

Chapter 10

ICE LOADS—ATMOSPHERIC ICING

10.1 GENERAL

Atmospheric ice loads due to freezing rain, snow, and in-cloud icing shall be considered in the design of ice-sensitive structures. In areas where records or experience indicate that snow or in-cloud icing produces larger loads than freezing rain, site-specific studies shall be used. Structural loads due to hoarfrost are not a design consideration. Roof snow loads are covered in Chapter 7.

10.1.1 Site-Specific Studies

Mountainous terrain and gorges shall be examined for unusual icing conditions. Site-specific studies shall be used to determine the 50-year mean recurrence interval ice thickness, concurrent wind speed, and concurrent temperature in

1. Alaska.
2. Areas where records or experience indicate that snow or in-cloud icing produces larger loads than freezing rain.
3. Special icing regions shown in Figs. 10-2, 10-4, and 10-5.
4. Mountainous terrain and gorges where examination indicates unusual icing conditions exist.

Site-specific studies shall be subject to review and approval by the authority having jurisdiction.

In lieu of using the mapped values, it shall be permitted to determine the ice thickness, the concurrent wind speed, and the concurrent temperature for a structure from local meteorological data based on a 50-year mean recurrence interval provided that

1. The quality of the data for wind and type and amount of precipitation has been taken into account.
2. A robust ice accretion algorithm has been used to estimate uniform ice thicknesses and concurrent wind speeds from these data.
3. Extreme-value statistical analysis procedures acceptable to the authority having jurisdiction have been employed in analyzing the ice thickness and concurrent wind speed data.
4. The length of record and sampling error have been taken into account.

10.1.2 Dynamic Loads

Dynamic loads, such as those resulting from galloping, ice shedding, and aeolian vibrations, that are

caused or enhanced by an ice accretion on a flexible structural member, component, or appurtenance are not covered in this section.

10.1.3 Exclusions

Electric transmission systems, communications towers and masts, and other structures for which national standards exist are excluded from the requirements of this section. Applicable standards and guidelines include the NESC, ASCE Manual 74, and ANSI/EIA/TIA-222.

10.2 DEFINITIONS

The following definitions apply only to the provisions of this chapter.

COMPONENTS AND APPURTENANCES:

Nonstructural elements that may be exposed to atmospheric icing. Examples are ladders, handrails, antennas, waveguides, Radio Frequency (RF) transmission lines, pipes, electrical conduits, and cable trays.

FREEZING RAIN: Rain or drizzle that falls into a layer of subfreezing air at the earth's surface and freezes on contact with the ground or an object to form glaze ice.

GLAZE: Clear high-density ice.

HOARFROST: An accumulation of ice crystals formed by direct deposition of water vapor from the air onto an object.

ICE-SENSITIVE STRUCTURES: Structures for which the effect of an atmospheric icing load governs the design of part or all of the structure. This includes, but is not limited to, lattice structures, guyed masts, overhead lines, light suspension and cable-stayed bridges, aerial cable systems (e.g., for ski lifts and logging operations), amusement rides, open catwalks and platforms, flagpoles, and signs.

IN-CLOUD ICING: Occurs when supercooled cloud or fog droplets carried by the wind freeze on impact with objects. In-cloud icing usually forms rime, but may also form glaze.

RIME: White or opaque ice with entrapped air.

SNOW: Snow that adheres to objects by some combination of capillary forces, freezing, and sintering.