

Cost impact of climatic load changes on Part 9: Adopting Part 4 proposed new return periods in PCF 2048

Currently, the 1-in-50-year snow loads are used to calculate the specific snow load in Part 9, which is used in various requirements to define the application of a requirement or in tables where structural members are selected based on the specified snow load. The 1-in-50-year wind loads (hourly wind pressures) are used directly in several requirements to define the application.

To align Part 9 with the Part 4 approach, which introduces longer return periods for snow and wind loads under PCF 1980, reference is made to the 1-in-1000-year snow loads for the calculation of specified snow loads and the 1-in-500-year hourly wind pressures. PCF 2048 introduces these longer return periods in Part 9 and the resulting cost impact is summarized in this document.

The specified snow loads are used in the following requirements:

- Platforms subject to snow and occupancy loads (Sentence 9.4.2.3.(1))
- Performance of windows, doors and skylight (Sentence 9.7.3.1.(2))
- Columns (Subclause 9.17.1.1.(1)(b)(ii))
- Ridge support (Sentence 9.23.14.8.(5) and Table 9.23.14.8., Rafter-to-joist nailing (unsupported ridge))
- ICF lintels (Sentence 9.20.17.4.(3) and Span Tables 9.20.17.4.-A, 9.20.17.4.-B and 9.20.17.4.-C)
- Spans for joists, rafters and beams (Sentence 9.23.4.2.(1))
 - Roof joists (Span Tables 9.23.4.2.-D and 9.23.4.2.-E)
 - Roof rafters (Span Tables 9.23.4.2.-F and 9.23.4.2.-G)
 - Built-up ridge beams and lintels supporting the roof (Span Table 9.23.4.2.-L)
 - Lintels for various wood species (Span Tables 9.23.12.3.-A, 9.23.12.3.-B, 9.23.12.3.-C and 9.23.12.3.-D)

The hourly wind pressures are used in the following requirements:

- Structural sufficiency of glass (Sentence 9.6.1.3.(2))
- Nailing of framing – roof trusses, rafters and joists to wall framing (Sentence 9.23.3.4.(3))
- Fasteners for sheathing (Article 9.23.3.5.)
- Anchorage of building frames (Sentence 9.23.6.1.(3))
- Required roof sheathing (Sentence 9.23.16.1.(1))
- Lumber roof sheathing (Article 9.23.16.5.)
- Attachment of cladding to flat ICF wall units (Sentence 9.27.5.4.(2))

General approach

As per the Policies and Procedures, Appendix G, the unit cost of material, labour and overhead/profit are obtained from RS Means. RS Means' cost database is a comprehensive collection of industry construction cost data that can be used to develop estimates for construction projects. All costs contained herein have been converted from the US national average cost to Canadian national average. The costs are based on 2023 construction cost data.

To determine overall costs, material quantities are calculated using archetypes and measured in AutoCAD to obtain lengths, areas, etc. Each archetype is described in the sections below.

First, all costs are calculated for a given archetype based on the climatic data in Table C-2 of Appendix C in NBC 2020 (herein this will be referred to as “before the change”). Then, the costs are recalculated using the new climatic data provided in the proposed change form, PCF 1979, for the 1-in-1000-year snow loads and the 1-in-500-year hourly wind pressures (herein this will be referred to as “after the change”) referenced in PCF 2048. The difference between the costs is determined, which gives the cost impact of the proposed change.

Snow loads

The new 1-in-1000-year snow load data results in a change in specified snow loads in most of the 680 locations in Table C-2 of PCF 1979. However, not all specified snow loads increase because a modification to the calculation of specified snow loads is proposed in PCF 2048, which divides the current formula by 1.5. As a result, the specified snow load remains the same in 41 locations (neutral), goes up in 154 locations (adverse) and goes down in the remaining 485 locations (beneficial).

Platforms subject to snow and occupancy loads (Sentence 9.4.2.3.(1))

The approach used to assess the cost impact of the proposed change on exterior platforms is to use an archetype exterior platform, in this case, a 3.5 m by 4 m long exterior platform. Sentence 9.4.2.3.(1) requires that exterior platforms be designed for a use and occupancy load of 1.9 kPa or the specified snow load, whichever is greater.

For locations where the specified snow load is less than 1.9 kPa before and after the change, there will be no impact. This is the case for exterior platform design in a total of 483 out of the 680 locations in Table C-2 in PCF 1979.

For the remaining 197 locations, there is potential impact. For the design of exterior platforms, the span tables can be used to select the required wood joists and built-up beams needed based on the specified snow load in a given location. The span tables provide values for specified snow loads of 1.0 kPa, 1.5 kPa, 2.0 kPa, 2.5 kPa, 3.0 kPa and for 3.5kPa and 4.0 kPa by way of an appendix note.

For locations where the specified snow load before and after the change remains between the same range (e.g., between 1.0 kPa and 1.5 kPa), there is no impact. This is the case for 115 locations. This leaves 82 locations out of a total of 680 locations in Table C-2 in PCF 1979 with potential impact resulting from PCF 2048.

Assessment of these 82 locations using the archetype, span tables and costs from RS Means, found that there are 16 locations that experience a cost increase (see Table below), ranging from \$47.77 to \$291.81, and 37 locations that experience a cost decrease (see Table below), ranging from \$47.77 to \$126.43. Note, there are 24 additional locations to those noted above that are not impacted because the same joist and built-up beam size is sufficient before and after the proposed change, based on the spans used in the archetype.

Province and Location	Province	Cost NBC 2020	Cost PCF1979/ PCF 2048	Cost Difference
Alberni	BC	\$542.61	\$590.38	\$47.77
Burns Lake	BC	\$669.04	\$590.38	-\$78.66
Campbell River	BC	\$542.61	\$669.04	\$126.43
Greenwood	BC	\$669.04	\$590.38	-\$78.66
Lytton	BC	\$542.61	\$590.38	\$47.77
Mackenzie	BC	\$817.80	\$716.81	-\$100.99
McBride	BC	\$716.81	\$669.04	-\$47.77
Nakusp	BC	\$716.81	\$669.04	-\$47.77
Ocean Falls	BC	\$716.81	\$1,008.62	\$291.81
Port Alberni	BC	\$542.61	\$590.38	\$47.77
Prince George	BC	\$669.04	\$590.38	-\$78.66
Salmon Arm	BC	\$669.04	\$542.61	-\$126.43
Smithers	BC	\$669.04	\$590.38	-\$78.66
North Vancouver	BC	\$542.61	\$669.04	\$126.43
Bancroft	ON	\$669.04	\$590.38	-\$78.66
Bracebridge	ON	\$669.04	\$590.38	-\$78.66
Earlton	ON	\$669.04	\$590.38	-\$78.66
Timmins	ON	\$669.04	\$542.61	-\$126.43
Amos	QC	\$669.04	\$542.61	-\$126.43
Kuujuarapik	QC	\$716.81	\$669.04	-\$47.77
Loretteville	QC	\$716.81	\$669.04	-\$47.77
Malartic	QC	\$669.04	\$542.61	-\$126.43
Montmagny	QC	\$669.04	\$590.38	-\$78.66
Nitchequon	QC	\$669.04	\$590.38	-\$78.66
Noranda	QC	\$669.04	\$542.61	-\$126.43
Québec	QC	\$716.81	\$669.04	-\$47.77
Sainte-Foy	QC	\$716.81	\$669.04	-\$47.77
Rivière-du-Loup	QC	\$716.81	\$669.04	-\$47.77
Rouyn	QC	\$669.04	\$542.61	-\$126.43
Saguenay (Jonquière)	QC	\$669.04	\$542.61	-\$126.43
Saguenay (Kénogami)	QC	\$669.04	\$542.61	-\$126.43
Saint-Hubert-de-Rivière-du-Loup	QC	\$817.80	\$716.81	-\$100.99
Saint-Nicolas	QC	\$716.81	\$669.04	-\$47.77
Senneterre	QC	\$669.04	\$590.38	-\$78.66
Shawinigan	QC	\$669.04	\$590.38	-\$78.66
Thetford Mines	QC	\$716.81	\$669.04	-\$47.77
Val-d'Or	QC	\$669.04	\$590.38	-\$78.66
Victoriaville	QC	\$669.04	\$590.38	-\$78.66
Boiestown	NB	\$716.81	\$669.04	-\$47.77
Grand Falls	NB	\$716.81	\$669.04	-\$47.77
Louisbourg	NS	\$542.61	\$590.38	\$47.77
Argentia	NL	\$669.04	\$590.38	-\$78.66

Province and Location	Province	Cost NBC 2020	Cost PCF1979/ PCF 2048	Cost Difference
Grand Bank	NL	\$669.04	\$590.38	-\$78.66
Twin Falls	NL	\$817.80	\$716.81	-\$100.99
Watson Lake	YT	\$542.61	\$590.38	\$47.77
Fort McPherson	NT	\$542.61	\$590.38	\$47.77
Inuvik	NT	\$542.61	\$590.38	\$47.77
Norman Wells	NT	\$542.61	\$590.38	\$47.77
Tungsten	NT	\$669.04	\$716.81	\$47.77
Arviat	NU	\$542.61	\$590.38	\$47.77
Iqaluit	NU	\$542.61	\$590.38	\$47.77
Kangiqiniq / Rankin Inlet	NU	\$542.61	\$590.38	\$47.77
Kugluktuk / Coppermine	NU	\$542.61	\$669.04	\$126.43

Performance of windows, doors and skylight (Sentence 9.7.3.1.(2))

In the 154 locations where the snow loads increase, there is potential for impact on the structural design of skylights. The magnitude of the cost impact could not be determined without industry knowledge on the structural design of skylights including the capacity of the skylight frames and glazing.

