

WoodWorks® Shearwalls 11.4.1

Single_ShearWall.wsw

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Project Information

DESIGN SETTINGS

Design Code			Wind Method	
CSA O86-19 / NBC 2015			NBC 4.1.7.6 – Low buildings	
Max Shearwall Offset [m]			Service Conditions	
Plan	Elevation		Moisture Content	
(within storey)	(between storeys)		Fabrication	Service
0.15	–		19% dry	10% dry
Max Height-to-length Ratio		Height Restrictions for Wind Loads	Disable Gypsum Contribution for Design	
Blocked	Unblocked	Use mean roof height	Seismic	Wind
3.5	2.0		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: Always				
Dead load in chord force for overturning design				
Tension end		Compression end	When completely counteracts overturning	
Wall length / 2		Wall length / 2	Wall length / 2	

SITE INFORMATION

Importance Category Normal (all other buildings)					
Wind			Seismic		
-			Equivalent Static Force Procedure NBC 4.1.8.11		
Velocity Pressure q: Openings: Int. Gust Factor Cgi: - Terrain:			Importance Factor: 1.0 Site Class: D: Stiff soil PGA: 0.16 T = 0.2 0.5 1.0 2.0 5.0 Sa (T): 0.249 0.126 0.063 0.029 0.007 F (T): 1.198 1.422 1.505 1.534 1.552		
Topographic Information [m]			N-S		
Hill Shape	Height	Length	Period Ta Calculated: 0.128s		
-	-	-	Ta Used: 0.128s		
Site Location: -			Ductility Factor Rd: 3.00		
			Overstrength Factor Ro: 1.70		
			E-W		
			Period Ta Calculated: 0.144s		
			Ta Used: 0.144s		
			Ductility Factor Rd: 3.00		
			Overstrength Factor Ro: 1.70		

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Structural Data

STOREY INFORMATION

	Storey Elev [m]	Floor/Ceiling Depth [mm]	Wall Height [m]	Hold-down Length subject to shrinkage [mm]	Bolt length [mm]
Ceiling	3.65	0			
Level 1	1.25	254	2.40	349.0	350.0
Foundation	1.00				

BLOCK and ROOF INFORMATION

Block Dimensions [m]				Roof Panels			
				Face	Type	Slope	Overhang [m]
Block 1	1 Storey	E-W Ridge					
Location X,Y =	0.00	0.00		North	Side	0.0	0.00
Extent X,Y =	8.00	8.00		South	Side	0.0	0.00
Ridge Y Location, Offset	4.00	0.00		East	Gable	0.0	0.00
Ridge Elevation, Height	3.65	0.00		West	Gable	0.0	0.00

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SHEATHING MATERIALS by WALL GROUP [mm]

Wall Grp	Surf	Sheathing: Material	Mark/ Ply	Thk	GU mm	Or	Bv	Dia	Fasteners Len	Pen	Spacing Edg Int	Bk	Jus	Note #
1	Ext	DF Plywood	3	7.5	-	Horz	4600	2.87	2	43	150 300	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 N/mm (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:

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 38 mm thick (O86 11.3.2.1), and panel edges separated by at least 2 mm (11.3.2.2).

FRAMING MATERIALS and STANDARD WALL by WALL GROUP

Wall Grp	Species	Grade	b mm	d mm	Spcg mm	E MPa	fcp	Standard Wall
1	S-P-F	No.1/No.2	38	89	400	9500	5.3	

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)

SHEARLINE, WALL and OPENING DIMENSIONS

North-south Shearlines	Hold downs	Wall Group	Location X [m]	Extent [m] Start	End	Length [m]	FHS [m]	Aspect Ratio	Height [m]	Studs S N
Line 1										
Level 1										
Line 1	All		0.00	0.00	8.00	8.00	7.85	-	2.40	- -
Wall 1-1	All		-	0.00	8.00	8.00	7.85	0.30	-	2 2
Line 2										
Level 1										
Line 2	All		12.00	0.00	8.00	8.00	7.85	-	2.40	- -
Wall 2-1	All		-	0.00	8.00	8.00	7.85	0.30	-	2 2
East-west Shearlines	Hold downs	Wall Group	Location Y [m]	Extent [m] Start	End	Length [m]	FHS [m]	Aspect Ratio	Height [m]	Studs W E
Line A										
Level 1										
Line A	All		0.00	0.00	12.00	12.00	11.85	-	2.40	- -
Wall A-1	All		-	0.00	12.00	12.00	11.85	0.20	-	2 2
Line B										
Level 1										
Line B	-	1	8.00	0.00	12.00	12.00	8.00	-	2.40	- -
Wall B-1	All	1	-	0.00	12.00	12.00	8.00	-	-	2 2
Segment 1	-	-	-	0.00	4.00	4.00	3.85	0.60	-	2 2
Opening 1	-	-	-	4.00	6.00	2.00	-	-	2.00	2 2
Segment 2	-	-	-	6.00	8.00	2.00	1.85	1.20	-	2 2
Opening 2	-	-	-	8.00	10.00	2.00	-	-	2.00	2 2
Segment 3	-	-	-	10.00	12.00	2.00	1.85	1.20	-	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. If two wall group numbers listed, they are for rigid diaphragm and flexible diaphragm design.

