
TO: **MAYOR J. LEHMAN AND MEMBERS OF COUNCIL**

FROM: **M. JANOTTA, P. ENG., CBCO, CHIEF BUILDING OFFICIAL, EXT. 4501**

NOTED: **B. ARANIYASUNDARAN, P. ENG., GENERAL MANAGER OF INFRASTRUCTURE AND GROWTH MANAGEMENT**

M. PROWSE, CHIEF ADMINISTRATIVE OFFICER

RE: **BUILDING CODE AMENDMENTS - UPDATE**

DATE: **MARCH 7, 2022**

The purpose of this Memorandum is to provide an update to members of Council on the Council Direction Memorandum dated August 9th, 2021, where staff were directed to propose Ontario Government specific measures to modernize the Ontario Building Code (OBC), with respect to severe wind protection for new homes, including the requirement for the use of straps, clips, or other mechanisms to better connect the roof, walls, and the foundation of homes.

The Ontario Building Code

The OBC defines the minimum standards for building construction. These minimum standards do not currently include resisting loads created by the effects of a tornado. The tornado event created loads on structures that are in excess of what they are intended to withstand. There is a difference between meeting the Building Code, which defines minimum construction requirements, and building to be tornado resistant, which is a standard much higher than specified in the Building Code. Canadian Standards Association (CSA) is in the process of creating a new standard (CSA S520), specifically outlining how to design a house to resist an F2 tornado. This standard will be published soon, but compliance with the standard will not be mandated in the Building Code.

The OBC consists of different parts, which apply to different building types based on size of building and occupancy type. Some buildings are required to be designed by professional engineers for the loads specified in the Code. These are performance standards, which are applied to engineered buildings. Other buildings are not required to be designed by professional engineers as there are prescriptive requirements, which are in lieu of engineered design. These prescriptive requirements are found within Part 9 of the Building Code.

Houses fall into the category of buildings that are built based on prescriptive standards. As such, most houses will be built with no specific consideration of wind loading. Construction based on the prescriptive requirements in Part 9 is deemed to comply with structural requirements listed elsewhere in the Building Code. As a result, there are currently no predetermined load paths identified in this type of construction to deal with lateral loads and uplift loads which are both caused by the effects of wind loading.

Staff will be proposing changes to the prescriptive requirements of the Building Code in Part 9 to develop a predetermined load path for uplift loads in houses. This can be created using some specialty fasteners and utilizing exterior sheathing to transfer loads into the foundation of the building. This will require specific sheathing placement, splicing and nailing to develop a continuous load path. In addition to this, other Building Code changes are being proposed to clarify and strengthen existing requirements in the Code.

Staff continue to work on this proposal to submit to the Ministry of Municipal Affairs and Housing. The proposal results from the following research, which staff have been actively working on over the last five months:

- Reviewing the current provisions in the Ontario Building Code, recognizing opportunities for improvement in making wood frame buildings more resilient to high wind loads;
- Review the current provisions in the National Building Code, which includes provisions beyond (and more stringent) than those in the Ontario Building Code;
- Review the contents and recommendations in a document prepared by the Institute for Catastrophic Loss Reduction (ICLR) dated April 2019, entitled "Increasing High Wind Safety for Canadian Homes: A Foundational Document for Low-Rise Residential and Small Buildings.";
- Participate in the creation of the new CSA Standard S520 entitled "High wind safety for low-rise residential and small buildings", which provides guidelines on how to design a building to resist a level F2 tornado; and
- Meet with industry experts on wood frame construction (Canadian Wood Council), specialty engineered fastening products (Simpson Strongtie), wind loads and building behaviour in high winds (University of Western Ontario), and disaster prevention research (ICLR) to review the proposed Code change proposals.

Work is ongoing to finalize the technical content of the changes and submit a proposal to the Ministry of Municipal Affairs and Housing.

