Table C1 b (continued)
Braced Wall Panels for High Wind or High Seismic Loads

Building with normal weight construction: 0.8 kPa ≤ $q_{1/50}$ wind load < 1.2 kPa or 0.7 < S_a (0.2) ≤ 1.2
Building constructed with tile roofs or concrete topping on floors: 0.8 kPa ≤ $q_{1/50}$ wind load < 1.2 kPa or 0.7 < S_a (0.2) ≤ 1.1

Description of braced panel construction for higher wind and seismic loads	Minimum length of braced panels[1,2,3]	Acceptable Bracing Method Minimum required percentage of length of braced wall band on each storey[4] Supporting only roof	Supporting roof plus one floor normal weight construction	Supporting roof plus two floors, normal weight construction or supporting roof plus one floor, heavy construction [5]	Supporting roof plus three floors, normal weight construction or supporting roof plus two floors, heavy construction [5]
Interior Walls only, 12.7 mm (400 mm stud spacing) or 15.9 mm (600 mm stud spacing) thick gypsum board installed on both sides conforming to Clause 9.29.5 of the NBCC.[8]	1.2 m	25%	25	40%	Not Permitted
Interior Walls Only 12.7 mm (400 mm stud spacing) or 15.9 mm (600 mm stud spacing) thick gypsum board installed on one side only conforming to conforming to Clause 9.29.5 of the NBCC.[8]	2.4 m	50%	50	80%	Not Permitted

Notes:
1. Braced wall panels to be spaced in accordance with Figure C2.
2. Minimum specified braced panel lengths in Table C1 b are greater than the minimum braced panel lengths specified in the Part 9 prescriptive requirements of the NBCC.
3. Alternative Procedure for Narrow Braced Wall Panels" may be used to determine the minimum length of braced wall panels. See Table C2
4. Percentage of bracing in a braced wall band is the sum of the lengths of the braced panels, meeting the minimum length requirements, along the braced wall band divided by the length of the braced wall band. See Figure C2. Percentage of bracing is calculated separately for each braced wall band on each storey
5. Prescriptive guidelines for lateral loads are not applicable to 3 storey buildings with tile roofs or concrete topping on floors where Sa (0.2) > 0.7.
6. Maximum building dimension in high wind and seismic areas is 15 m except where interior braced walls with wood braced wall panels applied to both sides of the wall are spaced at 15m or less or alternatively applied to one side of the wall, where the panel edge nail spacing is reduced to 75 mm,.
7. Alternate nails may be used in wood sheathed braced wall panels where nail spacing is adjusted. See Table C3
8. Gypsum board to be fastened to the top and bottom wall plates with gypsum board application nails – ring threaded conforming to CSA Standard B111 spaced at ≤ 200 mm o.c. or wallboard screws conforming to ASTM Standard C 1002, Type W spaced at ≤ 300 mm o.c.

10.2.5.3

Where there is no hold-down connection resisting overturning tension forces at the base of the shearwall segment, the factored uplift restraint force, P_{ij}, calculated in Clause 10.2.9.5 shall be greater than zero.

10.2.5.4

Shearwall segments that do not meet the requirements of 10.2.5.2 and 10.2.5.3 shall be designed with hold-down connections to resist overturning forces.

10.2.6 Shearwall Segment with Multiple Layers

10.2.6.1

The factored shear resistance for a shearwall segment with two layers of shear panels applied to one side is determined by the first (inside) layer of panels except as allowed in Footnote 2 of Table 10.2.10A.

10.2.6.2

The factored shear resistances from both sides of the same shearwall segment may be added together. Panel materials need not be the same on both sides of the shearwall segment.

10.2.7 Unblocked Shearwalls

10.2.7.1

The height of unblocked shearwalls shall not be greater than 4.88 m.

10.2.7.2

Shearwalls sheathed with structural wood-based panels, meeting all of the following conditions, may be designed without blocking at horizontal panel edges:

a) Sheathing is applied horizontally or vertically.
b) The specified shear resistance is based on shearwalls with 600 mm stud spacing, and with nails at the panel edges spaced not more than 150 mm in Table 10.2.10A.
c) Shearwall resistance is modified by J_{ub} (Clause 10.2.9.4). and
d) Sheathing is not designed to resist uplift forces due to wind suction on the roof.

10.2.7.3

Shearwalls sheathed with gypsum wallboard may be designed without blocking at panel edges using the appropriate resistance values from Table 10.2.10B.