Columns (Subclause 9.17.1.1.(1)(b)(ii))

To assess the cost impact of the proposed change on columns an exterior platform with dimensions of 2.44 m by 4 m is used; it is assumed to be raised from the ground by 3 m. Three columns are used to support a beam at the front edge of the deck along the 4 m length.

Subclause 9.17.1.1.(1)(b)(ii) limits the application of Section 9.17. to columns supporting exterior platforms where the sum of the specified snow load and the occupancy load (1.9 kPa) does not exceed 4.8 kPa. Therefore, in locations where the sum of the specified snow load and the occupancy load remains below 4.8 kPa before and after the change, there will be no impact. This is the case for 657 out of the 680 locations in Table C-2 in PCF 1979.

Assessment of the remaining 23 location using the archetype, Part 4 column design and costs from RS Means found that 1 location experiences an increase in cost of **\$290.86**, while 3 locations experience a decrease in cost of the same amount (see Table 4). The other 19 locations experience neither an increase or decrease because the same column size is applicable both before and after the proposed change.

Province and Location	Province	Cost Difference
Mackenzie	BC	-\$290.86
Ocean Falls	BC	\$290.86
Saint-Hubert-de-Rivière-du-Loup	QC	-\$290.86
Twin Falls	NL	-\$290.86

Ridge support (Sentence 9.23.14.8.(5) and Table 9.23.14.8., rafter-to-joint nailing (unsupported ridge))

To assess the cost impact of the proposed change on the nailed connection between a roof rafter and ceiling joist or collar tie, a 120 m² bungalow is used as an archetype (see Figure 1).

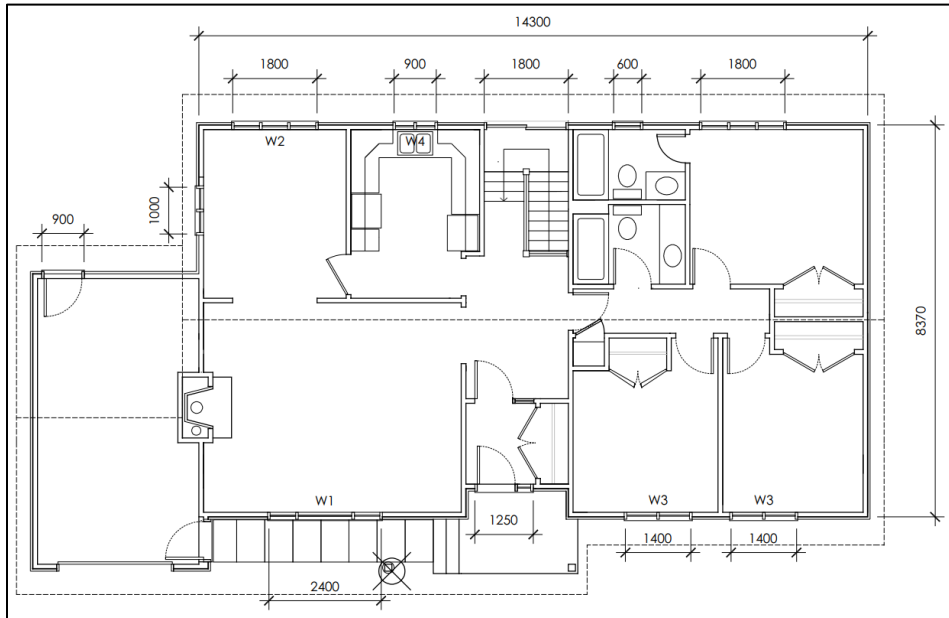


Figure 1 – 120 m² bungalow archetype

Table 9.23.14.8. provides the number of nails to be used at the rafter-to-joint connection for a 1.0 kPa, 1.5 kPa and 2.0 kPa specified snow load. In locations where the specified snow load remains within the same range there is no impact. This is the case for 481 locations. Of the remaining 199 locations, 29 experience an increase in the number of nails (maximum 3 additional nails), 112 experience a decrease in required number of nails (maximum 3 less nails) and an additional 58 are not impacted because the same number of nails are sufficient before and after the change.

Table 9.23.14.8. is used in the analysis to determine the number of nails in locations less than or equal to 2.0 kPa, while connection design using CSA O86-19 is used for locations with a specified snow load greater than 2.0 kPa.

Based on the archetype, adding 3 additional nails to each rafter-to-joint connection results in an additional material cost of **\$5.54** for a 120 m² bungalow with wood framed construction.

Location	Province	Required Number of Nails (Part 4 Design)	Required Number of Nails (Part 4 Design)	Additional Nails Required
		NBC 2020	PCF 2048	
Abbotsford	BC	10	11	1
Agassiz	BC	13	14	1
Bamfield	BC	7	10	3
Bella Bella	BC	15	16	1

Location	Province	Required Number of Nails (Part 4 Design)	Required Number of Nails (Part 4 Design)	Additional Nails Required
		NBC 2020	PCF 2048	
Bella Coola	BC	20	21	1
Burns Lake	BC	14	13	-1
Campbell River	BC	13	14	1
Castlegar	BC	16	15	-1
Chetwynd	BC	11	10	-1
Crescent Valley	BC	16	15	-1
Dease Lake	BC	11	10	-1
Fernie	BC	17	16	-1
Glacier	BC	31	28	-3
Golden	BC	15	14	-1
Gold River	BC	14	15	1
Greenwood	BC	14	13	-1
Mackenzie	BC	19	18	-1
McLeod Lake	BC	16	15	-1
Montrose	BC	15	14	-1
Nakusp	BC	16	15	-1
Nelson	BC	16	15	-1
Ocean Falls	BC	18	19	1
Port Hardy	BC	7	10	3
Prince George	BC	14	13	-1
Revelstoke	BC	24	22	-2
Salmon Arm	BC	14	13	-1
Sandspit	BC	10	11	1
Sechelt	BC	10	11	1
Smithers	BC	14	13	-1
Smith River	BC	11	10	-1
Stewart	BC	30	29	-1
Trail	BC	15	14	-1
Ucluelet	BC	7	10	3
Burnaby (Simon Fraser Univ.)	BC	15	16	1
New Westminster	BC	10	11	1
North Vancouver	BC	13	14	1
Victoria (Mt Tolmie)	BC	10	11	1
Whistler	BC	35	34	-1
Youbou	BC	17	18	1
Cold Lake	AB	10	7	-3
Hinton	AB	11	10	-1
Assiniboia	SK	7	10	3
Broadview	SK	10	7	-3
Dafoe	SK	10	7	-3

