Level 2: B-2, 2-1, 3-1, 4-1

Seismic Loads, Flexible Diaphragm

Under-capacity hold-downs were found on the following walls:

Level 1: 1-2, 2-1, 3-1, 4-1, 5-2

Level 2: 1-2, 2-1, 3-1, 4-1, 5-2

Level 3: B-2

Seismic Loads, Rigid Diaphragm

Under-capacity hold-downs were found on the following walls:

Level 1: B-1, B-3, 1-2, 2-1, 3-1, 4-1, 5-2

Level 2: B-1, B-3, 1-2, 2-1, 3-1, 4-1, 5-2
Level 3: B-1, B-3

COMPRESSION FORCE DESIGN

Wind Loads, Flexible Diaphragm

Force under end studs exceeded perpendicular-to-grain compressive capacity for the following walls:

Level 1: 2-1, 3-1, 4-1

Wind Loads, Rigid Diaphragm

Force under end studs exceeded perpendicular-to-grain compressive capacity for the following walls:

Level 1: 3-1

Seismic Loads, Flexible Diaphragm

Force under end studs exceeded perpendicular-to-grain compressive capacity for the following walls:

Level 1: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 2: B-1, B-2, B-3

Level 3: B-1, B-2, B-3

Seismic Loads, Rigid Diaphragm

Force under end studs exceeded perpendicular-to-grain compressive capacity for the following walls:

Level 1: B-1, B-3, 2-1, 3-1, 4-1

Flexible Diaphragm Wind Design

SHEAR RESULTS

North-south Shearlines	W Gp	For Dir	Wind Case	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
				FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L Int Ext		
Line 1											
Level 3											
Ln1, Lev3	-	Both		10.50	12.7	-	-	-	-	-	0.22S
Wall 1-2	5	Both		10.50	48.3	-	420	0.53	-	2695	0.22S
Level 2											
Ln1, Lev2	-	Both		10.50	40.4	-	-	-	-	-	0.48S
Wall 1-2	4	Both		10.50	154.0	-	318	1.00	-	1703	0.48S
Level 1											
Ln1, Lev1	-	Both		10.50	68.1	-	-	-	-	-	0.68
Wall 1-2	3	Both		10.50	259.6	-	381	1.00	-	1703	0.68
Line 2											
Level 3											
Ln2, Lev3	-	Both		11.15	38.0	-	-	-	-	-	0.11S
Wall 2-1	2	Both		11.15	136.5	0	1286	1.00	-	5323	0.11S
Level 2											
Ln2, Lev2	-	Both		11.15	121.2	-	-	-	-	-	0.34S
Wall 2-1	2	Both		11.15	434.7	0	1286	1.00	-	5323	0.34S
Level 1											
Ln2, Lev1	-	Both		11.15	204.3	-	-	-	-	-	0.57
Wall 2-1	2	Both		11.15	732.9	0	1286	1.00	-	5323	0.57
Line 3											
Level 3											
Ln3, Lev3	-	Both		14.76	50.7	-	-	-	-	-	0.11S
Wall 3-1	2	Both		14.76	137.5	0	1286	1.00	-	5323	0.11S
Level 2											
Ln3, Lev2	-	Both		14.76	161.5	-	-	-	-	-	0.34S
Wall 3-1	2	Both		14.76	437.9	0	1286	1.00	-	5323	0.34S
Level 1											
Ln3, Lev1	-	Both		14.76	272.4	-	-	-	-	-	0.57
Wall 3-1	2	Both		14.76	738.4	0	1286	1.00	-	5323	0.57
Line 4											
Level 3											
Ln4, Lev3	-	Both		11.15	38.0	-	-	-	-	-	0.11S
Wall 4-1	2	Both		11.15	136.5	0	1286	1.00	-	5323	0.11S
Level 2											
Ln4, Lev2	-	Both		11.15	121.2	-	-	-	-	-	0.34S
Wall 4-1	2	Both		11.15	434.7	0	1286	1.00	-	5323	0.34S
Level 1											
Ln4, Lev1	-	Both		11.15	204.3	-	-	-	-	-	0.57
Wall 4-1	2	Both		11.15	732.9	0	1286	1.00	-	5323	0.57
Line 5											
Level 3											
Ln5, Lev3	-	Both		10.83	12.7	-	-	-	-	-	0.13S
Wall 5-2	8	Both		10.83	46.9	-	679	0.52	-	5323	0.13S
Level 2											
Ln5, Lev2	-	Both		10.83	40.4	-	-	-	-	-	0.25S
Wall 5-2	7	Both		10.83	149.3	-	601	1.00	-	1703	0.25S
Level 1											
Ln5, Lev1	-	Both		10.83	68.1	-	-	-	-	-	0.53
Wall 5-2	6	Both		10.83	251.7	-	472	1.00	-	1703	0.53
East-west Shearlines	W Gp	For Dir	Wind Case	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
				FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L Int Ext		
Line B											
Level 3											
LnB, Lev3	-	Both		52.17	59.4	-	-	-	-	-	-
Wall B-1	2	Both		16.08	0.0	0	1286	1.00	-	5323	0.00S
Wall B-2	2	Both		20.01	178.3	0	1286	1.00	-	5323	0.14S
Wall B-3	2	Both		16.08	0.0	0	1286	1.00	-	5323	0.00S
Level 2											
LnB, Lev2	-	Both		52.17	189.3	-	-	-	-	-	-
Wall B-1	2	Both		16.08	196.7	0	1286	1.00	-	5323	0.15S
Wall B-2	2	Both		20.01	252.0	0	1286	1.00	-	5323	0.20S
Wall B-3	2	Both		16.08	196.7	0	1286	1.00	-	5323	0.15S
Level 1											

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SHEAR RESULTS (flexible wind design, continued)

LnB, Lev1	-	Both	52.17	319.2	-	-	-	-	-	-	-
Wall B-1	2	Both	16.08	333.0	0	1286	1.00	-	5323	1286	0.26S
Wall B-2	2	Both	20.01	422.6	0	1286	1.00	-	5323	1286	0.33S
Wall B-3	2	Both	16.08	333.0	0	1286	1.00	-	5323	1286	0.26S

Legend:

Results can have different meaning for shearlines, walls, and wall segments. Results for walls with no openings are the same as those for segments.

W Gp - Wall design group as listed in Sheathing and Framing Materials tables. "A" means that this wall is critical for all walls in the Standard Wall group.

Dir - Direction of wind force along shearline. "Both" appears if results are identical for both directions.

Wind case - Critical low-rise windward corner and load case A or B when using NBC 4.1.7.6; all other results are for this load case. Nothing shown when using 4.1.7.5.

FHS - Length of full height sheathing along shearline, wall, or segment.

Fv/L - For shearlines = diaphragm shear force = factored shearline force divided by length of shearline; for wall segments = design shear force = factored shear force divided by length of full height sheathing.

Vhd(vd)/L - Factored unit sheathing connection resistance = Vrs from O86 11.6.2 without Jhd

For wood panels (11.6.2.2(a)) = $0.80 \times v_d \times J_D \times J_s \times J_s$; $v_d = N_u$ (from 12.9.3) / nail spacing

J_D - diaphragm and shearwall factor (12.9.3.1) = 1.3; J_s - fastener spacing factor (11.5.1)

J_s - unblocked factor (11.5.4), shown in the Sheathing Materials table.

For gypsum wallboard (11.6.2.3) = $0.70 \times v_d$; v_d from Table 11.4

Jhd - Hold-down effect factor from 11.5.5

Vrs(vpb)/L - Factored unit panel buckling resistance (11.6.2.2(b)) = $0.80 \times v_{pb} \times K_D \times K_S \times K_T$.

K_D - load-duration factor (5.3.2.1) = 1.15; K_S - service-condition factor (9.4.2); K_T - treatment factor = 1.0

Vrs/L - Factored unit shear resistance of wall segment = $\min(Vhd(vd)/L \times Jhd, Vrs(vpb)/L)$.

Refer to Detailed Shear Wall design output for strengths, factors and other intermediate values for Vrs, Vhd and Jhd.

"S" indicates that the seismic design criterion was critical in selecting wall.

Notes:

According to O86 11.3.3.1 Note (1), there should be a balanced spatial distribution of gypsum wallboard and wood-based panels on every level in each direction.

Hold-Down and Compression Design (flexible wind design)

Level 1					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Uplift	Cmb'd			
Line 1											
1-2	L End	0.00	15.87		4657	1335		3321	HDU2	2900	1.15*
1-2	L End	0.00	15.87		4657	1855		6511	Compression	13413	0.49
1-2	R End	0.00	26.12		4657	1335		3321	HDU2	2900	1.15*
1-2	R End	0.00	26.12		4657	1855		6511	Compression	13413	0.49
Line 2											
2-1	L End	10.01	15.22		13032	851		12180	HDU2	2900	4.20*
2-1	L End	10.01	15.22		13032	1182		14214	Compression	13413	1.06*
2-1	R End	10.01	26.12		13032	851		12180	HDU2	2900	4.20*
2-1	R End	10.01	26.12		13032	1182		14214	Compression	13413	1.06*
Line 3											
3-1	L End	30.02	11.61		13055	1127		11928	HDU2	2900	4.11*
3-1	L End	30.02	11.61		13055	1565		14620	Compression	13413	1.09*
3-1	R End	30.02	26.12		13055	1127		11928	HDU2	2900	4.11*
3-1	R End	30.02	26.12		13055	1565		14620	Compression	13413	1.09*
Line 4											
4-1	L End	50.03	15.22		13032	851		12180	HDU2	2900	4.20*
4-1	L End	50.03	15.22		13032	1182		14214	Compression	13413	1.06*
4-1	R End	50.03	26.12		13032	851		12180	HDU2	2900	4.20*
4-1	R End	50.03	26.12		13032	1182		14214	Compression	13413	1.06*
Line 5											
5-2	L End	60.04	15.54		4511	1377		3134	HDU2	2900	1.08*
5-2	L End	60.04	15.54		4511	1913		6423	Compression	13413	0.48
5-2	R End	60.04	26.12		4511	1377		3134	HDU2	2900	1.08*
5-2	R End	60.04	26.12		4511	1913		6423	Compression	13413	0.48
Line B											
B-1	L End	2.09	26.25		5302	1227		4075	HDU2	2900	1.41*
B-1	L End	2.09	26.25		5302	1704		7006	Compression	13413	0.52
B-1	R End	17.92	26.25		5302	1227		4075	HDU2	2900	1.41*
B-1	R End	17.92	26.25		5302	1704		7006	Compression	13413	0.52
B-2	L End	20.14	26.25		8363	1527		6835	HDU2	2900	2.36*
B-2	L End	20.14	26.25		8363	2121		10484	Compression	13413	0.78
B-2	R End	39.90	26.25		8363	1527		6835	HDU2	2900	2.36*
B-2	R End	39.90	26.25		8363	2121		10484	Compression	13413	0.78
B-3	L End	42.12	26.25		5302	1227		4075	HDU2	2900	1.41*
B-3	L End	42.12	26.25		5302	1704		7006	Compression	13413	0.52
B-3	R End	57.95	26.25		5302	1227		4075	HDU2	2900	1.41*
B-3	R End	57.95	26.25		5302	1704		7006	Compression	13413	0.52
Level 2					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Uplift	Cmb'd			
Line 1											
1-2	L End	0.00	15.87		2036	890		1145	HDU2	2900	0.39
1-2	L End	0.00	15.87		2036	1236		3272	Compression	13413	0.24
1-2	R End	0.00	26.12		2036	890		1145	HDU2	2900	0.39
1-2	R End	0.00	26.12		2036	1236		3272	Compression	13413	0.24
Line 2											
2-1	L End	10.01	15.22		5642	568		5075	HDU2	2900	1.75*
2-1	L End	10.01	15.22		5642	788		6431	Compression	13413	0.48
2-1	R End	10.01	26.12		5642	568		5075	HDU2	2900	1.75*
2-1	R End	10.01	26.12		5642	788		6431	Compression	13413	0.48
Line 3											
3-1	L End	30.02	11.61		5653	751		4901	HDU2	2900	1.69*
3-1	L End	30.02	11.61		5653	1043		6696	Compression	13413	0.50
3-1	R End	30.02	26.12		5653	751		4901	HDU2	2900	1.69*
3-1	R End	30.02	26.12		5653	1043		6696	Compression	13413	0.50
Line 4											
4-1	L End	50.03	15.22		5642	568		5075	HDU2	2900	1.75*
4-1	L End	50.03	15.22		5642	788		6431	Compression	13413	0.48
4-1	R End	50.03	26.12		5642	568		5075	HDU2	2900	1.75*
4-1	R End	50.03	26.12		5642	788		6431	Compression	13413	0.48
Line 5											
5-2	L End	60.04	15.54		1971	918		1053	HDU2	2900	0.36
5-2	L End	60.04	15.54		1971	1275		3246	Compression	13413	0.24
5-2	R End	60.04	26.12		1971	918		1053	HDU2	2900	0.36
5-2	R End	60.04	26.12		1971	1275		3246	Compression	13413	0.24
Line B											
B-1	L End	2.09	26.25		1969	818		1151	HDU2	2900	0.40
B-1	L End	2.09	26.25		1969	1136		3105	Compression	13413	0.23

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Hold-Down and Compression Design (flexible wind design, continued)

Hold-down and Compression Design (flexible hold design, continued)											
B-1	R End	17.92	26.25		1969	818	1151	HDU2	2900	0.40	
B-1	R End	17.92	26.25		1969	1136	3105	Compression	13413	0.23	
B-2	L End	20.14	26.25		4145	1018	3126	HDU2	2900	1.08*	
B-2	L End	20.14	26.25		4145	1414	5559	Compression	13413	0.41	
B-2	R End	39.90	26.25		4145	1018	3126	HDU2	2900	1.08*	
B-2	R End	39.90	26.25		4145	1414	5559	Compression	13413	0.41	
B-3	L End	42.12	26.25		1969	818	1151	HDU2	2900	0.40	
B-3	L End	42.12	26.25		1969	1136	3105	Compression	13413	0.23	
B-3	R End	57.95	26.25		1969	818	1151	HDU2	2900	0.40	
B-3	R End	57.95	26.25		1969	1136	3105	Compression	13413	0.23	
Level 3					Tensile Hold-down or Compressive Stud Force [lbs]				Cap	Crit	
Line-Wall	Posit'n	Location [ft]		Note	Shear	Dead	Uplift	Cmb'd	Hold-down	[lbs]	Resp.
Line 1											
1-2	L End	0.00	15.87		481	445		36	Anchorage		
1-2	L End	0.00	15.87		481	618		1099	Compression	13413	0.08
1-2	R End	0.00	26.12		481	445		36	Anchorage		
1-2	R End	0.00	26.12		481	618		1099	Compression	13413	0.08
Line 2											
2-1	L End	10.01	15.22		1260	284		976	HDU2	2900	0.34
2-1	L End	10.01	15.22		1260	394		1654	Compression	13413	0.12
2-1	R End	10.01	26.12		1260	284		976	HDU2	2900	0.34
2-1	R End	10.01	26.12		1260	394		1654	Compression	13413	0.12
Line 3											
3-1	L End	30.02	11.61		1262	376		886	HDU2	2900	0.31
3-1	L End	30.02	11.61		1262	522		1784	Compression	13413	0.13
3-1	R End	30.02	26.12		1262	376		886	HDU2	2900	0.31
3-1	R End	30.02	26.12		1262	522		1784	Compression	13413	0.13
Line 4											
4-1	L End	50.03	15.22		1260	284		976	HDU2	2900	0.34
4-1	L End	50.03	15.22		1260	394		1654	Compression	13413	0.12
4-1	R End	50.03	26.12		1260	284		976	HDU2	2900	0.34
4-1	R End	50.03	26.12		1260	394		1654	Compression	13413	0.12
Line 5											
5-2	L End	60.04	15.54		465	459		6	Anchorage		
5-2	L End	60.04	15.54		465	638		1103	Compression	13413	0.08
5-2	R End	60.04	26.12		465	459		6	Anchorage		
5-2	R End	60.04	26.12		465	638		1103	Compression	13413	0.08
Line B											
B-1	L End	2.09	26.25		0			0	Not required	2900	0.00
B-1	R End	17.92	26.25		0			0	Not required	2900	0.00
B-2	L End	20.14	26.25		1629	509		1120	HDU2	2900	0.39
B-2	L End	20.14	26.25		1629	707		2336	Compression	13413	0.17
B-2	R End	39.90	26.25		1629	509		1120	HDU2	2900	0.39
B-2	R End	39.90	26.25		1629	707		2336	Compression	13413	0.17
B-3	L End	42.12	26.25		0			0	Not required	2900	0.00
B-3	R End	57.95	26.25		0			0	Not required	2900	0.00

Legend:

Line-Wall:

At wall or opening - Shearline and wall number

At vertical element - Shearline

Posit'n - Stud that hold-down is attached to:

V Elem - Vertical element: column or strengthened studs required where not at wall end or opening

L or R End - At left or right wall end

L or R Op n - At left or right side of opening n

Location - Co-ordinates in Plan View

Note - Number(s) of note(s) below to apply

Tensile Hold-down or Compressive Stud Force: Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.

Shear - Overturning component = $V \times h / L$; V = force on segment factored by 1.4; h = wall height + joist depth (O86 Fig. 11.7); L = wall segment length - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width). When anchorages used L = segment length - 300 mm (O86 11.6.4.1).

Dead - Dead load resisting component, factored by 0.9 when resisting overturning and 1.25 for compression

Uplift - Uplift wind load component, factored by 1.4

Cmb'd - Sum of factored overturning, dead and uplift forces

Hold-down - Device used from hold-down database or "Anchorage" if no hold-down required.

Cap - Allowable tension load

Crit. Resp. - Critical Response = Combined hold-down force / Allowable tension load

Notes:

Moment arm L used in hold-down force calculations is wall length minus the user-input hold-down offset at each end of wall. For anchorages, maximum moment arm is wall length minus 300 mm. Refer to O86 11.6.4.1.

H2-U2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 8 1/4" x 2 1/2" SDS heavy-duty screws; 5/8" anchor bolt.

Factored for load combination 4 from NBC Table 4.1.3.2A, without companion loads for maximum effect. Worst case of low-rise wind loads used.

