2010 Edition of ASCE 7
Minimum Design Loads for Buildings and Other Structures

Errata

This document, containing the errata to ASCE 7-10, is periodically updated and posted on the SEI website at www.SEInstitute.org The errata are organized by date in descending order (most recent to furthest past) hence regular users of this document need only review the errata posted since their previous use. This document will be regularly updated as errata are identified.

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CHAPTER 1:

Revise the titles of Sections 1.2 and 1.1.2 (1.2.2) and a definition as follows:

1.2 DEFINITIONS AND ~~NOTATIONS~~ SYMBOLS

RISK CATEGORY: A categorization of buildings and other structures for determination of flood, ~~wind,~~ snow, ice, and earthquake loads based on the risk associated with unacceptable performance. See Table 1.5-1.

1.2.2 ~~1.1.2~~ Symbols ~~and Notations~~

N Lateral ~~N~~notional load used to evaluate conformance with minimum structural integrity criteria

Revise Section 1.3.1 as follows:

1.3.1 Strength and stiffness. Buildings and other structures, and all parts thereof, shall be designed and constructed with adequate strength and stiffness to provide structural stability, protect nonstructural components and systems ~~from unacceptable damage~~, and meet the serviceability requirements of Section 1.3.2.

Revise cross references in Section 1.4 as follows:

1.4 GENERAL STRUCTURAL INTEGRITY All structures shall be provided with a continuous load path in accordance with the requirements of Section 1.4.2~~1~~ and shall have a complete lateral force-resisting system with adequate strength to resist the forces indicated in Section 1.4.3~~2~~. All members of the structural system shall be connected to their supporting members in accordance with Section 1.4.4~~3~~. Structural walls shall be anchored to diaphragms and supports in accordance with Section 1.4.5~~4~~. The effects on the structure and its components due to the forces stipulated in this section shall be taken as the notional load, *N*, and combined with the effects of other loads in accordance with the load combinations of Section 2.3 or

2.4. Where material resistance is dependent on load duration, notional loads are permitted to be taken as having a duration of 10 minutes. Structures designed in conformance with the requirements of this Standard for Seismic Design Categories B, C, D, E, or F shall be deemed to comply with the requirements of Sections ~~1.4.1,~~ 1.4.2, 1.4.3, 1.4.4 and 1.4.5.

Revise Section 1.4.1 as follows:

1.4.1 Load Combinations for Integrity Loads. The notional loads, N, specified in Sections 1.4.2 through 1.4.5 shall be combined with other ~~dead and live~~ loads in accordance with Section 1.4.1.1 for strength design and 1.4.1.2 for allowable stress design.

Revise equation A of Section 1.4.1.2 by including a plus sign:

A. $D + 0.7N$

Revise the third item for Risk Category III in Table 1.5-1 as shown below – Note the addition of the reference to Footnote "a" at the end of the item:

Buildings and other structures not included in Risk Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where ~~their~~ the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released. [a]

Revise the third item for Risk Category IV in Table 1.5-1 as shown below:

Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction ~~to be dangerous to the public if released~~ and is sufficient to pose a threat to the public if released. [a]

Revise footnote "a" of Table 1.5-1 as follows:

[a] Buildings and other structures containing toxic, highly toxic, or explosive substances shall be eligible for classification to a lower Risk Category if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in ~~Section 1.5.2~~ Section 1.5.3 that a release of the substances is commensurate with the risk associated with that Risk Category.

CHAPTER 2:

Revise Footnote 1 of Chapter 2 (bottom of page 7 and 8) as follows:

[1] The same *E* from Section ~~1.4 and~~ 12.4 is used for both Sections 2.3.2 and 2.4.1. Refer to the Chapter 11 Commentary for the Seismic Provisions.

CHAPTER 3:

Revise the designations of the footnotes to Table 3.2-1 as follows ("c" to "b" : "d" to "c" and "b" to "d"):

[a] Design lateral soil loads are given for moist conditions for the specified soils at their optimum densities. Actual field conditions shall govern. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.

~~[c]~~ [b] For relatively rigid walls, as when braced by floors, the design lateral soil load shall be increased for sand and gravel type soils to 60 psf (9.43 kN/m^2) per foot (meter) of depth. Basement walls extending not more than 8 ft (2.44 m) below grade and supporting light floor systems are not considered as being relatively rigid walls.

~~d~~ c For relatively rigid walls, as when braced by floors, the design lateral load shall be increased for silt and clay type soils to 100 psf (15.71 kN/m^2) per foot (meter) of depth. Basement walls extending not more than 8 ft (2.44 m) below grade and supporting light floor systems are not considered as being relatively rigid walls.

~~b~~ d Unsuitable as backfill material.

CHAPTER 4:

Revise Section 4.3.1 as follows:

> **4.3.1 Required Live Loads:** The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy, but shall in no case be less than the minimum uniformly distributed unit loads required by Table 4-1~~, including any permissible reduction~~.

Revise the title of Section 4.5 as follows:

4.5 LOADS ON HANDRAIL, GUARDRAIL, GRAB BAR AND VEHICLE BARRIER SYSTEMS, AND FIXED LADDERS

Revise the first paragraph of Section 4.5.1 as follows:

> All handrail and guardrail systems shall be designed to resist a single concentrated load of 200 lb (0.89 kN) applied in any direction at any point on the handrail or top rail ~~and to transfer this load through the supports to the structure~~ to produce the maximum load effect on the element being considered and to transfer this load through the supports to the structure.

Revise the first sentence of the third paragraph of Section 4.5.1 as follows:

> Intermediate rails (all those except the handrail or top rail), and panel fillers shall be designed to withstand a horizontally applied normal load of 50 lb (0.22 kN) on an area not to exceed 12 in. by 12 in. (305 mm by 305 mm) including openings and space between rails and located so as to produce the maximum load effects.

