

TECHNICAL BULLETIN

July 1, 2024

Wind Loads and Responsibility for Design

A roof is not just a waterproofing cover on a building; it is a structural element of a building enclosure, therefore only a “registered professional” (i.e., structural engineer) should calculate Specified Wind Loads for roofs.

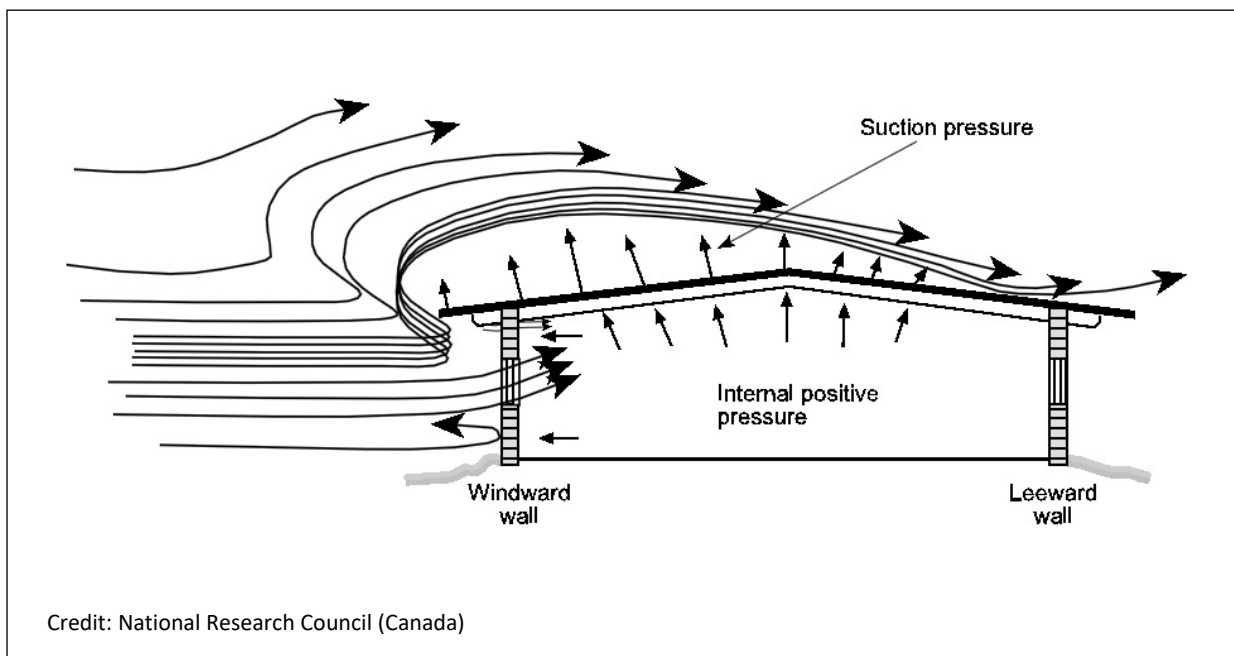
This expanded bulletin addresses the subject of design responsibility, with a focus on

- Roofs and the effects of wind
- Building Code Requirements
- RoofStar Guarantee Standards
- Ramifications for the roofer

The focus of this bulletin is, for the most part, on Part 3 buildings, as defined in the Building Code.

Roofs and the effects of wind

Wind is simply air in motion, induced to move by changes in pressure (air moving from a location of high pressure to one with low pressure). Wind is often thought of as a *pushing* phenomenon because that is how we commonly experience it – pressure against our skin, our clothing, or things we hold in our hands (like an umbrella). While all of that is true, it isn’t all that wind does; wind also *pulls* objects. It does that by creating negative pressure as it passes over any surface. The strength of negative pressure (what feels or behaves like a sucking or lifting force) is dependent on the geometry of the objects wind



encounters, and on what creates or diminishes turbulence as wind passes over and around it. Introduce turbulence, and the suction power of wind is altered and sometimes diminished.

