Table C10-2 Typical Reynolds Numbers for Iced Guys and Cables

Guy or Cable Diameter (in.)	Ice Thickness t(in.)	Importance Factor I_w	Design Ice Thickness t_d (in.)	Iced Diameter (in.)	Concurrent 3-s Gust Wind Speed (mi/h)	Reynolds Number
			Contiguous 48 States			
0.250	0.25	0.80	0.20	0.650	30	15,200
0.375	0.25	0.80	0.20	0.775	30	18,100
0.375	1.25	1.25	1.563	3.500	60	163,000
1.000	0.25	0.80	0.20	1.400	30	32,700
1.000	1.25	1.25	1.563	4.125	60	192,000
2.000	1.25	1.25	1.563	5.125	60	239,000
			Alaska			
0.250	0.25	0.80	0.20	0.650	50	27,000
2.000	0.50	1.25	0.625	3.250	80	202,000

(13.4 to 26.8 m/s) with speeds in Fig. 10-6 for Alaska up to 80 mi/h (35.8 m/s). Table C10-2 shows the Reynolds numbers (using U.S. standard atmosphere) for a range of iced guys and cables. In practice the Reynolds numbers range from subcritical through critical to supercritical depending on the roughness of the ice accretion. Considering that the shape of ice accretions is highly variable from relatively smooth cylindrical shapes to accretions with long icicles with projected areas greater than the equivalent radial thickness used in the maps, a single force coefficient of 1.2 has been chosen.

C10.6 DESIGN TEMPERATURES FOR FREEZING RAIN

Some ice-sensitive structures, particularly those utilizing overhead cable systems, are also sensitive to changes in temperature. In some cases the maximum load effect will occur around the melting point of ice (32 °F or 0 °C) and in others at the lowest temperature that occurs while the structure is loaded with ice. Figures 10-7 and 10-8 show the low temperatures to be used for design in addition to the melting temperature of ice.

The freezing rain model described in Section C10.4.2 tracked the temperature during each modeled icing event. For each event, the minimum temperature that occurred with the maximum ice thickness was recorded. The minimum temperatures for all the freezing rain events used in the extreme value analysis of ice thickness were analyzed to determine the 10th percentile temperature at each superstation (i.e., the temperature that was exceeded during 90% of the extreme icing events). These temperatures were used to make the maps shown in Figures 10-7 and 10-8. In areas where the temperature contours were close to the wind or ice thickness contours, they were moved to coincide with, first, the concurrent wind boundaries, and, second, the ice zone boundaries.

C10.7 PARTIAL LOADING

Variations in ice thickness due to freezing rain on objects at a given elevation are small over distances of about 1,000 ft (300 m). Therefore, partial loading of a structure from freezing rain is usually not significant (Cluts and Angelos 1977).

In-cloud icing is more strongly affected by wind speed, thus partial loading due to differences in exposure to in-cloud icing may be significant. Differences in ice thickness over several structures or components of a single structure are associated with differences in the exposure. The exposure is a function of shielding by other parts of the structure as well as by the upwind terrain.

Partial loading associated with ice shedding may be significant for snow or in-cloud ice accretions and for guyed structures when ice is shed from some guys before others.

REFERENCE

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