The values in Table 7-1 are for specific Alaskan locations only and generally do not represent appropriate design values for other nearby locations. They are presented to illustrate the extreme variability of snow loads within Alaska. This variability precludes statewide mapping of ground snow loads there.

Valuable information on snow loads for the Rocky Mountain states is contained in Structural Engineers Association of Northern California (1964), MacKinlay and Willis (1965), Brown (1970), U.S. Department of Agriculture Soil Conservation Service (1970), Structural Engineers Association of Colorado (1971), Structural Engineers Association of Oregon (1971), Structural Engineers Association of Arizona (1973), Videon and Stenberg (1978), Structural Engineers Association of Washington (1981), Placer County Building Division (1985), and Sack and Sheikh-Taberi (1986).

Most of these references for the Rocky Mountain states use annual probabilities of being exceeded that are different from the 2 percent value (50-yr mean recurrence interval) used in this standard. Reasonable, but not exact, factors for converting from other annual probabilities of being exceeded to the value herein are presented in Table C7-3.

For example, a ground snow load based on a 3.3 percent annual probability of being exceeded (30-yr mean recurrence interval) should be multiplied by 1.18 to generate a value of p_g for use in Eq. 7-1.

The snow load provisions of several editions of the National Building Code of Canada served as a guide in preparing the snow load provisions in this standard. However, there are some important differences between the Canadian and the United States databases. They include

1. The Canadian ground snow loads are based on a 3.3 percent annual probability of being exceeded (30-yr mean recurrence interval) generated by using the extreme-value, Type-I (Gumbel) distribution, while the normal-risk values in this standard are based on a 2 percent annual probability of being exceeded (50-yr mean recurrence interval) generated by a log-normal distribution.
2. The Canadian loads are based on measured depths and regionalized densities based on four or fewer measurements per month. Because of the infrequency of density measurements, an additional weight of rain is added (Newark 1984). In this standard, the weight of the snow is based on many years of frequently measured weights obtained at 204 locations across the United States. Those measurements contain many rain-on-snow events and thus a separate rain-on-snow surcharge load is not needed except for some roofs with a slope less than 1/2 in./ft (2.38°).

C7.3 FLAT-ROOF SNOW LOADS, p_f

The live load reductions in Section 4.8 should not be applied to snow loads. The minimum allowable values of p_f presented in Section 7.3 acknowledge that in some areas a single major storm can generate loads that exceed those developed from an analysis of weather records and snow-load case studies.

The factors in this standard that account for the thermal, aerodynamic, and geometric characteristics of the structure in its particular setting were developed using the National Building Code of Canada as a point of reference. The case study reports in Peter et al. (1963), Schriever et al. (1967), Lorenzen (1970), Lutes and Schriever (1971), Elliott (1975), Mitchell (1978), Meehan (1979), Taylor (1979 and 1980) were examined in detail.

In addition to these published references, an extensive program of snow load case studies was conducted by eight universities in the United States, the U.S. Army Corps of Engineers' Alaska District, and the United States Army Cold Regions Research and Engineering Laboratory (CRREL) for the Corps of Engineers. The results of this program were used to modify the Canadian methodology to better fit United States conditions. Measurements obtained during the severe winters of 1976–1977 and 1977–1978 are included. A statistical analysis of some of that information is presented in O'Rourke et al. (1983). The experience and perspective of many design professionals, including several with expertise in building failure analysis, have also been incorporated.

C7.3.1 Exposure Factor, C_e

Except in areas of "aerodynamic shade," where loads are often increased by snow drifting, less snow is present on most roofs than on the ground. Loads in unobstructed areas of conventional flat roofs average less than 50 percent of ground loads in some parts of the country. The values in this standard are above-average values, chosen to reduce the risk of snow load-induced failures to an acceptably low level. Because of the variability of wind action, a conservative approach has been taken when considering load reductions by wind.

The effects of exposure are handled on two scales. First, Eq. 7-1 contains a basic exposure factor of 0.7. Second, the type of terrain and the exposure of