Location	Province	Required Number of Nails (Part 4 Design)	Required Number of Nails (Part 4 Design)	Additional Nails Required
		NBC 2020	PCF 2048	
Estevan	SK	7	10	3
Meadow Lake	SK	10	7	-3
Melville	SK	10	7	-3
Lynn Lake	MB	11	10	-1
Split Lake	MB	11	10	-1
Thompson	MB	11	10	-1
Alliston	ON	11	10	-1
Aurora	ON	11	10	-1
Bancroft	ON	14	13	-1
Bracebridge	ON	14	13	-1
Burlington	ON	10	7	-3
Cavan	ON	11	10	-1
Earlton	ON	14	13	-1
Embro	ON	11	10	-1
Forest	ON	11	10	-1
Fort Frances	ON	11	10	-1
Hamilton	ON	10	7	-3
Hastings	ON	11	10	1
Hornepayne	ON	15	14	-1
Kitchener	ON	11	10	-1
Mattawa	ON	11	10	-1
Mississauga	ON	10	7	-3
Mississauga (Lester B. Pearson Int'l Airport)	ON	10	7	-3
Newmarket	ON	11	10	-1
Oakville	ON	10	7	-3
Peterborough	ON	11	10	-1
Picton	ON	11	10	-1
Sarnia	ON	10	7	-3
Schreiber	ON	15	14	-1
Shelburne	ON	14	13	-1
Etobicoke	ON	10	7	-3
Vaughan (Woodbridge)	ON	10	7	-3
Waterloo	ON	11	10	-1
Wawa	ON	15	14	-1
Alma	QC	15	14	-1
Amos	QC	14	13	-1
Baie-Saint-Paul	QC	16	15	-1
Beauport	QC	16	15	-1
Dolbeau	QC	15	14	-1

Location	Province	Required Number of Nails (Part 4 Design)	Required Number of Nails (Part 4 Design)	Additional Nails Required
		NBC 2020	PCF 2048	
Gagnon	QC	18	17	-1
Gaspé	QC	19	18	-1
Havre-Saint-Pierre	QC	18	17	-1
Inukjuak	QC	16	15	-1
Joliette	QC	14	13	-1
Kuujuarapik	QC	17	16	-1
La Malbaie	QC	15	14	-1
La Tuque	QC	15	14	-1
Loretteville	QC	17	16	-1
Malartic	QC	14	13	-1
Matane	QC	16	15	-1
Montmagny	QC	14	13	-1
Nitchequon	QC	15	13	-2
Noranda	QC	14	13	-1
Port-Cartier	QC	17	16	-1
Puvirnituq	QC	17	16	-1
Ancienne-Lorette	QC	16	15	-1
Lévis	QC	16	15	-1
Québec	QC	16	15	-1
Sainte-Foy	QC	17	16	-1
Sillery	QC	15	14	-1
Roberval	QC	15	14	-1
Rock Island	QC	11	10	-1
Rouyn	QC	13	12	-1
Saguenay (Jonquière)	QC	14	13	-1
Saguenay (Kénogami)	QC	14	13	-1
Sainte-Agathe-des-Monts	QC	15	14	-1
Saint-Félicien	QC	15	14	-1
Saint-Hubert-de-Rivière-du-Loup	QC	19	18	-1
Saint-Nicolas	QC	16	15	-1
Senneterre	QC	14	13	-1
Shawinigan	QC	14	13	-1
Tadoussac	QC	16	15	-1
Val-d'Or	QC	14	13	-1
Victoriaville	QC	14	13	-1
Bathurst	NB	18	17	-1
Edmundston	NB	16	15	-1
Miramichi	NB	16	15	-1
Moncton	NB	15	14	-1
Shippagan	NB	16	15	-1

Location	Province	Required Number of Nails (Part 4 Design)	Required Number of Nails (Part 4 Design)	Additional Nails Required
		NBC 2020	PCF 2048	
Buchans	NL	20	19	-1
Corner Brook	NL	17	16	-1
Gander	NL	17	16	-1
Grand Falls	NL	16	15	-1
Labrador City	NL	18	17	-1
St. Anthony	NL	24	23	-1
Twin Falls	NL	19	18	-1
Wabana	NL	15	16	1
Wabush	NL	18	17	-1
Tungsten	NT	16	17	1
Arctic Bay	NU	10	11	1
Baker Lake	NU	14	15	1
Eureka	NU	7	10	3
Igluligaarjuk / Chesterfield Inlet	NU	14	16	2
Kanngiqtugaapik / Clyde River	NU	16	17	1
Kugluktuk / Coppermine	NU	13	14	1
Resolution Island	NU	20	21	1
Salliq / Coral Harbour	NU	15	16	1

ICF lintels (Sentence 9.20.17.4.(3) and Span Tables 9.20.17.4.-A, 9.20.17.4.-B and 9.20.17.4.-C)

To assess the cost impact of the proposed change on insulating concrete form (ICF) lintels, an approximate 120 m² bungalow is used assuming 150 mm thick ICF walls (see Figure 1 above).

The three largest windows with openings of 2.4 m, 1.8 m and 1.4 m along with patio door and front entrance door, both of equal to or similar size opening to the window opening sizes, are analysed. ICF lintel sizes before and after the proposed change were determined using the ICF span tables in the NBC and using lintel span tables from an ICF manufacturer where the ground snow load, S_s , is more than 3.33 kPa (the upper limit of the ICF span tables in the NBC). Where the ground snow load exceeds 5.15 kPa, the size of lintels was not determined.

In locations where the ground snow load before and after the proposed change remains below or equal to 1.5 kPa, there will be no impact. This occurs in only 6 locations. In locations where the ICF lintel size is sufficient to support the snow load before and after the change, there will be no impact. This occurs in 105 out of the 680 locations in Table C-2 of PCF 1979. Sixty-two (62) locations have a ground snow load that exceeds both the span tables in the NBC and those provided by an ICF manufacturer. In these locations, concrete beam design using Part 4 is needed, which likely requires a structural engineer and additional material and labour costs.

For the remaining 507 locations not accounted for above, the proposed change results in an increased cost for the ICF lintels between **\$6.71** to **\$88.46** for a 120 m² bungalow with 150 mm thick ICF walls.

Spans for joists, rafters and beams (Sentence 9.23.4.2.(1))

As per above, to assess the impact of the future projected climatic data on the span tables (roof joists, roof rafters, built-up ridge beams and lintels) in Part 9 an approximate 120 m² bungalow is used (refer to Figure 1). Each of the span tables for wood members supporting snow loads provide member sizes for specified snow loads of 1.0 kPa, 1.5 kPa, 2.0 kPa, 2.5 kPa, 3.0 kPa; and, 3.5 kPa and 4.0 kPa by way of an appendix note. For locations where the specified snow load before and after the change remains between the same range (e.g., between 1.0 kPa and 1.5 kPa), there is no impact. This the case for 589 locations out of the 680 locations in Table C-2 of PCF 1979.

The impact of the proposed change on roof joists, roof rafters, built-up ridge beams and lintels, for the remaining 91 locations are summarized below.

Roof joists (Span Tables 9.23.4.2.-D and 9.23.4.2.-E)

Ten of the of the 91 locations experience a cost increase of approximately \$1,850.00, while 39 locations experience a cost decrease of the same amount (see Table below). Thirty-seven locations do not experience an impact because the same roof joist size is sufficient before and after the proposed change, based on the spans used in the archetype. Five locations have a specified snow load that exceeds 4.0 kPa and cannot use the span tables to determine the size of roof joists required either before or after the proposed change, so the cost impact was not determined for these locations.

Location	Province	Cost	Cost	Cost Difference
		NBC 2020	PCF 2048	
Bamfield	BC	\$6,725.16	\$8,579.88	\$1,854.72
Burns Lake	BC	\$10,429.56	\$8,579.88	-\$1,849.68
Campbell River	BC	\$8,579.88	\$10,429.56	\$1,849.68
Greenwood	BC	\$10,429.56	\$8,579.88	-\$1,849.68
Mackenzie	BC	\$12,164.01	\$10,429.56	-\$1,734.45
Ocean Falls	BC	\$10,429.56	\$12,164.01	\$1,734.45
Port Hardy	BC	\$6,725.16	\$8,579.88	\$1,854.72
Prince George	BC	\$10,429.56	\$8,579.88	-\$1,849.68
Salmon Arm	BC	\$10,429.56	\$8,579.88	-\$1,849.68
Smithers	BC	\$10,429.56	\$8,579.88	-\$1,849.68
Ucluelet	BC	\$6,725.16	\$8,579.88	\$1,854.72
North Vancouver	BC	\$8,579.88	\$10,429.56	\$1,849.68
Cold Lake	AB	\$8,579.88	\$6,725.16	-\$1,854.72
Assiniboia	SK	\$6,725.16	\$8,579.88	\$1,854.72
Broadview	SK	\$8,579.88	\$6,725.16	-\$1,854.72
Dafoe	SK	\$8,579.88	\$6,725.16	-\$1,854.72
Estevan	SK	\$6,725.16	\$8,579.88	\$1,854.72
Meadow Lake	SK	\$8,579.88	\$6,725.16	-\$1,854.72
Melville	SK	\$8,579.88	\$6,725.16	-\$1,854.72
Bancroft	ON	\$10,429.56	\$8,579.88	-\$1,849.68
Bracebridge	ON	\$10,429.56	\$8,579.88	-\$1,849.68