***WARNING - Design capacity has been exceeded.**

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

COLLECTOR FORCES (flexible wind design)

Level 1	Line-Wall	Position on Wall or Opening	Location [ft]		Drag Strut Force [lbs]		Strap/Blocking Force [lbs]		
			X	Y	--->	<---	--->	<---	
Level 1	Line 1								
	1-2	Left Wall End	0.00	15.75	-1072	1072			
	1-2	Right Wall End	0.00	26.25	938	-938			
	Line 2								
	2-1	Left Wall End	10.01	15.09	-3083	3083			
	2-1	Right Wall End	10.01	26.25	2815	-2815			
	Line 3								
	3-1	Left Wall End	30.02	11.48	-3127	3127			
	3-1	Right Wall End	30.02	26.25	3753	-3753			
	Line 4								
	4-1	Left Wall End	50.03	15.09	-3083	3083			
	4-1	Right Wall End	50.03	26.25	2815	-2815			
	Line 5								
	5-2	Left Wall End	60.04	15.42	-1050	1050			
	5-2	Right Wall End	60.04	26.25	938	-938			
	Line B								
B-1	Left Wall End	1.97	26.25	-628	628				
B-1	Right Wall End	18.04	26.25	-407	407				
B-2	Left Wall End	20.01	26.25	-1035	1035				
B-2	Right Wall End	40.03	26.25	1035	-1035				
B-3	Left Wall End	41.99	26.25	407	-407				
B-3	Right Wall End	58.07	26.25	628	-628				
Level 2	Line-Wall	Position on Wall or Opening	Location [ft]		Drag Strut Force [lbs]		Strap/Blocking Force [lbs]		
			X	Y	--->	<---	--->	<---	
Level 2	Line 1								
	1-2	Left Wall End	0.00	15.75	-636	636			
	1-2	Right Wall End	0.00	26.25	556	-556			
	Line 2								
	2-1	Left Wall End	10.01	15.09	-1828	1828			
	2-1	Right Wall End	10.01	26.25	1669	-1669			
	Line 3								
	3-1	Left Wall End	30.02	11.48	-1855	1855			
	3-1	Right Wall End	30.02	26.25	2226	-2226			
	Line 4								
	4-1	Left Wall End	50.03	15.09	-1828	1828			
	4-1	Right Wall End	50.03	26.25	1669	-1669			
	Line 5								
	5-2	Left Wall End	60.04	15.42	-623	623			
	5-2	Right Wall End	60.04	26.25	556	-556			
	Line B								
	B-1	Left Wall End	1.97	26.25	-373	373			
	B-1	Right Wall End	18.04	26.25	-255	255			
	B-2	Left Wall End	20.01	26.25	-627	627			
	B-2	Right Wall End	40.03	26.25	627	-627			
	B-3	Left Wall End	41.99	26.25	255	-255			
	B-3	Right Wall End	58.07	26.25	373	-373			
	Level 3	Line-Wall	Position on Wall or Opening	Location [ft]		Drag Strut Force [lbs]		Strap/Blocking Force [lbs]	
				X	Y	--->	<---	--->	<---
Level 3	Line 1								
	1-2	Left Wall End	0.00	15.75	-200	200			
	1-2	Right Wall End	0.00	26.25	175	-175			
	Line 2								
	2-1	Left Wall End	10.01	15.09	-574	574			
	2-1	Right Wall End	10.01	26.25	524	-524			
	Line 3								
	3-1	Left Wall End	30.02	11.48	-582	582			
	3-1	Right Wall End	30.02	26.25	699	-699			
	Line 4								
	4-1	Left Wall End	50.03	15.09	-574	574			
	4-1	Right Wall End	50.03	26.25	524	-524			
	Line 5								
	5-2	Left Wall End	60.04	15.42	-195	196			
	5-2	Right Wall End	60.04	26.25	175	-175			
	Line B								

COLLECTOR FORCES (flexible wind design, continued)

B-1	Left Wall End	1.97	26.25	-117	117	
B-1	Right Wall End	18.04	26.25	-1073	1073	
B-2	Left Wall End	20.01	26.25	-1190	1190	
B-2	Right Wall End	40.03	26.25	1190	-1190	
B-3	Left Wall End	41.99	26.25	1073	-1073	
B-3	Right Wall End	58.07	26.25	117	-117	

Legend:

Line-Wall - Shearline and wall number

Position... - Side of opening or wall end that drag strut is attached to

Location - Co-ordinates in Plan View

Drag Strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression. Based on factored shearline force.

----> Force in the west-to-east or south-to-north direction

<---- Force in the east-to-west or north-to-south direction

DEFLECTION (flexible wind design)

Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 1														
Line 1 1-2	3	Both	Ext	139.1	10.50	9.02	16.5	.003	.032	57	.006	.043	0.32	0.40
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.009	-	-	-	-	0.55	0.93
		Both	2	392.6					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.007	-	-	-	-	0.41	0.69
		Both	2	395.6					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.009	-	-	-	-	0.55	0.93
		Both	2	392.6					.000	0	.000	.000		
Line 5 5-2	6	Both	Ext	134.8	10.83	9.02	16.5	.003	.031	44	.004	.026	0.31	0.37
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.003	-	-	-	-	0.22	0.37
		Both	2	178.4					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	.003	-	-	-	-	0.22	0.37
		Both	2	226.4					.000	0	.000	.000		
B-3	2	Both	1	0.0	16.08	9.02	16.5	.003	-	-	-	-	0.22	0.37
		Both	2	178.4					.000	0	.000	.000		
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 2														
Line 1 1-2	4	Both	Ext	82.5	10.50	9.02	16.5	.002	.019	41	.003	.022	0.25	0.30
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.005	-	-	-	-	0.35	0.59
		Both	2	232.9					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.004	-	-	-	-	0.26	0.44
		Both	2	234.6					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.005	-	-	-	-	0.35	0.59
		Both	2	232.9					.000	0	.000	.000		
Line 5 5-2	7	Both	Ext	80.0	10.83	9.02	16.5	.002	.018	20	.001	.005	0.24	0.27
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.002	-	-	-	-	0.16	0.28
		Both	2	105.4					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	.002	-	-	-	-	0.16	0.27
		Both	2	135.0					.000	0	.000	.000		
B-3	2	Both	1	0.0	16.08	9.02	16.5	.002	-	-	-	-	0.16	0.28
		Both	2	105.4					.000	0	.000	.000		
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 3														
Line 1 1-2	5	Both	Ext	25.9	10.50	9.02	16.5	.001	.005	11	.000	.002	0.00	0.01
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.002	-	-	-	-	0.23	0.39
		Both	2	73.1					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.001	-	-	-	-	0.17	0.29
		Both	2	73.7					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.002	-	-	-	-	0.23	0.39
		Both	2	73.1					.000	0	.000	.000		
Line 5 5-2	8	Both	Ext	25.1	10.83	9.02	16.5	.001	.004	8	.000	.000	0.00	0.01
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	-	-	-	-	-	-	0.22
		Both	2	0.0					-	-	-	-		
B-2	2	Both	1	0.0	20.01	9.02	16.5	.001	-	-	-	-	0.13	0.22
		Both	2	95.5					.000	0	.000	.000		

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DEFLECTION (flexible wind design, continued)

B-3	2	Both	1	0.0	16.08	9.02	16.5	-	-	-	-	-	-	0.22
		Both	2	0.0					-	-	-	-		

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall.

Dir – Force direction

Srf – Wall surface, interior or exterior for perimeter walls, 1 or 2 for interior partitions

v - SLS-factored shear force on wall segment = Design shear force / 1.4 wind factor x 0.75 SLS importance factor / 1.0 ULS importance factor

L - Width of wall segment between openings

H - Wall height

Defl - Horizontal shearwall deflection due to given term:

Bending = $8vHs^3 / EALs$; A - Cross sectional area of segment end stud(s); E - Stud mod. of elasticity from Framing Materials table

Shear = vHs / Bv ; Bv - Shear-through-thickness rigidity from Tables 9.1-9.3, value is in Sheathing Materials table

Nail slip = $.762Hs \times en$; en – From O86 A.11.7 = $(0.013 \times vs / d^2)^{1/2}$ wood, $0.76 \times v / vcap$ GWB

vs - shear force per nail along panel edge, d - nail diameter.

Hold - Restraint system (hold-down) = $da \times h / L$;

da - Vertical hold-down displacement; refer to Hold-down Displacement table for components.

L = $Ls - (tension \text{ stud pack width} + hold-down \text{ anchor bolt offset}) - (1/2 \text{ compression stud pack width})$

Total Defl – Deflection from bending + shear + nail slip + hold-down / unblocked factor Jus, as per O86 11.7.1.2,3

HOLD-DOWN DISPLACEMENT (flexible wind design)

Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Displacement Manuf Add da in in in	Slippage Vf da lbs in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1										
Line 1 1-2	Both	HDU2	3321	.106 .003 0.108	- -	.247	3978	0.01	0.36	0.32
Line 2 2-1	Both	HDU2	12180	.387 .011 0.398	- -	.247	7927	0.02	0.66	0.55
Line 3 3-1	Both	HDU2	11928	.379 .010 0.389	- -	.247	8246	0.02	0.65	0.41
Line 4 4-1	Both	HDU2	12180	.387 .011 0.398	- -	.247	7927	0.02	0.66	0.55
Line 5 5-2	Both	HDU2	3134	.100 .003 0.102	- -	.247	3947	0.01	0.36	0.31
Line B B-1	Both	HDU2	4075	.129 .004 0.133	- -	.247	4204	0.01	0.39	0.22
B-2	Both	HDU2	6835	.217 .006 0.223	- -	.247	6177	0.01	0.48	0.22
B-3	Both	HDU2	4075	.129 .004 0.133	- -	.247	4204	0.01	0.39	0.22
Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Displacement Manuf Add da in in in	Slippage Vf da lbs in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 2										
Line 1 1-2	Both	HDU2	1145	.036 .001 0.037	- -	.248	2080	0.00	0.29	0.25
Line 2 2-1	Both	HDU2	5075	.161 .004 0.166	- -	.248	3653	0.01	0.42	0.35
Line 3 3-1	Both	HDU2	4901	.156 .004 0.160	- -	.248	3863	0.01	0.42	0.26
Line 4 4-1	Both	HDU2	5075	.161 .004 0.166	- -	.248	3653	0.01	0.42	0.35
Line 5 5-2	Both	HDU2	1053	.033 .001 0.034	- -	.248	2076	0.00	0.29	0.24
Line B B-1	Both	HDU2	1151	.037 .001 0.038	- -	.248	1963	0.00	0.29	0.16
B-2	Both	HDU2	3126	.099 .003 0.102	- -	.248	3352	0.01	0.36	0.16
B-3	Both	HDU2	1151	.037 .001 0.038	- -	.248	1963	0.00	0.29	0.16
Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Displacement Manuf Add da in in in	Slippage Vf da lbs in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 3										
Line 1 1-2	Both	Anchor	-	(nu = 144 lbs)			-		0.00	0.00
Line 2 2-1	Both	HDU2	976	.031 .001 0.032	- -	.248	990	0.00	0.28	0.23
Line 3 3-1	Both	HDU2	886	.028 .001 0.029	- -	.248	1093	0.00	0.28	0.17
Line 4 4-1	Both	HDU2	976	.031 .001 0.032	- -	.248	990	0.00	0.28	0.23
Line 5 5-2	Both	Anchor	-	(nu = 188 lbs)			-		0.00	0.00
Line B B-1	Both	HDU2	0	.000 .000 0.000	- -	.000	0	0.00	0.00	-
B-2	Both	HDU2	1120	.036 .001 0.037	- -	.248	1439	0.00	0.29	0.13
B-3	Both	HDU2	0	.000 .000 0.000	- -	.000	0	0.00	0.00	-

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

Dir – Force direction

Tens., Comp. – Accumulated ULS hold-down tension force T and SLS compression force C from overturning, dead, and wind uplift loads.

Tens. – ULS-factored force, used for proportion of manufacturer's maximum elongation

Comp. – Factored for serviceability

da – Vertical displacements due to the following components:

Vert. Displacement - Vertical displacement of hold-down

Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation

Unless marked with * = (ULS-factored tension force / hold-down capacity) x max displacement

* - Maximum displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.

Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = $TL / (Ab \times Es)$

T – Serviceability-factored tension force (not shown)

Ab = bolt cross-sectional area

E_s = steel modulus = 29000000 psi

$L = L_b - L_h$

L_b = Total bolt length shown in Storey Information table

L_h = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database

Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation

Nails = e_n from O86 A.11.7 = $(0.013 P_f / d^2)^2$, d = nail diameter

Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.

Shrinkage = $0.002 \times (19\% \text{ fabrication} - 10\% \text{ in-service moisture contents}) \times L_s$

L_s = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Storey Information table

Crush – Deformation of bottom plate at compression end of wall segment

= $0.5\text{mm} \times [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2r^3, r > 1]$

$r = C / Q_r$; $Q_r = K_D K_s K_z f_{cp} A$; A = cross sectional area of end studs

Total d_a – Vert. Displacement + Slippage + Shrink + Crush + Extra

Horz Defl – Restraint system term in deflection equation in O86 11.7.1.2 = $H_s / L \times d_a$

H_s = wall height; L = wall segment length L_s – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width)

H_s and L_s are shown in Deflection table

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

STOREY DRIFT (flexible wind design)

Level	Dir	Actual Storey Drift (in)		hs	Allowable Storey Drift	
		Max defl	Line	ft	Drift in	Ratio
1	N<->S	0.93	2	9.86	0.24	3.92*
	E<->W	0.37	B		0.24	1.58*
2	N<->S	0.59	2	9.86	0.24	2.49*
	E<->W	0.28	B		0.24	1.17*
3	N<->S	0.39	2	9.02	0.22	1.80*
	E<->W	0.22	B		0.22	1.02*

Legend:

Max defl – Largest deflection for any shearline on level in this direction; refer to Deflections table

Line – Shearline with largest deflection on level in this direction

hs – Storey height in 4.1.3.5.(3) = Height of walls plus joist depth between this level and the one above.

Drift = Allowable storey drift on this level from NBC 4.1.3.5.(3)

Ratio - Proportion of allowable storey drift experienced, on this level in this direction.

Notes:

*FAILURE – Story drift on this level is greater than maximum allowed according to NBC 4.1.3.5.(3).

Rigid Diaphragm Wind Design

SHEAR RESULTS

North-south Shearlines	W Gp	For Dir	Wind Case	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
				FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L Int Ext		
Line 1											
Level 3											
Ln1, Lev3	-	Both		10.50	3.3	-	-	-	-	-	0.06S
Wall 1-2	5	Both		10.50	12.4	-	420	0.53	-	2695	0.06S
Level 2											
Ln1, Lev2	-	Both		10.50	59.1	-	-	-	-	-	0.71S
Wall 1-2	4	Both		10.50	225.3	-	318	1.00	-	1703	0.71S
Level 1											
Ln1, Lev1	-	Both		10.50	98.4	-	-	-	-	-	0.98
Wall 1-2	3^	Both		10.50	375.2	-	381	1.00	-	1703	0.98
Line 2											
Level 3											
Ln2, Lev3	-	Both		11.15	39.8	-	-	-	-	-	0.11S
Wall 2-1	2	Both		11.15	142.7	0	1286	1.00	-	5323	0.11S
Level 2											
Ln2, Lev2	-	Both		11.15	93.8	-	-	-	-	-	0.26S
Wall 2-1	2	Both		11.15	336.5	0	1286	1.00	-	5323	0.26S
Level 1											
Ln2, Lev1	-	Both		11.15	166.4	-	-	-	-	-	0.46
Wall 2-1	2	Both		11.15	597.0	0	1286	1.00	-	5323	0.46
Line 3											
Level 3											
Ln3, Lev3	-	Both		14.76	67.2	-	-	-	-	-	0.14S
Wall 3-1	2	Both		14.76	182.2	0	1286	1.00	-	5323	0.14S
Level 2											
Ln3, Lev2	-	Both		14.76	182.6	-	-	-	-	-	0.38S
Wall 3-1	2	Both		14.76	494.9	0	1286	1.00	-	5323	0.38S
Level 1											
Ln3, Lev1	-	Both		14.76	290.0	-	-	-	-	-	0.61
Wall 3-1	2	Both		14.76	786.4	0	1286	1.00	-	5323	0.61
Line 4											
Level 3											
Ln4, Lev3	-	Both		11.15	36.5	-	-	-	-	-	0.10S
Wall 4-1	2	Both		11.15	130.8	0	1286	1.00	-	5323	0.10S
Level 2											
Ln4, Lev2	-	Both		11.15	82.7	-	-	-	-	-	0.23S
Wall 4-1	2	Both		11.15	296.7	0	1286	1.00	-	5323	0.23S
Level 1											
Ln4, Lev1	-	Both		11.15	158.6	-	-	-	-	-	0.44
Wall 4-1	2	Both		11.15	569.0	0	1286	1.00	-	5323	0.44
Line 5											
Level 3											
Ln5, Lev3	-	Both		10.83	5.5	-	-	-	-	-	0.06S
Wall 5-2	8	Both		10.83	20.2	-	679	0.52	-	5323	0.06S
Level 2											
Ln5, Lev2	-	Both		10.83	66.5	-	-	-	-	-	0.41S
Wall 5-2	7	Both		10.83	245.8	-	601	1.00	-	1703	0.41S
Level 1											
Ln5, Lev1	-	Both		10.83	103.6	-	-	-	-	-	0.81
Wall 5-2	6^	Both		10.83	383.1	-	472	1.00	-	1703	0.81
East-west Shearlines	W Gp	For Dir	Wind Case	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
				FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L Int Ext		
Line B											
Level 3											
LnB, Lev3	-	Both		52.17	59.4	-	-	-	-	-	-
Wall B-1	2	Both		16.08	0.0	0	1286	1.00	-	5323	0.00S
Wall B-2	2	Both		20.01	178.3	0	1286	1.00	-	5323	0.14S
Wall B-3	2	Both		16.08	0.0	0	1286	1.00	-	5323	0.00S
Level 2											
LnB, Lev2	-	Both		52.17	189.3	-	-	-	-	-	-
Wall B-1	2	Both		16.08	191.7	0	1286	1.00	-	5323	0.15S
Wall B-2	2	Both		20.01	259.9	0	1286	1.00	-	5323	0.20S
Wall B-3	2	Both		16.08	191.7	0	1286	1.00	-	5323	0.15S
Level 1											

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SHEAR RESULTS (rigid wind design, continued)

LnB, Lev1	-	Both	52.17	319.2	-	-	-	-	-	-	-
Wall B-1	2	Both	16.08	335.3	0	1286	1.00	-	5323	1286	0.26S
Wall B-2	2	Both	20.01	419.0	0	1286	1.00	-	5323	1286	0.33S
Wall B-3	2	Both	16.08	335.3	0	1286	1.00	-	5323	1286	0.26S

Legend:

Results can have different meaning for shearlines, walls, and wall segments. Results for walls with no openings are the same as those for segments.