Revise Section 4.5.3 as follows:

> **4.5.3 Loads on Vehicle Barrier Systems:** Vehicle barrier systems for passenger vehicles shall be designed to resist a single load of 6,000 lb (26.70 kN) applied horizontally in any direction to the barrier system, and shall have anchorages or attachments capable of transferring this load to the structure. For design of the system, the load shall be assumed to act at heights between 1 ft 6 in. (460 mm) and 2 ft 3 in. (686 mm) above the floor or ramp surface, located ~~selected~~ to produce the maximum load effects. The load shall be applied on an area not to exceed 12 in. by 12 in. (305 mm by 305 mm) ~~and located so as to produce the maximum load effects~~. This load is not required to act concurrently with any handrail or guardrail system loadings specified in Section 4.5.1. Vehicle barrier systems in garages accommodating trucks and buses shall be designed in accordance with *AASHTO LRFD Bridge Design Specifi cations*.

Revise Table 4-1 as follows (entire revised table included as separate file):

a. "Assembly areas." Delete "and theaters" from the title and add a sixth item: "Other assembly areas" – "100 (4.79)[a] "
b. "Balconies and decks." Change from "occupancy" to "area" in the second column so that it reads: "1.5 times the live load for the area served,"
c. "Corridors, Other floors." Relocate "same as occupancy served except as indicated" from the first column to the second column.
d. "Helipad." Change from "Nonreducible" to "nonreducible".
e. "Roofs, Roofs used for assembly purposes." Change from "assembly purposes" to "other occupancies" so that it reads: "Roofs used for other occupancies".
f. "Roofs, Roofs used for other occupancies." Change from "occupancies" to "special purposes" so that it reads: "Roofs used for other special purposes" .
g. "Roofs, Awnings and canopies, Fabric construction supported by a skeleton structure." At the third column, delete "300 (1.33) applied to skeleton structure" so that there is nothing specified.
h. "Roofs, Awnings and canopies, Screen enclosure support frame." At the second column, change from "applied to the roof frame members only, not the screen" to "based on the tributary area of the roof supported by the frame" so that it reads: "5 (0.24) nonreducible and based on the tributary area of the roof supported by the frame".
i. "Roofs, Awnings and canopies, Screen enclosure support frame." At the third column, delete "applied to supporting roof frame members only" so that it reads: "200 (0.89)".
j. Footnote (c). Change from "per" to "in accordance with" and add "therein" after "allowance" so that it reads: "…trucks and buses shall be in accordance with AASHTO…dynamic load allowance therein are not required…".
k. Footnote (f). Change from "shall not be concurrent" to "are not required to act concurrently".
l. Footnote (g). Change from "need not be assumed" to "is not required" and add "of" after "area" so that it reads: "…over an area of 4.5 in. by 4.5 in…"
m. Footnote (m). At the beginning of the second sentence, change from "At the trusses," to "For attics constructed of trusses," .
n. Footnote (n). Change from Section 4.8.1 to 4.8.2.
o. Footnote (o). Change from "occupancies" to "special purposes" so that it reads: "Roofs used for other special purposes shall…".

CHAPTER 7:

Revise equation embedded in Section 7.6.1 as shown below (h_d is removed from under the radical sign):

… and horizontal extent from the ridge ~~$8\sqrt{Sh_d}/3$~~ $\frac{8}{3}h_d\sqrt{S}$ where h_d is the …

CHAPTER 11:

Revise the symbol in Section 11.3 as follows:

Cs = seismic response coefficient determined in Section 12.8.1.1 or ~~and~~ 19.3.1 (dimensionless)

Revise the heading of Section 11.4.6 as follows:

11.4.6 Risk-Targeted Maximum Considered Earthquake (MCER) Response Spectrum.

Revise Section 11.5.1 as follows (I sub C should be I sub e):

11.5.1 Importance Factor. An importance factor, ~~I_C~~ I_e , shall be assigned to each structure in accordance with Table 1.5-2.

Revise the definition for PGA in Section 11.8.3 following Equation 11.8-1 as follows:

PGA = Mapped MCE_G peak ground acceleration shown in Figs. ~~22-6 through 22-10~~ 22-7 through 22-11.

CHAPTER 12:

Revise line A15 of Table 12.2-1 as follows:

15.	Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance ~~or steel sheets~~	~~14.1 and~~ 14.5	6½	3	4	NL	NL	65	65	65

Revise line D3 of Table 12.2-1 as follows (add reference to Note m in description of system):

3.	Special reinforced concrete shear walls [l, m]	14.2	7	2 ½	5 ½	NL	NL	NL	NL	NL

Revise line E2 of Table 12.2-1 as follows (add reference to Note m in description of system):

2.	Special reinforced concrete shear walls [l, m]	14.2	6 ½	2 ½	5	NL	NL	160	100	100

Revise the description of variables following Equation 12.10-1 as follows:

F_{px} = the diaphragm design force at Level x

Revise line A16 of Table 12.14-1 as follows:

16.	Light-frame (cold-formed steel) wall systems using fl at strap bracing	14.1 ~~and 14.5~~	4	P	P	P

Revise line B22 of Table 12.14-1 as follows:

22.	Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance ~~or steel sheets~~	14.5	7	P	P	P

Revise Section ***12.4.2.3 Seismic Load Combinations***, to agree with sections 2.3.2 and 2.4.1, as follows:

Basic Combinations for Strength Design (see Sections 2.3.2 and 2.2 for notation).

5. $(1.2 + 0.2S_{DS})D + \rho Q_E + L + 0.2S$

7 ~~6~~. $(0.9 - 0.2S_{DS})D + \rho Q_E$ ~~+1.6H~~

NOTES:

1. (no change)
2. ~~The load factor on H shall be set equal to zero in combination 7 if the structural action due to H counteracts that due to E.~~ Where fluid loads F are present, they shall be included with the same load factor as dead load D in combinations 1 through 5 and 7. Where load H are present, they shall be included as follows:
   a. where the effect of H adds to the primary variable load effect, include H with a load factor of 1.6;
   b. where the effect of H resists the primary variable load effect, include H with a load factor of 0.9 where the load is permanent or a load factor of 0 for all other conditions.

