FALLING ICE AND SNOW

Analyzing risks and finding solutions for the complex factors that govern accumulation and release of ice and snow

All buildings built in snowy environments collect ice and snow on roofs, parapets and façades. Under certain conditions, accumulated ice or snow can fall from the building, creating a hazard for people below. Such accumulations can also damage the structure.

Slight adjustments to design details can dramatically lower these risks. Often, such changes improve daily operations as well.

Our service

We help you manage the risk of harmful consequences from the accumulation of ice and snow. We can't guarantee that ice or snow will never fall from your structure, but we can help you significantly reduce the frequency and severity of such events.

We consult extensively with the design team to discuss the details of the building and to review options for reducing the risk of falling ice and snow. Our evaluations are based on observations made during decades of practice by company founder Colin Williams, a pioneer in engineering resilience to snow and ice. At the conclusion of this review, we issue a report summarizing the mitigation options that have been adopted for the building.

When desired, we can also apply our unique custom analysis methodology to assess the relative risks of particular design features. With this method, we quantify snow- and ice-related risk over the return period you specify, much as we would state risks of wind loading on structures or cladding. In developing this risk analysis, we may use wind tunnel studies to learn where wind-driven accumulation will occur. In addition, detailed simulations allow us to work through complex combinations of other contributing factors and possible solutions.

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How we work

All of our analyses focus on four main issues:

- How often will this issue arise?
- How severe are the consequences?
- How big a change to the architecture is required to mitigate the conditions?
- How much will the alteration cost?

We have the tools to address the first two points and propose ideas for the third. You and your team can then weigh in on the discussion regarding the third and fourth points. The result is well-rounded discussion that leads to a cost- and risk-optimized solution.

We use a proprietary statistical method to assess the relative risks associated with particular weather events and design features. With this method, we can present risk over a range of return periods. We also consider the expected use of the space below the façade where the snow and ice would be expected to fall. We then assign a "shedding performance index" value to each detail. This index allows your design team to address the most serious issues first.

We first determine how much snow and ice are likely to collect on various features of the building envelope during storms of varying severity. This model is built from detailed hourly meteorological records containing temperature, snowfall, rainfall, cloud cover, wind speed and wind direction. We also consider how patterns of accumulation will be affected by the shape and height of your

building and by the shape, height and position of other buildings. (Nearby structures may either prevent or promote accumulation.)

We then determine the likelihood that accumulated snow will reside for an extended period. Snow that resides may harden and densify before it is released by melting. The following are some factors that we may consider in a parametric analysis of snow aging:

- Air temperature
- Solar radiation
- Wind forces
- Building heat loss
- Insulation properties of accumulated snow
- Cyclical freezing/thawing due to daily temperature cycles
- Surface friction properties of building materials
- Melt-water drainage paths

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Wind tunnel tests.

If needed, we test scale models in a wind tunnel. In these tests, we use a particulate "snow stand-in" to identify building features that are aerodynamically most problematic. The snow stand-in behaves aerodynamically just like full-scale snow: It is transported by the wind and adheres to the building model by the same mechanisms.

Climatic wind tunnel/chamber tests.

When novel design details emerge during the consultation process, we may not have enough information to predict how they will perform. In these cases, we use a climatic wind tunnel or climatic chamber to study such design features. We apply actual snow and ice to mock-ups and then mimic the effects of diurnal freeze-thaw cycles, melting and other processes.

RWDI is a valuable partner to clients seeking to...

Explore Innovations

- Pursue innovative designs with confidence that ice and snow risks have been anticipated correctly

Create Opportunities

- Reduce operational costs by reducing the frequency and severity of ice and snow issues

Meet Challenges

- Find effective solutions for recurring issues

Fulfill Expectations

- Demonstrate to planning commissions that public safety has been addressed