W Gp - Wall design group as listed in Sheathing and Framing Materials tables. "A" means that this wall is critical for all walls in the Standard Wall group.

Dir - Direction of wind force along shearline. "Both" appears if results are identical for both directions.

Wind case - Critical low-rise windward corner and load case A or B when using NBC 4.1.7.6; all other results are for this load case. Nothing shown when using 4.1.7.5.

FHS - Length of full height sheathing along shearline, wall, or segment.

Fv/L - For shearlines = diaphragm shear force = factored shearline force divided by length of shearline; for wall segments = design shear force = factored shear force divided by length of full height sheathing.

Vhd(vd)/L - Factored unit sheathing connection resistance = Vrs from O86 11.6.2 without Jhd

For wood panels (11.6.2.2(a)) = $0.80 \times vd \times JD \times Jus \times Js$; $vd = Nu$ (from 12.9.3) / nail spacing

JD - diaphragm and shearwall factor (12.9.3.1) = 1.3; Js - fastener spacing factor (11.5.1)

Jus - unblocked factor (11.5.4), shown in the Sheathing Materials table.

For gypsum wallboard (11.6.2.3) = $0.70 \times vd$; vd from Table 11.4

Jhd - Hold-down effect factor from 11.5.5

Vrs(vpb)/L - Factored unit panel buckling resistance (11.6.2.2(b)) = $0.80 \times vpb \times KD \times KS \times KT$.

KD - load-duration factor (5.3.2.1) = 1.15; KS - service-condition factor (9.4.2); KT - treatment factor = 1.0

Vrs/L - Factored unit shear resistance of wall segment = $\min(Vhd(vd)/L \times Jhd, Vrs(vpb)/L)$.

Refer to Detailed Shear Wall design output for strengths, factors and other intermediate values for Vrs, Vhd and Jhd.

"S" indicates that the seismic design criterion was critical in selecting wall.

Notes:

According to O86 11.3.3.1 Note (1), there should be a balanced spatial distribution of gypsum wallboard and wood-based panels on every level in each direction.

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Hold-Down and Compression Design (rigid wind design)

Level 1					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Uplift	Cmb'd			
Line 1											
1-2	L End	0.00	15.87		6187	1335		4851	HDU2	2900	1.67*
1-2	L End	0.00	15.87		6187	1855		8041	Compression	13413	0.60
1-2	R End	0.00	26.12		6187	1335		4851	HDU2	2900	1.67*
1-2	R End	0.00	26.12		6187	1855		8041	Compression	13413	0.60
Line 2											
2-1	L End	10.01	15.22		10729	851		9877	HDU2	2900	3.41*
2-1	L End	10.01	15.22		10729	1182		11911	Compression	13413	0.89
2-1	R End	10.01	26.12		10729	851		9877	HDU2	2900	3.41*
2-1	R End	10.01	26.12		10729	1182		11911	Compression	13413	0.89
Line 3											
3-1	L End	30.02	11.61		14518	1127		13391	HDU2	2900	4.62*
3-1	L End	30.02	11.61		14518	1565		16082	Compression	13413	1.20*
3-1	R End	30.02	26.12		14518	1127		13391	HDU2	2900	4.62*
3-1	R End	30.02	26.12		14518	1565		16082	Compression	13413	1.20*
Line 4											
4-1	L End	50.03	15.22		9935	851		9083	HDU2	2900	3.13*
4-1	L End	50.03	15.22		9935	1182		11117	Compression	13413	0.83
4-1	R End	50.03	26.12		9935	851		9083	HDU2	2900	3.13*
4-1	R End	50.03	26.12		9935	1182		11117	Compression	13413	0.83
Line 5											
5-2	L End	60.04	15.54		6546	1377		5169	HDU2	2900	1.78*
5-2	L End	60.04	15.54		6546	1913		8458	Compression	13413	0.63
5-2	R End	60.04	26.12		6546	1377		5169	HDU2	2900	1.78*
5-2	R End	60.04	26.12		6546	1913		8458	Compression	13413	0.63
Line B											
B-1	L End	2.09	26.25		5276	1227		4049	HDU2	2900	1.40*
B-1	L End	2.09	26.25		5276	1704		6980	Compression	13413	0.52
B-1	R End	17.92	26.25		5276	1227		4049	HDU2	2900	1.40*
B-1	R End	17.92	26.25		5276	1704		6980	Compression	13413	0.52
B-2	L End	20.14	26.25		8405	1527		6878	HDU2	2900	2.37*
B-2	L End	20.14	26.25		8405	2121		10526	Compression	13413	0.78
B-2	R End	39.90	26.25		8405	1527		6878	HDU2	2900	2.37*
B-2	R End	39.90	26.25		8405	2121		10526	Compression	13413	0.78
B-3	L End	42.12	26.25		5276	1227		4049	HDU2	2900	1.40*
B-3	L End	42.12	26.25		5276	1704		6980	Compression	13413	0.52
B-3	R End	57.95	26.25		5276	1227		4049	HDU2	2900	1.40*
B-3	R End	57.95	26.25		5276	1704		6980	Compression	13413	0.52
Level 2											
Line- Wall	Posit'n	Location [ft]		Note	Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
		X	Y		Shear	Dead	Uplift	Cmb'd			
Line 1											
1-2	L End	0.00	15.87		2398	890		1508	HDU2	2900	0.52
1-2	L End	0.00	15.87		2398	1236		3635	Compression	13413	0.27
1-2	R End	0.00	26.12		2398	890		1508	HDU2	2900	0.52
1-2	R End	0.00	26.12		2398	1236		3635	Compression	13413	0.27
Line 2											
2-1	L End	10.01	15.22		4710	568		4142	HDU2	2900	1.43*
2-1	L End	10.01	15.22		4710	788		5498	Compression	13413	0.41
2-1	R End	10.01	26.12		4710	568		4142	HDU2	2900	1.43*
2-1	R End	10.01	26.12		4710	788		5498	Compression	13413	0.41
Line 3											
3-1	L End	30.02	11.61		6634	751		5883	HDU2	2900	2.03*
3-1	L End	30.02	11.61		6634	1043		7677	Compression	13413	0.57
3-1	R End	30.02	26.12		6634	751		5883	HDU2	2900	2.03*
3-1	R End	30.02	26.12		6634	1043		7677	Compression	13413	0.57
Line 4											
4-1	L End	50.03	15.22		4199	568		3631	HDU2	2900	1.25*
4-1	L End	50.03	15.22		4199	788		4987	Compression	13413	0.37
4-1	R End	50.03	26.12		4199	568		3631	HDU2	2900	1.25*
4-1	R End	50.03	26.12		4199	788		4987	Compression	13413	0.37
Line 5											
5-2	L End	60.04	15.54		2681	918		1763	HDU2	2900	0.61
5-2	L End	60.04	15.54		2681	1275		3956	Compression	13413	0.29
5-2	R End	60.04	26.12		2681	918		1763	HDU2	2900	0.61
5-2	R End	60.04	26.12		2681	1275		3956	Compression	13413	0.29
Line B											
B-1	L End	2.09	26.25		1920	818		1102	HDU2	2900	0.38
B-1	L End	2.09	26.25		1920	1136		3055	Compression	13413	0.23

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Hold-Down and Compression Design (rigid wind design, continued)

Hold-down and Compression Design (rigid wind design, continued)											
B-1	R End	17.92	26.25		1920	818	1102	HDU2	2900	0.38	
B-1	R End	17.92	26.25		1920	1136	3055	Compression	13413	0.23	
B-2	L End	20.14	26.25		4223	1018	3205	HDU2	2900	1.11*	
B-2	L End	20.14	26.25		4223	1414	5638	Compression	13413	0.42	
B-2	R End	39.90	26.25		4223	1018	3205	HDU2	2900	1.11*	
B-2	R End	39.90	26.25		4223	1414	5638	Compression	13413	0.42	
B-3	L End	42.12	26.25		1920	818	1102	HDU2	2900	0.38	
B-3	L End	42.12	26.25		1920	1136	3055	Compression	13413	0.23	
B-3	R End	57.95	26.25		1920	818	1102	HDU2	2900	0.38	
B-3	R End	57.95	26.25		1920	1136	3055	Compression	13413	0.23	
Level 3					Tensile Hold-down or Compressive Stud Force [lbs]						
Line-Wall	Posit'n	Location [ft]		Note	Shear	Dead	Uplift	Cmb'd	Hold-down	Cap [lbs]	Crit Resp.
		X	Y								
Line 1											
1-2	L End	0.00	15.87		124	124		0	Anchorage		
1-2	L End	0.00	15.87		124	172		295	Compression	13413	0.02
1-2	R End	0.00	26.12		124	124		0	Anchorage		
1-2	R End	0.00	26.12		124	172		295	Compression	13413	0.02
Line 2											
2-1	L End	10.01	15.22		1317	284		1034	HDU2	2900	0.36
2-1	L End	10.01	15.22		1317	394		1711	Compression	13413	0.13
2-1	R End	10.01	26.12		1317	284		1034	HDU2	2900	0.36
2-1	R End	10.01	26.12		1317	394		1711	Compression	13413	0.13
Line 3											
3-1	L End	30.02	11.61		1672	376		1297	HDU2	2900	0.45
3-1	L End	30.02	11.61		1672	522		2194	Compression	13413	0.16
3-1	R End	30.02	26.12		1672	376		1297	HDU2	2900	0.45
3-1	R End	30.02	26.12		1672	522		2194	Compression	13413	0.16
Line 4											
4-1	L End	50.03	15.22		1208	284		924	HDU2	2900	0.32
4-1	L End	50.03	15.22		1208	394		1602	Compression	13413	0.12
4-1	R End	50.03	26.12		1208	284		924	HDU2	2900	0.32
4-1	R End	50.03	26.12		1208	394		1602	Compression	13413	0.12
Line 5											
5-2	L End	60.04	15.54		201	201		0	Anchorage		
5-2	L End	60.04	15.54		201	279		479	Compression	13413	0.04
5-2	R End	60.04	26.12		201	201		0	Anchorage		
5-2	R End	60.04	26.12		201	279		479	Compression	13413	0.04
Line B											
B-2	L End	20.14	26.25		1629	509		1120	HDU2	2900	0.39
B-2	L End	20.14	26.25		1629	707		2336	Compression	13413	0.17
B-2	R End	39.90	26.25		1629	509		1120	HDU2	2900	0.39
B-2	R End	39.90	26.25		1629	707		2336	Compression	13413	0.17

Legend:

Line-Wall:

At wall or opening - Shearline and wall number

At vertical element - Shearline

Posit'n - Stud that hold-down is attached to:

V Elem - Vertical element: column or strengthened studs required where not at wall end or opening

L or R End - At left or right wall end

L or R Op n - At left or right side of opening n

Location - Co-ordinates in Plan View

Note - Number(s) of note(s) below to apply

Tensile Hold-down or Compressive Stud Force: Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.

Shear - Overturning component = $V \times h / L$; V = force on segment factored by 1.4; h = wall height + joist depth (O86 Fig. 11.7); L = wall segment length - (tension stud pack width + hold-down anchor bolt offset) - (1/2 compression stud pack width). When anchorages used L = segment length - 300 mm (O86 11.6.4.1).

Dead - Dead load resisting component, factored by 0.9 when resisting overturning and 1.25 for compression

Uplift - Uplift wind load component, factored by 1.4

Cmb'd - Sum of factored overturning, dead and uplift forces

Hold-down - Device used from hold-down database or "Anchorage" if no hold-down required.

Cap - Allowable tension load

Crit. Resp. - Critical Response = Combined hold-down force / Allowable tension load

Notes:

Moment arm L used in hold-down force calculations is wall length minus the user-input hold-down offset at each end of wall. For anchorages, maximum moment arm is wall length minus 300 mm. Refer to O86 11.6.4.1.

HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 8 1/4" x 2 1/2" SDS heavy-duty screws; 5/8" anchor bolt.

Factored for load combination 4 from NBC Table 4.1.3.2A, without companion loads for maximum effect. Worst case of low-rise wind loads used.

***WARNING - Design capacity has been exceeded.**

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

COLLECTOR FORCES (rigid wind design)

Level 1				Drag Strut Force [lbs]		Strap/Blocking Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]					
		X	Y	--->	<---	--->	<---
Line 1							
1-2	Left Wall End	0.00	15.75	-1550	1550		
1-2	Right Wall End	0.00	26.25	1356	-1356		
Line 2							
2-1	Left Wall End	10.01	15.09	-2511	2511		
2-1	Right Wall End	10.01	26.25	2293	-2293		
Line 3							
3-1	Left Wall End	30.02	11.48	-3330	3331		
3-1	Right Wall End	30.02	26.25	3997	-3997		
Line 4							
4-1	Left Wall End	50.03	15.09	-2393	2393		
4-1	Right Wall End	50.03	26.25	2185	-2185		
Line 5							
5-2	Left Wall End	60.04	15.42	-1598	1598		
5-2	Right Wall End	60.04	26.25	1428	-1428		
Line B							
B-1	Left Wall End	1.97	26.25	-628	628		
B-1	Right Wall End	18.04	26.25	-370	370		
B-2	Left Wall End	20.01	26.25	-998	998		
B-2	Right Wall End	40.03	26.25	998	-998		
B-3	Left Wall End	41.99	26.25	370	-370		
B-3	Right Wall End	58.07	26.25	628	-628		
Level 2				Drag Strut Force [lbs]		Strap/Blocking Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]					
		X	Y	--->	<---	--->	<---
Line 1							
1-2	Left Wall End	0.00	15.75	-931	931		
1-2	Right Wall End	0.00	26.25	814	-814		
Line 2							
2-1	Left Wall End	10.01	15.09	-1415	1415		
2-1	Right Wall End	10.01	26.25	1292	-1292		
Line 3							
3-1	Left Wall End	30.02	11.48	-2096	2096		
3-1	Right Wall End	30.02	26.25	2516	-2516		
Line 4							
4-1	Left Wall End	50.03	15.09	-1248	1248		
4-1	Right Wall End	50.03	26.25	1139	-1139		
Line 5							
5-2	Left Wall End	60.04	15.42	-1025	1025		
5-2	Right Wall End	60.04	26.25	916	-916		
Line B							
B-1	Left Wall End	1.97	26.25	-373	373		
B-1	Right Wall End	18.04	26.25	-334	334		
B-2	Left Wall End	20.01	26.25	-706	706		
B-2	Right Wall End	40.03	26.25	706	-706		
B-3	Left Wall End	41.99	26.25	334	-334		
B-3	Right Wall End	58.07	26.25	373	-373		
Level 3				Drag Strut Force [lbs]		Strap/Blocking Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]					
		X	Y	--->	<---	--->	<---
Line 1							
1-2	Left Wall End	0.00	15.75	-51	51		
1-2	Right Wall End	0.00	26.25	45	-45		
Line 2							
2-1	Left Wall End	10.01	15.09	-600	600		
2-1	Right Wall End	10.01	26.25	548	-548		
Line 3							
3-1	Left Wall End	30.02	11.48	-772	772		
3-1	Right Wall End	30.02	26.25	926	-926		
Line 4							
4-1	Left Wall End	50.03	15.09	-550	550		
4-1	Right Wall End	50.03	26.25	502	-502		
Line 5							
5-2	Left Wall End	60.04	15.42	-84	84		
5-2	Right Wall End	60.04	26.25	75	-75		
Line B							

COLLECTOR FORCES (rigid wind design, continued)

B-1	Left Wall End	1.97	26.25	-117	117	
B-1	Right Wall End	18.04	26.25	-1073	1073	
B-2	Left Wall End	20.01	26.25	-1190	1190	
B-2	Right Wall End	40.03	26.25	1190	-1190	
B-3	Left Wall End	41.99	26.25	1073	-1073	
B-3	Right Wall End	58.07	26.25	117	-117	

Legend:

Line-Wall - Shearline and wall number

Position... - Side of opening or wall end that drag strut is attached to

Location - Co-ordinates in Plan View

Drag Strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression. Based on factored shearline force.

