Glass, plastic, and fabric roofs of continuously heated structures are seldom subjected to much snow load because their high heat losses cause snow melt and sliding. For such specialty roofs, knowledgeable manufacturers and designers should be consulted. The National Greenhouse Manufacturers Association (1988) recommends use of $C_t = 0.83$ for continuously heated greenhouses and $C_t = 1.00$ for unheated or intermittently heated greenhouses. They suggest a value of $I_s = 1.0$ for retail greenhouses and $I_s = 0.8$ for all other greenhouses. To qualify as a continuously heated greenhouse, a production or retail greenhouse must have a constantly maintained temperature of 50 °F (10 °C) or higher during winter months. In addition, it must also have a maintenance attendant on duty at all times or an adequate temperature alarm system to provide warning in the event of a heating system failure. Finally, the greenhouse roof material must have a thermal resistance, R-value, less than 2 $\text{ft}^2 \times \text{h} \times$ °F/Btu (0.4 °C m^2/W). In this standard, the C_t factor for such continuously heated greenhouses is set at 0.85. An unheated or intermittently heated greenhouse is any greenhouse that does not meet the requirements of a continuously heated single or double glazed greenhouse. Greenhouses should be designed so that the structural supporting members are stronger than the glazing. If this approach is used, any failure caused by heavy snow loads will be localized and in the glazing. This should avert progressive collapse of the structural frame. Higher design values should be used where drifting or sliding snow is expected.

Little snow accumulates on warm air-supported fabric roofs because of their geometry and slippery surface. However, the snow that does accumulate is a significant load for such structures and should be considered. Design methods for snow loads on air structures are discussed in Air Structures Institute (1977) and ASCE (1994).

The combined consideration of exposure and thermal conditions generates ground-to-roof factors that range from a low of 0.49 to a high of 1.01. The equivalent ground-to-roof factors in the 1990 National Building Code of Canada are 0.8 for sheltered roofs, 0.6 for exposed roofs, and 0.4 for exposed roofs in exposed areas north of the tree line, all regardless of their thermal condition.

Sack (1988) and case history experience indicate that the roof snow load on open air structures (e.g., parking structures and roofs over loading docks) and on buildings intentionally kept below freezing (e.g., freezer buildings) can be larger than the nearby ground snow load. It is thought that this effect is due to the lack of heat flow up from the "warm" earth for these select groups of structures. Open air structures are explicitly included with unheated structures. For the freezer buildings,the thermal factor is specified to be 1.3 to account for this effect.

C7.3.3 Importance Factor, I_s

The importance factor I_s has been included to account for the need to relate design loads to the consequences of failure. Roofs of most structures having normal occupancies and functions are designed with an importance factor of 1.0, which corresponds to unmodified use of the statistically determined ground snow load for a 2 percent annual probability of being exceeded (50-yr mean recurrence interval).

A study of the 204 locations in Table C7-1 showed that the ratio of the values for 4 percent and 2 percent annual probabilities of being exceeded (the ratio of the 25-yr to 50-yr mean recurrence interval values) averaged 0.80 and had a standard deviation of 0.06. The ratio of the values for 1 percent and 2 percent annual probabilities of being exceeded (the ratio of the 100-yr to 50-yr mean recurrence interval values) averaged 1.22 and had a standard deviation of 0.08. On the basis of the nationwide consistency of these values it was decided that only one snow load map need be prepared for design purposes and that values for lower and higher risk situations could be generated using that map and constant factors.

Lower and higher risk situations are established using the importance factors for snow loads in Table 1.5-2. These factors range from 0.8 to 1.2. The factor 0.8 bases the average design value for that situation on an annual probability of being exceeded of about 4 percent (about a 25-year mean recurrence interval). The factor 1.2 is nearly that for a 1 percent annual probability of being exceeded (about a 100-year mean recurrence interval).

C7.3.4 Minimum Snow Load for Low-Slope Roofs, p_m

These minimums account for a number of situations that develop on low-slope roofs. They are particularly important considerations for regions where p_g is 20 lb/ft^2 (0.96 kN/m^2) or less. In such areas, single storm events can result in loading for which the basic ground-to-roof conversion factor of 0.7, as well as the C_e and C_t factors, are not applicable.

It is noted that the unbalanced load for hip and gable roofs, with an eave to ridge distance W of 20 ft (6.1 m) or less and having simply supported prismatic members spanning from ridge to eave, is greater than