Basic Combinations for Allowable Stress Design (see Sections 2.4.1 and 2.2 for notation).

5. $(1.0 + 0.14S_{DS})D + ~~H + F +~~ 0.7\,\rho Q_E$

6b ~~6~~. $(1.0 + 0.105_{DS})D + ~~H + F +~~ 0.525\,\rho Q_E + 0.75L + 0.75~~(L_r$ ~~or~~ S ~~or~~ $R)$

8. $(0.6 - 0.14\,S_{DS})D + 0.7\rho Q_E ~~+H~~$

NOTES:

Where fluid loads F are present, they shall be included in combinations 1 through 6 and 8 with the same factor as that used for dead load D.

Where load H is present, it shall be included as follows:

1. where the effect of H adds to the primary variable load effect, include H with a load factor of 1.0;
2. where the effect of H resists the primary variable load effect, include H with a load factor of 0.6 where the load is permanent or a load factor of 0 for all other conditions.

Revise Section ***12.4.3.2 Load Combinations with Overstrength Factor***, to agree with Sections 2.3.2 and 2.4.1, as follows:

Basic Combinations for Strength Design (see Sections 2.3.2 and 2.2 for notation).

5. $(1.2 + 0.2S_{DS})D + \Omega_o Q_E + L + 0.2S$

7 ~~6~~. $(0.9 - 0.2S_{DS})D + \Omega_o Q_E ~~+1.6H~~$

NOTES:

1. (no change)
2. ~~The load factor on H shall be set equal to zero in combination 7 if the structural action due to H counteracts that due to E.~~ Where fluid loads F are present, they shall be included with the same load factor as dead load D in combinations 1 through 5 and 7. Where load H are present, they shall be included as follows:
   a. where the effect of H adds to the primary variable load effect, include H with a load factor of 1.6;
   b. where the effect of H resists the primary variable load effect, include H with a load factor of 0.9 where the load is permanent or a load factor of 0 for all other conditions.

   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.

Basic Combinations for Allowable Stress Design with Overstrength Factor (see Sections 2.4.1 and 2.2 for notation).

5. $(1.0 + 0.14S_{DS})D + ~~H + F +~~ 0.7\Omega_o Q_E$

6b ~~6~~. $(1.0 + 0.105_{DS})D + ~~H + F +~~ 0.525\,\rho Q_E + 0.75L + 0.75~~(L_r$ ~~or~~ S ~~or~~ $R)$

8. $(0.6 - 0.14S_{DS})D + 0.7\Omega_o\, Q_E ~~+H~~$

NOTES:

Where fluid loads F are present, they shall be included in combinations 1 through 6 and 8 with the same factor as that used for dead load D.

Where load H is present, it shall be included as follows:

1. where the effect of H adds to the primary variable load effect, include H with a load factor of 1.0;
2. where the effect of H resists the primary variable load effect, include H with a load factor of 0.6 where the load is permanent or a load factor of 0 for all other conditions.

Revise Section ***12.14.3.1Seismic Load Effect***, to agree with Sections 2.3.2 and 2.4.1, as follows:

Basic Combinations for Strength Design (see Sections 2.3.2 and 2.2 for notation).

5. $(1.2 + 0.2S_{DS})D + Q_E + L + 0.2S$

7. $(0.9 - 0.2S_{DS})D + Q_E ~~+1.6H~~$

NOTES:

1. (no change)

2. ~~The load factor on *H* shall be set equal to zero in combination 7 if the structural action due to *H* counteracts that due to *E*.~~ Where fluid loads *F* are present, they shall be included with the same load factor as dead load *D* in combinations 1 through 5 and 7. Where load *H* are present, they shall be included as follows:
   a. where the effect of *H* adds to the primary variable load effect, include *H* with a load factor of 1.6;
   b. where the effect of *H* resists the primary variable load effect, include *H* with a load factor of 0.9 where the load is permanent or a load factor of 0 for all other conditions.

   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.

Basic Combinations for Allowable Stress Design (see Sections 2.4.1 and 2.2 for notation).

5. $(1.0 + 0.14S_{DS})D + \sout{H + F +} 0.7\,Q_E$
6b ~~6~~. $(1.0 + 0.105_{DS})D + \sout{H + F +} 0.525Q_E + 0.75L + 0.75S$ ~~(L_r or S or R)~~
8. $(0.6 - 0.14\,S_{DS})D + 0.7Q_E$ ~~$+H$~~

NOTES:

Where fluid loads *F* are present, they shall be included in combinations 1 through 6 and 8 with the same factor as that used for dead load *D*.

Where load *H* is present, it shall be included as follows:

1. where the effect of *H* adds to the primary variable load effect, include *H* with a load factor of 1.0;
2. where the effect of *H* resists the primary variable load effect, include *H* with a load factor of 0.6 where the load is permanent or a load factor of 0 for all other conditions.

Revise Section ***12.14.3.2 Seismic Load Effect Including a 2.5 Overstrength Factor***, to agree with Sections 2.3.2 and 2.4.1, as follows:

Basic Combinations for Strength Design (see Sections 2.3.2 and 2.2 for notation).

5. $(1.2 + 0.2S_{DS})D + 2.5Q_E + L + 0.2S$
7. $(0.9 - 0.2S_{DS})D + 2.5Q_E$ ~~$+1.6H$~~

NOTES:

1. (no change)
2. ~~The load factor on *H* shall be set equal to zero in combination 7 if the structural action due to *H* counteracts that due to *E*.~~ Where fluid loads *F* are present, they shall be included with the same load factor as dead load *D* in combinations 1 through 5 and 7. Where load *H* are present, they shall be included as follows:
   a. where the effect of *H* adds to the primary variable load effect, include *H* with a load factor of 1.6;
   b. where the effect of *H* resists the primary variable load effect, include *H* with a load factor of 0.9 where the load is permanent or a load factor of 0 for all other conditions.