----> Force in the west-to-east or south-to-north direction

<---- Force in the east-to-west or north-to-south direction

DEFLECTION (rigid wind design)

Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 1														
Line 1 1-2	3	Both	Ext	201.0	10.50	9.02	16.5	.005	.046	82	.013	.091	0.37	0.51
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.007	.000	0	.000	.000	0.48	0.82
		Both	2	319.8					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.007	-	-	-	-	0.44	0.74
		Both	2	421.3					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.007	.000	0	.000	.000	0.46	0.78
		Both	2	304.8					.000	0	.000	.000		
Line 5 5-2	6	Both	Ext	205.3	10.83	9.02	16.5	.005	.047	67	.009	.060	0.36	0.48
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.003	-	-	-	-	0.22	0.37
		Both	2	179.6					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	.003	-	-	-	-	0.22	0.37
		Both	2	224.4					.000	0	.000	.000		
B-3	2	Both	1	0.0	16.08	9.02	16.5	.003	-	-	-	-	0.22	0.37
		Both	2	179.6					.000	0	.000	.000		
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 2														
Line 1 1-2	4	Both	Ext	120.7	10.50	9.02	16.5	.003	.028	59	.007	.047	0.27	0.34
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.004	-	-	-	-	0.32	0.54
		Both	2	180.3					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.005	.000	0	.000	.000	0.28	0.47
		Both	2	265.1					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.004	-	-	-	-	0.31	0.52
		Both	2	158.9					.000	0	.000	.000		
Line 5 5-2	7	Both	Ext	131.7	10.83	9.02	16.5	.003	.030	32	.002	.014	0.26	0.31
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.002	-	-	-	-	0.16	0.28
		Both	2	102.7					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	.002	-	-	-	-	0.16	0.28
		Both	2	139.2					.000	0	.000	.000		
B-3	2	Both	1	0.0	16.08	9.02	16.5	.002	-	-	-	-	0.16	0.28
		Both	2	102.7					.000	0	.000	.000		
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 3														
Line 1 1-2	5	Both	Ext	6.6	10.50	9.02	16.5	.000	.001	3	.000	.000	0.00	0.00
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.002	-	-	-	-	0.23	0.39
		Both	2	76.5					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.002	-	-	-	-	0.18	0.31
		Both	2	97.6					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.002	-	-	-	-	0.23	0.39
		Both	2	70.1					.000	0	.000	.000		
Line 5 5-2	8	Both	Ext	10.8	10.83	9.02	16.5	.000	.002	4	.000	.000	0.00	0.00
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	-	-	-	-	-	-	0.22
		Both	2	0.0					-	-	-	-		
B-2	2	Both	1	0.0	20.01	9.02	16.5	.001	-	-	-	-	0.13	0.22
		Both	2	95.5					.000	0	.000	.000		

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DEFLECTION (rigid wind design, continued)

B-3	2	Both	1	0.0	16.08	9.02	16.5	-	-	-	-	-	-	0.22
		Both	2	0.0					-	-	-	-		

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall.

Dir – Force direction

Srf – Wall surface, interior or exterior for perimeter walls, 1 or 2 for interior partitions

v - SLS-factored shear force on wall segment = Design shear force / 1.4 wind factor x 0.75 SLS importance factor / 1.0 ULS importance factor

L - Width of wall segment between openings

H - Wall height

Defl - Horizontal shearwall deflection due to given term:

Bending = $8vHs^3 / EALs$; A - Cross sectional area of segment end stud(s); E - Stud mod. of elasticity from Framing Materials table

Shear = vHs / Bv ; Bv - Shear-through-thickness rigidity from Tables 9.1-9.3, value is in Sheathing Materials table

Nail slip = $.762Hs \times en$; en – From O86 A.11.7 = $(0.013 vs / d^2)^2$ wood, $0.76 v / vcap$ GWB

vs - shear force per nail along panel edge, d - nail diameter.

Hold - Restraint system (hold-down) = $da \times h / L$;

da - Vertical hold-down displacement; refer to Hold-down Displacement table for components.

L = $Ls - (tension\ stud\ pack\ width + hold-down\ anchor\ bolt\ offset) - (1/2\ compression\ stud\ pack\ width)$

Total Defl – Deflection from bending + shear + nail slip + hold-down / unblocked factor Jus, as per O86 11.7.1.2,3

HOLD-DOWN DISPLACEMENT (rigid wind design)

Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Displacement Manuf Add da in in in	Slippage Vf da lbs in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1										
Line 1 1-2	Both	HDU2	4851	.154 .004 0.158	- -	.247	4798	0.01	0.42	0.37
Line 2 2-1	Both	HDU2	9877	.314 .009 0.322	- -	.247	6693	0.01	0.58	0.48
Line 3 3-1	Both	HDU2	13391	.425 .012 0.437	- -	.247	9029	0.02	0.70	0.44
Line 4 4-1	Both	HDU2	9083	.289 .008 0.296	- -	.247	6268	0.01	0.56	0.46
Line 5 5-2	Both	HDU2	5169	.164 .005 0.169	- -	.247	5037	0.01	0.43	0.36
Line B B-1	Both	HDU2	4049	.129 .004 0.132	- -	.247	4190	0.01	0.39	0.22
B-2	Both	HDU2	6878	.218 .006 0.224	- -	.247	6200	0.01	0.48	0.22
B-3	Both	HDU2	4049	.129 .004 0.132	- -	.247	4190	0.01	0.39	0.22
Level 2										
Line 1 1-2	Both	HDU2	1508	.048 .001 0.049	- -	.248	2274	0.00	0.30	0.27
Line 2 2-1	Both	HDU2	4142	.132 .004 0.135	- -	.248	3154	0.01	0.39	0.32
Line 3 3-1	Both	HDU2	5883	.187 .005 0.192	- -	.248	4389	0.01	0.45	0.28
Line 4 4-1	Both	HDU2	3631	.115 .003 0.119	- -	.248	2880	0.01	0.37	0.31
Line 5 5-2	Both	HDU2	1763	.056 .002 0.058	- -	.248	2456	0.00	0.31	0.26
Line B B-1	Both	HDU2	1102	.035 .001 0.036	- -	.248	1937	0.00	0.29	0.16
B-2	Both	HDU2	3205	.102 .003 0.105	- -	.248	3394	0.01	0.36	0.16
B-3	Both	HDU2	1102	.035 .001 0.036	- -	.248	1937	0.00	0.29	0.16
Level 3										
Line 1 1-2	Both	Anchor	-	(nu = 144 lbs)			-		0.00	0.00
Line 2 2-1	Both	HDU2	1034	.033 .001 0.034	- -	.248	1021	0.00	0.28	0.23
Line 3 3-1	Both	HDU2	1297	.041 .001 0.042	- -	.248	1313	0.00	0.29	0.18
Line 4 4-1	Both	HDU2	924	.029 .001 0.030	- -	.248	962	0.00	0.28	0.23
Line 5 5-2	Both	Anchor	-	(nu = 188 lbs)			-		0.00	0.00
Line B B-1	Both	HDU2	0	.000 .000 0.000	- -	.000	0	0.00	0.00	-
B-2	Both	HDU2	1120	.036 .001 0.037	- -	.248	1439	0.00	0.29	0.13
B-3	Both	HDU2	0	.000 .000 0.000	- -	.000	0	0.00	0.00	-

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

Dir – Force direction

Tens., Comp. – Accumulated ULS hold-down tension force T and SLS compression force C from overturning, dead, and wind uplift loads.

Tens. – ULS-factored force, used for proportion of manufacturer's maximum elongation

Comp. – Factored for serviceability

da – Vertical displacements due to the following components:

Vert. Displacement - Vertical displacement of hold-down

Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation

Unless marked with * = (ULS-factored tension force / hold-down capacity) x max displacement

* - Maximum displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.

Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = $TL / (Ab \times Es)$

T – Serviceability-factored tension force (not shown)

Ab = bolt cross-sectional area

E_s = steel modulus = 29000000 psi

$L = L_b - L_h$

L_b = Total bolt length shown in Storey Information table

L_h = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database

Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation

Nails = e_n from O86 A.11.7 = $(0.013 P_f / d^2)^2$, d = nail diameter

Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.

Shrinkage = $0.002 \times (19\% \text{ fabrication} - 10\% \text{ in-service moisture contents}) \times L_s$

L_s = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Storey Information table

Crush – Deformation of bottom plate at compression end of wall segment

= $0.5\text{mm} \times [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2r^3, r > 1]$

$r = C / Q_r$; $Q_r = K_D K_s K_z f_{cp} A$; A = cross sectional area of end studs

Total d_a – Vert. Displacement + Slippage + Shrink + Crush + Extra

Horz Defl – Restraint system term in deflection equation in O86 11.7.1.2 = $H_s / L \times d_a$

H_s = wall height; L = wall segment length L_s – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width)

H_s and L_s are shown in Deflection table

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

STOREY DRIFT (rigid wind design)

Level	Dir	Actual Storey Drift (in)		Allowable Storey Drift		
		Max defl	Line	hs ft	Drift in	Ratio
1	N<->S	0.82	2	9.86	0.24	3.45
	E<->W	0.37	B		0.24	1.58
2	N<->S	0.54	2	9.86	0.24	2.30
	E<->W	0.28	B		0.24	1.17
3	N<->S	0.39	2	9.02	0.22	1.82
	E<->W	0.22	B		0.22	1.02

Legend:

Max defl – Largest deflection for any shearline on level in this direction; refer to Deflections table

Line – Shearline with largest deflection on level in this direction

hs – Storey height in 4.1.3.5.(3) = Height of walls plus joist depth between this level and the one above.

Drift = Allowable storey drift on this level from NBC 4.1.3.5.(3)

Ratio - Proportion of allowable storey drift experienced, on this level in this direction.

Notes:

***FAILURE** – Story drift on this level is greater than maximum allowed according to NBC 4.1.3.5.(3).

Out-of-plane Wind Design

COMPONENTS AND CLADDING by SHEARLINE

North-South Shearlines			Sheathing [psf]			Fastener Withdrawal [lbs]					Service Condition Factor	
Line	Lev	Grp	Force	Cap	Force/ Cap	Force		Cap	Force/Cap			
						End	Int		End	Int		
1	1	3	33.2	684.5	0.05	28.6	22.6	29.8	0.96	0.76	1.00	
		1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	2	4	33.2	684.5	0.05	28.6	22.6	29.8	0.96	0.76	1.00	
		1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	3	5	33.2	646.9	0.05	21.4	17.0	27.5	0.78	0.62	1.00	
		1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	5	1	6	33.2	684.5	0.05	28.6	22.6	29.8	0.96	0.76	1.00
			1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00
	2	7	33.2	684.5	0.05	28.6	22.6	29.8	0.96	0.76	1.00	
			1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00
3		8	33.2	909.5	0.04	28.6	22.6	39.6	0.72	0.57	1.00	
		1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
East-West Shearlines			Sheathing [psf]			Fastener Withdrawal [lbs]					Service Condition Factor	
Line	Lev	Grp	Force	Cap	Force/ Cap	Force		Cap	Force/Cap			
						End	Int		End	Int		
A	1	1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	2	1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	3	1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
C	1	1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	2	1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	
	3	1	33.2	248.7	0.13	28.6	22.6	33.7	0.85	0.67	1.00	

Legend:

Grp - Wall Design Group (results for all design groups for rigid, flexible design listed for each wall)

Sheathing:

Force - Factored C&C end zone pressure using the worst-case combination of negative (suction) and positive exterior and interior coefficients from NBC 4.1.7.5.(4) and 4.1.7.7.

Cap - Out-of-plane bending and shear capacity of exterior sheathing, using mp and vpsb strengths from O86 Tables 9.1-9.3. Assumes continuous

over 3 spans, except for vertical panels and 24" stud spacing (2 spans).

Fastener Withdrawal:

Force - Factored force tributary to each nail in end zone and interior zone, using exterior suction pressure.

Cap - Factored withdrawal capacity of individual nail according to O86 12.9.4.

Flexible Diaphragm Seismic Design

SEISMIC INFORMATION

Level	Mass [lbs]	Storey Shear [lbs]		Shear Capacity [lbs]		Over-capacity		Length of SFRS [ft]	
		E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S
3	43320	4294967296	12516	67072	53884	0.00	4.31	56.1	14.8
2	48996	4294967296	22198	67072	56423	0.00	2.54	56.1	14.8
1	48996	4294967296	27040	67072	56780	0.00	2.10	56.1	14.8
All	141312	-	-	-	-	1.00	1.21	-	-

Ratio C2/C1 of second to first storey over capacity is between 0.9 and 1.2 in E-W direction as per 11.8.3.2

WARNING - Ratio C2/C1 of second to first storey over-capacity is greater than 1.2 in the N-S direction, contravening CSA O86 11.8.3.2

Storey shear - Sum of factored, vertically accumulated shearline forces on level, including torsional effects.

Total unfactored base shear - 24109 lbs

IRREGULARITIES (NBC Table 4.1.8.6)

$leFaSa(0.2) = 0.813$

Only those provisions for height less than 20 m are considered.

No.	Irregularity Type	NBC 4.1.8... Commentary	Irregular for...		Fails for...		Notes
			Levels	Dir/Ln	Levels	Dir/Ln	
1	Vertical Stiffness	7 (1) (c) ; 10 (2) (a) J-118, 150	2, 3 2, 1	Both Both	None	None	a, b
2	Weight (mass)	7 (1) (c) J-118	None	None	None	None	-
3	Vertical Geometric	7 (1) (c) ; 10 (2) (a) J-118, 150	None	None	None	None	-
4	In-Plane Disc. (offset)	7 (1) (c) ; 10 (2) (a) 15 (5) , J-118, 150, 208	None	None	None	None	-
4	In-Plane Disc. (stiffness)	7 (1) (c) ; 10 (2) (a) J-118, 150	3, 2 2, 1	1, 5 5	None	None	a, b
5	Out-of-Plane Offsets	7 (1) (c) ; 10 (2) (a) 15 (5) , J-118, 150, 208	None	None	None	None	-
6	Weak Storey	7 (1) (c) ; 10 (1) , (2) (b) J-118, 150	None	None	None	None	-
7	Torsional Sensitivity	7 (1) ; 10 (2) (a) 11 (10) ; 11 (11) (b) J-120, 150, 173-5	n/a	n/a	n/a	n/a	c
8	Non-orthogonal	7 (1) (c) J-120	n/a	n/a	n/a	n/a	d
9	Gravity-Induced	7 (1) ; 10 (2) , (5-7) J-150	n/a	n/a	n/a	n/a	e

Notes:

- Equivalent Static Procedure allowable because period $T_a < 0.5s$, as per 4.1.8.7.(1)(c).
- Irregularity must be considered since $leFaSa(0.2) \geq 0.35$, as per NBC 4.1.8.7.(1)(a), 4.1.8.6.(3) and Commentary J-122.
- This irregularity not applicable to flexible diaphragm design.
- Not applicable, as all buildings modelled by Shearwalls are orthogonal.
- Not applicable to structures using wood shear walls.

Irregularities:

- Vertical Stiffness: Stiffness in a storey is less than 70% of the stiffness in an adjacent storey, or 80% of that of 3 storeys above or below. Table shows the storey followed by stiffer level(s), e.g. 4,5 or 4,1-3.
- Weight (mass): Weight of any storey is more than 150% of weight of adjacent storey. Weight of storey is effective mass used for vertical seismic mass distribution. Table shows the heavy storey followed by light storey, e.g. 4,3.
- Vertical Geometric: Horizontal dimension of SFRS in any storey more than 130% of that in adjacent storey. Shearwalls checks using the nearest and farthest points from all walls in a storey for each direction. It shows the storey with the long SRFS in the table, and the affected direction(s).
- In-Plane Discontinuity in Vertical Element (offset): In plane offset of a lateral force-resisting element in the storey below. Shearwalls detects whenever the ends wall segments on adjacent storeys do not line up to within 3". It shows both upper and lower storey in table, e.g. 4,3, and shearlines affected.
- In-Plane Discontinuity in Vertical Element (stiffness): Reduction in the lateral stiffness of the resisting element in the storey below. Shearwalls uses a linearized approximation of the deflection equation from O86 11.7.1.2 to determine constant shearwall stiffnesses, then compares the stiffness of collinear shearwall segments on adjacent storeys. It shows both upper and lower storey in table, e.g. 4,3, and shearlines affected.
- Out-of-Plane Offsets: Discontinuities in the lateral force path. Shearwalls detects wherever shearwalls do not exist on a shearline for particular level, and the program has transferred the force from the shearline on the floor above directly into the diaphragm. It shows the storey without shear-resisting elements in the table, and the directions(s) affected.
- Discontinuity in Capacity - Weak Storey: The storey shear strength is less than the storey above for the direction under consideration. Shearwalls determines the total capacity of all shearwalls for each direction on each level, and reports weaker lower levels in the table.
- Torsional Sensitivity: Ratio B of maximum to average storey displacements is greater than 1.7. Applies only to rigid diaphragm design results. Shearwalls calculates shearline forces and deflections in the extreme shearlines for both positive and negative accidental eccentricity, and for each case computes $B_x = \text{largest deflection} / \text{average of the two}$. Table shows any storey and force direction for which B_x is greater than 1.7.
- Non-orthogonal: Occurs when shearlines are not oriented at right angles (skewed shearwalls). Shearwalls does not currently allow input of skewed shearwalls, so this irregularity does not apply.
- Gravity-Induced Lateral Demand: Any such demands in a typical wood-frame structure, such as from cantilevered floors, affect the overturning force on hold-downs; however these are not the predominant yielding mechanism so this irregularity does not apply.