Wind that blows across a flat roof does the same thing, and the effects can be quite dramatic. Just a little wind can lift tons of material upward (see the photograph below). These negative forces (loads) can be measured and even predicted. To resist those negative forces, both replacement and new membrane roof systems must be designed so that all the component materials in the system are held together and securely attached to the building structure, using proven patterns of adhesives, fasteners, or a combination of both.

Building Code Requirements

Both the British Columbia Building Code (BCBC) and the Vancouver Building Bylaw (VBBL)¹ refer to these negative wind forces as wind loads (“specified wind load” in Article 5.2.2.2. of Division B). They are considered a structural load every building will experience and must be able to resist. While we usually think about structural loads in terms of downward forces – gravity that can make an unstable building fall down – wind loads are a critical force every building has to resist, not just because of the *pushing* nature of wind, but also because of the suction forces (negative loads) that wind can induce on all sides of a building.



Credit: Gage Swejda (Roof blow-off, winter 2022: Dawson Creek,

¹ In this bulletin, the term “Building Code” is used as a collective term for the National Building Code of Canada (NBCC), the BCBC, and the VBBL.



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In Division B of the Building Code (Acceptable Solutions, or the “how to” Division), Part 4 deals exclusively with structural design, and only a “registered professional skilled in the work [of performing structural calculations]” may do the work required in Part 4 (Ref. Div. C, [Article 2.2.1.2.](#)). That includes the calculation of wind loads ([Subsection 4.1.7.](#)). Roof design, on the other hand, falls largely under Part 5 (Environmental Separation). However, two articles in Part 5 provide a bridge between the structural design of a building and the design and construction of a roof assembly.

[Article 5.2.2.1.](#) in the Building Code makes it clear that where “materials, components or assemblies...separate dissimilar environments or are exposed to the exterior”, they (or their connections) must be “designed to withstand structural loads” which must be determined using the design requirements in Div. B, Part 4. [Article 5.2.2.2.](#) makes it clear what that means – that because a roof assembly separates the interior from the exterior, the roof must be designed to resist structural loads exerted by wind. Article 5.2.2.2. goes on to describe two ways a membrane roof design can comply with this requirement. First, the design of a roof assembly may comply with the Building Code by using a roof assembly tested in a laboratory (using the test method, CSA-A123.21); the test provides an objective basis for wind resistance and includes a margin for strong wind gusts or rare, sustained storm events. Second, a design may comply by using a roof assembly that has a proven record of resisting the calculated wind loads².

Framed another way, the requirements in Part 5 mean a membrane roof is not just a waterproofing cover on a building; it is a *de facto* structural element of a building enclosure.

All the structural elements of a building are governed in the Building Code by Part 4 of Division B – for example, dead loads, live loads (other than those named in the following sub-sections), snow and rain loads (Sub-section 4.1.6.), wind loads (Sub-section 4.1.7.), and seismic (earthquake) loads and effects (Sub-section 4.1.8.). All of these must be documented by the *Coordinating Registered Professional* (CRP) in Schedule B forms, which must be submitted to the Authority Having Jurisdiction when making an application for construction (Division C, [Note A-2.2.7.2.\(1\)\(a\)](#)). Again, only a “registered professional” (i.e., structural engineer) should calculate wind loads.

Notice that wind loads must be calculated and documented by the CRP before he or she applies for a construction permit. Also, because wind loads form part of a suit of structural design loads that the “registered professional skilled in the work concerned” is exclusively responsible for (Division C, [Article 2.2.1.2.](#)), wind loads cannot be assigned to a contractor just as snow loads or seismic loads cannot be assigned elsewhere.

The Vancouver Building By-Law, which is the Building Code in the City of Vancouver, goes further, stating that when “structural drawings and related documents [are] submitted with the application to build” they shall indicate (in Sentence (6)) “all effects and loads, other than *dead loads*, used for the design and construction of the structural members and exterior cladding, including the *roof assembly*.” Note A-2.2.6.2.(1). adds that “Examples of information that should be shown on architectural drawings... and building enclosure assemblies are: (p) the dimensions of the edge, field and corner zones of the roof, and

² This is an oversimplification of the term “proven past performance” which is defined in the Notes to Part 5 and is actually onerous. In a future edition of the National Building Code of Canada, it will be dropped because, as it states in the last paragraph to Note A-5.1.4.1.(5), “Past performance is a reasonable basis for determining compliance for lighter materials, components or assemblies not subject to wind load.”



