Snow Drifting

The design of the built environment, taking into consideration landscape and structures can influence snow accumulation and wind activity, thereby impacting: safety; expense of maintenance; and the quality of the environment around buildings and transportation routes. Deflection fins, wind breaks, screens, landscaping, topography, and minor modifications to buildings can improve conditions.

Snow Drifting
Snow drifting on roadways and airport runways can increase maintenance costs, and blowing snow can cause accidents. Strategically placed snow fencing reduces the cost for maintenance, while increasing safety.

Snow Accumulation & Pedestrian Safety
Roof steps, clerestory windows, and the building shapes inevitably create areas of localized shelter from the wind, which tend to get filled with snow. Main entrances and emergency exits are often in wind sheltered and drift prone areas. The end result is a door that is frequently barricaded with snow. Excessive snow may block ventilation louvres, windows, or doors, and increase snow loads and structural steel costs.

Snow Infiltration
High volume intakes that run all winter at full capacity are very sensitive to snow ingestion. Ingested snow can collapse filters, soak ceilings, and put users at risk from chemical exposure. Proper aerodynamic design along with equipment selection can eliminate this problem.

The best time to consider the general impacts of issues is early in any new design or retrofit project. RWDI offers a timely, cost-effective advice through which potential impacts and constraints can be addressed early to avoid problems or minimize re-designs at later stages.
Snow Drifting (continued)

Model Testing and Aerodynamic Simulation
Depending on the needs of the project, RWDI uses the most accurate and cost-effective testing resources available. RWDI has a wide selection of such resources including wind tunnels, a water flume, Computational Fluid Dynamics (CFD), monitoring equipment, and more. With these resources, RWDI can assist clients in engineering a project to save time and money.

- **Water Flume Testing:**
  Wind activity around buildings and the potential for snow accumulation and drifting can be assessed using RWDI’s water flume.

- **CFD-Based Snowdrift Simulation:**
  Using proprietary snowdrift models coupled with Computational Fluid Dynamic (CFD) techniques, snow drifting patterns and the rate of deposition on and around a complex building structures can be modeled. This simulation is visualized through animation of the formation of a snowdrift.

- **Finite Area Element (FAE) Method:**
  RWDI has developed a method of comprehensively simulating the complexities of the snow accumulation, drifting, and melting processes on building roofs called the Finite Area Element (FAE) technique. The technique is a hybrid of model testing and computer simulation that allows fine tuning of shape (i.e., flat, sloped, gabled, vaulted, etc.) factors specifically for the geometry of the roof being designed and its specific location.

- **Assessment:**
  Through consultation, the designer can identify areas of the building geometry to refine in order to improve the serviceability and integrity of the design. In consultation with RWDI, these simulations, coupled with practical experience in snowdrift impact on buildings, are particularly useful at early stages in the design process, where the flexibility still exists to make improvements to the concept design that will ultimately lead to an improved final design. An example of a snow drift simulation with a scale model in a water flume is shown in Figure 1, and using CFD on an industrial facility is shown in Figure 2.

The snow drift simulation can be used to effectively evaluate the effects of structural modifications on roof or ground level snow drift characteristics. An example is shown below (see Figure 3) of a comparative snowdrift simulation performed to assess the difference of the snow deposition rate around a rectangular elevated building, with and without windward streamlined edges.

![Figure 1: Water flume testing](image1)

![Figure 2: Simulation of snow drifts surrounding an industrial facility.](image2)

![Figure 3: Snow deposition region for an elevated rectangular body with square (above) and streamlined (below) windward corners.](image3)