   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.

Basic Combinations for Allowable Stress Design with Overstrength Factor (see Sections 2.4.1 and 2.2 for notation).

5. $(1.0 + 0.14S_{DS})D + \sout{H + F +} 1.75Q_E$
6b ~~6~~. $(1.0 + 0.105_{DS})D + \sout{H + F +} 1.313Q_E + 0.75L + 0.75S$ ~~(L_r or S or R)~~
8. $(0.6 - 0.14S_{DS})D + 1.75Q_E$ ~~$+H$~~

NOTES:

Where fluid loads *F* are present, they shall be included in combinations 1 through 6 and 8 with the same factor as that used for dead load *D*.

Where load *H* is present, it shall be included as follows:

1. where the effect of *H* adds to the primary variable load effect, include *H* with a load factor of 1.0;

2. where the effect of *H* resists the primary variable load effect, include *H* with a load factor of 0.6 where the load is permanent or a load factor of 0 for all other conditions.

CHAPTER 13:

Revise the 4th sentence of the 2nd paragraph of Section 13.4 as follows:

The component forces shall be those determined in Section 13.3.1. ~~, except that modifications to *Fp* and *Rp* due to anchorage conditions need not be considered.~~

Revise the header of the third column of Table 13.5-1 to remove the superscript "b":

TABLE 13.5-1 COEFFICIENTS FOR ARCHITECTURAL COMPONENTS

Architectural Component	a_p[a]	R_p[~~b~~]

Revise the first paragraph of Section 13.4.2.2 as follows:

13.4.2.2 Anchors in Masonry: Anchors in masonry shall be designed in accordance with TMS 402/ACI ~~503~~530/ASCE 5. Anchors shall be designed to be governed by the tensile or shear strength of a ductile steel element.

EXCEPTION: Anchors shall be permitted to be designed so that the support ~~attachment~~ that the anchor is connecting to the structure undergoes ductile yielding at a load level corresponding to anchor forces not greater than their design strength, or the minimum design strength of the anchors shall be at least 2.5 times the factored forces transmitted by the component.

Revise the format of the Exception in Section 13.4.5 as follows:

13.4.5 Power Actuated Fasteners: Power actuated fasteners in concrete or steel shall not be used for sustained tension loads or for brace applications in Seismic Design Categories D, E, or F unless approved for seismic loading. Power actuated fasteners in masonry are not permitted unless approved for seismic loading.

EXCEPTIONS:

1. Power actuated fasteners in concrete used for support of acoustical tile or lay-in panel suspended ceiling applications and distributed systems where the service load on any individual fastener does not exceed 90 lb (400 N).
2. Power actuated fasteners in steel where the service load on any individual fastener does not exceed 250 lb (1,112 N).

Revise the title "EXCEPTION" in Section 13.5.9.1 to "EXCEPTIONS"

CHAPTER 14:

Revise Section 14.1.3.2 as follows:

> ***14.1.3.2 Seismic Requirements for Cold-Formed Steel Structures:*** Where a response modification coefficient, *R*, in accordance with Table 12.2-1 is used for the design of cold-formed steel structures, the structures shall be designed and detailed in accordance with the requirements of AISI S100, ASCE 8, and, for cold-formed steel-special bolted moment frames, AISI S110 as modified in Section 14.1.3.3.

Revise the Exception in Section 14.1.7 as follows:

> **EXCEPTION:** Connection tensile capacity need not exceed the strength required to resist seismic load effects including overstrength factor of ~~Section 12.4.3.2 or Section 12.14.2.2.2~~ Section 12.4.3 or 12.14.3.2. Connections need not be provided where the foundation or supported structure does not rely on the tensile capacity of the piles for stability under the design seismic forces.

Revise Section 14.4.5.6 as follows:

> ***14.4.5.6 Shear Keys:*** Add the following new Section 3.3.6.6 to TMS 402/ACI 530/ASCE 5:
>
> > ***3.3.6.~~11~~6 Shear Keys.*** *The surface of concrete upon which a special reinforced masonry… (remainder of section is unchanged)*

CHAPTER 15:

Revise the formatting of Item 2 of Section 15.4.1 as follows:

2. For nonbuilding systems that have an *R* value provided in Table 15.4-2, the minimum specified value in Eq. 12.8-5 shall be replaced by

   $C_S = 0.044 S_{DS} I_e$ (15.4-1)

   The value of *Cs* shall not be taken as less than 0.03.

   And for nonbuilding structures located where $S_1 \geq 0.6g$, the minimum specified value in Eq. 12.8-6 shall be replaced by

   $C_S = 0.8 S_1 / (R/I_e)$ (15.4-2)

The sentence containing Equation 15.4-4 – the first word, “and”, should be capitalized as follows:

> And ~~and~~ for nonbuilding structures located where $S1 \geq 0.6g$, the minimum specified value in Eq. 12.8-6 shall be replaced by
>
> $Cs = 0.5S1/(R/I_e)$ (15.4-4)

In the listing of terms for Equation 15.7-3, the metric units should be added as follows:

> *D* = tank diameter in feet (m)
> *Ws* = total weight of tank shell in pounds (N)

In Table 15.4-2, first column, last line in table should be changed from "standards that are similar to buildings" to "standards that are not similar to buildings".