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load values for each affected area of a wall and roof assembly (see Figures 4.1.7.6.A through 4.1.7.6.-C in Article 4.1.7.6. of Division B).” That means that not only must the CRP ensure that structural design loads are calculated before the design is presented for a permit, those loads must be conveyed in a meaningful manner on design drawings so that trades know what to do with them.

Interpretation of Building Code Requirements

In the summer of 2023, the RCABC raised the issue of assigned structural designed with the BC Building Code Interpretation Committee, asking that they answer three questions related to Part 3 buildings:

1. Is the *Coordinating Registered Professional* responsible to ascertain that the appropriate registered professionals of record have been retained for the design and field review of the roof assembly, including the wind resistance of the roofing membrane?
2. Is the *Structural Registered Professional of Record* responsible for determining the applicable wind loads on the roof assembly, and must the applicable wind loads be indicated on the structural drawings?
3. Is the *Architectural Registered Professional of Record* responsible for assuring that the design and installation of the roofing membrane substantially complies with the requirements of Subsection 5.2.2.?

In response, the Committee issued Interpretation File No. 18-0273 (see the attached copy). In short, the answer they provided to all three questions was “yes”. And their responses answer another question, which is, Is it permissible for the designer to assign to the roofing contractor aspects of the roof assembly design including the calculation of wind loads? The answer is essentially given in their first answer, which is no.

RoofStar Guarantee Standards, Part 3

All these Building Code requirements are reflected in Part 3 of the RoofStar Guarantee Standards. [Article 3.1.3.1](#)³, “Responsibility for Design”, spells it out clearly: “The *Design Authority* is responsible for determining *Specified Wind Loads* for each *roof system* and each *roof areas* of a *project*, including roofs that support *Vegetated Roof Systems* or any other *overburden*, amenities, or equipment”. The term *Design Authority* is a defined term in the RPM. It refers to the “the individual or firm responsible for the issuance of project specifications and details to which the project will be bid and constructed” (RoofStar Standards, Article 1.1.1.4., “Definitions”), and has the same meaning as the term “Coordinating Registered Professional” used in the Building Code.

The requirement to calculate wind loads, and to design the roof assembly accordingly, applies equally to new construction roofs and replacement roofing. While the Building Code often is not applied to existing buildings (and therefore to “re-roofing”), the requirements in the RoofStar Guarantee Standards extend to all roofs. The reasons for this are several – certainly, life safety is high on the list, but because wind can damage a roof and lead to a leak, the RCABC Guarantee Corp. (RGC)⁴ requires every roof to be designed as if it were a new roof.

³ The reference hyperlinks to Article 3.1.3.1. in Securing the Roof Assembly which is a current replica of Part 3 of the waterproofing roof Standards.

⁴ The RGC is the publisher of the Roofing Practices Manual (RPM) and the Guarantor that issues the RoofStar Guarantee.



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This Technical Bulletin is focused on membrane roof systems, but the same principles apply to the design and construction of *any* roof. Both negative (suction) and positive (pushing) loads from wind are real and potentially damaging, irrespective of the type of roof. Each design must be based on an understanding of the service conditions the roof will experience, for its expected service life (British Columbia Building Code, Division A, Article 3.2.1.1., Functional Statement 80). When anyone sets out to design a roof, every aspect of its performance must be thoughtfully considered.⁵

Ramifications for the roofer

All these Building Code requirements, and the requirements in the RoofStar Standards, mean the *Design Authority* carries responsibility for the design. Some project documents delegate the calculation of wind loads to the roofer. Clearly, this is precluded by both the VBBL and the interpretation rendered for the RGC on the key questions around “assigned design”, at least with respect to new construction buildings or wherever a permit for replacement roofing is required. When the roofing contractor offers a design, the roofing contractor becomes the *Design Authority*, and those responsibilities and liabilities transfer to the contractor.

