1605.2

Load Combinations Using Strength Design of Load and Resistance Factor Design

$$\Sigma \gamma_i Q_i \leq R_n$$

LRFD method limit state

CHANGE TYPE: Modification

CHANGE SUMMARY: The strength design load combinations in the 2012 IBC have been coordinated with Section 2.3 of ASCE 7-10 and expanded to include loads due to fluids, F, and other lateral pressures, H, as well as ice loads.

2012 CODE: 1605.2.~~1~~ Load Combinations Using Strength Design of Load and Resistance Factor Design. Where strength design or load and resistance factor design is used, <u>buildings and other</u> structures, and portions thereof, shall <u>be designed to</u> resist the most critical effects resulting from the following combinations of factored loads:

$$1.4(D + F) \tag{Equation 16-1}$$

$$1.2(D + F + \sim\!\!T\sim) + 1.6(L + H) + 0.5(L_r \text{ or } S \text{ or } R) \tag{Equation 16-2}$$

$$1.2(D \underline{+ F}) + 1.6(L_r \text{ or } S \text{ or } R) \underline{+ 1.6H} + (f_1 L \text{ or } \sim\!\!0.8\sim \underline{0.5}W) \tag{Equation 16-3}$$

$$1.2(D \underline{+ F}) + \sim\!\!1.6\sim \underline{1.0}W + f_1 L \underline{+ 1.6H} + 0.5(L_r \text{ or } S \text{ or } R) \tag{Equation 16-4}$$

$$1.2(D \underline{+ F}) + 1.0E + f_1 L \underline{+ 1.6H} + f_2 S \tag{Equation 16-5}$$

$$0.9D + \sim\!\!1.6\sim \underline{1.0}W + 1.6H \tag{Equation 16-6}$$

$$0.9(D \underline{+ F}) + 1.0E + 1.6H \tag{Equation 16-7}$$

where:

f_1 = 1 for ~~floors in~~ places of public assembly, ~~for~~ live loads in excess of 100 pounds per square foot (4.79 kN/m^2), and ~~for~~ parking garages,

= and 0.5 for other live loads.

f_2 = 0.7 for roof configurations (such as saw tooth) that do not shed snow off the structure, and

= 0.2 for other roof configurations.

Exception<u>s</u>:

1. Where other factored load combinations are specifically required by ~~the~~ <u>other</u> provisions of this code, such combinations shall take precedence.

2. <u>Where the effect of H resists the primary variable load effect, a load factor of 0.9 shall be included with H, where H is permanent, and H shall be set to zero for all other conditions.</u>

1605.2.1 ~~Flood~~ <u>Other</u> Loads. Where flood loads, F_a, are to be considered in the design, the load combinations of Section 2.3.3 of ASCE 7 shall be used. <u>Where self-straining loads, T, are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.3.5 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.3.4 of ASCE 7 shall be considered.</u>

CHANGE SIGNIFICANCE: The IBC load combinations have been coordinated with the strength design load combinations in Section 2.3 of ASCE 7-10 and loads due to fluids, *F*, and lateral earth pressures, ground water pressures, or the pressure of bulk materials, *H,* have been included. The load factor on the wind load, *W*, has been changed to 1.0 to account for the new ultimate design wind speed and strength level wind forces in ASCE 7-10. Note that *F* and *H* must be considered in ASCE 7-10, but they are indirectly combined with other loads as required by the text in Section 2.3.2. The self-straining load, *T*, was deleted from the load combinations because it is indirectly combined as described under Section 1605.2.2 for other loads. The load and resistance factor design (LRFD) load combinations in Section 1605.2.2 and the allowable stress design (ASD) load combinations in Section 1605.3.1.2 were modified to include ice loads for ice sensitive structures. Where atmospheric ice loads must be considered in the design of ice-sensitive structures, these sections cross reference ASCE 7 Section 2.3.4 for LRFD and Section 2.4.3 for ASD, respectively.