Modify the heading of Table 15.4-2 as follows (pages 142 and 143):

TABLE 15.4-2 SEISMIC COEFFICIENTS FOR NONBUILDING STRUCTURES NOT SIMILAR TO BUILDINGS

Nonbuilding Structure Type	Detailing Requirements[c]	*R*	Ω_0	C_d	Structural System And Structural Height, h_n, Limits (ft.)[a,d]				
					A & B	C	D	E	F

Modify entry in Table 15.4-2 as follows:

All steel and reinforced concrete distributed mass cantilever structures not otherwise covered herein including stacks, chimneys, silos, and skirt-supported vertical vessels, ~~and single pedestal or skirt supported~~	15.6.2								
Single pedestal or skirt supported									
Welded steel	15.7.10	2	2[b]	2	NL	NL	NL	NL	NL
Welded steel with special detailing[e]	15.7.10 & 15.7.10.5 a and b.	3	2[b]	2	NL	NL	NL	NL	NL
Prestressed or reinforced concrete	15.7.10	2	2[b]	2	NL	NL	NL	NL	NL
Prestressed or reinforced concrete with special detailing	15.7.10 and 14.2.3.6 ~~and ACI 318 Chapter 21, Sections 21.2 and 21.7~~	3	2[b]	2	NL	NL	NL	NL	NL

Revise paragraph breaks of Section 15.6.1 as follows:

> **15.6.1 Earth-Retaining Structures:** This section applies to all earth-retaining structures assigned to Seismic Design Category D, E, or F. The lateral earth pressures due to earthquake ground motions shall be determined in accordance with Section 11.8.3. *[remove break]* The risk category shall be determined by the proximity of the earth-retaining structure to other buildings and structures. If failure of the earth-retaining structure would affect the adjacent building or structure, the risk category shall not be less than that of the adjacent building or structure. *[add break]*
>
> Earth-retaining walls are permitted to be designed for seismic loads as either yielding or nonyielding walls. Cantilevered reinforced concrete or masonry retaining walls shall be assumed to be yielding walls and shall be designed as simple flexural wall elements.

Revise reference in second paragraph of Section 15.6.5 as follows:

> … determined by the risk assessment required by Section ~~1.5.2~~ 1.5.3 or by the authority having jurisdiction that the site may be… *(remainder of section unchanged)*

Section 15.7.6.1 - Clarify the portions of the text that are the "Notes" and that which is the "Exception" in Section 15.7.6.1 as shown below. There is no change to the text itself – boxes and shading added for clarity.

For $T_i > T_L$

$$S_{ai} = \frac{S_{D1}T_L}{T_i^2} \qquad (15.7\text{-}9)$$

NOTES:

a. Where a reference document is used in which the spectral acceleration for the tank shell, and the impulsive component of the liquid is independent of T_i, then $S_{ai} = S_{DS}$.
b. Eq. 15.7-8 and Eq. 15.7-9 shall not be less than the minimum values required in Section 15.4.1 Item 2 multiplied by $\frac{R}{I}$.
c. For tanks in Risk Category IV, the value of the importance factor, I, used for freeboard determination only shall be taken as 1.0.
d. For tanks in Risk Categories I, II, and III, the value of T_L used for freeboard determination are permitted to be set equal to 4 s. The value of the importance factor, I, used for freeboard determination for tanks in Risk Categories I, II, and III shall be the value determined from Table 11.5-1.
e. Impulsive and convective seismic forces for tanks are permitted to be combined using the square root of the sum of the squares (SRSS) method in lieu of the direct sum method shown in Section 15.7.6 and its related subsections.

S_{ac} = the spectral acceleration of the sloshing liquid (convective component) based on the sloshing period T_c and 0.5 percent damping

For $T_c \le T_L$:

$$S_{ac} = \frac{1.5S_{D1}}{T_c} \le 1.5S_{DS} \qquad (15.7\text{-}10)$$

For $T_c > T_L$:

$$S_{ac} = \frac{1.5S_{D1}T_L}{T_c^2} \qquad (15.7\text{-}11)$$

EXCEPTION: For $T_c > 4$ s, S_{ac} is permitted be determined by a site-specific study using one or more of the following methods: (i) the procedures found in Chapter 21, provided such procedures, which rely on ground-motion attenuation equations for computing response spectra, cover the natural period band containing T_c, (ii) ground-motion simulation methods employing seismological models of fault rupture and wave propagation, and (iii) analysis of representative strong-motion accelerogram data with reliable long-period content extending to periods greater than T_c. Site-specific values of S_{ac} shall be based on one standard deviation determinations. However, in no case shall the value of S_{ac} be taken as less than the value determined in accordance with Eq. 15.7-11 using 50% of the mapped value of *TL* from Chapter 22.

The 80 percent limit on S_a required by Sections 21.3 and 21.4 shall not apply to the determination of site-specific values of S_{ac}, which satisfy the requirements of this exception. In determining the value of S_{ac}, the value of *TL* shall not be less than 4 s.

Where

$$T_c = 2\pi\sqrt{\frac{D}{3.68g\tanh\left(\frac{3.68H}{D}\right)}} \qquad (15.7\text{-}12)$$

and where

D = the tank diameter in ft (m),
H = liquid height in ft (m),
g = acceleration due to gravity in consistent units
W_i = impulsive weight (impulsive component of liquid, roof and equipment, shell, bottom, and internal elements)
W_c = the portion of the liquid weight sloshing

15.7.6.1.1 Distribution of Hydrodynamic and Inertia Forces Unless otherwise required by the appropriate reference document listed in Chapter 23, the method given in ACI 350.3 is permitted to be used to determine the vertical and horizontal distribution of the hydrodynamic and inertia forces on the walls of circular and rectangular tanks.

CHAPTER 17:

Revise item 3 of Section 17.4.1 as follows:

a. The structure above the isolation interface is less than or equal to four stories or 65 ft (19.8 m) in structural height, h_n ~~measured from the base as defined in Section 11.2~~.

Revise the second paragraph of 17.5.4.2 as follows:

The R_I factor shall be based on the type of seismic force-resisting system used for the structure above the isolation system and shall be three-eighths of the value of R given in Table 12.2-1, Table 15.4-1 or Table 15.4-2, as appropriate, with a maximum value not greater than 2.0 and a minimum value of 1.0.

