High Wind Protection: New Construction in Southern Ontario

This document provides **basic**, **enhanced**, and **resilience** level measures appropriate for any Part 9 building in Ontario to reduce risk of damage from high wind.

As this document is meant to support pilot implementation of high wind resilience, it focuses on basic protection options. Details concerning basic, enhanced, and resilience level measures are provided in the table below. Basic and enhanced options are described in the appendices, and resilience options are provided in CSA S520:22 – *Design and construction of low-rise residential and small buildings to resist high wind*.

During high intensity wind events and tornadoes, most affected buildings will likely experience damage to roof cover and other cladding failures. When roof cover is lost, these buildings may experience significant losses associated with water penetration into the building. Therefore, basic measures focused on ensuring the roof deck remains covered and sealed can offer many households considerable protection during high wind events.

Basic measures can help: The majority of homes damaged during the 2021 Barrie tornado experienced relatively minor damage to roof cover and cladding**.** ***Roof cover loss can result in water penetration causing major damage inside of the building.*** (Images: Barrie, 2021. Northern Tornadoes Project)

Protection level	Recommendations
Basic	• **Install roof cover rated for high wind resistance, and use six fasteners per full length of shingle (or fastener patterns recommended for high wind regions by manufacturers).** • **Tape sheathing joints to provide a basic, secondary water barrier on the roof deck.** *See appendix A for additional detail on basic high wind protection options.*
Enhanced	Basic measures plus: • Adhere to asphalt shingle manufacturers' installation temperature requirements. • Implementation of enhancements to the secondary water barrier, such as adding underlayment along with taped joints, using capped nails to fasten underlayment, and/or applying self-adhered underlayment to the entire roof deck. • Include structural connections to enhance the uplift resistance of roof-to-wall (truss to top-plate) connections, and top plate to stud connections. *See appendix B for additional detail on enhanced protection options.*

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Protection level	Recommendations
Resilience	Enhanced measures plus full application of remaining CSA S520:22 recommendations, including: • Thicker roof sheathing, enhanced roof framing and connections to resist uplift, accommodating higher wind pressures on edges, corners, projections of roofs. • Enhanced roof-to-wall connections to resist uplift. • Gable end-wall bracing. • Enhanced inter-storey connections to resist uplift. • Application of wall sheathing to resist lateral movement and suction forces. • Enhanced wall-to-floor connections, floor-to-sill plate connections, and use of anchor bolts and larger washers to secure building to the foundation. • Enhance post-base and cap connections to resist uplift. • Address non-structural vulnerabilities including addressing roof penetrations, vents, high wind resistant garage doors, use of wind-borne debris resistant fenestration, and use of wall cladding products that perform well under high wind loads.

Appendix A: Recommendations for achieving basic high wind protection

Roof cover (asphalt shingles):

- Install roof cover rated for 120 mph wind gust (i.e., ASTM 7158 Class G or higher)
- Asphalt shingles should be installed using the greater of:
  - a minimum of six fasteners per full length of shingle; or
  - the manufacturer's recommendation for high wind regions.
- Do not use staples for the installation of asphalt shingles.

Secondary water barrier:

- Provide a secondary water barrier on the roof deck by taping all sheathing joints along with penetrations. Tapes should comply with CSA A123.22, ASTM D1970, or AAMA 711. Taping should accommodate expansion and contraction of wood structural panels.

Basic secondary water barrier: Roof deck taping to seal seams between sheathing panels

(Images: Insurance Institute for Business and Home Safety)

Appendix B: Recommendations for achieving enhanced high wind protection

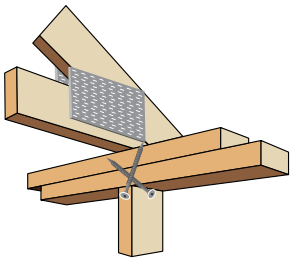
Enhanced asphalt shingle installation:

- To achieve an effective seal, shingles shall be installed at a temperature no less than 10 °C, unless the manufacturer permits otherwise.
- Shingles shall be installed with fasteners such that the fastener pull-through resistance is equal to or greater than 0.13 kN (30 lb) when tested in accordance with ASTM D228.

Enhanced secondary water barrier – underlayment installed on the entire roof in accordance with one of the following methods:

- One layer of Type 2 underlayment as specified in CSA A123.3 (commonly referred to as "No. 15") or one layer of synthetic underlayment complying with ASTM D8257 and all sheathing joints taped along with penetrations.
  - Tapes should comply with CSA A123.22, ASTM D1970, or AAMA 711. The taping component should accommodate the expansion and contraction of the wood structural panels.
  - If the underlayment is fastened, the underlayment should be installed:
    - using cap staples or cap nails following the specified spacing recommended by the underlayment manufacturer for roofing nails; or
    - using roofing nails with fastening of 150 mm along the perimeter and 300 mm on centre in field; or
- two layers of Type 3 felt as specified in CSA A123.3 (commonly referred to as "No. 30") or two layers of synthetic underlayment complying with ASTM D8257 using one of the following fastening methods:
  - using cap staples or cap nails following the specified spacing recommended by the underlayment manufacturer for roofing nails; or
  - using roofing nails with fastening of 150 mm along the perimeter and 300 mm on centre in field; or
- Application of self-adhering underlayment as specified in CSA A123.22 to the entire roof deck.

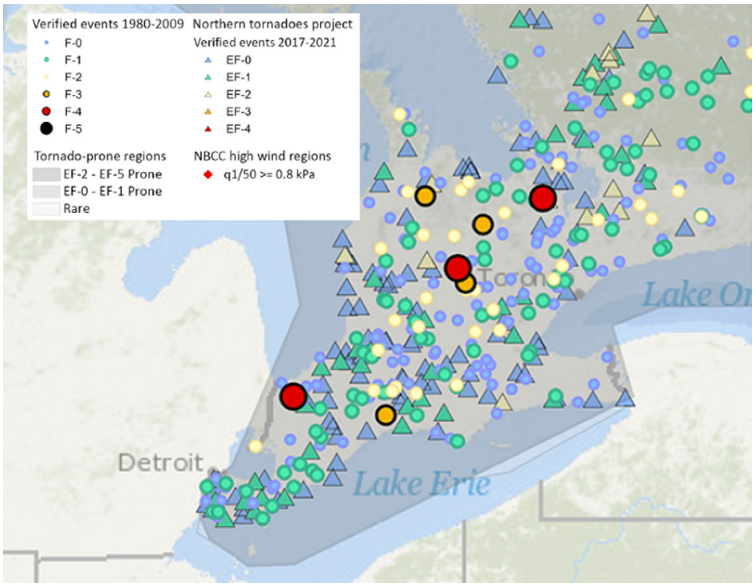
Example installation of truss screws to enhance connection between top plate to truss, and stud to top plate.



Structural connections:

- Install 6" truss screw for each connection between top plate and roof structure (e.g., truss), and for each stud to top plate. Install truss screws according to manufacturers' instructions.

Appendix C: High Wind Hazards, S. Ontario. S. Ontario is considered "EF5 Tornado Prone" by Western University's Northern Tornadoes Project.



Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other copntributors.