SHEAR RESULTS (flexible seismic design)

North-south Shearlines	W Gp	For Dir	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
			FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L		
Line 1										
Level 3										
Ln1, Lev3	-	Both	10.50	40.0	-	-	-	-	-	0.67
Wall 1-2	5^	Both	10.50	152.3	-	420	0.54	-	2695	0.67
Level 2										
Ln1, Lev2	-	Both	10.50	77.2	-	-	-	-	-	0.93
Wall 1-2	4^	Both	10.50	294.4	-	318	1.00	-	1703	0.93
Level 1										
Ln1, Lev1	-	Both	10.50	95.9	-	-	-	-	-	0.96W
Wall 1-2	3	Both	10.50	365.5	-	381	1.00	-	1703	0.96W
Line 2										
Level 3										
Ln2, Lev3	-	Both	11.15	73.7	-	-	-	-	-	0.21#
Wall 2-1	2	Both	11.15	264.6	0	1286	1.00	-	5323	0.21#
Level 2										
Ln2, Lev2	-	Both	11.15	126.6	-	-	-	-	-	0.35#
Wall 2-1	2	Both	11.15	454.1	0	1286	1.00	-	5323	0.35#
Level 1										
Ln2, Lev1	-	Both	11.15	153.0	-	-	-	-	-	0.43W#
Wall 2-1	2	Both	11.15	548.9	0	1286	1.00	-	5323	0.43W#
Line 3										
Level 3										
Ln3, Lev3	-	Both	14.76	85.3	-	-	-	-	-	0.18#
Wall 3-1	2	Both	14.76	231.3	0	1286	1.00	-	5323	0.18#
Level 2										
Ln3, Lev2	-	Both	14.76	147.0	-	-	-	-	-	0.31#
Wall 3-1	2	Both	14.76	398.6	0	1286	1.00	-	5323	0.31#
Level 1										
Ln3, Lev1	-	Both	14.76	177.9	-	-	-	-	-	0.38W#
Wall 3-1	2	Both	14.76	482.3	0	1286	1.00	-	5323	0.38W#
Line 4										
Level 3										
Ln4, Lev3	-	Both	11.15	73.7	-	-	-	-	-	0.21#
Wall 4-1	2	Both	11.15	264.6	0	1286	1.00	-	5323	0.21#
Level 2										
Ln4, Lev2	-	Both	11.15	126.6	-	-	-	-	-	0.35#
Wall 4-1	2	Both	11.15	454.1	0	1286	1.00	-	5323	0.35#
Level 1										
Ln4, Lev1	-	Both	11.15	153.0	-	-	-	-	-	0.43W#
Wall 4-1	2	Both	11.15	548.9	0	1286	1.00	-	5323	0.43W#
Line 5										
Level 3										
Ln5, Lev3	-	Both	10.83	40.0	-	-	-	-	-	0.42
Wall 5-2	8	Both	10.83	147.7	-	679	0.52	-	5323	0.42
Level 2										
Ln5, Lev2	-	Both	10.83	77.2	-	-	-	-	-	0.57
Wall 5-2	7	Both	10.83	285.5	-	601	0.83	-	1703	0.57
Level 1										
Ln5, Lev1	-	Both	10.83	95.9	-	-	-	-	-	0.75W
Wall 5-2	6	Both	10.83	354.4	-	472	1.00	-	1703	0.75W
East-west Shearlines	W Gp	For Dir	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
			FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L		
Line B										
Level 3										
LnB, Lev3	-	Both	52.17	2318355 04.0	-	-	-	-	-	-
Wall B-1	2	Both	16.08	4308404 16.0	0	1286	1.00	-	5323	335087. 81*#
Wall B-2	2	Both	20.01	3336697 .0	0	1286	1.00	-	5323	2595.13 *#
Wall B-3	2	Both	16.08	4308404 16.0	0	1286	1.00	-	5323	335087. 81*#
Level 2										
LnB, Lev2	-	Both	52.17	2318356 48.0	-	-	-	-	-	-

SHEAR RESULTS (flexible seismic design, continued)

Wall B-1	2	Both	16.08	9110060 .0	0	1286	1.00	-	5323	1286	7085.38 *#
Wall B-2	2^	Both	20.01	6808710 40.0	0	1286	1.00	-	5323	1286	529550. 12*#
Wall B-3	2	Both	16.08	9110060 .0	0	1286	1.00	-	5323	1286	7085.38 *#
Level 1											
LnB, Lev1	-	Both	52.17	2318357 28.0	-	-	-	-	-	-	-
Wall B-1	2	Both	16.08	3259085 76.0	0	1286	1.00	-	5323	1286	253476. 66*#
Wall B-2	2	Both	20.01	1719163 36.0	0	1286	1.00	-	5323	1286	133708. 59*#
Wall B-3	2	Both	16.08	3259085 76.0	0	1286	1.00	-	5323	1286	253476. 66*#

Legend:

Results can have different meaning for shearlines, walls, and wall segments. Results for walls with no openings are the same as those for segments.
W Gp - Wall design group as listed in Sheathing and Framing Materials tables. "^" means that this wall is critical for all walls in the Standard Wall group.

Dir - Direction of seismic shear force along shearline. "Both" appears if results are identical for both directions.

FHS - Length of full height sheathing along shearline, wall, or segment

Fv/L - For shearlines = diaphragm shear force = factored shearline force divided by length of shearline; for wall segments = design shear force = factored shear force divided by length of full height sheathing.

Vhd(vd)/L - Factored unit sheathing connection resistance = Vrs from O86 11.6.2 without Jhd

For wood panels (11.6.2.2(a)) = $0.80 \times v_d \times J_D \times J_u \times J_s$; $v_d = N_u$ (from 12.9.3) / nail spacing

J_D - diaphragm and shearwall factor (12.9.3.1) = 1.3; J_s - fastener spacing factor (11.5.1)

J_u - unblocked factor (11.5.4), shown in the Sheathing Materials table.

For gypsum wallboard (11.6.2.3) = $0.70 \times v_d$; v_d from Table 11.4

Jhd - Hold-down effect factor from 11.5.5

Vrs(vpb)/L - Factored unit panel buckling resistance (11.6.2.2(b)) = $0.80 \times v_{pb} \times K_D \times K_S \times K_T$.

K_D - load-duration factor (5.3.2.1) = 1.15; K_S - service-condition factor (9.4.2); K_T - treatment factor = 1.0

Vrs/L - Factored unit shear resistance of wall segment = $\min(Vhd(vd)/L \times Jhd, Vrs(vpb)/L)$.

Refer to Detailed Shear Wall design output for strengths, factors and other intermediate values for Vrs, Vhd and Jhd.

"W" indicates that the wind design criterion was critical in selecting wall.

Notes:

According to O86 11.3.3.1 Note (1), there should be a balanced spatial distribution of gypsum wallboard and wood-based panels on every level in each direction.

*WARNING - Design capacity has been exceeded.

#WARNING - The following walls fail because panel buckling from O86 11.6.2.2.(b) or a non-ductile nail strength mode from 12.9.3.2 governs for shear resistance Vrs, as per 11.8.1. Refer to the Detailed Shearwall Design output for these walls.

Level 1: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 2: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 3: B-1, B-2, B-3, 2-1, 3-1, 4-1

WARNING – Over-capacity ratio from O86 11.8.3.2 exceeded. See Seismic Information table for more details.

Hold-Down and Compression Design (flexible seismic design)

Level 1					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Jx	Cmb'd			
Line 1					1.0						
1-2	L End	0.00	15.87		9815	1484		8331	HDU2	2900	2.87*
1-2	L End	0.00	15.87		9815	1484		11299	Compression	13413	0.84
1-2	R End	0.00	26.12		9815	1484		8331	HDU2	2900	2.87*
1-2	R End	0.00	26.12		9815	1484		11299	Compression	13413	0.84
Line 2					1.0						
2-1	L End	10.01	15.22		15064	946		14119	HDU2	2900	4.87*
2-1	L End	10.01	15.22		15064	946		16010	Compression	13413	1.19*
2-1	R End	10.01	26.12		15064	946		14119	HDU2	2900	4.87*
2-1	R End	10.01	26.12		15064	946		16010	Compression	13413	1.19
Line 3					1.0						
3-1	L End	30.02	11.61		13144	1252		11892	HDU2	2900	4.10*
3-1	L End	30.02	11.61		13144	1252		14396	Compression	13413	1.07*
3-1	R End	30.02	26.12		13144	1252		11892	HDU2	2900	4.10*
3-1	R End	30.02	26.12		13144	1252		14396	Compression	13413	1.07*
Line 4					1.0						
4-1	L End	50.03	15.22		15064	946		14119	HDU2	2900	4.87*
4-1	L End	50.03	15.22		15064	946		16010	Compression	13413	1.19*
4-1	R End	50.03	26.12		15064	946		14119	HDU2	2900	4.87*
4-1	R End	50.03	26.12		15064	946		16010	Compression	13413	1.19*
Line 5					1.0						
5-2	L End	60.04	15.54		9506	1530		7976	HDU2	2900	2.75*
5-2	L End	60.04	15.54		9506	1530		11036	Compression	13413	0.82
5-2	R End	60.04	26.12		9506	1530		7976	HDU2	2900	2.75*
5-2	R End	60.04	26.12		9506	1530		11036	Compression	13413	0.82
Line B					1.0						
B-1	L End	2.09	26.25		-- 4294967 296	1363		-- 4294967 296	HDU2	2900	0.00
B-1	L End	2.09	26.25		-- 4294967 296	1363		-- 4294967 296	Compression	13413	320216. 12*
B-1	R End	17.92	26.25		-- 4294967 296	1363		-- 4294967 296	HDU2	2900	0.00
B-1	R End	17.92	26.25		-- 4294967 296	1363		-- 4294967 296	Compression	13413	320216. 12*
B-2	L End	20.14	26.25		-- 4294967 296	1697		-- 4294967 296	HDU2	2900	0.00
B-2	L End	20.14	26.25		-- 4294967 296	1697		-- 4294967 296	Compression	13413	320216. 12*
B-2	R End	39.90	26.25		-- 4294967 296	1697		-- 4294967 296	HDU2	2900	0.00
B-2	R End	39.90	26.25		-- 4294967 296	1697		-- 4294967 296	Compression	13413	320216. 12*
B-3	L End	42.12	26.25		-- 4294967 296	1363		-- 4294967 296	HDU2	2900	0.00
B-3	L End	42.12	26.25		-- 4294967 296	1363		-- 4294967 296	Compression	13413	320216. 12*
B-3	R End	57.95	26.25		-- 4294967 296	1363		-- 4294967 296	HDU2	2900	0.00
B-3	R End	57.95	26.25		-- 4294967 296	1363		-- 4294967 296	Compression	13413	320216. 12*
Level 2					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Jx	Cmb'd			
Line 1					1.0						
1-2	L End	0.00	15.87		5387	989		4398	HDU2	2900	1.52*
1-2	L End	0.00	15.87		5387	989		6376	Compression	13413	0.48
1-2	R End	0.00	26.12		5387	989		4398	HDU2	2900	1.52*

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Hold-Down and Compression Design (flexible seismic design, continued)

1-2	R End	0.00	26.12	5387	989	6376	Compression	13413	0.48		
Line 2						1.0					
2-1	L End	10.01	15.22	8424	631	7794	HDU2	2900	2.69*		
2-1	L End	10.01	15.22	8424	631	9055	Compression	13413	0.68		
2-1	R End	10.01	26.12	8424	631	7794	HDU2	2900	2.69*		
2-1	R End	10.01	26.12	8424	631	9055	Compression	13413	0.68		
Line 3						1.0					
3-1	L End	30.02	11.61	7342	835	6508	HDU2	2900	2.24*		
3-1	L End	30.02	11.61	7342	835	8177	Compression	13413	0.61		
3-1	R End	30.02	26.12	7342	835	6508	HDU2	2900	2.24*		
3-1	R End	30.02	26.12	7342	835	8177	Compression	13413	0.61		
Line 4						1.0					
4-1	L End	50.03	15.22	8424	631	7794	HDU2	2900	2.69*		
4-1	L End	50.03	15.22	8424	631	9055	Compression	13413	0.68		
4-1	R End	50.03	26.12	8424	631	7794	HDU2	2900	2.69*		
4-1	R End	50.03	26.12	8424	631	9055	Compression	13413	0.68		
Line 5						1.0					
5-2	L End	60.04	15.54	5216	1020	4196	HDU2	2900	1.45*		
5-2	L End	60.04	15.54	5216	1020	6236	Compression	13413	0.46		
5-2	R End	60.04	26.12	5216	1020	4196	HDU2	2900	1.45*		
5-2	R End	60.04	26.12	5216	1020	6236	Compression	13413	0.46		
Line B						1.0					
				--		--					
B-1	L End	2.09	26.25	4294967 296	909	4294967 296	HDU2	2900	0.00		
				--		--					
B-1	L End	2.09	26.25	4294967 296	909	4294967 296	Compression	13413	320216. 12*		
				--		--					
B-1	R End	17.92	26.25	4294967 296	909	4294967 296	HDU2	2900	0.00		
				--		--					
B-1	R End	17.92	26.25	4294967 296	909	4294967 296	Compression	13413	320216. 12*		
				--		--					
B-2	L End	20.14	26.25	4294967 296	1131	4294967 296	HDU2	2900	0.00		
				--		--					
B-2	L End	20.14	26.25	4294967 296	1131	4294967 296	Compression	13413	320216. 12*		
				--		--					
B-2	R End	39.90	26.25	4294967 296	1131	4294967 296	HDU2	2900	0.00		
				--		--					
B-2	R End	39.90	26.25	4294967 296	1131	4294967 296	Compression	13413	320216. 12*		
				--		--					
B-3	L End	42.12	26.25	4294967 296	909	4294967 296	HDU2	2900	0.00		
				--		--					
B-3	L End	42.12	26.25	4294967 296	909	4294967 296	Compression	13413	320216. 12*		
				--		--					
B-3	R End	57.95	26.25	4294967 296	909	4294967 296	HDU2	2900	0.00		
				--		--					
B-3	R End	57.95	26.25	4294967 296	909	4294967 296	Compression	13413	320216. 12*		
Level 3					Tensile Hold-down						
Line-Wall	Posit'n	Location [ft]			or Compressive Stud Force [lbs]						
		X	Y	Note	Shear	Dead	Jx	Cmb'd	Hold-down	Cap [lbs]	Crit Resp.
Line 1							1.0				
1-2	L End	0.00	15.87		1820	495		1325	Anchorage		
1-2	L End	0.00	15.87		1820	495		2314	Compression	13413	0.17
1-2	R End	0.00	26.12		1820	495		1325	Anchorage		
1-2	R End	0.00	26.12		1820	495		2314	Compression	13413	0.17
Line 2							1.0				
2-1	L End	10.01	15.22		2930	315		2615	HDU2	2900	0.90
2-1	L End	10.01	15.22		2930	315		3246	Compression	13413	0.24
2-1	R End	10.01	26.12		2930	315		2615	HDU2	2900	0.90
2-1	R End	10.01	26.12		2930	315		3246	Compression	13413	0.24
Line 3							1.0				
3-1	L End	30.02	11.61		2547	417		2130	HDU2	2900	0.73

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Hold-Down and Compression Design (flexible seismic design, continued)

3-1	L End	30.02	11.61	2547	417	2964	Compression	13413	0.22
3-1	R End	30.02	26.12	2547	417	2130	HDU2	2900	0.73
3-1	R End	30.02	26.12	2547	417	2964	Compression	13413	0.22
Line 4						1.0			
4-1	L End	50.03	15.22	2930	315	2615	HDU2	2900	0.90
4-1	L End	50.03	15.22	2930	315	3246	Compression	13413	0.24
4-1	R End	50.03	26.12	2930	315	2615	HDU2	2900	0.90
4-1	R End	50.03	26.12	2930	315	3246	Compression	13413	0.24
Line 5						1.0			
5-2	L End	60.04	15.54	1759	510	1249	Anchorage		
5-2	L End	60.04	15.54	1759	510	2269	Compression	13413	0.17
5-2	R End	60.04	26.12	1759	510	1249	Anchorage		
5-2	R End	60.04	26.12	1759	510	2269	Compression	13413	0.17
Line B						1.0			
				--		--			
B-1	L End	2.09	26.25	4294967	454	4294967	HDU2	2900	0.00
				296		296			
				--		--			
B-1	L End	2.09	26.25	4294967	454	4294967	Compression	13413	320216.12*
				296		296			
				--		--			
B-1	R End	17.92	26.25	4294967	454	4294967	HDU2	2900	0.00
				296		296			
				--		--			
B-1	R End	17.92	26.25	4294967	454	4294967	Compression	13413	320216.12*
				296		296			
B-2	L End	20.14	26.25	3658264	566	3658207	HDU2	2900	12614.36*
				2		7			
B-2	L End	20.14	26.25	3658264	566	3658320	Compression	13413	2727.50*
				2		7			
B-2	R End	39.90	26.25	3658264	566	3658207	HDU2	2900	12614.36*
				2		7			
B-2	R End	39.90	26.25	3658264	566	3658320	Compression	13413	2727.50*
				2		7			
				--		--			
B-3	L End	42.12	26.25	4294967	454	4294967	HDU2	2900	0.00
				296		296			
				--		--			
B-3	L End	42.12	26.25	4294967	454	4294967	Compression	13413	320216.12*
				296		296			
				--		--			
B-3	R End	57.95	26.25	4294967	454	4294967	HDU2	2900	0.00
				296		296			
				--		--			
B-3	R End	57.95	26.25	4294967	454	4294967	Compression	13413	320216.12*
				296		296			

Legend:

Line-Wall:

At wall or opening – Shearline and wall number

At vertical element - Shearline

Posit'n - Stud that hold-down is attached to:

V Elem - Vertical element column or strengthened studs required where not at wall end or opening

L or R End - At left or right wall end

L or R Op n - At left or right side of opening n

Location - Co-ordinates in Plan View

Note - Number(s) of note(s) below to apply

Tensile Hold-down or Compressive Stud Force: Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.

Shear – Overturning component = $V \times h / L$; V = force on segment increased by 20% as per O86 11.8.2. Jx – Overturning moment reduction factor from NBC 4.1.8.11.(8), applied to shear component; h = wall height + joist depth (O86 Fig. 11.7); L = wall segment length – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width). When anchorages used L = segment length – 300 mm (O86 11.6.4.1).

Dead - Dead load resisting component

Cmb'd - Sum of factored overturning and forces

Hold-down – Device used from hold-down database or "Anchorage" if no hold-down required.

Cap – allowable tension load

Crit. Resp. – Critical Response = Combined hold-down force / Allowable tension load

Notes:

Moment arm L used in hold-down force calculations is wall length minus the user-input hold-down offset at each end of wall. For anchorages,

maximum moment arm is wall length minus 300 mm. Refer to O86 11.6.4.1.

HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 8 1/4" x 2 1/2" SDS heavy-duty screws; 5/8" anchor bolt.

Unfactored as per load combination 5 from NBC Table 4.1.3.2.A and without companion loads for maximum effect.