Alternative Procedure for Narrow Braced Wall Panels

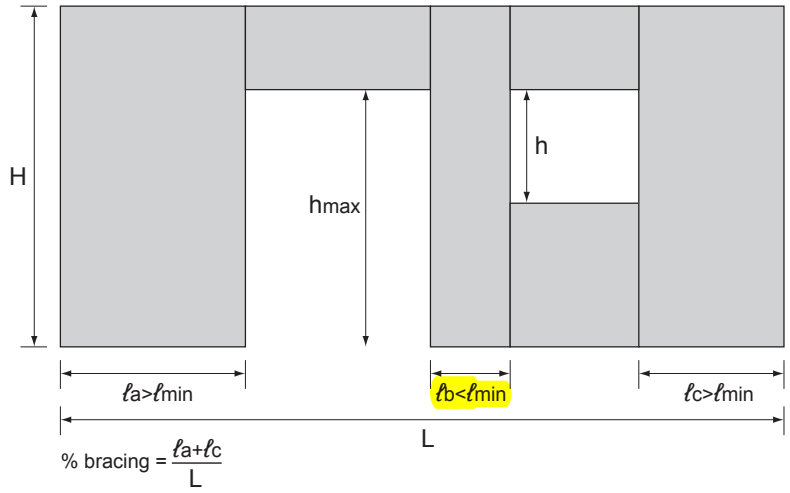
These guidelines are additional to the Part 9 prescriptive requirements of the NBCC

Where a braced wall band consists of narrow panels; i.e. panels that are less than 1.2 m in length as defined in Tables C 1a and b, and where these narrow braced wall panels are to be counted in the total percentage of braced wall required, Table C2 provides an alternative procedure that may be used to adjust the percentage of full height sheathing panels required in Tables C1 a and b.

Table C2

Percentage of Full Height Sheathing Required for Narrow Braced Wall Panels

Wall Height (H), m	2.4	3.1	3.7	As an Alternative to Table C1a, percentage of Full Height Sheathing Required Where Minimum length of braced panels are Less than 1.2 m	Adjusted Percentage of Full Height Sheathing Required for Narrow Braced Wall Panels Specified in Accordance with Table C1b		
Minimum length of full height sheathing (ℓ_{min}), m	0.68	0.87*	1.05		Supporting: – only roof, or – roof plus one floor normal weight construction	Supporting: – roof plus two floors normal weight construction, or – roof plus one floor heavy construction	Supporting: – roof plus three floors normal weight construction, or – roof plus two floors heavy construction
Height of highest wall opening, % wall height	Height of highest wall opening (h_{max}), m						
33	0.81	1.0	1.2	16%	25%	40%	75%
40	0.98	1.2	1.5	19%	29%	45%	79%
50	1.2	1.5	1.8	23%	34%	52%	84%
60	1.5	1.8	2.2	27%	40%	59%	90%
70*	1.7	2.1*	2.6	31%	46%*	66%	96%
80	2.0.	2.4	2.9	35%	51%	74%	N/A
90	2.2	2.7	3.3	39%	57%	81%	N/A
100	2.4	3.1	3.7	43%	63%	88%	N/A



Notes:
1. The minimum length of full height sheathing, ℓ_{min}, is based on a height to length ratio of 3.5:1 and is calculated as H/3.5
2. The maximum height of wall opening, $h_{i,max}$, is the maximum opening clear height in a braced wall. Where areas above and/or below an opening are without sheathing, the height of each opening is defined as the clear height of the opening plus the unsheathed areas
3. The height of highest wall opening (% wall height) is the percentage ratio of maximum height of the wall opening, $h_{i,max}$, to the total height, H.
4. The adjusted percentage required is the sum of the lengths of the braced wall panels that respect the minimum length requirements divided by the total length of the braced wall band. The adjusted percentage of full height sheathing in this table is to replace the corresponding percentage of bracing requirements in Table C1 b.

*Example:

This example is for a building where Sa(0.2) is greater than 0.7,and therefore the guidelines in Table C1b need to be satisfied.

An upper storey exterior braced wall has a length of 10.6 m and a configuration as shown in the figure below. For a braced wall supporting only the roof, 25 % of the length of the braced wall is required to consist of braced wall panels that are not less than 1.2 m. or, alternatively, the braced wall may be constructed in accordance with the alternate procedure for narrow braced wall panels.

25% of 10.6 m is 3.15 m.