Location	Province	Cost	Cost	Cost
		NBC 2020	PCF 2048	Difference
Burlington	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Earlton	ON	\$10,429.56	\$8,579.88	-\$1,849.68
Hamilton	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Mississauga	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Mississauga (Lester B. Pearson Int'l Airport)	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Oakville	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Sarnia	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Timmins	ON	\$10,429.56	\$8,579.88	-\$1,849.68
Etobicoke	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Vaughan (Woodbridge)	ON	\$8,579.88	\$6,725.16	-\$1,854.72
Amos	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Malartic	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Montmagny	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Nitchequon	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Noranda	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Rouyn	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Saguenay (Jonquière)	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Saguenay (Kénogami)	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Saint-Hubert-de-Rivière-du-Loup	QC	\$12,164.01	\$10,429.56	-\$1,734.45
Senneterre	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Shawinigan	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Val-d'Or	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Victoriaville	QC	\$10,429.56	\$8,579.88	-\$1,849.68
Argentia	NL	\$10,429.56	\$8,579.88	-\$1,849.68
Grand Bank	NL	\$10,429.56	\$8,579.88	-\$1,849.68
Twin Falls	NL	\$12,164.01	\$10,429.56	-\$1,734.45
Eureka	NU	\$6,725.16	\$8,579.88	\$1,854.72
Kugluktuk / Coppermine	NU	\$8,579.88	\$10,429.56	\$1,849.68

Roof rafters (Span Tables 9.23.4.2.-F and 9.23.4.2.-G)

Sixteen of the 91 locations experience an increase in roof rafter costs between **\$255.30** and **\$1,342.89** and 44 locations experience a decrease in roof rafter costs between **\$255.30** and **\$1,342.89** (see Table below). Twenty-six additional locations are not impacted because the size of the roof rafters is sufficient before and after the proposed change, based on the spans used in the archetype. Five locations have a specified snow load that exceeds 4.0 kPa and cannot use the span tables to determine the size of roof rafters required either before or after the proposed change, so the cost impact was not determined for these locations.

Province and Location	Province	Cost	Cost	Cost
		NBC 2020	PCF 2048	Difference
Abbotsford	BC	\$5,082.92	\$6,425.81	\$1,342.89
Bamfield	BC	\$4,827.62	\$5,082.92	\$255.30
Chetwynd	BC	\$6,425.81	\$5,082.92	-\$1,342.89
Dease Lake	BC	\$6,425.81	\$5,082.92	-\$1,342.89
Mackenzie	BC	\$8,262.36	\$7,768.70	-\$493.66
McBride	BC	\$7,768.70	\$6,425.81	-\$1,342.89
Nakusp	BC	\$7,768.70	\$6,425.81	-\$1,342.89
Ocean Falls	BC	\$7,768.70	\$8,262.36	\$493.66
Parksville	BC	\$5,082.92	\$6,425.81	\$1,342.89
Port Hardy	BC	\$4,827.62	\$5,082.92	\$255.30
Qualicum Beach	BC	\$5,082.92	\$6,425.81	\$1,342.89
Sandspit	BC	\$5,082.92	\$6,425.81	\$1,342.89
Sechelt	BC	\$5,082.92	\$6,425.81	\$1,342.89
Smith River	BC	\$6,425.81	\$5,082.92	-\$1,342.89
Ucluelet	BC	\$4,827.62	\$5,082.92	\$255.30
New Westminster	BC	\$5,082.92	\$6,425.81	\$1,342.89
Victoria (Mt Tolmie)	BC	\$5,082.92	\$6,425.81	\$1,342.89
Cold Lake	AB	\$5,082.92	\$4,827.62	-\$255.30
Hinton	AB	\$6,425.81	\$5,082.92	-\$1,342.89
Assiniboia	SK	\$4,827.62	\$5,082.92	\$255.30
Broadview	SK	\$5,082.92	\$4,827.62	-\$255.30
Dafoe	SK	\$5,082.92	\$4,827.62	-\$255.30
Estevan	SK	\$4,827.62	\$5,082.92	\$255.30
Meadow Lake	SK	\$5,082.92	\$4,827.62	-\$255.30
Melville	SK	\$5,082.92	\$4,827.62	-\$255.30
Lynn Lake	MB	\$6,425.81	\$5,082.92	-\$1,342.89
Split Lake	MB	\$6,425.81	\$5,082.92	-\$1,342.89
Thompson	MB	\$6,425.81	\$5,082.92	-\$1,342.89
Barriefield	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Bradford	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Burlington	ON	\$5,082.92	\$4,827.62	-\$255.30
Cornwall	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Fort Frances	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Gananoque	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Hamilton	ON	\$5,082.92	\$4,827.62	-\$255.30
Kingston	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Mattawa	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Mississauga	ON	\$5,082.92	\$4,827.62	-\$255.30
Mississauga (Lester B. Pearson Int'l Airport)	ON	\$5,082.92	\$4,827.62	-\$255.30
North Bay	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Norwood	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Oakville	ON	\$5,082.92	\$4,827.62	-\$255.30

Province and Location	Province	Cost	Cost	Cost Difference
		NBC 2020	PCF 2048	
Sarnia	ON	\$5,082.92	\$4,827.62	-\$255.30
Tavistock	ON	\$6,425.81	\$5,082.92	-\$1,342.89
Etobicoke	ON	\$5,082.92	\$4,827.62	-\$255.30
Vaughan (Woodbridge)	ON	\$5,082.92	\$4,827.62	-\$255.30
Kuujuarapik	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Loretteville	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Québec	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Sainte-Foy	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Rivière-du-Loup	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Saint-Hubert-de-Rivière-du-Loup	QC	\$8,262.36	\$7,768.70	-\$493.66
Saint-Nicolas	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Thetford Mines	QC	\$7,768.70	\$6,425.81	-\$1,342.89
Boiestown	NB	\$7,768.70	\$6,425.81	-\$1,342.89
Grand Falls	NB	\$7,768.70	\$6,425.81	-\$1,342.89
Twin Falls	NL	\$8,262.36	\$7,768.70	-\$493.66
Tungsten	NT	\$6,425.81	\$7,768.70	\$1,342.89
Arctic Bay	NU	\$5,082.92	\$6,425.81	\$1,342.89
Eureka	NU	\$4,827.62	\$5,082.92	\$255.30

Built-up ridge beams and lintels supporting the roof (Span Table 9.23.4.2.-L)

Seventeen out of the 91 locations experience an increase in built-up ridge beam costs between \$140.24 and \$262.66 and 53 locations experience a decrease in cost between \$140.24 and \$262.66 (see Table below). Twelve locations are not impacted because the size of the built-up ridge beam is sufficient before and after the proposed change, based on the archetype and assuming the 14.3 m long built-up ridge beam is supported every 2.86 m. Nine locations have a specified snow load that exceeds 3.0 kPa and cannot use the span tables to determine the size of the built-up ridge beam required either before or after the proposed change, so the cost impact was not determined for these locations.

Location	Province	Cost	Cost	Difference
		NBC 2020	PCF 2048	
Abbotsford	BC	\$645.40	\$908.06	\$262.66
Bamfield	BC	\$505.16	\$645.40	\$140.24
Burns Lake	BC	\$1,061.91	\$908.06	-\$153.85
Campbell River	BC	\$908.06	\$1,061.91	\$153.85
Chetwynd	BC	\$908.06	\$645.40	-\$262.66
Dease Lake	BC	\$908.06	\$645.40	-\$262.66
Greenwood	BC	\$1,061.91	\$908.06	-\$153.85
Parksville	BC	\$645.40	\$908.06	\$262.66
Port Hardy	BC	\$505.16	\$645.40	\$140.24