***WARNING - Design capacity has been exceeded.**

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

COLLECTOR FORCES (flexible seismic design)

Level 1					Drag Strut Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]		Notes	Force [lbs]	
		X	Y		---->	<---
Line 1						
1-2	Left Wall End	0.00	15.75		-1812	1812
1-2	Right Wall End	0.00	26.25		1585	-1585
Line 2						
2-1	Left Wall End	10.01	15.09		-2770	2770
2-1	Right Wall End	10.01	26.25		2529	-2529
Line 3						
3-1	Left Wall End	30.02	11.48		-2451	2451
3-1	Right Wall End	30.02	26.25		2941	-2941
Line 4						
4-1	Left Wall End	50.03	15.09		-2770	2770
4-1	Right Wall End	50.03	26.25		2529	-2529
Line 5						
5-2	Left Wall End	60.04	15.42		-1774	1774
5-2	Right Wall End	60.04	26.25		1585	-1585
Line B						
B-1	Left Wall End	1.97	26.25		- 482773 487	547643 516
B-1	Right Wall End	18.04	26.25		126714 7347	- 482773 487
B-2	Left Wall End	20.01	26.25		719503 888	- 482773 487
B-2	Right Wall End	40.03	26.25		- 482773 487	719506 075
B-3	Left Wall End	41.99	26.25		- 482773 487	126715 0109
B-3	Right Wall End	58.07	26.25		547640 696	- 482773 487
Level 2					Drag Strut Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]		Notes	Force [lbs]	
		X	Y		---->	<---
Line 1						
1-2	Left Wall End	0.00	15.75		-1459	1459
1-2	Right Wall End	0.00	26.25		1277	-1277
Line 2						
2-1	Left Wall End	10.01	15.09		-2292	2292
2-1	Right Wall End	10.01	26.25		2093	-2093
Line 3						
3-1	Left Wall End	30.02	11.48		-2026	2026
3-1	Right Wall End	30.02	26.25		2431	-2431
Line 4						
4-1	Left Wall End	50.03	15.09		-2292	2292
4-1	Right Wall End	50.03	26.25		2093	-2093
Line 5						
5-2	Left Wall End	60.04	15.42		-1429	1429
5-2	Right Wall End	60.04	26.25		1277	-1277
Line B						
B-1	Left Wall End	1.97	26.25		- 482773 487	547643 286
B-1	Right Wall End	18.04	26.25		- 482773 487	- 429496 7296
B-2	Left Wall End	20.01	26.25		- 482773 487	- 429496 7296
B-2	Right Wall End	40.03	26.25		- 429496 7296	- 482773 487
B-3	Left Wall End	41.99	26.25		- 429496 7296	- 482773 487

COLLECTOR FORCES (flexible seismic design, continued)

B-3	Right Wall End	58.07	26.25		547641 789	- 482773 487
Level 3						
Line-Wall	Position on Wall or Opening	Location [ft]			Drag Strut Force [lbs]	
		X	Y	Notes	--->	<---
Line 1						
1-2	Left Wall End	0.00	15.75		-755	755
1-2	Right Wall End	0.00	26.25		661	-661
Line 2						
2-1	Left Wall End	10.01	15.09		-1335	1335
2-1	Right Wall End	10.01	26.25		1219	-1219
Line 3						
3-1	Left Wall End	30.02	11.48		-1175	1175
3-1	Right Wall End	30.02	26.25		1410	-1410
Line 4						
4-1	Left Wall End	50.03	15.09		-1335	1335
4-1	Right Wall End	50.03	26.25		1219	-1219
Line 5						
5-2	Left Wall End	60.04	15.42		-739	739
5-2	Right Wall End	60.04	26.25		661	-661
Line B						
B-1	Left Wall End	1.97	26.25		- 482773 487	547642 940
B-1	Right Wall End	18.04	26.25		- 429496 7296	- 482773 487
B-2	Left Wall End	20.01	26.25		- 429496 7296	- 482773 487
B-2	Right Wall End	40.03	26.25		- 482773 487	- 429496 7296
B-3	Left Wall End	41.99	26.25		- 482773 487	- 429496 7296
B-3	Right Wall End	58.07	26.25		- 547642 883	- 482773 487

Legend:

Line-Wall - Shearline and wall number

Position... - Side of opening or wall end that drag strut is attached to

Location - Co-ordinates in Plan View

Drag Strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression. Based on shearline force unless otherwise noted below. Increased by 20% as per O86 11.8.6.

----> Force in the west-to-east or south-to-north direction

<--- Force in the east-to-west or north-to-south direction

DEFLECTION (flexible seismic design)

Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending		Shear	Nail slip			Hold	Total
							A sq.in	Defl in	Defl in	vs lbs	en in	Defl in	Defl in	Defl in
Level 1														
Line 1 1-2	3	Both	Ext	365.5	10.50	9.02	16.5	.009	.084	150	.044	.300	0.43	0.82
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.013	-	-	-	-	0.55	0.94
		Both	2	548.9					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.008	-	-	-	-	0.37	0.63
		Both	2	482.3					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.013	-	-	-	-	0.55	0.94
		Both	2	548.9					.000	0	.000	.000		
Line 5 5-2	6	Both	Ext	354.4	10.83	9.02	16.5	.008	.081	116	.026	.180	0.41	0.68
Line B														
B-1	2	Both	1	0.0	16.08	9.02	16.5	5241. 78	-	-	-	-	216895 8484.4 8	216895 8484.4 8
		Both	2	3259085 76.0					.000	0	.000	.000	-	-
B-2	2	Both	1	0.0	20.01	9.02	16.5	2221. 09	-	-	-	-	216895 8484.4 8	216895 8484.4 8
		Both	2	1719163 36.0					.000	0	.000	.000	-	-
B-3	2	Both	1	0.0	16.08	9.02	16.5	5241. 78	-	-	-	-	216895 8484.4 8	216895 8484.4 8
		Both	2	3259085 76.0					.000	0	.000	.000	-	-
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending		Shear	Nail slip			Hold	Total
							A sq.in	Defl in	Defl in	vs lbs	en in	Defl in	Defl in	Defl in
Level 2														
Line 1 1-2	4	Both	Ext	294.4	10.50	9.02	16.5	.007	.067	145	.041	.280	0.33	0.68
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.011	-	-	-	-	0.39	0.67
		Both	2	454.1					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.007	-	-	-	-	0.27	0.46
		Both	2	398.6					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.011	-	-	-	-	0.39	0.67
		Both	2	454.1					.000	0	.000	.000		
Line 5 5-2	7	Both	Ext	285.5	10.83	9.02	16.5	.007	.065	70	.010	.066	0.31	0.45
Line B														
B-1	2	Both	1	0.0	16.08	9.02	16.5	146.5 2	-	-	-	-	216895 8484.4 8	216895 8484.4 8
		Both	2	9110060 .0					.000	0	.000	.000	-	-
B-2	2	Both	1	0.0	20.01	9.02	16.5	8796. 59	-	-	-	-	216895 8484.4 8	216895 8484.4 8
		Both	2	6808710 40.0					.000	0	.000	.000	-	-
B-3	2	Both	1	0.0	16.08	9.02	16.5	146.5 2	-	-	-	-	216895 8484.4 8	216895 8484.4 8
		Both	2	9110060 .0					.000	0	.000	.000	-	-

DEFLECTION (flexible seismic design, continued)

Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 3														
Line 1														
1-2	5	Both	Ext	152.3	10.50	9.02	16.5	.004	.029	62	.008	.052	0.02	0.11
Line 2														
2-1	2	Both	1	0.0	11.15	9.02	16.5	.006	.000	0	.000	.000	0.27	0.45
		Both	2	264.6					.000	0	.000	.000		
Line 3														
3-1	2	Both	1	0.0	14.76	9.02	16.5	.004	-	-	-	-	0.19	0.33
		Both	2	231.3					.000	0	.000	.000		
Line 4														
4-1	2	Both	1	0.0	11.15	9.02	16.5	.006	.000	0	.000	.000	0.27	0.45
		Both	2	264.6					.000	0	.000	.000		
Line 5														
5-2	8	Both	Ext	147.7	10.83	9.02	16.5	.004	.024	48	.003	.017	0.01	0.05
Line B														
B-1	2	Both	1	0.0	16.08	9.02	16.5	6929. 47	.000	0	.000	.000	- 216895 8484.4 8	- 21689 58484 .48
		Both	2	4308404 16.0					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	43.11	.000	0	.000	.000	- 211049 766.30	- 35174 9644. 09
		Both	2	3336697 .0					.000	0	.000	.000		
B-3	2	Both	1	0.0	16.08	9.02	16.5	6929. 47	.000	0	.000	.000	- 216895 8484.4 8	- 21689 58484 .48
		Both	2	4308404 16.0					.000	0	.000	.000		

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall.

Dir – Force direction

Srf - Wall surface, interior or exterior for perimeter walls, 1 or 2 for interior partitions

v - Shear force per unit distance on wall segment

L - Width of wall segment between openings

H - Wall height

Defl - Horizontal shearwall deflection due to given term:

Bending = $8vHs^3 / EALs$; A - Cross sectional area of segment end stud(s); E - Stud mod. of elasticity from Framing Materials table

Shear = vHs / Bv ; Bv - Shear-through-stiffness rigidity from O86 Tables 9.1-9.3, value is in Sheathing Materials table

Nail slip = $.762Hs \times en$; en – From A.11.7 = $(0.013 vs / d^2)^2$ wood, 0.76 v / vcap GWB

vs - shear force per nail along panel edge, d - nail diameter.

Hold - Restraint system (hold-down) = $da \times h / L$;

da - Vertical hold-down displacement; refer to Hold-down Displacement table for components.

L = Ls – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width)

Total Defl = Deflection from bending + shear + nail slip + hold-down / unblocked factor Jus, as per O86 11.7.1.2,3

HOLD-DOWN DISPLACEMENT (flexible seismic design)

Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Manuf in	Displacement Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1													
Line 1													
1-2	Both	HDU2	6696	.213	.006	0.219	-	-	.247	9663	0.02	0.49	0.43
Line 2													
2-1	Both	HDU2	11608	.369	.010	0.379	-	-	.247	13500	0.04	0.67	0.55
Line 3													
3-1	Both	HDU2	9702	.308	.008	0.317	-	-	.247	12205	0.03	0.60	0.37
Line 4													
4-1	Both	HDU2	11608	.369	.010	0.379	-	-	.247	13500	0.04	0.67	0.55
Line 5													
5-2	Both	HDU2	6392	.203	.006	0.209	-	-	.247	9452	0.02	0.47	0.41
Line B													
B-1	Both	HDU2	- 429496 7296	23198 1.87	6385. 29	238367 .165	-	-	.247	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
B-2	Both	HDU2	- 429496 7296	27134 1.73	7468. 67	278810 .394	-	-	.247	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
B-3	Both	HDU2	- 429496 7296	23198 1.87	6385. 29	238367 .165	-	-	.247	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Manuf in	Displacement Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 2													
Line 1													
1-2	Both	HDU2	3500	.111	.003	0.114	-	-	.248	5478	0.01	0.37	0.33
Line 2													
2-1	Both	HDU2	6390	.203	.006	0.209	-	-	.248	7651	0.02	0.47	0.39
Line 3													
3-1	Both	HDU2	5284	.168	.005	0.172	-	-	.248	6953	0.01	0.43	0.27
Line 4													
4-1	Both	HDU2	6390	.203	.006	0.209	-	-	.248	7651	0.02	0.47	0.39
Line 5													
5-2	Both	HDU2	3326	.106	.003	0.109	-	-	.248	5367	0.01	0.37	0.31
Line B													
B-1	Both	HDU2	- 429496 7296	12833 2.59	3532. 35	131864 .931	-	-	.248	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
B-2	Both	HDU2	- 429496 7296	21683 6.28	5968. 41	222804 .685	-	-	.248	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
B-3	Both	HDU2	- 429496 7296	12833 2.59	3532. 35	131864 .931	-	-	.248	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Manuf in	Displacement Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 3													
Line 1													
1-2	Both	Anchor	-	(nu = 144 lbs)						-		0.02	0.02
Line 2													
2-1	Both	HDU2	2127	.068	.002	0.069	-	-	.248	2757	0.01	0.32	0.27
Line 3													
3-1	Both	HDU2	1705	.054	.001	0.056	-	-	.248	2540	0.01	0.31	0.19
Line 4													
4-1	Both	HDU2	2127	.068	.002	0.069	-	-	.248	2757	0.01	0.32	0.27
Line 5													
5-2	Both	Anchor	-	(nu = 188 lbs)						-		0.01	0.01
Line B													

HOLD-DOWN DISPLACEMENT (flexible seismic design, continued)

B-1	Both	HDU2	- 429496 7296	12543 5.31	3452. 60	128887 .904	-	-	.248	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48
B-2	Both	HDU2	304849 71	968.4 2	26.66	995.07 8	-	-	.248	304861 01	46229 7741. 10	46229 8748. 98	21104 9766. 30
B-3	Both	HDU2	- 429496 7296	12543 5.31	3452. 60	128887 .904	-	-	.248	- 429496 7296	- 21689 58484 .48	- 21689 58484 .48	- 21689 58484 .48

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

Dir – Force direction

Tens., Comp. – Accumulated ULS hold-down tension force *T* and SLS compression force *C* from overturning and dead loads. *T* does not include 1.2 factor from O86 11.8.2.

da – Vertical displacements due to the following components:

Vert. Displacement - Vertical displacement of hold-down

Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation

Unless marked with * = (tension force / hold-down capacity) x max displacement

* - Maximum displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.

Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = $TL / (Ab \times Es)$

Ab = bolt cross-sectional area

Es = steel modulus = 29000000 psi

L = Lb – Lh

Lb = Total bolt length shown in Storey Information table

Lh = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database

Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation

Nails = en from O86 A.11.7 = $(0.013 Pf / d^2)^2$, d = nail diameter

Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.

Shrinkage = $0.002 \times (19\% \text{ fabrication} - 10\% \text{ in-service moisture contents}) \times Ls$

Ls = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Storey Information table

Crush – Deformation of bottom plate at compression end of wall segment

= $0.5\text{mm} \times [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2r^3, r > 1]$

r = C / Qr; Qr = KD Ks Kz fcp A; A = cross sectional area of end studs

Total da – Vert. Displacement + Slippage + Shrink + Crush + Extra

Horz Defl – Restraint system term in deflection equation in O86 11.7.1.2 = $Hs/L \times da$

Hs = wall height; L = wall segment length Ls – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width)

Hs and Ls are shown in Deflection table

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

STOREY DRIFT (flexible seismic design)

Level	Dir	RdRo/I	Actual Storey Drift (in)			Amp defl	Allowable Storey Drift		
			Const defl	Max defl	Line		hs ft	Drift in	Ratio
1	N<->S	5.1	0.20	0.94	2	3.97	9.86	2.96	1.34*
	E<->W	5.1	0.11	2168958 484.48	B	2168958 484.48		2.96	1334457 6131563 5*
2	N<->S	5.1	0.21	0.68	1	2.61	9.86	2.96	0.88
	E<->W	5.1	0.11	2168958 484.48	B	2168958 484.48		2.96	6810056 1211228 1*
3	N<->S	5.1	0.20	0.45	2	1.50	9.02	2.71	0.55
	E<->W	5.1	0.14	2168958 484.48	B	2168958 484.48		2.71	1798302 2699642 8*

Legend:

RdRo/I – Amplification factor from NBC 4.1.8.13.(2)

Refer to Site Information for response modification factors Rd, Ro from Table 4.1.8.9 and Importance factor I from 4.1.8.5.(1)

Const defl – Deflection due to shrinkage, gaps, bolt hole, etc. (constant with respect to force)

Max defl – Largest deflection for any shear line on this level in this direction; refer to Deflection table

Line – Shearline with largest deflection on this level

Amp defl – Amplified deflection = const defl + (max defl – const defl) x RdRo/I

hs – Storey height = Height of walls plus joist depth between this level and the one above.

Drift = Allowable storey drift on this level from NBC 4.1.8.13.(3) = 0.025x hs

Ratio - Proportion of allowable storey drift experienced on line with maximum deflection.

Notes:

*FAILURE – Story drift on this level is greater than maximum allowed according to NBC 4.1.8.13.(3).

Rigid Diaphragm Seismic Design

SEISMIC INFORMATION

Level	Mass [lbs]	Storey Shear [lbs]		Shear Capacity [lbs]		Over-capacity		Length of SFRS [ft]	
		E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S
3	43320	11142	13734	67072	55908	6.02	4.07	56.1	14.8
2	48996	19787	24963	67072	54286	3.39	2.17	56.1	14.8
1	48996	24109	30269	67072	56780	2.78	1.88	56.1	14.8
All	141312	-	-	-	-	1.22	1.16	-	-

Ratio C2/C1 of second to first storey over capacity is between 0.9 and 1.2 in N-S direction as per 11.8.3.2

WARNING - Ratio C2/C1 of second to first storey over-capacity is greater than 1.2 in the E-W direction, contravening CSA O86 11.8.3.2

Storey shear - Sum of factored, vertically accumulated shearline forces on level, including torsional effects.

Total unfactored base shear - 24109 lbs

IRREGULARITIES (NBC Table 4.1.8.6)

WARNING: Design fails because at least one irregularity exists such that the structure violates design code provisions for that irregularity. See table below.

$I_{eFaSa}(0.2) = 0.813$

Only those provisions for height less than 20 m are considered.

No.	Irregularity Type	NBC 4.1.8... Commentary	Irregular for...		Fails for...		Notes
			Levels	Dir/Ln	Levels	Dir/Ln	
1	Vertical Stiffness	7 (1) (c) ; 10 (2) (a) J-118, 150	2, 3 2, 1	Both Both	None	None	b, a
2	Weight (mass)	7 (1) (c) J-118	None	None	None	None	-
3	Vertical Geometric	7 (1) (c) ; 10 (2) (a) J-118, 150	None	None	None	None	-
4	In-Plane Disc. (offset)	7 (1) (c) ; 10 (2) (a) 15 (5), J-118, 150, 208	None	None	None	None	-
4	In-Plane Disc. (stiffness)	7 (1) (c) ; 10 (2) (a) J-118, 150	3, 2 2, 1	1, 5 5	None	None	b, a
5	Out-of-Plane Offsets	7 (1) (c) ; 10 (2) (a) 15 (5), J-118, 150, 208	None	None	None	None	-
6	Weak Storey	7 (1) (c) ; 10 (1), (2) (b) J-118, 150	2	N-S	2	N-S	b, c, d
7	Torsional Sensitivity	7 (1) ; 10 (2) (a) 11 (10) ; 11 (11) (b) J-120, 150, 173-5	None	None	None	None	-
8	Non-orthogonal	7 (1) (c) J-120	n/a	n/a	n/a	n/a	e
9	Gravity-Induced	7 (1) ; 10 (2), (5-7) J-150	n/a	n/a	n/a	n/a	f

Notes:

- Irregularity must be considered since $I_{eFaSa}(0.2) \geq 0.35$, as per NBC 4.1.8.7.(1)(a), 4.1.8.6.(3) and Commentary J-122.
- Equivalent Static Procedure allowable because period $T_a < 0.5s$, as per 4.1.8.7.(1)(c).
- Seismic design not permitted under NBC 4.1.8.10.(1). Design results are presented for your information only; they are not valid for design.
- Seismic design not permitted because $I_{eFaSa}(0.2) \geq 0.2$.
- Not applicable, as all buildings modelled by Shearwalls are orthogonal.
- Not applicable to structures using wood shear walls.

