Changes in Flat Roof Snow Calculation in ASCE 7-22.

Chapter 7 of ASCE 7-22 (Minimum Design Loads and Associated Criteria for Buildings and Other Structures) introduces significant changes that affect the magnitude of snow loads and, consequently, truss design. While some of these changes reduce snow load values, others increase them. One of the key updates is the revision of ground snow loads.

It is important to note that the snow load applied to trusses is typically not the ground snow load, but rather the flat roof snow load.

The flat roof snow load, p_f, is derived by multiplying the ground snow load by several factors that account for snow loss due to wind and melting from heat escaping the interior space below the roof. This load represents the unfactored, balanced design snow load that applies to flat roofs (slope ≤ 5 degrees), and is calculated using formula 7.3-1 in ASCE 7:

$$p_f = 0.7 C_e C_t I_s p_g \text{ (ASCE 7 previous editions)}$$

$$p_f = 0.7 C_e C_t p_g \text{ (ASCE 7 -22 edition)}$$

Where:
C_e – Exposure factor
C_t – Thermal factor
I_s – Importance factor
p_g – Ground Snow load

While the basic formula for flat roof snow load remains similar, a notable revision is the removal of the Snow Importance factor (I_s), a variable based on the Risk Category of the building, from the flat roof snow load (P_f) equation. Instead, the revised standard introduces separate ground snow load maps for each Risk Category, based on updated data. The ASCE 7-22 edition is the first edition of ASCE-7 where the ground snow map from ASCE 7's previous editions has been replaced with four ground snow maps: one for each Risk Category. As the Risk Category increases, so does the design ground snow load on each map.

For example, for all structures in Chesterfield, MO, regardless of their intended use, designed according to ASCE 7-16, the ground snow load (Pg) is 20 psf (pounds per square foot). Following the ASCE 7-16 flat roof snow load calculation, the Importance factor, along with other factors, will increase / decrease the design snow load for structures that pose a higher / lower risk to human life. According to Table 1.5-2 of ASCE 7-16:

Risk Category	Snow Importance Factor, I_s
I	0.80
II	1.00
III	1.10
IV	1.20

According to ground snow maps of ASCE 7-22 for Chesterfield, MO, the new ground snow loads corresponding with Risk Categories are:

- Risk Category I: Low occupancy, low risk (e.g., barns) – 18 psf
- Risk Category II: Standard occupancy and risk (e.g., residential homes) – 23 psf
- Risk Category III: High occupancy, reasonable risk (e.g., schools) – 26 psf
- Risk Category IV: Essential facilities, high risk (e.g. hospitals) – 30 psf

Ground snow load values used in our example are based on data from the ASCE Hazard Tool.

Another significant update in ASCE 7-22 concerns the Thermal Factor (Ct). This factor reflects how much heat escapes from the space below the roof and contributes to melting snow.

Previously, fixed Ct values were used:

- 1.1 for most residential structures
- 1.2 for unheated buildings (e.g., barns)
- 1.0 for certain commercial buildings

ASCE 7-22 now allows for a broader range of Ct values (0.85 to 1.3), determined from Table 7.3-3, based on the building's thermal properties and use.

It is important to remember that MiTek engineers do not specify loading values for trusses. All loading parameters must be verified by the authority having jurisdiction or the building designer. Overestimating snow load can lead to unnecessarily high construction costs, while underestimating can result in structural failure and costly repairs.

For additional information, or if you have questions, please contact the MiTek Engineering department.