Location	Province	Cost	Cost	Difference
		NBC 2020	PCF 2048	
Prince George	BC	\$1,061.91	\$908.06	-\$153.85
Qualicum Beach	BC	\$645.40	\$908.06	\$262.66
Salmon Arm	BC	\$1,061.91	\$908.06	-\$153.85
Sandspit	BC	\$645.40	\$908.06	\$262.66
Sechelt	BC	\$645.40	\$908.06	\$262.66
Smithers	BC	\$1,061.91	\$908.06	-\$153.85
Smith River	BC	\$908.06	\$645.40	-\$262.66
Ucluelet	BC	\$505.16	\$645.40	\$140.24
New Westminster	BC	\$645.40	\$908.06	\$262.66
North Vancouver	BC	\$908.06	\$1,061.91	\$153.85
Victoria (Mt Tolmie)	BC	\$645.40	\$908.06	\$262.66
Cold Lake	AB	\$645.40	\$505.16	-\$140.24
Hinton	AB	\$908.06	\$645.40	-\$262.66
Assiniboia	SK	\$505.16	\$645.40	\$140.24
Broadview	SK	\$645.40	\$505.16	-\$140.24
Dafoe	SK	\$645.40	\$505.16	-\$140.24
Estevan	SK	\$505.16	\$645.40	\$140.24
Meadow Lake	SK	\$645.40	\$505.16	-\$140.24
Melville	SK	\$645.40	\$505.16	-\$140.24
Lynn Lake	MB	\$908.06	\$645.40	-\$262.66
Split Lake	MB	\$908.06	\$645.40	-\$262.66
Thompson	MB	\$908.06	\$645.40	-\$262.66
Bancroft	ON	\$1,061.91	\$908.06	-\$153.85
Barrie/field	ON	\$908.06	\$645.40	-\$262.66
Bracebridge	ON	\$1,061.91	\$908.06	-\$153.85
Bradford	ON	\$908.06	\$645.40	-\$262.66
Burlington	ON	\$645.40	\$505.16	-\$140.24
Cornwall	ON	\$908.06	\$645.40	-\$262.66
Earlton	ON	\$1,061.91	\$908.06	-\$153.85
Fort Frances	ON	\$908.06	\$645.40	-\$262.66
Gananoque	ON	\$908.06	\$645.40	-\$262.66
Hamilton	ON	\$645.40	\$505.16	-\$140.24
Kingston	ON	\$908.06	\$645.40	-\$262.66
Mattawa	ON	\$908.06	\$645.40	-\$262.66
Mississauga	ON	\$645.40	\$505.16	-\$140.24
Mississauga (Lester B. Pearson Int'l Airport)	ON	\$645.40	\$505.16	-\$140.24
North Bay	ON	\$908.06	\$645.40	-\$262.66
Norwood	ON	\$908.06	\$645.40	-\$262.66
Oakville	ON	\$645.40	\$505.16	-\$140.24
Sarnia	ON	\$645.40	\$505.16	-\$140.24

Location	Province	Cost NBC 2020	Cost PCF 2048	Difference
Tavistock	ON	\$908.06	\$645.40	-\$262.66
Timmins	ON	\$1,061.91	\$908.06	-\$153.85
Etobicoke	ON	\$645.40	\$505.16	-\$140.24
Vaughan (Woodbridge)	ON	\$645.40	\$505.16	-\$140.24
Amos	QC	\$1,061.91	\$908.06	-\$153.85
Malartic	QC	\$1,061.91	\$908.06	-\$153.85
Montmagny	QC	\$1,061.91	\$908.06	-\$153.85
Nitchequon	QC	\$1,061.91	\$908.06	-\$153.85
Noranda	QC	\$1,061.91	\$908.06	-\$153.85
Rouyn	QC	\$1,061.91	\$908.06	-\$153.85
Saguenay (Jonquière)	QC	\$1,061.91	\$908.06	-\$153.85
Saguenay (Kénogami)	QC	\$1,061.91	\$908.06	-\$153.85
Senneterre	QC	\$1,061.91	\$908.06	-\$153.85
Shawinigan	QC	\$1,061.91	\$908.06	-\$153.85
Val-d'Or	QC	\$1,061.91	\$908.06	-\$153.85
Victoriaville	QC	\$1,061.91	\$908.06	-\$153.85
Argentia	NL	\$1,061.91	\$908.06	-\$153.85
Grand Bank	NL	\$1,061.91	\$908.06	-\$153.85
Arctic Bay	NU	\$645.40	\$908.06	\$262.66
Eureka	NU	\$505.16	\$645.40	\$140.24
Kugluktuk / Coppermine	NU	\$908.06	\$1,061.91	\$153.85

Lintels for various wood species (Span Tables 9.23.12.3.-A, 9.23.12.3.-B, 9.23.12.3.-C and 9.23.12.3.-D)

The archetype bungalow includes six different opening sizes for the front entrance door, rear patio door, rear garage entrance door and the 8 windows.

Eighteen of the 91 locations experience a lintel cost increase between \$32.13 and \$84.47 and 64 locations experience a cost decrease between \$32.13 and \$84.47 (see Table below) as a result of the proposed change, based on the archetype. Nine locations have a specified snow load that exceeds 3.0 kPa and cannot use the span tables to determine the size of the lintel required either before or after the proposed change, so the cost impact was not determined for these locations.

Province and Location	Province	Cost Difference
Abbotsford	BC	\$32.13
Bamfield	BC	\$41.82
Burns Lake	BC	-\$53.88
Campbell River	BC	\$53.88
Chetwynd	BC	-\$32.13
Dease Lake	BC	-\$32.13

Province and Location	Province	Cost Difference
Greenwood	BC	-\$53.88
McBride	BC	-\$84.47
Nakusp	BC	-\$84.47
Parksville	BC	\$32.13
Port Hardy	BC	\$41.82
Prince George	BC	-\$53.88
Qualicum Beach	BC	\$32.13
Salmon Arm	BC	-\$53.88
Sandspit	BC	\$32.13
Sechelt	BC	\$32.13
Smithers	BC	-\$53.88
Smith River	BC	-\$32.13
Ucluelet	BC	\$41.82
New Westminster	BC	\$32.13
North Vancouver	BC	\$53.88
Victoria (Mt Tolmie)	BC	\$32.13
Cold Lake	AB	-\$41.82
Hinton	AB	-\$32.13
Assiniboia	SK	\$41.82
Broadview	SK	-\$41.82
Dafoe	SK	-\$41.82
Estevan	SK	\$41.82
Meadow Lake	SK	-\$41.82
Melville	SK	-\$41.82
Lynn Lake	MB	-\$32.13
Split Lake	MB	-\$32.13
Thompson	MB	-\$32.13
Bancroft	ON	-\$53.88
Barriefield	ON	-\$32.13
Bracebridge	ON	-\$53.88
Bradford	ON	-\$32.13
Burlington	ON	-\$41.82
Cornwall	ON	-\$32.13
Earlton	ON	-\$53.88
Fort Frances	ON	-\$32.13
Gananoque	ON	-\$32.13
Hamilton	ON	-\$41.82
Kingston	ON	-\$32.13
Mattawa	ON	-\$32.13
Mississauga	ON	-\$41.82
Mississauga (Lester B. Pearson Int'l Airport)	ON	-\$41.82
North Bay	ON	-\$32.13
Norwood	ON	-\$32.13

Province and Location	Province	Cost Difference
Oakville	ON	-\$41.82
Sarnia	ON	-\$41.82
Tavistock	ON	-\$32.13
Timmins	ON	-\$53.88
Etobicoke	ON	-\$41.82
Vaughan (Woodbridge)	ON	-\$41.82
Amos	QC	-\$53.88
Kuujuarapik	QC	-\$84.47
Loretteville	QC	-\$84.47
Malartic	QC	-\$53.88
Montmagny	QC	-\$53.88
Nitchequon	QC	-\$53.88
Noranda	QC	-\$53.88
Québec	QC	-\$84.47
Sainte-Foy	QC	-\$84.47
Rivière-du-Loup	QC	-\$84.47
Rouyn	QC	-\$53.88
Saguenay (Jonquière)	QC	-\$53.88
Saguenay (Kénogami)	QC	-\$53.88
Saint-Nicolas	QC	-\$84.47
Senneterre	QC	-\$53.88
Shawinigan	QC	-\$53.88
Thetford Mines	QC	-\$84.47
Val-d'Or	QC	-\$53.88
Victoriaville	QC	-\$53.88
Boiestown	NB	-\$84.47
Grand Falls	NB	-\$84.47
Argentia	NL	-\$53.88
Grand Bank	NL	-\$53.88
Tungsten	NT	\$84.47
Arctic Bay	NU	\$32.13
Eureka	NU	\$41.82
Kugluktuk / Coppermine	NU	\$53.88

Hourly wind pressures

The new 1-in-500-year hourly wind pressure data results in a change in hourly wind pressures in all 680 locations in Table C-2 of PCF 1979. However, to align the new return period with the prescriptive solutions existing in Part 9, the proposed change, PCF 2048, introduces a new equation to determine the “reference hourly wind pressure”. The reference hourly wind pressure is the 1-in-500-year hourly wind pressure divided by 1.4. The reference hourly wind pressure is proposed to replace the existing 1-in-50-year hourly wind pressure and when comparing the two, the data still increase for most of the 680 locations, but decreases for 6 locations and remains the same in 8 locations. The order of magnitude for the increase in data is 0.8% to 11.4%.