Irregularities:

- Vertical Stiffness: Stiffness in a storey is less than 70% of the stiffness in an adjacent storey, or 80% of that of 3 storeys above or below. Table shows the storey followed by stiffer level(s), e.g. 4,5 or 4,1-3.
- Weight (mass): Weight of any storey is more than 150% of weight of adjacent storey. Weight of storey is effective mass used for vertical seismic mass distribution. Table shows the heavy storey followed by light storey, e.g. 4,3.
- Vertical Geometric: Horizontal dimension of SFRS in any storey more than 130% of that in adjacent storey. Shearwalls checks using the nearest and farthest points from all walls in a storey for each direction. It shows the storey with the long SFRS in the table, and the affected direction(s).
- In-Plane Discontinuity in Vertical Element (offset): In plane offset of a lateral force-resisting element in the storey below. Shearwalls detects whenever the ends wall segments on adjacent storeys do not line up to within 3". It shows both upper and lower storey in table, e.g. 4,3, and shearlines affected.
- In-Plane Discontinuity in Vertical Element (stiffness): Reduction in the lateral stiffness of the resisting element in the storey below. Shearwalls uses a linearized approximation of the deflection equation from O86 11.7.1.2 to determine constant shearwall stiffnesses, then compares the stiffness of collinear shearwall segments on adjacent storeys. It shows both upper and lower storey in table, e.g. 4,3, and shearlines affected.
- Out-of-Plane Offsets: Discontinuities in the lateral force path. Shearwalls detects wherever shearwalls do not exist on a shearline for particular level, and the program has transferred the force from the shearline on the floor above directly into the diaphragm. It shows the storey without shear-resisting elements in the table, and the directions(s) affected.
- Discontinuity in Capacity - Weak Storey: The storey shear strength is less than the storey above for the direction under consideration. Shearwalls determines the total capacity of all shearwalls for each direction on each level, and reports weaker lower levels in the table.
- Torsional Sensitivity: Ratio B of maximum to average storey displacements is greater than 1.7. Applies only to rigid diaphragm design results. Shearwalls calculates shearline forces and deflections in the extreme shearlines for both positive and negative accidental eccentricity, and for each case computes $B_x = \text{largest deflection} / \text{average of the two}$. Table shows any storey and force direction for which B_x is greater than 1.7.
- Non-orthogonal: Occurs when shearlines are not oriented at right angles (skewed shearwalls). Shearwalls does not currently allow input of skewed shearwalls, so this irregularity does not apply.
- Gravity-Induced Lateral Demand: Any such demands in a typical wood-frame structure, such as from cantilevered floors, affect the overturning force on hold-downs; however these are not the predominant yielding mechanism so this irregularity does not apply.

SHEAR RESULTS (rigid seismic design)

North-south Shearlines	W Gp	For Dir	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
			FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L		
								Int	Ext	
Line 1										
Level 3										
Ln1, Lev3	-	Both	10.50	69.5	-	-	-	-	-	0.63
Wall 1-2	5	Both	10.50	264.9	-	420	1.00	-	2695	0.63
Level 2										
Ln1, Lev2	-	Both	10.50	53.4	-	-	-	-	-	0.64
Wall 1-2	4	Both	10.50	203.6	-	318	1.00	-	1703	0.64
Level 1										
Ln1, Lev1	-	Both	10.50	84.5	-	-	-	-	-	0.84W
Wall 1-2	3	Both	10.50	322.1	-	381	1.00	-	1703	0.84W
Line 2										
Level 3										
Ln2, Lev3	-	Both	11.15	66.6	-	-	-	-	-	0.19#
Wall 2-1	2	Both	11.15	239.0	0	1286	1.00	-	5323	0.19#
Level 2										
Ln2, Lev2	-	Both	11.15	163.9	-	-	-	-	-	0.46#
Wall 2-1	2	Both	11.15	588.2	0	1286	1.00	-	5323	0.46#
Level 1										
Ln2, Lev1	-	Both	11.15	178.4	-	-	-	-	-	0.50W#
Wall 2-1	2	Both	11.15	640.3	0	1286	1.00	-	5323	0.50W#
Line 3										
Level 3										
Ln3, Lev3	-	Both	14.76	76.1	-	-	-	-	-	0.16#
Wall 3-1	2	Both	14.76	206.2	0	1286	1.00	-	5323	0.16#
Level 2										
Ln3, Lev2	-	Both	14.76	190.6	-	-	-	-	-	0.40#
Wall 3-1	2	Both	14.76	516.8	0	1286	1.00	-	5323	0.40#
Level 1										
Ln3, Lev1	-	Both	14.76	227.8	-	-	-	-	-	0.48W#
Wall 3-1	2	Both	14.76	617.7	0	1286	1.00	-	5323	0.48W#
Line 4										
Level 3										
Ln4, Lev3	-	Both	11.15	37.6	-	-	-	-	-	0.11#
Wall 4-1	2	Both	11.15	135.1	0	1286	1.00	-	5323	0.11#
Level 2										
Ln4, Lev2	-	Both	11.15	146.3	-	-	-	-	-	0.41#
Wall 4-1	2	Both	11.15	525.1	0	1286	1.00	-	5323	0.41#
Level 1										
Ln4, Lev1	-	Both	11.15	178.3	-	-	-	-	-	0.50W#
Wall 4-1	2	Both	11.15	639.8	0	1286	1.00	-	5323	0.50W#
Line 5										
Level 3										
Ln5, Lev3	-	Both	10.83	93.3	-	-	-	-	-	0.98
Wall 5-2	8^	Both	10.83	345.1	-	679	0.52	-	5323	0.98
Level 2										
Ln5, Lev2	-	Both	10.83	69.4	-	-	-	-	-	0.85
Wall 5-2	7^	Both	10.83	256.4	-	601	0.50	-	1703	0.85
Level 1										
Ln5, Lev1	-	Both	10.83	87.2	-	-	-	-	-	0.68W
Wall 5-2	6	Both	10.83	322.3	-	472	1.00	-	1703	0.68W
East-west Shearlines	W Gp	For Dir	Shear Force		Vhd (vd) / L		Capacities [plf]		Vrs/L	Ratio Fv/V
			FHS [ft]	Fv/L [plf]	Int	Ext	Jhd	Vrs (vpb) / L		
								Int	Ext	
Line B										
Level 3										
LnB, Lev3	-	Both	52.17	185.6	-	-	-	-	-	-
Wall B-1	2	Both	16.08	346.5	0	1286	1.00	-	5323	0.27#
Wall B-2	2	Both	20.01	0.0	0	1286	1.00	-	5323	0.00#
Wall B-3	2	Both	16.08	346.5	0	1286	1.00	-	5323	0.27#
Level 2										
LnB, Lev2	-	Both	52.17	329.6	-	-	-	-	-	-
Wall B-1	2	Both	16.08	615.4	0	1286	1.00	-	5323	0.48#
Wall B-2	2	Both	20.01	0.0	0	1286	1.00	-	5323	0.00#
Wall B-3	2	Both	16.08	615.4	0	1286	1.00	-	5323	0.48#
Level 1										
LnB, Lev1	-	Both	52.17	401.6	-	-	-	-	-	-
Wall B-1	2	Both	16.08	749.8	0	1286	1.00	-	5323	0.58#

SHEAR RESULTS (rigid seismic design, continued)

Wall B-2	2	Both	20.01	0.0	0	1286	1.00	-	5323	1286	0.00#
Wall B-3	2	Both	16.08	749.8	0	1286	1.00	-	5323	1286	0.58#

Legend:

Results can have different meaning for shearlines, walls, and wall segments. Results for walls with no openings are the same as those for segments.
W Gp - Wall design group as listed in Sheathing and Framing Materials tables. "A" means that this wall is critical for all walls in the Standard Wall group.

Dir - Direction of seismic shear force along shearline. "Both" appears if results are identical for both directions.

FHS - Length of full height sheathing along shearline, wall, or segment

Fv/L - For shearlines = diaphragm shear force = factored shearline force divided by length of shearline; for wall segments = design shear force = factored shear force divided by length of full height sheathing.

Vhd(vd)/L - Factored unit sheathing connection resistance = Vrs from O86 11.6.2 without Jhd

For wood panels (11.6.2.2(a)) = $0.80 \times vd \times JD \times Jus \times Js$; vd = Nu (from 12.9.3) / nail spacing

JD - diaphragm and shearwall factor (12.9.3.1) = 1.3; Js - fastener spacing factor (11.5.1)

Jus - unblocked factor (11.5.4), shown in the Sheathing Materials table.

For gypsum wallboard (11.6.2.3) = $0.70 \times vd$; vd from Table 11.4

Jhd - Hold-down effect factor from 11.5.5

Vrs(vpb)/L - Factored unit panel buckling resistance (11.6.2.2(b)) = $0.80 \times vpb \times KD \times KS \times KT$.

KD - load-duration factor (5.3.2.1) = 1.15; KS - service-condition factor (9.4.2); KT - treatment factor = 1.0

Vrs/L - Factored unit shear resistance of wall segment = $\min(Vhd(vd)/L \times Jhd, Vrs(vpb)/L)$.

Refer to Detailed Shear Wall design output for strengths, factors and other intermediate values for Vrs, Vhd and Jhd.

"W" indicates that the wind design criterion was critical in selecting wall.

Notes:

According to O86 11.3.3.1 Note (1), there should be a balanced spatial distribution of gypsum wallboard and wood-based panels on every level in each direction.

#WARNING - The following walls fail because panel buckling from O86 11.6.2.2(b) or a non-ductile nail strength mode from 12.9.3.2 governs for shear resistance Vrs, as per 11.8.1. Refer to the Detailed Shearwall Design output for these walls.

Level 1: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 2: B-1, B-2, B-3, 2-1, 3-1, 4-1

Level 3: B-1, B-2, B-3, 2-1, 3-1, 4-1

WARNING – Over-capacity ratio from O86 11.8.3.2 exceeded. See Seismic Information table for more details.

Hold-Down and Compression Design (rigid seismic design)

Level 1					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Jx	Cmb'd			
Line 1							1.0				
1-2	L End	0.00	15.87		9307	1484		7823	HDU2	2900	2.70*
1-2	L End	0.00	15.87		9307	1484		10790	Compression	13413	0.80
1-2	R End	0.00	26.12		9307	1484		7823	HDU2	2900	2.70*
1-2	R End	0.00	26.12		9307	1484		10790	Compression	13413	0.80
Line 2							1.0				
2-1	L End	10.01	15.22		17510	946		16564	HDU2	2900	5.71*
2-1	L End	10.01	15.22		17510	946		18456	Compression	13413	1.38*
2-1	R End	10.01	26.12		17510	946		16564	HDU2	2900	5.71*
2-1	R End	10.01	26.12		17510	946		18456	Compression	13413	1.38*
Line 3							1.0				
3-1	L End	30.02	11.61		15920	1252		14668	HDU2	2900	5.06*
3-1	L End	30.02	11.61		15920	1252		17171	Compression	13413	1.28*
3-1	R End	30.02	26.12		15920	1252		14668	HDU2	2900	5.06*
3-1	R End	30.02	26.12		15920	1252		17171	Compression	13413	1.28*
Line 4							1.0				
4-1	L End	50.03	15.22		15589	946		14643	HDU2	2900	5.05*
4-1	L End	50.03	15.22		15589	946		16534	Compression	13413	1.23*
4-1	R End	50.03	26.12		15589	946		14643	HDU2	2900	5.05*
4-1	R End	50.03	26.12		15589	946		16534	Compression	13413	1.23*
Line 5							1.0				
5-2	L End	60.04	15.54		11115	1530		9585	HDU2	2900	3.31*
5-2	L End	60.04	15.54		11115	1530		12645	Compression	13413	0.94
5-2	R End	60.04	26.12		11115	1530		9585	HDU2	2900	3.31*
5-2	R End	60.04	26.12		11115	1530		12645	Compression	13413	0.94
Line B							1.0				
B-1	L End	2.09	26.25		20213	1363		18849	HDU2	2900	6.50*
B-1	L End	2.09	26.25		20213	1363		21576	Compression	13413	1.61*
B-1	R End	17.92	26.25		20213	1363		18849	HDU2	2900	6.50*
B-1	R End	17.92	26.25		20213	1363		21576	Compression	13413	1.61*
B-2	L End	20.14	26.25		0			0	Not required	2900	0.00
B-2	R End	39.90	26.25		0			0	Not required	2900	0.00
B-3	L End	42.12	26.25		20213	1363		18849	HDU2	2900	6.50*
B-3	L End	42.12	26.25		20213	1363		21576	Compression	13413	1.61*
B-3	R End	57.95	26.25		20213	1363		18849	HDU2	2900	6.50*
B-3	R End	57.95	26.25		20213	1363		21576	Compression	13413	1.61*
Level 2					Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
Line- Wall	Posit'n	Location [ft]		Note	Shear	Dead	Jx	Cmb'd			
Line 1							1.0				
1-2	L End	0.00	15.87		5404	989		4415	HDU2	2900	1.52*
1-2	L End	0.00	15.87		5404	989		6394	Compression	13413	0.48
1-2	R End	0.00	26.12		5404	989		4415	HDU2	2900	1.52*
1-2	R End	0.00	26.12		5404	989		6394	Compression	13413	0.48
Line 2							1.0				
2-1	L End	10.01	15.22		9764	631		9133	HDU2	2900	3.15*
2-1	L End	10.01	15.22		9764	631		10394	Compression	13413	0.77
2-1	R End	10.01	26.12		9764	631		9133	HDU2	2900	3.15*
2-1	R End	10.01	26.12		9764	631		10394	Compression	13413	0.77
Line 3							1.0				
3-1	L End	30.02	11.61		8489	835		7654	HDU2	2900	2.64*
3-1	L End	30.02	11.61		8489	835		9323	Compression	13413	0.70
3-1	R End	30.02	26.12		8489	835		7654	HDU2	2900	2.64*
3-1	R End	30.02	26.12		8489	835		9323	Compression	13413	0.70
Line 4							1.0				
4-1	L End	50.03	15.22		7849	631		7218	HDU2	2900	2.49*
4-1	L End	50.03	15.22		7849	631		8479	Compression	13413	0.63
4-1	R End	50.03	26.12		7849	631		7218	HDU2	2900	2.49*
4-1	R End	50.03	26.12		7849	631		8479	Compression	13413	0.63
Line 5							1.0				
5-2	L End	60.04	15.54		7213	1020		6193	HDU2	2900	2.14*
5-2	L End	60.04	15.54		7213	1020		8233	Compression	13413	0.61
5-2	R End	60.04	26.12		7213	1020		6193	HDU2	2900	2.14*
5-2	R End	60.04	26.12		7213	1020		8233	Compression	13413	0.61
Line B							1.0				
B-1	L End	2.09	26.25		11204	909		10296	HDU2	2900	3.55*
B-1	L End	2.09	26.25		11204	909		12113	Compression	13413	0.90
B-1	R End	17.92	26.25		11204	909		10296	HDU2	2900	3.55*
B-1	R End	17.92	26.25		11204	909		12113	Compression	13413	0.90

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Hold-Down and Compression Design (rigid seismic design, continued)

Tensile Hold-down and Compression Design (Rigid seismic design, continued)													
B-2	L End	20.14	26.25		0			0	Not required	2900	0.00		
B-2	R End	39.90	26.25		0			0	Not required	2900	0.00		
B-3	L End	42.12	26.25		11204	909		10296	HDU2	2900	3.55*		
B-3	L End	42.12	26.25		11204	909		12113	Compression	13413	0.90		
B-3	R End	57.95	26.25		11204	909		10296	HDU2	2900	3.55*		
B-3	R End	57.95	26.25		11204	909		12113	Compression	13413	0.90		
Level 3					Tensile Hold-down								
Line-Wall	Posit'n	Location [ft]			or Compressive Stud Force [lbs]					Cap	Crit		
		X	Y	Note	Shear	Dead	Jx	Cmb'd	Hold-down	[lbs]	Resp.		
Line 1								1.0					
1-2	L End	0.00	15.87	5	2938	495		2443	HDU2	2900	0.84		
1-2	L End	0.00	15.87	5	2938	495		3432	Compression	13413	0.26		
1-2	R End	0.00	26.12	5	2938	495		2443	HDU2	2900	0.84		
1-2	R End	0.00	26.12	5	2938	495		3432	Compression	13413	0.26		
Line 2								1.0					
2-1	L End	10.01	15.22		2647	315		2332	HDU2	2900	0.80		
2-1	L End	10.01	15.22		2647	315		2963	Compression	13413	0.22		
2-1	R End	10.01	26.12		2647	315		2332	HDU2	2900	0.80		
2-1	R End	10.01	26.12		2647	315		2963	Compression	13413	0.22		
Line 3								1.0					
3-1	L End	30.02	11.61		2271	417		1854	HDU2	2900	0.64		
3-1	L End	30.02	11.61		2271	417		2688	Compression	13413	0.20		
3-1	R End	30.02	26.12		2271	417		1854	HDU2	2900	0.64		
3-1	R End	30.02	26.12		2271	417		2688	Compression	13413	0.20		
Line 4								1.0					
4-1	L End	50.03	15.22		1496	315		1181	HDU2	2900	0.41		
4-1	L End	50.03	15.22		1496	315		1811	Compression	13413	0.14		
4-1	R End	50.03	26.12		1496	315		1181	HDU2	2900	0.41		
4-1	R End	50.03	26.12		1496	315		1811	Compression	13413	0.14		
Line 5								1.0					
5-2	L End	60.04	15.54		4109	510		3599	Anchorage				
5-2	L End	60.04	15.54		4109	510		4619	Compression	13413	0.34		
5-2	R End	60.04	26.12		4109	510		3599	Anchorage				
5-2	R End	60.04	26.12		4109	510		4619	Compression	13413	0.34		
Line B								1.0					
B-1	L End	2.09	26.25		3811	454		3357	HDU2	2900	1.16*		
B-1	L End	2.09	26.25		3811	454		4265	Compression	13413	0.32		
B-1	R End	17.92	26.25		3811	454		3357	HDU2	2900	1.16*		
B-1	R End	17.92	26.25		3811	454		4265	Compression	13413	0.32		
B-2	L End	20.14	26.25		0			0	Not required	2900	0.00		
B-2	R End	39.90	26.25		0			0	Not required	2900	0.00		
B-3	L End	42.12	26.25		3811	454		3357	HDU2	2900	1.16*		
B-3	L End	42.12	26.25		3811	454		4265	Compression	13413	0.32		
B-3	R End	57.95	26.25		3811	454		3357	HDU2	2900	1.16*		
B-3	R End	57.95	26.25		3811	454		4265	Compression	13413	0.32		

Legend:

Line-Wall:

At wall or opening – Shearline and wall number

At vertical element - Shearline

Posit'n - Stud that hold-down is attached to:

V Elem - Vertical element column or strengthened studs required where not at wall end or opening

L or R End - At left or right wall end

L or R Op n - At left or right side of opening n

Location - Co-ordinates in Plan View

Note - Number(s) of note(s) below to apply

Tensile Hold-down or Compressive Stud Force: Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.