Revise the title of Section 17.5.4.3 by italicizing the symbol V_S to match outline level formatting.

17.5.4.3 Limits on ~~V_S~~ V_S

Clarify what text is part of the Exceptions in 17.6.4.2 (the sentence beginning "The design…" and ending "… Section 17.5.4.3." is not part of the Exception). There is no change to the text itself.

…. from the dynamic analysis reduced by a factor of *RI* as determined in accordance with Section 17.5.4.2. The design lateral shear force on the structure above the isolation system, if regular in configuration, shall not be taken as less than 80 percent of *Vs*, or less than the limits specified by Section 17.5.4.3.

EXCEPTION: The lateral shear force on the structure above the isolation system, if regular in configuration, is permitted to be taken as less than 80 percent, but shall not be less than 60 percent of *Vs*, where the response-history procedure is used for analysis of the seismically isolated structure.

The design lateral shear force on the structure above the isolation system, if irregular in configuration, shall not be taken as less than *Vs* or less than the limits specified by Section 17.5.4.3.

EXCEPTION: The design lateral shear force on the structure above the isolation system, if irregular in configuration, is permitted to be taken as less than 100 percent, but shall not be less than 80 percent of *Vs*, where the response-history procedure is used for analysis of the seismically isolated structure.

17.6.4.3 Scaling of Results…

Revise notations following Eq. 17.5-9 as follows:

Where

F_x = portion of V_s that is assigned to Level x
V_s = total lateral seismic design force or shear on elements above the isolation system as prescribed by Eq. 17.5-8
w_x = portion of W that is located at or assigned to Level ~~x~~ i, n, or x, respectively
h_x = height above the base to Level ~~x~~ i, n, or x, respectively

CHAPTER 18:

Revise Section 18.1.3 as follows:

~~h_r = height of the structure above the base to the roof level, Section 18.5.2.3~~

Revise Eq. 18.5-3 as follows *(the subscript in the denominator is "n" not "r")*:

$$\phi_{i1} = h_i / h_{\text{~~r~~}\,n} \qquad (18.5\text{-}3)$$

No change to equation 18.5-4

where:

h_i = the height ~~of the structure~~ above the base to Level i
$h_{\text{~~r~~}\,n}$ = the structural height ~~of the structure above the base to the roof level~~ as defined in Section 11.2
w_i = the portion of the total effective seismic weight, W, located at or assigned to Level i

CHAPTER 19:

Clarify the end of the Exception in Section 19.2.1.2 as follows *(the sentence starting with "The value…" is not part of the Exception)*:

….value of r shall be determined by linear interpolation.

EXCEPTION: For structures supported on point-bearing piles and in all other cases where the foundation soil consists of a soft stratum of reasonably uniform properties underlain by a much stiffer, rock-like deposit with an abrupt increase in stiffness, the factor β_o in Eq. 19.2-9 shall be replaced by β_0' if $\frac{4D_s}{v_s\tilde{T}} < 1$ where D_s is the total depth of the stratum. β_0' shall be determined as follows:

$$\beta_o' = \left(\frac{4D_s}{v_s\tilde{T}}\right)^2 \beta_o \qquad (19.2\text{-}12)$$

The value of $\tilde{\beta}$ computed from Eq. 19.2-9, both with or without the adjustment represented by Eq. 19.2-12, shall in no case be taken as less than $\tilde{\beta} = 0.05$ or greater than $\tilde{\beta} = 0.20$.

CHAPTER 21:

Revise Section 21.2.1.1 as follows:

21.2.1.1 Method 1. At each spectral response period for which the acceleration is computed, ordinates of the probabilistic ground-motion response spectrum shall be determined as the product of the risk coefficient, C_R, and the spectral response acceleration from a 5 percent damped acceleration response spectrum having a 2 percent probability of exceedance within a 50-yr. period. The value of the risk coefficient, C_R, shall be determined using values of C_{RS} and C_{R1} from Figs. 22-17 and 22-18 ~~22-3 and 22-4~~, respectively. At spectral response periods less than or equal to 0.2 second, C_R shall be taken as equal to C_{RS}. At spectral response periods greater than or equal to 1.0 second, C_R shall be taken as equal to C_{R1}. At response spectral periods greater than 0.2 second and less than 1.0 second, C_R shall be based on linear interpolation of C_{RS} and C_{R1}.

CHAPTER 22:

Revise first paragraph as follows:

Contained in this chapter are Figs. 22-1 through 22-6, which provide the risk-targeted ~~adjusted~~ maximum considered earthquake (MCE_R) ground motion parameters S_S and S_1; Figs. 22-17 and 22-18, which provide the risk coefficients C_{RS} and C_{R1}; and Figs. 22-12 through 22-15, which provide the long-period transition periods T_L for use in applying the seismic provisions of this standard. S_S is the risk- targeted ~~adjusted~~ MCE_R, 5 percent damped, spectral response acceleration parameter at short periods as defined in Section 11.4.1. S_1 is the risk-targeted ~~mapped~~ MCE_R ground motion, 5 percent damped, spectral response acceleration parameter at a period of 1 s as defined in Section 11.4.1. C_{RS} is the mapped risk coefficient at short periods used in Section 21.2.1.1. C_{R1} is the mapped risk coefficient at a period of 1 s used in Section 21.2.1.1. T_L is the mapped long-period transition period used in Section 11.4.5.

Revise the titles of the following figures as shown below:

Figure 22-1 S_S Risk-~~Adjusted~~ Targeted Maximum Considered Earthquake (MCE_R) Ground Motion for the Conterminous United States of 0.2 s Spectral Response Acceleration (5% of Critical Damping), Site Class B.