Structural sufficiency of glass (Sentence 9.6.1.3.(2))

To assess the impact of the proposed change on the structural sufficiency of glass, a 128.5 m², two storey detached home is used as the archetype (see Figure 2). The detached home contains five different sized windows with glass areas between 0.57 m² and 1.43 m².

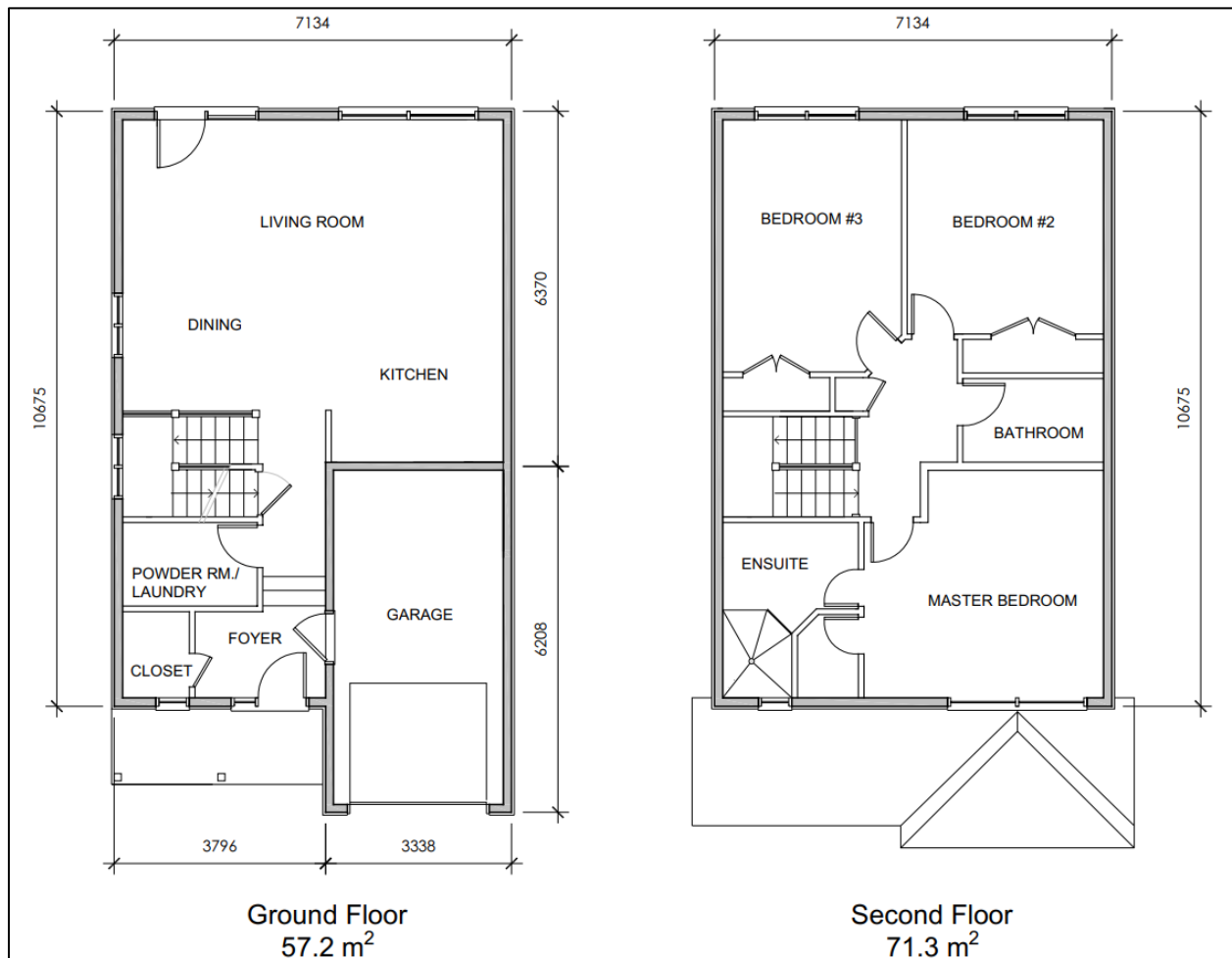


Figure 2 – 128.5 m², 2-storey detached house archetype

Tables 9.6.1.3.-A, 9.6.1.3.-B and 9.6.1.3. provide the maximum glass area for windows in locations in Table C-2 with 1-in-50 hourly wind pressures of less than 0.55 kPa, less than 0.75 kPa and less than 1.0 kPa, respectively. For the impact analysis, factory-sealed insulated glass (IG) units are assumed.

For locations where the reference hourly wind pressures remain below the maximum limits provided in the tables before and after the change, there will be no impact. This is the case for 620 out of 680 locations in Table C-2 of PCF 1979. For the remaining 60 locations, there is potential impact. Three locations—Cowley, AB; Cape Race, NL; and Resolution Island, NU—have a reference hourly wind pressure, before and after the proposed change, that exceeds the maximum value of 1.0 kPa provided in the prescriptive table in the NBC. These locations would need to consult the window manufacturer for glass thickness. For the remaining 57 locations out of 60, the proposed change results in an increased cost for windows between **\$126.98** to **\$353.51** (see Table below) for the 128.5 m², 2-storey detached archetype.

Province and Location	Province	Cost Difference
Agassiz	BC	\$126.98
Bamfield	BC	\$126.98
Prince Rupert	BC	\$126.98
Squamish	BC	\$126.98
Tofino	BC	\$353.51
Ucluelet	BC	\$353.51
Battrum	SK	\$126.98
Estevan	SK	\$126.98
Moose Jaw	SK	\$126.98
Swift Current	SK	\$126.98
Boissevain	MB	\$126.98
Morden	MB	\$126.98
Ailsa Craig	ON	\$126.98
Ajax	ON	\$126.98
Brighton	ON	\$126.98
Centralia	ON	\$126.98
Cobourg	ON	\$126.98
Colborne	ON	\$126.98
Embro	ON	\$126.98
Exeter	ON	\$126.98
Forest	ON	\$126.98
Goderich	ON	\$126.98
Ingersoll	ON	\$126.98
Kincardine	ON	\$126.98
Lion's Head	ON	\$126.98
Lucan	ON	\$126.98
Mississauga (Port Credit)	ON	\$126.98
Nanticoke (Jarvis)	ON	\$126.98
Nanticoke (Port Dover)	ON	\$126.98

Province and Location	Province	Cost Difference
Newcastle	ON	\$126.98
Newcastle (Bowmanville)	ON	\$126.98
Oshawa	ON	\$126.98
Parkhill	ON	\$126.98
Pickering (Dunbarton)	ON	\$126.98
Picton	ON	\$126.98
Port Elgin	ON	\$126.98
Port Hope	ON	\$126.98
Southampton	ON	\$126.98
Thamesford	ON	\$126.98
Theford	ON	\$126.98
Whitby	ON	\$126.98
Mont-Joli	QC	\$126.98
Port-Cartier	QC	\$126.98
Rimouski	QC	\$126.98
Sept-Îles	QC	\$126.98
Tadoussac	QC	\$126.98
Moncton	NB	\$126.98
Sackville	NB	\$126.98
Saint John	NB	\$126.98
Antigonish	NS	\$126.98
Greenwood (CFB)	NS	\$126.98
Kentville	NS	\$126.98
Stewiacke	NS	\$126.98
Wolfville	NS	\$126.98
Grand Bank	NL	\$353.51
Echo Bay / Port Radium	NT	\$126.98
Baker Lake	NU	\$126.98

Nailing of framing – roof trusses, rafters and joists to wall framing (Sentence 9.23.3.4.(3))

To assess the impact of the proposed change on the nailing of framing, specifically for roof truss, rafter or joist connections to wall framing, a 120 m² bungalow is used as the archetype (see Figure 1 above).

Currently, where the 1-in-50-year hourly wind pressure is equal to or exceeds 0.8 kPa, roof trusses, rafters or joists are required to be tied to wall framing with connectors that can resist 3 kilonewtons (kN) of roof uplift. Galvanized-steel straps that are 50 mm wide, no less than 0.91 mm thick and allow for fastening at each end with four 63 mm nails are deemed to comply with the roof uplift requirement.

Currently, there are 7 locations out of 680 locations in Table C-2 with a 1-in-50 hourly wind pressure and reference hourly wind pressure that is equal to or exceeds 0.80 kPa. As a result of the climatic data in PCF 1979 and revised requirements in PCF 2048, 2 additional locations would exceed 0.80 kPa.