Shear – Overturning component = $V \times h / L$; V = force on segment increased by 20% as per O86 11.8.2. Jx – Overturning moment reduction factor from NBC 4.1.8.11.(8), applied to shear component; h = wall height + joist depth (O86 Fig. 11.7); L = wall segment length – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width). When anchorages used L = segment length – 300 mm (O86 11.6.4.1).

Dead - Dead load resisting component

Cmb'd - Sum of factored overturning and forces

Hold-down – Device used from hold-down database or "Anchorage" if no hold-down required.

Cap – allowable tension load

Crit. Resp. – Critical Response = Combined hold-down force / Allowable tension load

Notes:

Moment arm L used in hold-down force calculations is wall length minus the user-input hold-down offset at each end of wall. For anchorages,

maximum moment arm is wall length minus 300 mm. Refer to O86 11.6.4.1.

HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 8 1/4" x 2 1/2" SDS heavy-duty screws; 5/8" anchor bolt.

Unfactored as per load combination 5 from NBC Table 4.1.3.2.A and without companion loads for maximum effect.

Note 5. Hold-down placed at this location because Jhd = 1 needed to achieve successful design.

***WARNING - Design capacity has been exceeded.**

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

COLLECTOR FORCES (rigid seismic design)

Level 1					Drag Strut Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]		Notes	Force [lbs]	
		X	Y		---->	<----
Line 1						
1-2	Left Wall End	0.00	15.75		-1596	1596
1-2	Right Wall End	0.00	26.25		1397	-1397
Line 2						
2-1	Left Wall End	10.01	15.09		-3232	3232
2-1	Right Wall End	10.01	26.25		2951	-2951
Line 3						
3-1	Left Wall End	30.02	11.48		-3139	3139
3-1	Right Wall End	30.02	26.25		3767	-3767
Line 4						
4-1	Left Wall End	50.03	15.09		-3229	3229
4-1	Right Wall End	50.03	26.25		2948	-2948
Line 5						
5-2	Left Wall End	60.04	15.42		-1613	1613
5-2	Right Wall End	60.04	26.25		1442	-1441
Line B						
B-1	Left Wall End	1.97	26.25		-948	949
B-1	Right Wall End	18.04	26.25		5770	-5770
B-2	Left Wall End	20.01	26.25		4822	-4822
B-2	Right Wall End	40.03	26.25		-4822	4822
B-3	Left Wall End	41.99	26.25		-5770	5770
B-3	Right Wall End	58.07	26.25		949	-948
Level 2					Drag Strut Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]		Notes	Force [lbs]	
		X	Y		---->	<----
Line 1						
1-2	Left Wall End	0.00	15.75		-1009	1009
1-2	Right Wall End	0.00	26.25		883	-883
Line 2						
2-1	Left Wall End	10.01	15.09		-2969	2969
2-1	Right Wall End	10.01	26.25		2711	-2711
Line 3						
3-1	Left Wall End	30.02	11.48		-2627	2627
3-1	Right Wall End	30.02	26.25		3152	-3152
Line 4						
4-1	Left Wall End	50.03	15.09		-2650	2650
4-1	Right Wall End	50.03	26.25		2420	-2420
Line 5						
5-2	Left Wall End	60.04	15.42		-1283	1283
5-2	Right Wall End	60.04	26.25		1147	-1147
Line B						
B-1	Left Wall End	1.97	26.25		-778	778
B-1	Right Wall End	18.04	26.25		4736	-4736
B-2	Left Wall End	20.01	26.25		3957	-3957
B-2	Right Wall End	40.03	26.25		-3957	3957
B-3	Left Wall End	41.99	26.25		-4736	4736
B-3	Right Wall End	58.07	26.25		778	-778
Level 3					Drag Strut Force [lbs]	
Line-Wall	Position on Wall or Opening	Location [ft]		Notes	Force [lbs]	
		X	Y		---->	<----
Line 1						
1-2	Left Wall End	0.00	15.75		-1313	1313
1-2	Right Wall End	0.00	26.25		1149	-1149
Line 2						
2-1	Left Wall End	10.01	15.09		-1206	1206
2-1	Right Wall End	10.01	26.25		1102	-1101
Line 3						
3-1	Left Wall End	30.02	11.48		-1048	1048
3-1	Right Wall End	30.02	26.25		1258	-1258
Line 4						
4-1	Left Wall End	50.03	15.09		-682	682
4-1	Right Wall End	50.03	26.25		622	-622
Line 5						
5-2	Left Wall End	60.04	15.42		-1727	1727
5-2	Right Wall End	60.04	26.25		1543	-1543
Line B						

COLLECTOR FORCES (rigid seismic design, continued)

B-1	Left Wall End	1.97	26.25	-438	438
B-1	Right Wall End	18.04	26.25	2667	-2667
B-2	Left Wall End	20.01	26.25	2228	-2228
B-2	Right Wall End	40.03	26.25	-2228	2228
B-3	Left Wall End	41.99	26.25	-2667	2667
B-3	Right Wall End	58.07	26.25	438	-438

Legend:

Line-Wall - Shearline and wall number

Position... - Side of opening or wall end that drag strut is attached to

Location - Co-ordinates in Plan View

Drag Strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression. Based on shearline force unless otherwise noted below. Increased by 20% as per O86 11.8.6.

----> Force in the west-to-east or south-to-north direction

<---- Force in the east-to-west or north-to-south direction

DEFLECTION (rigid seismic design)

Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 1														
Line 1 1-2	3	Both	Ext	322.1	10.50	9.02	16.5	.008	.074	132	.034	.233	0.41	0.73
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.015	-	-	-	-	0.62	1.06
		Both	2	640.3					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.011	-	-	-	-	0.43	0.73
		Both	2	617.7					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.015	-	-	-	-	0.57	0.97
		Both	2	639.8					.000	0	.000	.000		
Line 5 5-2	6	Both	Ext	322.3	10.83	9.02	16.5	.008	.074	106	.022	.149	0.45	0.68
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.012	-	-	-	-	0.49	0.83
		Both	2	749.8					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	-	-	-	-	-	-	0.83
		Both	2	0.0					-	-	-	-		
B-3	2	Both	1	0.0	16.08	9.02	16.5	.012	-	-	-	-	0.49	0.83
		Both	2	749.8					.000	0	.000	.000		
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 2														
Line 1 1-2	4	Both	Ext	203.6	10.50	9.02	16.5	.005	.047	100	.019	.134	0.33	0.51
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.014	-	-	-	-	0.42	0.73
		Both	2	588.2					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.009	-	-	-	-	0.29	0.50
		Both	2	516.8					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.012	-	-	-	-	0.38	0.65
		Both	2	525.1					.000	0	.000	.000		
Line 5 5-2	7	Both	Ext	256.4	10.83	9.02	16.5	.006	.059	63	.008	.053	0.36	0.48
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.010	-	-	-	-	0.31	0.53
		Both	2	615.4					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	-	-	-	-	-	-	0.53
		Both	2	0.0					-	-	-	-		
B-3	2	Both	1	0.0	16.08	9.02	16.5	.010	-	-	-	-	0.31	0.53
		Both	2	615.4					.000	0	.000	.000		
Wall, segment	W Gp	Dir	Srf	v plf	Ls ft	Hs ft	Bending A sq.in	Defl in	Shear Defl in	vs lbs	Nail slip en in	Defl in	Hold Defl in	Total Defl in
Level 3														
Line 1 1-2	5	Both	Ext	264.9	10.50	9.02	16.5	.007	.050	109	.023	.157	0.08	0.29
Line 2 2-1	2	Both	1	0.0	11.15	9.02	16.5	.006	-	-	-	-	0.26	0.44
		Both	2	239.0					.000	0	.000	.000		
Line 3 3-1	2	Both	1	0.0	14.76	9.02	16.5	.004	-	-	-	-	0.19	0.32
		Both	2	206.2					.000	0	.000	.000		
Line 4 4-1	2	Both	1	0.0	11.15	9.02	16.5	.003	-	-	-	-	0.23	0.39
		Both	2	135.1					.000	0	.000	.000		
Line 5 5-2	8	Both	Ext	345.1	10.83	9.02	16.5	.008	.056	113	.014	.094	0.06	0.22
Line B B-1	2	Both	1	0.0	16.08	9.02	16.5	.006	.000	0	.000	.000	0.20	0.34
		Both	2	346.5					.000	0	.000	.000		
B-2	2	Both	1	0.0	20.01	9.02	16.5	-	-	-	-	-	-	0.34
		Both	2	0.0					-	-	-	-		

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DEFLECTION (rigid seismic design, continued)

B-3	2	Both	1	0.0	16.08	9.02	16.5	.006	.000	0	.000	.000	0.20	0.34
		Both	2	346.5					.000	0	.000	.000		

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall.

Dir – Force direction

Srf - Wall surface, interior or exterior for perimeter walls, 1 or 2 for interior partitions

v - Shear force per unit distance on wall segment

L - Width of wall segment between openings

H - Wall height

Defl - Horizontal shearwall deflection due to given term:

Bending = $8vHs^3 / EALs$; A - Cross sectional area of segment end stud(s); E - Stud mod. of elasticity from Framing Materials table

Shear = vHs / Bv ; Bv - Shear-through-stiffness rigidity from O86 Tables 9.1-9.3, value is in Sheathing Materials table

Nail slip = $.762Hs \times en$; en – From A.11.7 = $(0.013 vs / d^2)^2$ wood, $0.76 v / vcap$ GWB

vs - shear force per nail along panel edge, d - nail diameter.

Hold - Restraint system (hold-down) = $da \times h / L$;

da - Vertical hold-down displacement; refer to Hold-down Displacement table for components.

L = $Ls - (tension\ stud\ pack\ width + hold-down\ anchor\ bolt\ offset) - (1/2\ compression\ stud\ pack\ width)$

Total Defl = Deflection from bending + shear + nail slip + hold-down / unblocked factor Jus, as per O86 11.7.1.2,3

HOLD-DOWN DISPLACEMENT (rigid seismic design)

Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Manuf in	Displacement Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 1													
Line 1													
1-2	Both	HDU2	6272	.199	.005	0.205	-	-	.247	9239	0.02	0.47	0.41
Line 2													
2-1	Both	HDU2	13646	.433	.012	0.445	-	-	.247	15538	0.06	0.75	0.62
Line 3													
3-1	Both	HDU2	12015	.382	.011	0.392	-	-	.247	14518	0.05	0.69	0.43
Line 4													
4-1	Both	HDU2	12045	.383	.011	0.393	-	-	.247	13936	0.04	0.68	0.57
Line 5													
5-2	Both	HDU2	7733	.246	.007	0.252	-	-	.247	10793	0.03	0.52	0.45
Line B													
B-1	Both	HDU2	15481	.492	.014	0.505	-	-	.247	18207	0.10	0.85	0.49
B-2	Both	HDU2	0	.000	.000	0.000	-	-	.000	0	0.00	0.00	-
B-3	Both	HDU2	15481	.492	.014	0.505	-	-	.247	18207	0.10	0.85	0.49
Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Manuf in	Displacement Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 2													
Line 1													
1-2	Both	HDU2	3515	.112	.003	0.115	-	-	.248	5493	0.01	0.37	0.33
Line 2													
2-1	Both	HDU2	7506	.238	.007	0.245	-	-	.248	8767	0.02	0.51	0.42
Line 3													
3-1	Both	HDU2	6239	.198	.005	0.204	-	-	.248	7908	0.02	0.47	0.29
Line 4													
4-1	Both	HDU2	5910	.188	.005	0.193	-	-	.248	7171	0.01	0.45	0.38
Line 5													
5-2	Both	HDU2	4991	.159	.004	0.163	-	-	.248	7031	0.01	0.42	0.36
Line B													
B-1	Both	HDU2	8428	.268	.007	0.275	-	-	.248	10246	0.02	0.54	0.31
B-2	Both	HDU2	0	.000	.000	0.000	-	-	.000	0	0.00	0.00	-
B-3	Both	HDU2	8428	.268	.007	0.275	-	-	.248	10246	0.02	0.54	0.31
Wall, segment	Dir	Hold- down	Tens. force lbs	Vert. Manuf in	Displacement Add in	da in	Slippage Vf lbs	da in	Shrink +Extra in	Comp. force lbs	Crush da in	Total da in	Horz Defl in
Level 3													
Line 1													
1-2	Both	Anchor	-	(nu = 144 lbs)						-		0.09	0.08
Line 2													
2-1	Both	HDU2	1891	.060	.002	0.062	-	-	.248	2521	0.01	0.31	0.26
Line 3													
3-1	Both	HDU2	1475	.047	.001	0.048	-	-	.248	2310	0.00	0.30	0.19
Line 4													
4-1	Both	HDU2	931	.030	.001	0.030	-	-	.248	1562	0.00	0.28	0.23
Line 5													
5-2	Both	Anchor	-	(nu = 188 lbs)						-		0.07	0.06
Line B													
B-1	Both	HDU2	2722	.086	.002	0.089	-	-	.248	3630	0.01	0.34	0.20
B-2	Both	HDU2	0	.000	.000	0.000	-	-	.000	0	0.00	0.00	-
B-3	Both	HDU2	2722	.086	.002	0.089	-	-	.248	3630	0.01	0.34	0.20

Legend:

Wall, segment – Wall and segment between openings, e.g. B-3,2 = second segment on Wall 3 on Shearline B

Dir – Force direction

Tens., Comp. – Accumulated ULS hold-down tension force T and SLS compression force C from overturning and dead loads. T does not include 1.2 factor from O86 11.8.2.

da – Vertical displacements due to the following components:

Vert. Displacement - Vertical displacement of hold-down

Manuf – Using manufacturer's value for anchor bolt length, or no bolt contribution for connector-only elongation

Unless marked with * = (tension force / hold-down capacity) x max displacement

* - Maximum displacement is used. May result in higher than actual displacements for lightly loaded hold-downs, causing the segment to draw less force due to lower than actual stiffness.

Add – Due to longer anchor bolt length than manufacturer's value, or entire bolt length for connector-only elongation = $TL / (Ab \times Es)$

Ab = bolt cross-sectional area

Es = steel modulus = 29000000 psi

L = Lb – Lh

L_b = Total bolt length shown in Storey Information table

L_h = Manufacturer's anchor bolt length for given displacement/elongation from hold-down database

Slippage – Due to vertical slippage of hold-down fasteners attached to stud(s) when not combined with elongation

Nails = *n* from O86 A.11.7 = $(0.013 Pf / d^2)^2$, *d* = nail diameter

Shrink + Extra – Wood shrinkage plus extra displacement due to mis-cuts, gaps, etc.

Shrinkage = $0.002 \times (19\% \text{ fabrication} - 10\% \text{ in-service moisture contents}) \times L_s$

L_s = Length between anchor bolt fasteners subject to perp-to-grain shrinkage; see Storey Information table

Crush – Deformation of bottom plate at compression end of wall segment

= $0.5\text{mm} \times [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2r^3, r > 1]$

$r = C / Q_r$; $Q_r = K_D K_s K_z f_{cp} A$; *A* = cross sectional area of end studs

Total da – Vert. Displacement + Slippage + Shrink + Crush + Extra

Horz Defl – Restraint system term in deflection equation in O86 11.7.1.2 = $H_s / L \times da$

H_s = wall height; *L* = wall segment length *L_s* – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width)

H_s and *L_s* are shown in Deflection table

Warning - Fastener slip and hold-down capacity based on D-Fir-L and S-P-F values, however at least some walls are neither, which may overestimate the capacity of the hold-down.

STOREY DRIFT (rigid seismic design)

Level	Dir	RdRo/I	Actual Storey Drift (in)			Amp defl	Allowable Storey Drift		
			Const defl	Max defl	Line		hs ft	Drift in	Ratio
1	N<->S	5.1	0.20	1.06	2	4.61	9.86	2.96	1.56
	E<->W	5.1	0.14	0.83	B	3.66		2.96	1.24
2	N<->S	5.1	0.20	0.73	2	2.88	9.86	2.96	0.97
	E<->W	5.1	0.14	0.53	B	2.15		2.96	0.73
3	N<->S	5.1	0.00	0.29	1	1.50	9.02	2.71	0.55
	E<->W	5.1	0.14	0.34	B	1.14		2.71	0.42

Legend:

RdRo/I – Amplification factor from NBC 4.1.8.13.(2)

Refer to Site Information for response modification factors Rd, Ro from Table 4.1.8.9 and Importance factor I from 4.1.8.5.(1)

Const defl – Deflection due to shrinkage, gaps, bolt hole, etc. (constant with respect to force)

Max defl – Largest deflection for any shear line on this level in this direction; refer to Deflection table

Line – Shearline with largest deflection on this level

Amp defl – Amplified deflection = const defl + (max defl – const defl) x RdRo/I

hs – Storey height = Height of walls plus joist depth between this level and the one above.

Drift = Allowable storey drift on this level from NBC 4.1.8.13.(3) = 0.025x hs

Ratio - Proportion of allowable storey drift experienced on line with maximum deflection.

Notes:

***FAILURE** – Story drift on this level is greater than maximum allowed according to NBC 4.1.8.13.(3).