

Considering the Importance of Periodic Inspections of Façades for Tall Buildings

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Façades comprise the majority of the building envelope of tall buildings, and are the critical component providing separation between the conditioned and unconditioned environment. Building facades continue to evolve aesthetically, in complexity, but also in efficiency. At the same time, building facades deteriorate due to environmental exposure, lack of maintenance, design and construction errors, or a combination of such factors [1]. Deterioration can result in potentially unsafe conditions, and if unaddressed, can jeopardize public safety and surrounding properties. This prompts the need for periodic inspection and assessment of building exterior façades to identify such hazardous conditions.

Building façade deterioration is not specific to any one region, but is a widespread phenomenon. Even with the growing knowledge around the performance of building facades and their deterioration, a significantly low percentage of cities throughout North America have enacted façade ordinances. Effectively integrated legislation, combined with promoting an understanding of

inherent risks and available mitigation techniques, may help reduce the impact of unsafe façade conditions in the urban setting.

Notable Failures & Jurisdictional Requirements

Incidents of façade failures resulting in falling debris pose an endemic problem in the built-up areas of Canada and the United States, with many failures resulting in tragedy. For example, in 2009 in Montreal, a precast concrete panel fell from the 18th floor killing a woman in the restaurant directly below, as well as seriously injuring her partner [3]. Similarly in 2011, a metal cladding panel fell from the first floor of a downtown high-rise building in Chicago leaving a pedestrian in serious to critical condition. The metal panel was estimated to measure 15-foot tall, by 3-foot wide, and more than 1 inch thick [4]. In Alberta an incident was recorded in 2020, involving the collapse of an architectural feature roof, clad mainly with concrete roofing tiles and stucco, that fell from a 7th-floor penthouse resulting in property damage.

Incidents like these have resulted in multiple jurisdictions enacting legislation related to building façade inspection and maintenance. In Canada, Calgary, Alberta, and the province of Quebec have active façade ordinances. In the United States, cities include Boston, Chicago, →



Cincinnati, Cleveland, Columbus, Detroit, Milwaukee, New York City, Philadelphia, Pittsburgh, San Francisco, and St. Louis [2].

A comparison of façade ordinances reveals the following common building façade inspection requirements:

- Building height: 5 storeys or greater (and/or buildings with appurtenances in excess of 60 feet)
- Building age: 10 years or older
- Review periods/intervals: 5-year intervals

Ordinances vary in specifying other requirements including:

- Minimum inspections methods
- Minimum access methods
- Inspector qualifications: Registered architect or professional structural engineer
- Hazardous condition repair deadlines
- Penalties and fines for violations

Research provides minimal information related to building façade ordinances or any direct inspection and maintenance legislation for other municipal jurisdictions in Canada. Additionally, provinces do not provide legislation related to building façade inspection and maintenance in their Public Health Acts or building codes (excluding Quebec). A 2013 report by The Elliot Lake Commission of Inquiry outlining Property Maintenance and Repair Policies, Regulations, Legislation and By-Laws highlights in general the lack of written policy throughout Ontario municipalities requiring inspection or visual assessment of buildings for unsafe conditions [3]. It is noted that policies typically do not address how enforcement is carried out or what is required to trigger building inspections, but rather that practice of enforcement is mostly complaint-driven [3].

Interest and consensus surrounding the potentially unsafe conditions

caused by building façade deterioration led to the development of the ASTM E2270 – Standard Practice for Periodic Inspection of Building Facades for Unsafe Conditions [1]. ASTM International (formerly the American Society for Testing and Materials) is a global leader in developing voluntary consensus standards accepted internationally. ASTM elects a board of directors and is made up of over 30,000 volunteer members from +140 countries [4]. The intent of ASTM E2270 is to establish minimum requirements for conducting such periodic building façade inspections and provide basic guidelines or standard practices applicable in all jurisdictions internationally [1].

