

C – 2.2.3 (n.) ICE PRESSURE

The 1973 AASHTO - Standard Specification for Highway Bridges specified an effective design ice pressure of 400 psi (2.8 MPa). The 400 psi (2.8 MPa) pressure was based on a study conducted by the Committee of Power Division of ASCE in 1931. The study found the crushing strength of the samples of laboratory ice to range from 50 psi (0.34 MPa) to 1800 psi (12.4 MPa). A 400 psi (2.8 MPa) effective ice pressure represents an upper limit for most of the conditions found in nature(Reference 1).

The current AREMA ice load provisions can be traced back to the Canadian Code “Design of Highway Bridges,” CSA S6-1974. These specifications were developed from field measurements collected from instrumented piers installed on two northward flowing rivers in central Alberta, Canada. A discussion of these field measurements can be found in the book “Ice Loads on Bridge Piers” (Reference 1).

The current ice load factor has a value of 1.4 or 1.2 depending on the load combination. Determining an accurate design ice force is complex in that many parameters are significant. In certain cases the ice load can have a substantial role in sizing the substructure. In these cases the appropriate design ice force should be examined more closely. It is suggested that the load factor be reevaluated if the Engineer considers the predictability of the ice load to be different than anticipated in the provisions.

The Canadian Highway Bridge Design Code ice load provisions were revised in 1988 and in turn adopted by AASHTO in 1994 to incorporate more recent research. The majority of the background information on the revised recommendations is from a paper “Application of Ice Engineering to Bridge Design Standards” (Reference 2). Although these AASHTO provisions have not been adopted by AREMA, they may be considered by the Engineer as an alternative method to compute design ice forces.

References

1. Watts, Fred J. and Podolny, Jr., Walter, “Ice Loads on Bridge Piers”, January 1976.
2. Montgomery, C.J., R. Gerard, W.J. Huiskamp, R.W. Kornelson, Application of Ice Engineering to Bridge Design Standards, *Proceedings, Cold Regions Engineering Specialty Conference, 4–6 April, 1984*, Canadian Society for Civil Engineering, Montreal, Canada, pp. 795–810.