



## **CRREL Wind Tunnels**

**Purpose** The Cold Regions Research and Engineering Laboratory has two boundary-layer wind tunnels that enable civil engineers and architects to model snowdrift processes and drift development on natural and manmade structures to alleviate hazards caused by drifting and accumulating snow.

The Snow Drift Wind Tunnel (SDWT), a recirculating wind tunnel, uses glass beads to simulate snow. A particle trap allows the measurement of the drift mass transport, which enables detailed study of the rate of drift development in addition to drift geometry. Initial work performed in the SDWT involved model studies of building and base layouts, and more recent work has focused on fundamental studies of snow drifting and the mechanisms that govern it.

The Environmental Wind Tunnel is an open-circuit, boundary-layer wind tunnel equipped with an automated traversing mechanism for measuring airflow velocity distribution and snow-drift patterns. Snow drift is modeled with glass beads that are drawn through the tunnel and collected for mass-flux measurement and reuse. The wind tunnel flow field is calibrated to ensure that it resembles the planetary boundary layer. The EWT has been used to model snowdrift formation on buildings, roadways, and building complexes.



*The Environmental Wind Tunnel is the CRREL workhorse for customers who require modeling of snowdrifts on large buildings and structures. Its size allows many practical problems to be modeled without having to reduce the scale much beyond 1:100, thus ensuring more accurate modeling.*

### **Specifications**

#### **Snow Drift Wind Tunnel**

- 20-in. (50-cm) square test section, 15 ft (4.6 m) long
- Controlled air flow velocities up to 20 m/s

#### **Environmental Wind Tunnel**

- 32 ft (15.1 m) long, 8 ft (2.4 m) wide, and 4 ft (1.2 m) high
- Controlled air flow velocities up to 11 m/s
- 40 hp fan

## Benefits

The CRREL wind tunnels are used to model the processes of snow transport. Blowing snow reduces visibility and drifted snow frequently deposits on traveled ways, making driving hazardous or stopping transportation entirely, snowdrifts on buildings can cause roofs to collapse, and drifting can both inhibit access to buildings and facilitate access to secure facilities by interfering with intruder detection systems, but CRREL's wind tunnels provide engineers and architects with the understanding needed to devise remedial measures for snow drift control.

## Success Stories

The Environmental Wind Tunnel was recently used to study snowdrift formation around the silo covers of a proposed interceptor-missile field that could be part of a National Missile Defense system. This effort contributed to the ERDC Award for Outstanding Team Effort, 2001.

Snowdrift formation around the Amundsen-Scott South Pole Station was modeled at a scale of 600:1 in the CRREL Snow Drift Wind Tunnel to confirm structural plans for the station's remodeling.

In the photo, a scale model shows how snowdrifts can inundate a security fence. Using local wind and snow climatology, the likelihood of this occurrence can be determined in the Environmental Wind Tunnel for any site of interest.



## Point of Contact

Contact Dr. James Lever at (603) 646-4309 or by email at: [James.H.Lever@usace.army.mil](mailto:James.H.Lever@usace.army.mil)