Figure 22-2 S_1 Risk-~~Adjusted~~ Targeted Maximum Considered Earthquake (MCE_R) Ground Motion for the Conterminous United States of 1 s Spectral Response Acceleration (5% of Critical Damping), Site Class B

Figure 22-3 S_S Risk-~~Adjusted~~ Targeted Maximum Considered Earthquake (MCE_R) Ground Motion for Alaska of 0.2 s Spectral Response Acceleration (5% of Critical Damping), Site Class B

Figure 22-4 S_1 Risk-~~Adjusted~~ Targeted Maximum Considered Earthquake (MCE_R) Ground Motion for Alaska of 1.0s Spectral Response Acceleration (5% of Critical Damping), Site Class B

Figure 22-5 S_S and S_1 Risk-~~Adjusted~~ Targeted Maximum Considered Earthquake (MCE_R) Ground Motion for Hawaii of 0.2 and 1.0 s Spectral Response Acceleration (5% of Critical Damping), Site Class B

Figure 22-6 S_S and S_1 Risk-~~Adjusted~~ Targeted Maximum Considered Earthquake (MCE_R) Ground Motion for Puerto Rico and the United States Virgin Islands of 0.2 and 1.0 s Spectral Response Acceleration (5% of Critical Damping), Site Class B

Figure 22-14 Mapped Long-Period Transition Period, TL (s), for ~~the~~ Hawaii.

Figure 22-16 Mapped Long-Period Transition Period, *TL* (s), for ~~Puerto~~ Guam and American Samoa.

CHAPTER 26:

Revise text in first box in Figure 26.1-1 as follows:

> **Chapter 26- General Requirements:** ~~Use~~ Used to determine….

Revise the title and first sentence of Section 26.3 as follows:

> **26.3 SYMBOLS ~~AND NOTATION~~:** The following symbols ~~and notation~~ apply only to the provisions of Chapters 26 through 31:

Revise the titles of the basic wind speed maps as follows:

> Figure 26.5-1A Basic Wind Speeds for ~~Occupancy~~ Risk Category II Buildings and Other Structures.
>
> Figure 26.5-1B Basic Wind Speeds for ~~Occupancy~~ Risk Category III and IV Buildings and Other Structures.
>
> Figure 26.5-1C Basic Wind Speeds for ~~Occupancy~~ Risk Category I Buildings and Other Structures.

Revise the first paragraph of Section 26.8.1 as follows:

> **26.8.1 Wind Speed-Up over Hills, Ridges, and Escarpments:** Wind speed-up effects at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, shall be included in the ~~design~~ determination of the wind loads when buildings….

Revise the last paragraph of Section 26.8.2 as follows:

> If site conditions and locations of buildings and other structures do not meet all the conditions specified in Section 26.8.1 then $Kzt = 1.0$.

Revise the first sentence of Section 26.9.2 as follows:

> **26.9.2 Frequency Determination.** To determine whether a building or other structure is rigid or flexible as defined…

Revise the last paragraph in Section 26.10.3.1 as follows (add the word "other" in three places):

> For Risk Category II buildings and other structures and Risk Category III buildings and other structures, except health care facilities, the wind-borne debris region shall be based on Fig. 26.5-1A. For Risk Category III health care facilities and Risk Category IV buildings and other structures, the wind-borne debris region shall be based on Fig. 26.5-1B. Risk Categories shall be determined in accordance with Section 1.5.

Revise the first sentence of the last paragraph of Section 26.10.3.2 as follows:

> Glazing and impact-protective systems in buildings and other structures classified as Risk Category IV in accordance with Section 1.5 shall…..

CHAPTER 27:

Relocate Section 27.4.7 to become Section 27.1.5 so that the requirements of the section are applicable to wind loads calculated using either Part I or Part II of Chapter 27:

> **27.1.5** ~~**27.4.7**~~ **Minimum Design Wind Loads.** The wind load to be used in the design of the MWFRS for an enclosed or partially enclosed building shall not be less than 16 lb/ft2 (0.77 kN/m2) multiplied by the wall area of the building and 8 lb/ft^2 (0.38 kN/m2) multiplied by the roof area of the building projected onto a vertical plane normal to the assumed wind direction. Wall and roof loads shall be applied simultaneously. The design wind force for open buildings shall be not less than 16 lb/ft^2 (0.77 kN/m2) multiplied by the area *Af*.

CHAPTER 29:

Revise Table 29.1-1 as follows:

> **Step 4:** Determine velocity pressure exposure coefficient, K_z or K_h, see Table ~~29.2-1~~ 29.3-1
>
> **Step 6:** Determine force coefficient, *Cf*:
> - Solid freestanding signs or solid freestanding walls, Fig. 29.4-1
> - Chimneys, tanks, rooftop equipment Fig. 29.5-1
> - Open signs, lattice frameworks Fig. 29.5-2
> - Trussed towers Fig. ~~29.4-3~~ 29.5-3
>
> **Step 7:** Calculate wind force, F:
> - Eq. 29.4-1 for signs and walls
> - Eq. ~~29-6-1 and Eq. 29.6-2~~ 29.5-2 and 29.5-3 for rooftop structures and equipment
> - Eq. 29.5-1 for other structures

Appendix 11B:

Revise reference to "Table 1-1" in the first paragraph of Section **11B.5 CHANGE OF USE**, to read "Table 1.5-1"

COMMENTARY

CHAPTER C1:

Revise the header of Table C1.3.1a to read "Risk Category" instead of "Occupancy Category".

Basis	~~Occupancy~~ Risk Category			
	I	II	III	IV

CHAPTER C3:

Replace Tables C3-1 and C3-2 with the reformatted tables (attached as separate file) that clearly distinguish between the customary and SI values. Previously the table was shown as one large table with no clear break between customary units and SI units. Table header was only labeled with customary units. The table has now been broken into two tables. Note that none of the values in either table were changed.

