SECTION 2.0
COMBINATIONS OF LOADS

SECTION 2.1
GENERAL

Buildings and other structures shall be designed using the provisions of either Section 2.3 or 2.4. Either Section 2.3 or 2.4 shall be used exclusively for proportioning elements of a particular construction material throughout the structure.

SECTION 2.2
SYMBOLS AND NOTATION

D = dead load;
D_i = weight of ice;
E = earthquake load;
F = load due to fluids with well-defined pressures and maximum heights;
F_a = flood load;
H = load due to lateral earth pressure, ground water pressure, or pressure of bulk materials;
L = live load;
L_r = roof live load;
R = rain load;
S = snow load;
T = self-straining force;
W = wind load;
W_i = wind-on-ice determined in accordance with Section 10.

SECTION 2.3
COMBINING FACTORED LOADS USING STRENGTH DESIGN

2.3.1 Applicability. The load combinations and load factors given in Section 2.3.2 shall be used only in those cases in which they are specifically authorized by the applicable material design standard.

2.3.2 Basic Combinations. Structures, components, and foundations shall be designed so that their design strength equals or exceeds the effects of the factored loads in the following combinations:

1. $1.4(D + F)$
2. $1.2(D + F + T) + 1.6(L + H) + 0.5(L_r \text{ or } S \text{ or } R)$
3. $1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (L \text{ or } 0.8W)$
4. $1.2D + 1.6W + L + 0.5(L_r \text{ or } S \text{ or } R)$
5. $1.2D + 1.0E + L + 0.2S$
6. $0.9D + 1.6W + 1.6H$
7. $0.9D + 1.0E + 1.6H$

Exceptions:

1. The load factor on L in combinations (3), (4), and (5) is permitted to equal 0.5 for all occupancies in which L_o in Table 4.1 is less than or equal to 100 psf, with the exception of garages or areas occupied as places of public assembly.
2. The load factor on H shall be set equal to zero in combinations (6) and (7) if the structural action due to H counteracts that due to W or E. Where lateral earth pressure provides resistance to structural actions from other forces, it shall not be included in H but shall be included in the design resistance.

Each relevant strength limit state shall be investigated. Effects of one or more loads not acting shall be investigated. The most unfavorable effects from both wind and earthquake loads shall be investigated, where appropriate, but they need not be considered to act simultaneously. Refer to Section 9.2.2 for specific definition of the earthquake load effect E.[1]

2.3.3 Load Combinations Including Flood Load. When a structure is located in a flood zone (Section 5.3.1), the following load combinations shall be considered:

1. In V-Zones or Coastal A-Zones, $1.6W$ in combinations (4) and (6) shall be replaced by $1.6W + 2.0F_a$.
2. In noncoastal A-Zones, $1.6W$ in combinations (4) and (6) shall be replaced by $0.8W + 1.0F_a$.

2.3.4 Load Combinations Including Atmospheric Ice Loads. When a structure is subjected to atmospheric ice and wind-on-ice loads, the following load combinations shall be considered:

1. 0.5 (L_r or S or R) in combination (2) shall be replaced by $0.2D_i + 0.5S$.
2. $1.6W + 0.5$ (L_r or S or R) in combination (4) shall be replaced by $D_i + W_i + 0.5S$.
3. $1.6W$ in combination (6) shall be replaced by $D_i + W_i$.

[1] The same E from Section 9 is used for both Section 2.3.2 and Section 2.4.1. Refer to the Commentary for Section 9.

SECTION 2.4
COMBINING NOMINAL LOADS USING ALLOWABLE STRESS DESIGN

2.4.1 Basic Combinations. Loads listed herein shall be considered to act in the following combinations; whichever produces the most unfavorable effect in the building, foundation, or structural member being considered. Effects of one or more loads not acting shall be considered.

1. $D+ F$
2. $D + H + F + L + T$
3. $D + H + F + (L_r \text{ or } S \text{ or } R)$
4. $D + H + F + 0.75(L + T) + 0.75(L_r \text{ or } S \text{ or } R)$
5. $D + H + F + (W \text{ or } 0.7E)$
6. $D + H + F + 0.75(W \text{ or } 0.7E) + 0.75L + 0.75(L_r \text{ or } S \text{ or } R)$
7. $0.6D + W + H$
8. $0.6D + 0.7E + H$

The most unfavorable effects from both wind and earthquake loads shall be considered, where appropriate, but they need not be assumed to act simultaneously. Refer to Section 9.2.2 for the specific definition of the earthquake load effect E.[2]

Increases in allowable stress shall not be used with the loads or load combinations given in this standard unless it can be demonstrated that such an increase is justified by structural behavior caused by rate or duration of load.

[2] The same E from Section 9 is used for both Section 2.3.2 and Section 2.4.1. Refer to the Commentary for Section 9.

2.4.2 Load Combinations Including Flood Load. When a structure is located in a flood zone, the following load combinations shall be considered:

1. In V-Zones or Coastal A-Zones (Section 5.3.1), $1.5F_a$ shall be added to other loads in combinations (5), (6), and (7) and E shall be set equal to zero in (5) and (6).
2. In noncoastal A-Zones, $0.75F_a$ shall be added to combinations (5), (6), and (7) and E shall be set equal to zero in (5) and (6).

2.4.3 Load Combinations Including Atmospheric Ice Loads. When a structure is subjected to atmospheric ice and wind-on-ice loads, the following load combinations shall be considered:

1. $0.7D_i$ shall be added to combination (2).
2. $(L_r \text{ or } S \text{ or } R)$ in combination (3) shall be replaced by $0.7D_i + 0.7W_i + S$.
3. W in combination (7) shall be replaced by $0.7D_i + 0.7W_i$.

SECTION 2.5
LOAD COMBINATIONS FOR EXTRAORDINARY EVENTS

Where required by the applicable code, standard, or the authority having jurisdiction, strength and stability shall be checked to ensure that structures are capable of withstanding the effects of extraordinary (i.e., low-probability) events such as fires, explosions, and vehicular impact.