Active façade ordinances in the United States appear to define minimum requirements similar to those described in ASTM E2270, with several cities referencing the standard directly. However, variability still exists due to the jurisdictional nature of the legislation. For instance, New York City (NYC) permits only qualified exterior wall inspectors (QEWIs) to complete building façade inspections. QEWIs must be registered design professionals with at least seven years of relevant experience with facades over six storeys, and pass both written and oral exams as required by the NYC Department of Building’s Facades Unit [2]. In contrast, Detroit, and Calgary provide minimal to no qualification criteria for inspectors. In Calgary, visual assessments must “be performed by a person with sufficient education, training, skill and experience [relating to roofs and/or walls] such that the person’s visual assessment may reasonably be relied upon [5, p. 3].”

Available Façade Inspection Technologies

ASTM E2270 defines two façade inspection categories as follows, both of which are required to implement an adequate inspection:

(1) General inspection, which includes “visual observation of façade components from distances equal to or greater than 6 ft (1.8m) with or without the use of magnification or remote optical devices” [1, p. 3] (e.g., binoculars or drones); and

(2) Detailed inspection which requires “visual observation and tactile evaluation of façade components, including probing and NDT [non-destructive testing] to observe concealed conditions of wall construction” [1, p. 3].

General inspection or visual review from ground level



Visual assessments must “be performed by a person with sufficient education, training, skill and experience such that the person’s visual assessment may reasonably be relied upon.”



can be effective for the review of low-rise buildings and some mid-rise buildings but may provide limited ability to detect hazards during a review of high-rise building facades [6]. Close-up or tactile visual review can be performed via swingstage, rope access techniques, accessing adjacent balconies, etc. [6]. Industry consultants and contractors should inform building owners of the limitations of visual inspection or assessment as hidden façade conditions with potentially unsafe conditions cannot be captured.

Incorporation of NDT technologies can augment the effectiveness of the overall visual inspection and may detect or identify isolated façade areas requiring more detailed or intrusive review. When intrusive review is required, use of destructive testing (DT) technologies may capture conditions of hidden cladding components (such as anchor connections, reinforcement, etc.). Some examples of available NDT technologies include drones, laser scanning (LIDAR), infrared thermography, ultrasonic testing, and hammer sounding, while DT options may include exploratory openings and borescope probes.

Depending on the jurisdiction, selecting appropriate assessment methods and supplemental technologies is often left to the individual (or company) performing the façade inspection. Cost pressure for building owners may contribute to building façade inspections meeting only the minimum requirements of a jurisdictional façade ordinance (e.g., strictly visual assessment from ground and roofs).

Attaining a Reasonable Level of Confidence in the Inspection

A representative sample area must be defined when performing facade inspections to acquire data that is

statistically significant. This provides a reasonable level of confidence that the building's exterior has been adequately assessed for the stability of façade components. Existing facade conditions can vary widely between buildings and even jurisdictionally. There is no absolute value for representative sample sizes that apply to all buildings; therefore, a representative sample must be determined based on past knowledge of façade inspections, reference to available standards or best practices (such as ASTM E2270), and the building façade service history (if available).

A review of available architectural drawings, structural drawings, and past façade performance and service history for the building may distinguish between original construction issues and subsequent repairs. This document review may isolate façade areas that require more detailed inspection or provide grounds to expand the sample area based on indicated facade performance problems.

Solutions in Legislation and Standards

Cladding failure is an endemic problem that continues to jeopardize public safety and result in damage to property. Data suggests municipalities are typically the governing bodies to enact such regulations, but in Canada, provinces may also produce and enforce legislation (e.g. Quebec). Due to the jurisdictional nature of the legislation, variability of defined minimum façade inspection requirements is common.

Enacting legislation to enforce periodic building façade inspection may offer an approach to ensure preventative identification and maintenance of potentially unsafe building façade conditions are performed; however, the legislation does not guarantee public safety from hazardous conditions. The quality and reliability of building façade inspections are dependent on both the owner and inspector (i.e., fee/level of inspection/inspector qualifications). Cost pressure for building owners on inspection fees will remain and may result in only minimum legislative requirements being met.

Reference to internationally accepted standards, such as ASTM E2270, can assist when determining an appropriate level of façade inspection, representative sample area, and use of available NDT and DT technologies. Industry consultants and contractors should remain cognizant of standard practices and industry consensus for appropriate minimum requirements. This will assist in their efforts to educate building owners and continue to refine how building façade inspections for unsafe conditions are conducted.

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