Proposed Code Changes

A high-level description of the proposed changes and other considerations is provided below. Technical Building Code verbiage is not provided for clarity:

1. Mandate exterior structural sheathing for housing.

Currently, the Ontario Building Code does not mandate that all houses have exterior sheathing attached to the stud walls. Sheathing provides much of the stabilizing effect in houses when subject to lateral and uplift loads from wind and is an important structural component. Most of the houses sustaining damage from the tornado event in Barrie did not have exterior sheathing. This significantly contributed to the damage which occurred. Exterior sheathing placed in the proper locations with specific nailing will provide a much higher capacity to withstand loads from high winds.

Proposals for Code changes include:

- Mandating exterior sheathing use on all houses; and
- Providing prescriptive requirements for location of sheathing, splicing of sheathing, and nailing requirements for sheathing.

2. Provide clarification that where upward forces exist in engineered roof components, that these loads must be transferred to the foundation.

The Ontario Building Code separates the design of engineered buildings (and components of buildings) from non-engineered buildings. Different design rules apply to a building depending on if it is engineered or not. When a component of a building (within a non-engineered building) requires engineering, the Code is not clear how these elements need to interact. In a house where there is an uplift load from a roof truss, which is an engineered component, that load must be resisted through the remainder of the building that is not engineered. Providing a specific clause in the Code to address this will result in more buildings having increased capacity in resisting uplift loads.

Proposals for Code changes include:

- Clarifying that uplift forces from an engineered component in a building must be resolved through the remainder of the non-engineered building.

3. Specify location of anchor bolts and provide placing tolerances.

The Ontario Building Code does not specify the location of anchor bolts when connecting a wall to a foundation. It only specifies that bolts must be spaced 2.4m (8') apart. Mandating that anchor bolts be placed close to corners, which are subject to higher wind loads and that they be placed within certain tolerances, will improve how buildings react to high wind.

Proposals for Code changes include:

- Requiring anchor bolts be located within the end portion of a wall (500 mm);
- Requiring larger washers to connect the building frame to the foundation; and
- Requiring placement of the anchor bolt a minimum distance from the edge of the wall.

4. Increase the strength of the roof to wall connection in housing and small buildings and provide a continuous load transfer path for uplift loads.

The Ontario Building Code currently has a prescriptive requirement of how to connect a roof to a wall. This connection provides about 100 lbs. of (factored) uplift resistance as determined by calculation. This represents one of several weak links in the load transfer path to the foundation. The use of hurricane clips (or other strengthening options) significantly increases the capacity of that critical link. Attention to detailing and nailing patterns for the exterior sheathing can eliminate other weak links, which currently exist. This will improve the resiliency of buildings when subject to high wind loads.

Proposals for Code changes include:

- Requiring the use of hurricane clips, or other fasteners, of a prescribed strength at the roof to wall connection; and
- Ensure the entire load path, which consists of 8 separate joints, can transfer those loads into the foundation of the building.

5. Assess tornado history and determine if certain geographic locations can be identified as high tornado risk areas in the OBC.

It is unlikely that this can be done because there is demonstrated evidence of tornadoes throughout all southern Ontario. If any areas were to be excluded, they would be in very remote areas and would not likely make any practical difference to the application of the additional requirements.

Proposals for Code changes include:

- None.

Next Steps

It is estimated that the proposed Technical Building Code changes are 80% complete. Once finalized, a Report will be provided to the Director of the Building Branch of MMAH outlining the proposed changes. This will be submitted to the National Building Code. As well, there is currently a "harmonization" effort underway to ensure provisions in the Ontario and National Codes are the same. This is currently a major initiative of the Provincial Government.

For any questions, please contact Bala Araniyasundaran, General Manager of Infrastructure and Growth Management at extension 4551 (email bala.araniyasundaran@barrie.ca), or Michael Janotta, Chief Building Official, Building Services at extension 4501 (email michael.janotta@barrie.ca).