12 Analyze Wind Risks

I. Summary

Issue:
New York City is in a hurricane-prone region and our building code incorporates modern standards for wind design. However, most NYC buildings were constructed under older codes that did not include the same level of protection. In addition, buildings under construction and climate change impacts are not fully addressed in the new codes.

Recommendations:
Analyze wind effects on existing buildings and those with particular wind vulnerability, such as homes raised on columns and buildings under construction. Study how climate change may affect wind speeds. Recommend changes to code and construction practices to address any vulnerabilities identified.

II. Proposed Legislation, Rule or Study

Conduct the Following Wind Studies:

1. **Buildings At Risk For Falling Debris**
   Study the types of buildings at risk for falling debris, utilizing factors such as age, construction classification, construction methods and materials, height, and occupancy. Based on these results, as necessary:

   a. Propose changes to Table 3 of Rule 1 RCNY 101-14, which lists exterior façade work exempt from filing and inspection.
   b. Propose additional periodic inspections for buildings not already subject to the Department of Building's Façade Safety Inspection Program (Section 28-302.1 of the Administrative Code).
   c. Produce design requirements, retrofit strategies, or requirements including standardized details.
   d. Produce standardized engineering inspection practices.

2. **Column-Supported Homes**
   Determine if additional standards are required for existing one- and two-family homes in coastal zones that become elevated on columns in order to comply with flood hazard area construction standards.

3. **Partially Completed Buildings**
   Study the effects of wind on buildings that are under construction, including buildings with incomplete façade assemblies and the storage of construction materials. Propose standard wind emergency action plans for the various partial completeness scenarios. Determine if additional wind analysis should be required for new tall buildings under construction.

4. **Temporary Structures & Equipment**
   Propose standard wind emergency action plans for each type of temporary structure or equipment, including cranes, derricks, scaffolds, concrete formwork, and sidewalk bridges.

5. **Future Wind Events & Weather Stations**
   Study forecasts for future changes in frequency, intensity, and paths of future storm events; predict how this climate change will affect wind speeds; and determine whether the Building Code's current design wind loads are sufficient for buildings constructed today to withstand future wind events. Study the benefits of installing and maintaining weather stations across the city, including on high-rise buildings, to improve our understanding of localized wind patterns in New York City's urban environment. Identify a mechanism to install such weather stations.

III. Supporting Information

Expanded Issues and Benefits:

Buildings At Risk For Falling Debris
Many New York City buildings constructed prior to 1968 were not required to consider wind as a factor in structural design calculations. Although the construction methods for these older buildings were prescriptive in nature, the performance gap between these older buildings and current wind load requirements for new construction during wind events should be evaluated. Studies of wind pressure and typical building response may help when formulating design requirements in the proposed Existing Building Code (Task Force Proposal #29: Adopt an Existing Building Code).

A category of typical New York City buildings that may be vulnerable to high winds, and should be the subject of the proposed studies, are high-rise buildings constructed under the requirements of the 1938 Code. Among these, there are roughly 60 high-rise commercial buildings built under the 1938 Code, the majority of which feature glass and metal curtain walls that would benefit from evaluation under current wind load standards. Similarly, there are many

tall residential buildings from the 1960s that utilized cavity wall construction, when this technology was in its early stages of development. Wind load considerations were not required by code at the time and any analysis should be aware that the detailing, technology, and construction methods of cavity walls were all in flux as these systems were optimized.

Parapets are among the most sensitive elements of a building façade as they are exposed to the wind, rain, snow, and heat on both faces. While lower façade elements benefit from the stabilizing weight of the material above, there is no additional weight to help keep the parapet in place, which acts as a kind of vertical cantilever, and is vulnerable to wind and other forces. One of the most common façade incidents is the collapse of the parapet, typically due to a lack of maintenance and most frequent in those composed of lime-based mortar. Lime-based mortar is very common among older masonry buildings, but decomposes over time when exposed to air and water. As parapets age, even hairline cracks can provide an entry point for water, compromising the mortar throughout the parapet and often extending through the masonry to the line of the lintels of the highest windows.

Masonry parapets and cornices that were built before 1929 that are six stories high are of particular concern. Cornices of buildings for taller buildings are already inspected every five years pursuant to the Department of Building's Façade Safety Inspection Program. Also, consideration may be given to parapets that were reconstructed or substantially rebuilt in the last 10 years or that are adjacent to other buildings.

Column-Supported Homes

New flood regulations encourage the elevation of many one- and two-family homes on unenclosed columns. The vulnerability of this exposed column structure, and the underside of the elevated floors, to wind loads should be analyzed. Construction methods (such as screens) that mitigate any wind load impacts while allowing water passage during flooding should be identified.

Partially Completed Buildings; Temporary Structures & Equipment

Wind can affect buildings undergoing construction as well as the temporary installations used to construct buildings, such as cranes, derricks, and scaffolds. Being only partially complete, buildings under construction will respond differently to wind events than a completed and fully enclosed building and may introduce temporary irregularities, such as a partially completed façade, that may be vulnerable to high winds. The design of temporary structures should consider the height, location, and timeframe of installation at a given site. The study should propose typical emergency action plans to be followed prior to a forecasted wind event for a variety of possible scenarios of partial completeness, including how to address temporary structures that cannot be easily disassembled. The study should address additional wind protection that may be required for super high-rise buildings (and any required temporary structures) while under construction.

Future Wind Events & Weather Stations

The regional impacts of global climate change will almost certainly include greater frequency and ferocity of inclement weather events. This particular study should assess the probable impacts of these changes on wind speed and pressure, and hence any required modifications to wind load requirements in the building code.

Since New York City is a coastal, dense urban environment with building heights that vary from single-family homes to skyscrapers, wind patterns are not uniform across the five boroughs. The study should address the effectiveness of existing weather monitoring stations in providing data on these local variations.

The study should include a review of wind design parameters from other jurisdictions (including internationally) with similar wind patterns, density, and type of development, and an assessment of the applicability of these standards in New York City.

Implementation:

The city should retain a consultant to perform the studies.

Cost:

No cost estimation was performed for this proposal.