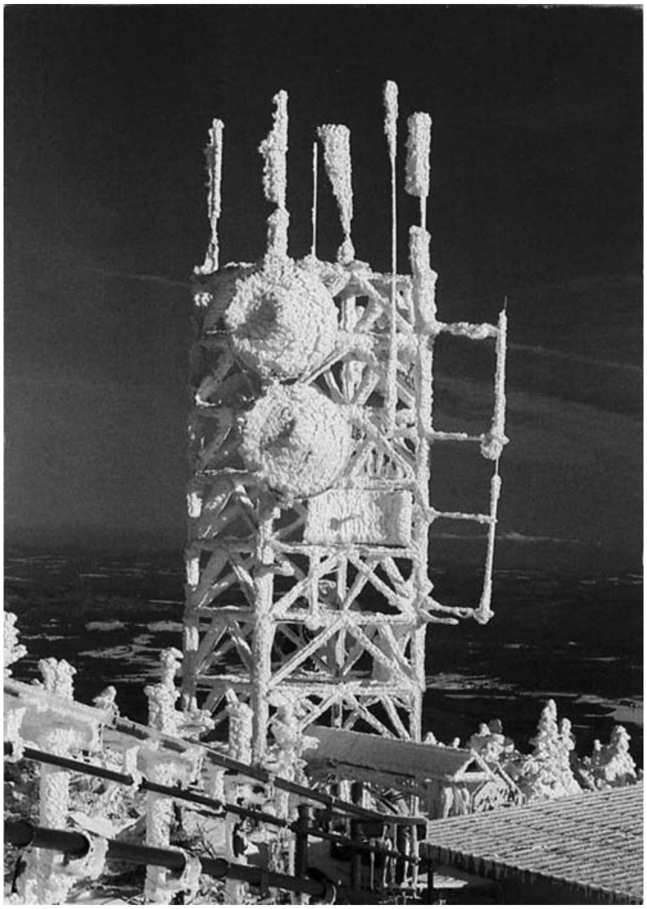

FIGURE C10-2 Rime Ice Accretion Due to In-Cloud Icing.

is free to rotate, such as a long guy or a long span of a single conductor or wire, the ice accretes with a roughly circular cross-section. On more rigid structural members, components, and appurtenances, the ice forms in irregular pennant shapes extending into the wind.

SNOW: Under certain conditions snow falling on objects may adhere due to capillary forces, inter-particle freezing (Colbeck and Ackley 1982), and/or sintering (Kuroiwa 1962). On objects with circular cross-section such as a wire, cable, conductor, or guy, sliding, deformation, and/or torsional rotation of the underlying cable may occur, resulting in the formation of a cylindrical sleeve, even around bundled conductors and wires; see Fig. C10-3. Since accreting snow is often accompanied by high winds, the density of accretions may be much higher than the density of the same snowfall on the ground.

Damaging snow accretions have been observed at surface air temperatures ranging from about 23 to

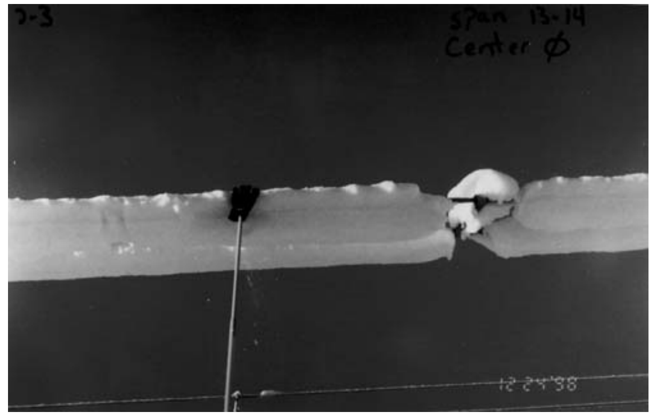

FIGURE C10-3 Snow Accretion on Wires.

36 °F (–5 to 2 °C). Snow with a high moisture content appears to stick more readily than drier snow. Snow falling at a surface air temperature above freezing may accrete even at wind speeds above 25 mi/h (10 m/s), producing dense 37 to 50 pcf (600 to 800 kg/m^3) accretions. Snow with a lower moisture content is not as sticky, blowing off the structure in high winds. These accreted snow densities are typically between 2.5 and 16 pcf (40 and 250 kg/m^3) (Kuroiwa 1965).

Even apparently dry snow can accrete on structures (Gland and Admirat 1986). The cohesive strength of the dry snow is initially supplied by the interlocking of the flakes and ultimately by sintering, as molecular diffusion increases the bond area between adjacent snowflakes. These dry snow accretions appear to form only in very low winds and have densities estimated at between 5 and 10 pcf (80 and 150 kg/m^3) (Sakamoto et al. 1990 and Peabody 1993).

C10.4 ICE LOADS DUE TO FREEZING RAIN

C10.4.1 Ice Weight

The ice thicknesses shown in Figs. 10-2 through 10-6 were determined for a horizontal cylinder oriented perpendicular to the wind. These ice thicknesses cannot be applied directly to cross-sections that are not round, such as channels and angles. However, the ice area from Eq. 10-1 is the same for all shapes for which the circumscribed circles have equal diameters. It is assumed that the maximum dimension of the cross-section is perpendicular to the trajectory of the raindrops. Similarly the ice volume in Eq. 10-2 is for a flat plate perpendicular to the trajectory of the