Occasionally, a design provides calculated wind loads but does not interpret how to apply the loads and zone dimensions to a project. When that happens, the RGC recommends asking for that information from the Design Authority through an RFI, especially if roof shape is complex. Don’t risk underbuilding the roof in the critical zones – corners and edges.

There is nothing in the Building Code that would prevent the *Design Authority* from assigning other elements of design to the roofing contractor, such as the selection of a Tested Assembly. As long as the design provides enough information for the roofing contractor, assigning the selection of a suitable roof assembly is entirely permissible under the Building Code, and by the RGC.

For more information about wind, roof design, and roof construction, read “Roof Design: from Code to Specification” in Roofing BC ([Vol. 18, No. 3; Fall 2021](#)), or contact the **RoofStar Guarantee Program** at technical@rcabc.org.

End of Bulletin

⁵ Supreme Court of Canada. Steel Company of Canada Ltd. v. Willand Management Ltd., [1966] S.C.R. 746.


BC BUILDING CODE INTERPRETATION COMMITTEE

A joint committee with members representing
AIBC, EGBC, BOABC

File No: 18-0273

INTERPRETATION

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Interpretation Date:	September 22, 2023
Building Code Edition:	BC Building Code 2018
Subject:	Wind Loads on Roofing Membranes
Keywords:	Wind loads, roofing membrane, structural design
Building Code Reference(s):	2.2.4.3.(1)(e) of Div C, Schedules A & B
Question:	
For a Part 3 building:	
<ol style="list-style-type: none">1. Is the Coordinating Registered Professional responsible to ascertain that the appropriate registered professionals of record have been retained for the design and field review of the roof assembly, including the wind resistance of the roofing membrane?2. Is the Structural Registered Professional of Record responsible for determining the applicable wind loads on the roof assembly, and must the applicable wind loads be indicated on the structural drawings?3. Is the Architectural Registered Professional of Record responsible for assuring that the design and installation of the roofing membrane substantially complies with the requirements of Subsection 5.2.2.?	
Interpretation:	
<ol style="list-style-type: none">1. Yes. Note 1 at the bottom of Page 1 of Schedule A states that “it is the responsibility of the Coordinating Registered Professional to ascertain which registered professionals of record are required” for the project.2. Yes. Clause 2.2.4.3.(1)(e) of Division C requires the information on structural drawings to include “all effects and loads, other than dead loads, used for the design of the structural members and exterior cladding”.	
 _____ Patrick Shek, P.Eng., CP, FEC, Committee Chair	
<small>The views expressed are the consensus of the joint committee with members representing AIBC, EGBC and BOABC, which form the BC Building Code Interpretation Committee. The Building and Safety Standards Branch, Province of BC and the City of Vancouver participate in the committee’s proceedings with respect to interpretations of the BC Building Code. The purpose of the committee is to encourage uniform province wide interpretation of the BC Building Code. These views should not be considered as the official interpretation of legislated requirements based on the BC Building Code, as final responsibility for an interpretation rests with the local <i>Authority Having Jurisdiction</i>. The views of the joint committee should not be construed as legal advice.</small>	

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INTERPRETATION

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Although the term “exterior cladding” is commonly attributed to exterior wall cladding, with respect to a roof assembly, it would also include the wind loads on a roof assembly.

3. Yes.

Item 1.18 of Schedule B requires the Architectural Registered Professional of Record be responsible for the design and field review of “roofing and flashings”.

Item 1.23 of Schedule B requires the Architectural Registered Professional of Record be responsible for the design and field review of “Environmental separation requirements (Part 5)”.

Although the architect has overall responsibility for roofing systems, they can rely upon supporting registered professionals to assist in fulfilling their obligations described in their Schedule B.



Patrick Shek, P.Eng., CP, FEC, Committee Chair

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