There are four full-height wall segments:

Segment	ℓ
A	1.0 m
B	1.0 m
C	1.5 m
D	1.5 m

Sum of full height segments where $\ell \geq$ 1.2 m

$\ell_A + \ell_B$ = 1.5 m + 1.5 m < 3.15 m – Alternate procedure for narrow braced wall panels may be used

From Table C2:

1) Determine minimum length of full height sheathing, ℓ_{min}, allowed to be used in determination of full height wall sheathing:
   Wall height (H) = 3.1 m
   ℓ_{min} for 3.1 m high wall = 0.87 m
2) Determine length of full height wall sheathing required:
   Height of highest wall opening (hmax) = 2.1 m (70% of H)
   From Table C2 for narrow braced wall panels supporting only a roof, full height wall sheathing required is 46%
   46% of 10.6 m is 4.88 m.

Determine if there is sufficient wall sheathing:

All wall segments are longer than 0.87 m therefore all segments can be used in determining length of full height sheathing

$\ell_A + \ell_B + \ell_C + \ell_D$ = 1.0 m + 1.0 m + 1.5 m + 1.5 m = 5.0 m > 4.88 m

The wall has sufficient bracing.

Roof Design Tables

Table	Title	Input Tables	Reference Clauses Part B
Roof 1	Roof Sheathing Attachment Sheathing Attached With 2 in. Common Nails or Larger	Climatic Data	5.2.3
Roof 2	Roof Joists	National Building Code and The Span Book	5.3
Roof 3	Roof Rafter	National Building Code and The Span Book	5.4
Roof 4	Ceiling Joists	National Building Code and The Span Book	5.4
Roof 5	Adjustment Factors for Rafters and Roof Joists Under Wind Loads	Climatic Data	5.3, 5.4
Roof 6 Roof 6a Roof 6b	Adjustment Factors for Rafters with Raised Ties Span Reduction Factor for Raised Ties Connection Size Increase Factor for Roof Rafter/Raised Tie Connection	Climatic Data	5.4.4
Roof 7	Rafter/Ceiling Joist Connection 3 in. Common Nails at the Heel Connection	Climatic Data	5.4
Roof 8	Rafter Connection at Roof Ridge Ridge Tension Strap Nailed to Rafters	Load 16	5.5
Roof 9	Roof Framing Connection at Exterior Wall Diaphragm 1	Load 15, Load 17,	5.9, 9.5
Roof 10	Hip and Valley Rafters	Climatic Data	5.7
Roof 11	Permanent Bracing for Trusses		5.8.2

Diaphragm 8

Wall Top Plate as Diaphragm Chord

Factored Chord Capacity Based on Connection Capacity

Top plate splice
Type A – Plate members nailed together

Top plate splice
Type B – Steel splice plate

Type A - Double Lapped Chord
End Joints Staggered 1.2 m min.

Common nail length in.	Nail spacing mm	No. of nail rows	No. of nails in the connection	Factored chord resistance kN
3	600	2	4	3.5
3	400	2	6	5.3
3	200	2	12	11
3.5	600	2	4	4.3
3.5	400	2	6	6.4
3.5	200	2	12	13
3	600	3	4	5.3
3	400	3	6	8.0
3	200	3	12	16
3.5	600	3	4	6.4
3.5	400	3	6	9.6
3.5	200	3	12	19

Notes:
1. Table applies to S-P-F. For D. Fir-L and Hem-Fir mutiply the resistance by 1.1. For Nothern Species mutiply the resistance by 0.9.
2. If a Type A splice is used, the factored member resistance is based on a single ply member.

Type B - Double Top Plate
Joints Spliced With Nailed Steel Plate

Common nail length in.	No. of nail rows	No. of nails per row	Factored chord resistance kN
3	1	3	5.6
3	1	4	7.4
3	1	5	9.3
3	2	3	11
3	2	4	15
3	2	5	19
3.5	1	3	6.6
3.5	1	4	8.8
3.5	1	5	11
3.5	2	3	13
3.5	2	4	18
3.5	2	5	22
3	3	3	17
3	3	4	22
3	3	5	28
3.5	3	3	20
3.5	3	4	26
3.5	3	5	33

Notes:
1. For factored axial chord forces see Tables Diaphragm 1 and 2.
2. For factored axial chord forces see Tables Diaphragm 1 and 2.