Using the 120m² bungalow archetype, the number of required galvanized-steel connectors are calculated to be approximately 72, resulting in a cost increase for these 2 new locations of **\$437.04** (see Table below).

Province and Location	Province	Total Cost Increase
Channel-Port aux Basques	NL	\$437.04
St. John's	NL	

Fasteners for sheathing (Article 9.23.3.5.)

To assess the impact of the proposed change on fastening of both roof and wall sheathing, the 128.5 m², 2-storey detached house (see Figure 2) is used as an archetype.

Currently, the NBC provides three prescriptive tables to determine fastener size and spacing for sheathing. Application of each table depends on the 1-in-50-year hourly wind pressure and seismic spectral acceleration in a given location. For location where the 1-in-50-year hourly wind pressure is less than 0.8 kPa requirement for fasteners are less stringent than locations with a 1-in-50-year hourly wind pressure that is equal to or exceeds 0.8 kPa.

For locations where the 1-in-50-year hourly wind pressure and the reference hourly wind pressure are both below 0.8 kPa, there will be no impact. This is the case for 671 out of 680 locations. As noted above, there are 7 locations with a 1-in-50 hourly wind pressure (NBC 2020) and reference hourly wind pressure (PCF 1980 and 2048) that is equal to or exceeds 0.80 kPa so there will be no impact in these locations. However, the same 2 locations noted above will exceed 0.8 kPa as a result of PCF 2048 and the data in PCF 1979 and could experience cost increases for both roof and wall sheathing fasteners.

Roof sheathing

As a result of the proposed change, roof sheathing in the 2 new locations would now require larger size fasteners and fasteners spaced at 50 mm within 1 m of the roof edge. For the cost impact analysis common wire nails are assumed. Based on the increase in nail size (51 mm to 63 mm), additional fasteners at the edge of the roof and the size of the archetype roof, a cost increase of **\$468.68** is estimated for the 6 new locations (see Table below).

Province and Location	Province	Total Cost Increase
Channel-Port aux Basques	NL	\$468.68
St. John's	NL	

Wall sheathing

The impact of the proposed change on fasteners for wall sheathing occurs when braced wall panels are required per Subsection 9.23.13 in the NBC. Similar to the prescriptive tables for roof sheathing, a 1-in-50-year hourly wind pressure of 0.8 kPa acts as a threshold for when braced wall panels with wood-based wall sheathing are required. As a result of the future projected climate data, the same 2 locations

identified above will need to follow the NBC requirements for high wind forces (Article 9.23.13.2.) resulting in a cost increase of **\$1,125.30** (see Table below).

To determine the above cost impact, the length of braced wall panels is calculated for the 128.5 m² 2-storey detached archetype using the braced wall panel spacing and length requirements in Table 9.23.13.5. A total length of 28.2 m is calculated. For the cost assessment, it is assumed that the archetype is constructed without wood-based exterior sheathing (e.g., sheathed with rigid insulation) before the proposed change and now requires some percentage of wood-based sheathing at exterior wall and the interior, end garage wall. In this case, the cost impact is dictated by the requirement for wood-based sheathing (11 mm thick OSB assumed), which requires specific size and spacing of wall sheathing fasteners.

Province and Location	Province	Total Cost Increase
Channel-Port aux Basques	NL	\$1,125.30
St. John's	NL	

Anchorage of building frames (Sentence 9.23.6.1.(3))

Similar to the fasteners for wall sheathing, a cost increase for anchorage of building frames is dictated by the need for braced wall panels when the 1-in-50-year hourly wind pressure exceeds 0.8 kPa, which is the case for the 2 new locations noted above. The spacing and length of braced wall panels is calculated as described above. Sentence 9.23.6.1.(3) requires that two anchor be provided for each braced wall panel and that the anchor bolts are either 15.9 mm diameter spaced at 2.4 m or 12.7 mm diameter spaced at 1.7 m. Between braced wall panels the regular requirement for 12.7 mm diameter anchor bolts at 2.4 m is maintained.

For the cost assessment, braced wall panel anchorage with 12.7 mm diameter anchor bolts at 1.7 m is used. As a result of the future projected climatic data in PCF 1979 and the need for braced wall panels, the number of anchor bolts is estimated to increase by 15 for a total cost increase of **\$94.20** in the 2 new locations noted (see Table below).

Province and Location	Province	Total Cost Increase
Channel-Port aux Basques	NL	\$94.20
St. John's	NL	

Required roof sheathing (Sentence 9.23.16.1.(1))

To assess the impact of the proposed change on required roof sheathing, the 128.5 m² 2-storey detached bungalow is used. It is assumed that trusses are spaced at 600 mm and before the proposed change the roof is sheathed with panel-type material that would not comply with Subsection 9.23.16. (i.e., sheathing that is too thin for the truss spacing—7.5 mm plywood).

Sentence 9.23.16.1. requires that continuous lumber or panel-type roof sheathing be installed to support the roofing when the 1-in-50 hourly wind pressure is equal to or exceeds 0.8 kPa. Similar to above, 2 locations would be impacted by the change to reference hourly wind pressure and increases in

data and would be required to follow the roof sheathing requirements in Subsection 9.23.16. For this cost assessment, 9.5 mm plywood sheathing, supported at edges, to comply with Subsection 9.23.16. The resulting cost increase from a sheathing that would be deemed to thin for the truss spacing in Sentence 9.23.16.7.(2) to a compliant plywood sheathing is approximately **\$168.82**.

Province and Location	Province	Total Cost Increase
Channel-Port aux Basques	NL	\$168.82
St. John's	NL	

Lumber roof sheathing (Article 9.23.16.5.)

To assess the impact of the proposed change on lumber roof sheathing the roof area of the 128.5 m², 2-storey detached archetype is used.

Currently, Sentence 9.23.16.5. requires that lumber roof sheathing be installed diagonally when the 1-in-50-year hourly wind pressure is equal to or exceeds 0.8 kPa. Therefore, the same 2 locations will be impacted by a change to reference hourly wind pressure and increase above 0.8 kPa as a result of PCF 2048. The cost impact for lumber roof sheathing in these 2 locations is approximately **\$311.67** and represents the difference between installing lumber roof sheathing horizontally versus diagonally.

Province and Location	Province	Total Cost Increase
Channel-Port aux Basques	NL	\$311.67
St. John's	NL	

Attachment of cladding to flat ICF wall units (Sentence 9.27.5.4.(2))

To assess the impact of the proposed change on the attachment of cladding to flat wall insulating concrete form (ICF) units, the 128.5m², 2-storey detached archetype is used. Sentence 9.27.5.4.(2) and Table 9.27.5.4.-B provide the screw size and spacing requirements for the attachment of cladding, trim and furring members to the web fastening strips of flat wall ICF and, currently, limits the application to locations where the 1-in-50-year hourly wind pressure is equal to or less than 0.60 kPa.

For the impact analysis, it is assumed that the cladding is attached to furring that is attached to either the flat wall ICF web fastening strips when permitted or to the solid concrete core of the ICF where the 1-in-50-year hourly wind pressure or the reference hourly wind pressure exceeds 0.6 kPa.

For locations where the 1-in-50-year hourly wind pressure and the reference hourly wind pressure are equal to or less than 0.6 kPa, there will be no impact. This is the case for locations in 619 out of the 680 locations in Table C-2 of PCF 1979. For the remaining 61 locations there is potential impact requiring further assessment.

For locations where the 1-in-50-year hourly wind pressure and reference hourly wind pressure is greater than 0.6 kPa, the impact is assumed to be minimal and would account for additional fasteners. This is the case for 34 of the remaining 61 locations.

The greatest impact is assumed to occur when the 1-in-50-year hourly wind pressure is equal to or less than 0.60 kPa and the reference hourly wind pressure is more than 0.6 kPa. This is the case for 27 locations. The resulting cost increase in these locations for the attachment of cladding to flat ICF walls is approximately **\$2,009.15** (see Table below), which represents the different material costs for fasteners into concrete and the additional labour and reduced daily output to attach the furring through the flat wall ICF units into the solid concrete backup wall.

Province and Location	Province	Cost Difference for Strapping
Ocean Falls	BC	\$2,009.15
Claresholm	AB	
Kuujuuaq	QC	
Puvirnituq	QC	
Bridgewater	NS	
Digby	NS	
Dartmouth	NS	
Halifax	NS	
Lockeport	NS	
New Glasgow	NS	
North Sydney	NS	
Pictou	NS	
Sydney	NS	
Tatamagouche	NS	
Yarmouth	NS	
Charlottetown	PE	
Souris	PE	
Summerside	PE	
Buchans	NL	
Cape Harrison	NL	
Gander	NL	
Grand Falls	NL	
Stephenville	NL	
Destruction Bay	YT	
Mould Bay	NT	
Isachsen	NU	
Kangiqiniq / Rankin Inlet	NU	

Impact of PCF 2048 on major city centres in each province/territory.