CHAPTER C4:

Revise the heading in the right hand column of the table contained in Figure C4-1 to read "Figure C4-1"

Revise the reference to Section 1.4.5 in the first paragraph of **C1.4 GENERAL STRUCTURAL INTEGRITY** to read "Section 1.4.":

> For such structures, additional precautions can and should be taken in the design of structures to limit the effects of local collapse and to prevent or minimize progressive collapse in accordance with the procedures of Section 2.5, as charged by Section 1.4.~~5.~~

CHAPTER C5:

Revise two references to Table 1-1 in Section **C5.4.5 Impact Loads** to read "Table 1.5-1"

Page 419, first paragraph.
Page421, **Coefficients *CI*, *CO*, *CD*, and *CB*.**, second paragraph

CHAPTER C7:

Revise Table C7-1 to place city location names under the correct state heading. Unaffected states omitted for brevity. Note that none of the values are affected.

Location	*Ground Snow Load (lb/ft²)*		
	Years of record	*Maximum observed*	*2% Annual probability*[a]
MASSACHUSETTS			
Boston	39	25	34
Nantucket	16	14	24

Worcester	33	29	44
~~Columbus~~	~~40~~	~~11~~	~~11~~
~~Dayton~~	~~40~~	~~18~~	~~11~~
~~Mansfield~~	~~30~~	~~31~~	~~17~~
~~Toledo Express~~	~~36~~	~~10~~	~~10~~
~~Youngstown~~	~~40~~	~~14~~	~~10~~
OHIO			
Akron-Canton	40	16	14
Cleveland	40	27	19
Columbus	40	11	11
Dayton	40	18	11
Mansfield	30	31	17
Toledo Express	36	10	10
Youngstown	40	14	10
~~Austin~~	~~39~~	~~2~~	~~2~~
~~Dallas~~	~~23~~	~~3~~	~~3~~
~~El Paso~~	~~38~~	~~8~~	~~8~~
~~Fort Worth~~	~~39~~	~~5~~	~~4~~
~~Lubbock~~	~~40~~	~~9~~	~~11~~
~~Midland~~	~~38~~	~~4~~	~~4~~
~~San Angelo~~	~~40~~	~~3~~	~~3~~
~~San Antonio~~	~~40~~	~~9~~	~~4~~
~~Waco~~	~~40~~	~~3~~	~~2~~
~~Wichita Falls~~	~~40~~	~~4~~	~~5~~
TEXAS			
Abilene	40	6	6
Amarillo	39	15	10
Austin	39	2	2
Dallas	23	3	3
El Paso	38	8	8
Fort Worth	39	5	4
Lubbock	40	9	11
Midland	38	4	4
San Angelo	40	3	3
San Antonio	40	9	4
Waco	40	3	2
Wichita Falls	40	4	5

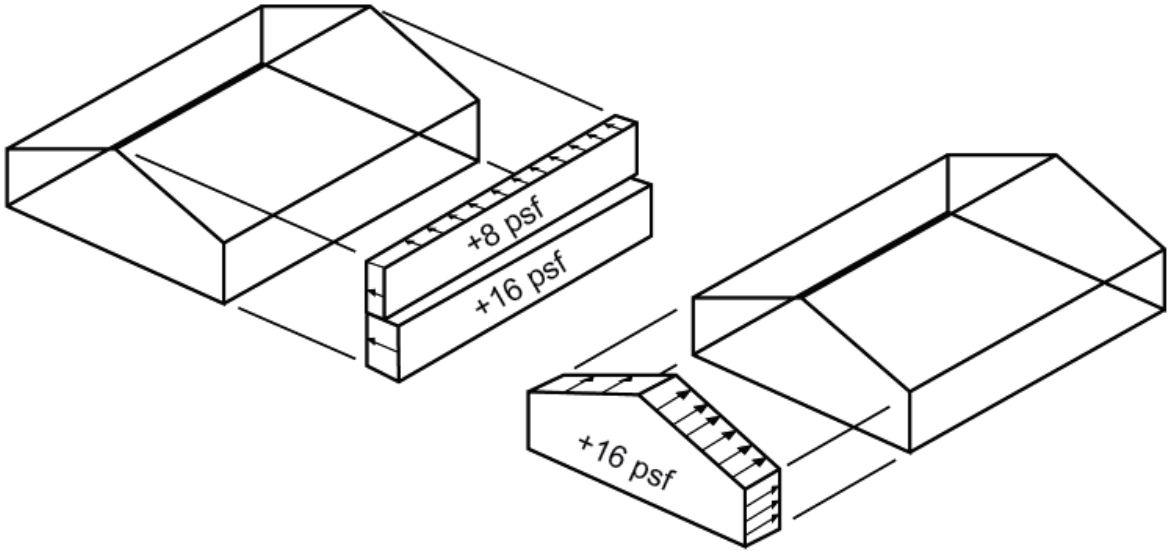
CHAPTER C26:

Revise right-hand column labeled "ASCE 7-10 Section" of Table C26.1-1 as follows:

~~29.7~~ 29.6 Parapets
~~30.10~~ 30.9 Parapets
~~30.10.1 General Design Procedure~~
~~29.6~~ 29.5.1 Rooftop Structures and Equipment for Buildings with $h \leq 60$ ft (18.3 m)

CHAPTER C27:

Revise Figure C27.4-1 as shown below:



CHAPTER C29:

Revise the title of Section C29.6 section as follows:

~~C29.6~~ C29.5.1 ROOFTOP STRUCTURES AND EQUIPMENT FOR BUILDINGS WITH $h \leq 60$ ft

Revise section C29.6 first paragraph as follows:

Because of the small size of the structures in comparison to the building, it is expected that the wind force will be higher than predicted by ~~Eq. 29.6-1~~Eq. 29.5-2 due to higher correlation of pressures across the structure surface, higher turbulence on the building roof, and accelerated wind speed on the roof.

Revise section C29.6 last paragraph as follows:

In both cases the research also showed high uplifts on the top of rooftop. Hence uplift load should also be considered by the designer and is addressed in Section ~~29.6~~29.5.1.