Shearwall 6

Factored Basic Shear Resistance

Gypsum Wallboard[1] Panels with all Species of Framing

Φv_{dg} (kN/m) for Wind and Seismic Loads

Minimum nominal panel thickness mm	Minimum nail[2] and screw[3] penetration in framing mm	Wall construction	Panels applied directly to framing: 400 mm stud spacing, Fastener spacing at panel edges (mm) 200	150	100	500 mm stud spacing, Fastener spacing at panel edges (mm) 200	150	100	600 mm stud spacing, Fastener spacing at panel edges (mm) 200	150	100
12.5	19	Unblocked	0.8	1.0	1.1	0.7	0.8	0.9	0.5	0.6	0.7
12.5	19	Blocked	1.0	1.2	1.5	1.0	1.2	1.5	1.0	1.2	1.5
15.9	19	Unblocked	1.1	1.2	1.5	0.8	1.0	1.2	0.6	0.7	0.9
15.9	19	Blocked	1.2	1.5	1.8	1.0	1.2	1.4	0.7	0.9	1.1

Notes:
1. Tabulated values for gypsum wallboard Type X (fire rated) defined in ASTM Standard C36 used in dry service conditions.
2. Gypsum board application nails – ring thread as specified in CSA Standard B111.
3. Gypsum board screws – Type W as specified in ASTM C1002
4. Space Fasteners at maximum 300 mm on centre along intermediate framing members.
5. Maximum storey shear force resisted by the gypsum wallboard cannot exceed the values in Table Shearwall 6a.
6. Table may only be used when storey height does not exceed 3.6 m.

Shearwall 6a

Maximum Storey Shear Forces Resisted by Gypsum Wallboard

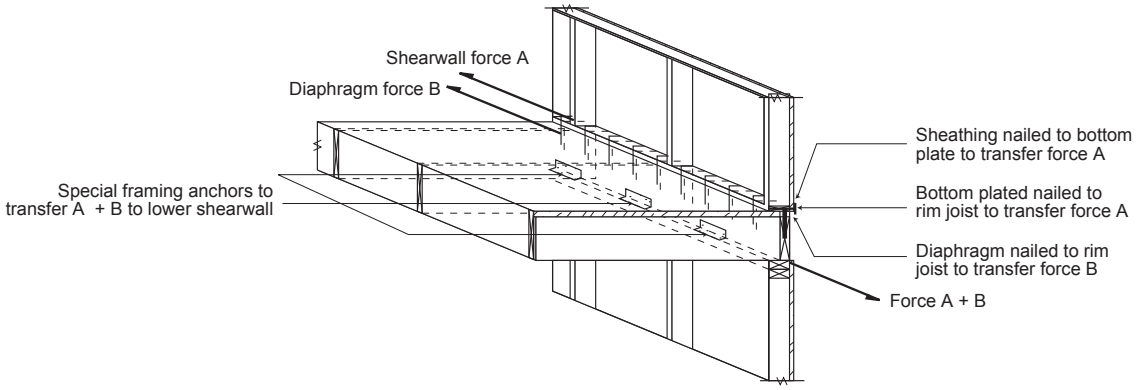
Percentage of Storey Shear Forces

Storey Building	3-storey Building	2-storey Building	1-storey
3rd	80	–	–
2nd	60	80	–
1st	40	60	80

Shearwall 14 (con't)

Shear Transfer Upper Shearwall to Lower Shearwall

Case B – Shear Transfer When Sheathing is Discontinuous at Floor Framing



See Table Shearwall 1c or Shearwall 1b for upper shearwall force A.
See Table Diaphragm 1 for diaphragm shear force B.
See Table Shearwall 1a for shear resistance of upper and lower shearwalls.

Factored Shear Resistance (kN)

Common nail length (in.)	Bottom wall plate nailed to rim joist or end joist (kN/m)			Floor framing or floor blocking toe-nailed to wall plate[1] (kN)		Rim joist or end joist toe-nailed to top wall plate (kN/m)		
	nails @ 400 mm	nails @ 300 mm	nails @ 200 mm	3 nails	4 nails	nails @ 400 mm	nails @ 300 mm	nails @ 200 mm
3.25	2.2	2.9	4.4	0.96	1.3	1.8	2.4	3.7
3.5	2.7	3.6	5.4	1.1	1.5	2.2	3.0	4.4
4	3.7	4.9	7.4	1.5	2.0	3.1	4.1	6.1

Note:
1. Table applies to S-P-F. For D. Fir-L and Hem-Fir mutiply the resistance by 1.1. For Nothern Species mutiply the resistance by 0.9.
2. The resistance of the floor framing or floor blocking toenailed to the wall plate may be added to the resistance of the rim joist or end joist toe-nailed to the wall plate.
3. In lieu of toe-nails, special framing anchors may be used to transfer the shear force.