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 (within storey)	Elevation (between storeys)	Moisture Content: Fabrication	Moisture Content: Service
0.15	-	19% dry	10% dry

Max Height-to-length Ratio		Height Restrictions for Wind Loads	Disable Gypsum Contribution for Design	
Blocked	Unblocked		Seismic	Wind
3.5	2.0	Use mean roof height	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:		**Importance Factor:**	1.0			
Openings:		**Site Class:**	D: Stiff soil			
Int. Gust Factor Cgi:	-	**PGA:**	0.16			
Terrain:		**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	E-W
Hill Shape	Height	Length	**Period Ta Calculated:**	0.128s	0.144s
-	-	-	**Ta Used:**	0.128s	0.144s
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 [m]	Floor/Ceiling Depth [mm]	Wall Height [m]	Hold-down Length subject to shrinkage [mm]	Hold-down 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	Wall Surf	Sheathing: Material	Mark/ Ply	Thk	GU mm	Or	Bv	Fasteners Dia	Fasteners Len	Fasteners Pen	Spacing Edg	Spacing 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 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)

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SHEARLINE, WALL and OPENING DIMENSIONS

North-south Shearlines	Hold downs	Wall Group	Location X [m]	Extent [m] Start	Extent [m] End	Length [m]	FHS [m]	Aspect Ratio	Height [m]	Studs S	Studs 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	Extent [m] End	Length [m]	FHS [m]	Aspect Ratio	Height [m]	Studs W	Studs 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.

Loads

DEAD LOADS (for hold-down calculations)

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

SEISMIC LOADS

Level 1 Force Dir	Profile	Location [m] Start	Location [m] End	Mag [kN,kN/m,kN/m^2] Start	Mag [kN,kN/m,kN/m^2] 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] E-W	Storey Shear [kN] N-S	Shear Capacity [kN] E-W	Shear Capacity [kN] N-S	Over-capacity E-W	Over-capacity N-S	Length of SFRS [m] E-W	Length of SFRS [m] 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)

IeFaSa(0.2) = 0.298
Only those provisions for height less than 20 m are considered.

Irregularity No.	Irregularity Type	NBC 4.1.8... Commentary	Irregular for... Levels	Irregular for... Dir/Ln	Fails for... Levels	Fails for... Dir/Ln	Notes
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 SRFS 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 Bx = largest deflection / average of the two. Table shows any storey and force direction for which Bx 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.

SHEAR RESULTS (flexible seismic design)

North-south Shearlines	W Gp	For Dir	Shear Force FHS [m]	Shear Force Fv/L [kN/m]	Capacities [kN/m] Vhd (vd) / L Int	Vhd (vd) / L Ext	Jhd	Vrs (vpb) / L Int	Vrs (vpb) / L Ext	Vrs/L	Ratio Fv/V
East-west Shearlines	**W Gp**	**For Dir**	**Shear Force FHS [m]**	**Shear Force Fv/L [kN/m]**	**Capacities [kN/m] Vhd (vd) / L Int**	**Vhd (vd) / L Ext**	**Jhd**	**Vrs (vpb) / L Int**	**Vrs (vpb) / L 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

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 x vd x JD x Jus x 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 x 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 x vpb x KD x KS x 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 x Jhd, Vrs(vpb)/L).
Refer to Detailed Shear Wall design output for strengths, factors and other intermediate values for Vrs, Vhd and Jhd.

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 (flexible seismic design)

Level 1 Line-Wall	Posit'n	Location [m] X	Y	Note	Tensile Hold-down or Compressive Stud Force [kN] Shear	Dead	Jx	Cmb'd	Hold-down	Cap [kN]	Crit Resp.
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 x 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 Line-Wall	Position on Wall or Opening	Location [m] X	Y	Notes	Drag Strut Force [kN] --->	<---
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

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DEFLECTION (flexible seismic design)

Wall, segment	W Gp	Dir	Srf	v kN/m	Ls m	Hs m	Bending A mm2	Bending Defl mm	Ga kN/ mm	Nail slip vs N	Nail slip 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 / 3EALs x 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 Ie) ;
Bv - Shear-through-thickness rigidity from Tables 9.1-9.3, value is in Sheathing Materials table; Ie - 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 x 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. Displacement Manuf mm	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 x 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 x (19% fabrication – 10% in-service moisture contents) x 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 x [r / 0.73, r < 0.73; (1 + (r - 0.73) / 0.27), 0.73 < r < 1; 2 r^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 x 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) RdRo/I	Const defl	Max defl	Line	Amp defl	Allowable Storey Drift 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.