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Loads

DEAD LOADS (for hold-down calculations)

Applied to	Shear Line	Level	Profile	Tributary Width [m]	Location [m]		Mag [kN,kN/m^2,MPa]	
					Start	End	Start	End
Line B	B	1	Line		0.00	12.00	10.00	

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SEISMIC LOADS

Level 1 Force Dir	Profile	Location [m]		Mag [kN,kN/m,kN/m^2]	
		Start	End	Start	End
E-W	Point	8.00	8.00	25.00	25.00

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

Seismic Loads, Flexible Diaphragm

All shearwalls have sufficient design capacity.

Storey drift (NBC 4.1.8.13.(3)): Within limits. Refer to Storey Drift table.

Over-capacity ratio (O86 11.8.3.2): Within 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.

HOLD-DOWN DESIGN

Seismic Loads, Flexible Diaphragm

All hold-downs have sufficient design capacity.

COMPRESSION FORCE DESIGN

Seismic Loads, Flexible Diaphragm

Bottom plate has sufficient perpendicular-to-grain compressive capacity under all wall end studs.

Flexible Diaphragm Seismic Design

SEISMIC INFORMATION

Level	Mass [kN]	Storey Shear [kN]		Shear Capacity [kN]		Over-capacity		Length of SFRS [m]	
		E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S
1	0.00	25.00	0.00	97.62	89.49	3.90	inf	12.0	8.0
All	0.00	-	-	-	-	-	-	-	-

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

Total unfactored base shear - 0.00 kN

IRREGULARITIES (NBC Table 4.1.8.6)

leFaSa(0.2) = 0.298

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	None	None	None	None	-
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	None	None	None	None	-
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	a
8	Non-orthogonal	7 (1) (c) J-120	n/a	n/a	n/a	n/a	b
9	Gravity-Induced	7 (1) ; 10 (2), (5-7) J-150	n/a	n/a	n/a	n/a	c

Notes:

- a) This irregularity not applicable to flexible diaphragm design.
- b) Not applicable, as all buildings modelled by Shearwalls are orthogonal.
- c) Not applicable to structures using wood shear walls.

Irregularities:

1. 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.
2. 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.
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).
4. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.

North-south Shearlines	W Gp	For Dir	Shear Force		Capacities [kN/m]					Ratio Fv/V	
			FHS [m]	Fv/L [kN/m]	Vhd (vd) / L Int Ext	Jhd	Vrs (vpb) / L Int Ext	Vrs/L			
East-west Shearlines	W Gp	For Dir	FHS [m]	Fv/L [kN/m]	Vhd (vd) / L Int Ext	Jhd	Vrs (vpb) / L Int Ext	Vrs/L	Ratio Fv/V		
Line B											
Level 1											
LnB, Lev1	-	Both	8.00	2.08	-	-	-	-	-	0.82	
Wall B-1	1^	Both	8.00	-	-	3.81	-	-	-	0.82	
Segment 1	-	W->E	4.00	3.16	-	-	1.00	-	5.36	3.81	0.83
	-	E->W	4.00	3.27	-	-	1.00	-	5.36	3.81	0.86
Segment 2	-	W->E	2.00	3.04	-	-	1.00	-	5.86	3.81	0.80
	-	E->W	2.00	3.03	-	-	1.00	-	5.86	3.81	0.79
Segment 3	-	W->E	2.00	3.15	-	-	1.00	-	5.86	3.81	0.82
	-	E->W	2.00	2.94	-	-	1.00	-	5.86	3.81	0.77

Refer to Detailed Shear Wall design output for strengths, factors and other intermediate values for V_{rs} , V_{hd} and J_{hd} .