As provided herein, not all locations for each requirement that includes reference to specified snow loads or hourly wind pressures are impacted by the change in return periods. In some cases, major Canadian cities are not impacted by the proposed change. Appendix A provides a table summarizing the results of the cost impact analysis detailed herein for major city centres in each province/territory.

Appendix A

Impact of PCF 2048 on major city centres in each province/territory.

			Climatic Data						Requirements using Snow Loads							
			Snow Load, kPa 1/50 Ss	Snow Load, kPa 1/50 Ss	Specified Snow Load (Part 9) S = CbSs + Sr	Specified Snow Load (Part 9) S = CbSs + Sr	Hourly Wind Pressure 1/50 (kPa)	Hourly Wind Pressure 1/50 (kPa)	Impact on Article 9.4.2.3.	Impact on Article 9.17.1.1.	Impact on Sentence 9.23.14.8.(5)	Impact on Sentence 9.20.17.4.(3)	Impact on Sentence 9.23.4.2.(1)	Impact on Sentence 9.23.4.2.(1)	Impact on Sentence 9.23.4.2.(4)	Impact on Sentence 9.23.12.3.(1)
Location	Province	2021 Census Populations	NBC 2020	PCF 1979	NBC 2020	PCF 1979	NBC 2020	PCF 1979	Platforms	Columns	Rafter Nailing	ICF Lintels	Roof Joists	Roof Rafters	Built-up Ridge Beam and Lintels	Lintels
Kelowna	BC	222162	1.7	1.7	1.04	1.04	0.40	0.42	\$0.00	\$0.00	\$0.00	\$16.51	\$0.00	\$0.00	\$0.00	\$0.00
Vancouver (City Hall)	BC	2642825	1.8	1.8	1.19	1.19	0.45	0.50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Victoria	BC	397237	1.1	1.1	0.81	0.81	0.57	0.63	\$0.00	\$0.00	\$0.00	\$30.52	\$0.00	\$0.00	\$0.00	\$0.00
Calgary	AB	1481806	1.1	1.1	0.71	0.71	0.48	0.50	\$0.00	\$0.00	\$0.00	\$14.01	\$0.00	\$0.00	\$0.00	\$0.00
Edmonton	AB	1418118	1.7	1.7	1.04	1.04	0.45	0.47	\$0.00	\$0.00	\$0.00	\$16.51	\$0.00	\$0.00	\$0.00	\$0.00
Lethbridge	AB	123847	1.2	1.2	0.76	0.76	0.66	0.69	\$0.00	\$0.00	\$0.00	\$30.52	\$0.00	\$0.00	\$0.00	\$0.00
Prince Albert	SK	45718	1.9	1.9	1.15	1.15	0.38	0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Regina	SK	249217	1.4	1.4	0.87	0.87	0.49	0.51	\$0.00	\$0.00	\$0.00	\$30.52	\$0.00	\$0.00	\$0.00	\$0.00
Saskatoon	SK	317480	1.7	1.7	1.04	1.04	0.46	0.48	\$0.00	\$0.00	\$0.00	\$16.51	\$0.00	\$0.00	\$0.00	\$0.00
Brandon	MB	54268	2.1	2.1	1.36	1.36	0.49	0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Steinbach	MB	17806	2.0	2.0	1.30	1.30	0.40	0.42	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Winnipeg	MB	834678	1.9	1.9	1.25	1.25	0.45	0.47	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Hamilton	ON	785184	1.1	1.1	1.01	1.01	0.46	0.51	\$0.00	\$0.00	\$5.54	\$14.01	\$0.00	-\$255.30	-\$140.24	-\$41.82
Ottawa (City Hall)	ON	1135014	2.4	2.4	1.72	1.72	0.41	0.45	\$0.00	\$0.00	\$0.00	\$39.34	\$0.00	\$0.00	\$0.00	\$0.00
Toronto (City Hall)	ON	6202225	0.9	0.9	0.90	0.90	0.44	0.48	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Montréal (City Hall)	QC	4291732	2.6	2.6	1.83	1.83	0.44	0.46	\$0.00	\$0.00	\$0.00	\$54.90	\$0.00	\$0.00	\$0.00	\$0.00
Québec	QC	839311	3.6	3.6	2.58	2.58	0.41	0.43	-\$47.77	\$0.00	-\$5.54	\$33.56	\$0.00	-\$1,342.89	\$0.00	-\$84.47
Sherbrooke	QC	227398	2.2	2.2	1.81	1.81	0.32	0.34	\$0.00	\$0.00	\$0.00	\$6.71	\$0.00	\$0.00	\$0.00	\$0.00
Fredericton	NB	108610	3.1	3.1	2.31	2.31	0.38	0.42	\$0.00	\$0.00	\$0.00	\$57.78	\$0.00	\$0.00	\$0.00	\$0.00
Moncton	NB	157717	3.0	3.0	2.25	2.25	0.50	0.55	\$0.00	\$0.00	-\$5.54	\$64.49	\$0.00	\$0.00	\$0.00	\$0.00
Saint John	NB	130613	2.3	2.3	1.87	1.87	0.53	0.58	\$0.00	\$0.00	\$0.00	\$39.34	\$0.00	\$0.00	\$0.00	\$0.00
Halifax	NS	465703	1.9	1.9	1.65	1.65	0.58	0.64	\$0.00	\$0.00	\$0.00	\$0.00	-\$1,854.72	\$0.00	\$0.00	\$0.00
New Glasgow	NS	34397	2.2	2.2	1.81	1.81	0.55	0.61	\$0.00	\$0.00	\$0.00	\$6.71	\$0.00	\$0.00	\$0.00	\$0.00
Truro	NS	46157	2.0	2.0	1.70	1.70	0.48	0.53	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Charlottetown	PE	78858	2.7	2.7	2.09	2.09	0.56	0.62	\$0.00	\$0.00	\$0.00	\$54.90	\$0.00	\$0.00	\$0.00	\$0.00
Summerside	PE	18157	3.1	3.1	2.31	2.31	0.60	0.66	\$0.00	\$0.00	\$0.00	\$81.75	\$0.00	\$0.00	\$0.00	\$0.00
Corner Brook	NL	29762	3.7	3.7	2.64	2.64	0.55	0.61	\$0.00	\$0.00	-\$5.54	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Grand Falls	NL	13853	3.4	3.4	2.47	2.47	0.60	0.66	\$0.00	\$0.00	-\$5.54	\$49.12	\$0.00	-\$1,342.89	\$0.00	-\$84.47
St. John's	NL	212579	2.9	2.9	2.30	2.30	0.78	0.86	\$0.00	\$0.00	\$0.00	\$64.49	\$0.00	\$0.00	\$0.00	\$0.00
Dawson	YK	1577	2.9	3.0	1.70	1.75	0.31	0.33	\$0.00	\$0.00	\$0.00	\$64.49	\$0.00	\$0.00	\$0.00	\$0.00
Whitehorse	YK	31913	2.0	2.1	1.20	1.26	0.38	0.40	\$0.00	\$0.00	\$0.00	\$6.71	\$0.00	\$0.00	\$0.00	\$0.00
Hay River	NT	3169	2.4	2.5	1.42	1.48	0.35	0.37	\$0.00	\$0.00	\$0.00	\$54.90	\$0.00	\$0.00	\$0.00	\$0.00
Inuvik	NT	3137	3.1	3.3	1.81	1.92	0.40	0.42	\$47.77	\$0.00	\$0.00	\$81.75	\$0.00	\$0.00	\$0.00	\$0.00
Yellowknife	NT	20340	2.2	2.3	1.31	1.37	0.40	0.42	\$0.00	\$0.00	\$0.00	\$39.34	\$0.00	\$0.00	\$0.00	\$0.00
Iqaluit	NU	7429	2.9	3.0	1.80	1.85	0.65	0.68	\$47.77	\$0.00	\$0.00	\$88.46	\$0.00	\$0.00	\$0.00	\$0.00
Kangiqiniq / Rankin Inlet	NU	2975	3.0	3.2	1.85	1.96	0.60	0.63	\$47.77	\$0.00	\$0.00	\$88.46	\$0.00	\$0.00	\$0.00	\$0.00