Hold-Down and Compression Design (flexible seismic design)

Level 1					Tensile Hold-down or Compressive Stud Force [kN]				Hold-down	Cap [kN]	Crit Resp.
Line- Wall	Posit'n	Location [m]		Note	Shear	Dead	Jx	Cmb'd			
Line B							1.0				
B-1	L End	0.11	8.00		8.0	8.0		0.00	Not required	12.9	0.00
B-1	L End	0.11	8.00		8.3			8.30	Compression	37.9	0.22
B-1	L Op 1	3.89	8.00		8.0	18.0		26.0	Compression	37.9	0.69
B-1	R Op 1	6.11	8.00		8.2	10.0		18.18	Compression	37.9	0.48
B-1	L Op 2	7.89	8.00		8.2	10.0		18.2	Compression	37.9	0.48
B-1	R Op 2	10.11	8.00		7.9	17.9		25.87	Compression	37.9	0.68
B-1	R End	11.89	8.00		7.9	7.9		0.00	Not required	12.9	0.00
B-1	R End	11.89	8.00		8.5			8.49	Compression	37.9	0.22

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 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 > 0.08 m and depth > 0.09 m : 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 - 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 [kN]	
Line-Wall	Position on Wall or Opening	Location [m]		Notes	---	---
		X	Y		-->	<---
Line B						
B-1	Left Opening 1	4.00	8.00		5.2	-5.7
B-1	Right Opening 1	6.00	8.00		0.2	-0.7
B-1	Left Opening 2	8.00	8.00		2.5	-2.9
B-1	Right Opening 2	10.00	8.00		-2.5	2.1

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 kN/m	Ls m	Hs m	Bending A mm ²	Defl mm	Ga kN/ mm	Nail slip vs N	en mm	Shear Defl mm	Hold Defl mm	Total Defl mm
Level 1														
Line 1														
Line 2														
Line A														
Line B														
B-1,1	1	W->E	ExtS	3.16	4.00	2.40	6764	.11	1.3	572	.81	5.7	0.3	6.1
		E->W	ExtS	3.27	4.00	2.40	6764	.12	1.3	572	.81	5.9	0.1	6.1
B-1,2		W->E	ExtS	3.04	2.00	2.40	6764	.22	1.3	572	.81	5.5	0.4	6.1
		E->W	ExtS	3.03	2.00	2.40	6764	.22	1.3	572	.81	5.5	0.4	6.1
B-1,3		W->E	ExtS	3.15	2.00	2.40	6764	.23	1.3	572	.81	5.7	0.2	6.1
		E->W	ExtS	2.94	2.00	2.40	6764	.21	1.3	572	.81	5.3	0.6	6.1

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 = $2vHs^3 / 3EAs \times 10^6$; A - Cross sectional area of segment end stud(s); E - Stud mod. of elasticity from Framing Materials table

Shear = $vh / 1000 Ga$; Ga – Apparent stiffness = $vcap / (vcap / Bv + 2.5 en)$; vcap – SLS factored sheathing force at capacity = $Vrs / (Ls le)$;

Bv - Shear-through-thickness rigidity from Tables 9.1-9.3, value is in Sheathing Materials table; le - ULS Importance factor; en – Nail slip from

A.11.7 = $(0.013 vs / d^2)^2$ wood, $0.76 v / vcap$ GWB; vs – factored shear force per nail along panel edge based on vcap, 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 + 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 kN	Vert. Manuf mm	Displacement Add mm	da mm	Slippage Vf kN	da mm	Shrink +Extra mm	Comp. force kN	Crush da mm	Total da mm	Horz Defl mm
Level 1													
Line 1													
Line 2													
Line A													
Line B													
B-1, 1	W->E	HDU2	0.00	.00	.00	0.00	-	-	.00	26.04	0.49	0.5	0.3
	E->W	HDU2	0.00	.00	.00	0.00	-	-	.00	8.30	0.15	0.1	0.1
B-1, 2	W->E	HDU2	0.00	.00	.00	0.00	-	-	.00	18.21	0.33	0.3	0.4
	E->W	HDU2	0.00	.00	.00	0.00	-	-	.00	18.18	0.33	0.3	0.4
B-1, 3	W->E	HDU2	0.00	.00	.00	0.00	-	-	.00	8.49	0.15	0.2	0.2
	E->W	HDU2	0.00	.00	.00	0.00	-	-	.00	25.87	0.47	0.5	0.6

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 = 200 GPa

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

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

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	Actual Storey Drift (mm)				Amp defl	Allowable Storey Drift		
		RdRo/I	Const defl	Max defl	Line		hs m	Drift mm	Ratio
1	E<->W	5.1	0.0	6.1	B	31.2	2.40	60.0	0.52

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.

