

2021 Virginia Construction Code

CHAPTER 19 CONCRETE

SECTION 1905 MODIFICATIONS TO ACI 318

1905.1 General.

The text of [ACI 318](#) shall be modified as indicated in [Sections 1905.1.1](#) through [1905.1.8](#).

1905.1.1 ACI 318, Section 2.3.

Modify existing definitions and add the following definitions to [ACI 318](#), Section 2.3.

DETAILED PLAIN CONCRETE STRUCTURAL WALL. A wall complying with the requirements of [Chapter 14](#), including [14.6.2](#).

ORDINARY PRECAST STRUCTURAL WALL. A precast wall complying with the requirements of [Chapters 1](#) through [13](#), [15](#), [16](#) and [19](#) through [26](#).

ORDINARY REINFORCED CONCRETE STRUCTURAL WALL. A *cast-in-place* wall complying with the requirements of [Chapters 1](#) through [13](#), [15](#), [16](#) and [19](#) through [26](#).

ORDINARY STRUCTURAL PLAIN CONCRETE WALL. A wall complying with the requirements of [Chapter 14](#), *excluding* [14.6.2](#).

1905.1.2 ACI 318, Section 18.2.1.

Modify [ACI 318](#) Sections 18.2.1.2 and 18.2.1.6 to read as follows:

- 18.2.1.2 – Structures assigned to Seismic Design Category A shall satisfy requirements of [Chapters 1](#) through [17](#) and [19](#) through [26](#); [Chapter 18](#) does not apply. Structures assigned to Seismic Design Category B, C, D, E or F shall satisfy 18.2.1.3 through 18.2.1.7, as applicable. *Except for structural elements of plain concrete complying with [Section 1905.1.7](#) of the International Building Code, structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category C, D, E or F.*
- 18.2.1.6 – Structural systems designated as part of the seismic force-resisting system shall be restricted to those permitted by [ASCE 7](#). Except for Seismic Design Category A, for which [Chapter 18](#) does not apply, the following provisions shall be satisfied for each structural system designated as part of the seismic force-resisting system, regardless of the seismic design category:
 - (a) Ordinary moment frames shall satisfy 18.3.
 - (b) Ordinary reinforced concrete structural walls and ordinary precast structural walls need not satisfy any provisions in [Chapter 18](#).
 - (c) Intermediate moment frames shall satisfy 18.4.
 - (d) Intermediate precast structural walls shall satisfy 18.5.
 - (e) Special moment frames shall satisfy 18.6 through 18.9.
 - (f) Special structural walls shall satisfy 18.10.
 - (g) Special structural walls constructed using precast concrete shall satisfy 18.11.

Special moment frames and special structural walls shall also satisfy 18.2.4 through 18.2.8.

1905.1.3 ACI 318, Section 18.5.

Modify [ACI 318](#), Section 18.5 by adding new Section 18.5.2.2 and renumbering existing Sections 18.5.2.2 and 18.5.2.3 to become 18.5.2.3 and 18.5.2.4, respectively.

18.5.2.2 – Connections that are designed to yield shall be capable of maintaining 80 percent of the design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.

18.5.2.3 – Elements of the connection that are not designed to yield shall develop at least 1.5 S_y .

18.5.2.4 – In structures assigned to SDC D, E or F, wall piers shall be designed in accordance with 18.10.8 or 18.14 in [ACI 318](#).

1905.1.4 ACI 318, Section 18.11.

Modify [ACI 318](#), Section 18.11.2.1 to read as follows:

18.11.2.1 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 18.10 for cast-in-place special structural walls in addition to 18.5.2.

Copyright © 2024 International Code Council, Inc., or its licensors (ALL RIGHTS RESERVED).

Accessed by Venkatesh Shanmugam on 11/14/2024 pursuant to License Agreement with ICC. No further reproduction or distribution authorized. Any Unauthorized reproduction or distribution is a violation of the federal copyright, and subject to civil and criminal penalties thereunder.

1905.1.5 ACI 318, Section 18.13.1.1.

Modify ACI 318, Section 18.13.1.1 to read as follows:

18.13.1.1 – Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of 18.13 and other applicable provisions of ACI 318 unless modified by Chapter 18 of the International Building Code.

1905.1.6 ACI 318, Section 14.6.

Modify ACI 318, Section 14.6 by adding new Section 14.6.2 to read as follows:

14.6.2 – Detailed plain concrete structural walls.

14.6.2.1 – Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 14.6.2.2.

14.6.2.2 – Reinforcement shall be provided as follows:

- Vertical reinforcement of at least 0.20 square inch (129 mm²) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by 14.6.1.
- Horizontal reinforcement at least 0.20 square inch (129 mm²) in cross-sectional area shall be provided:
 1. Continuously at structurally connected roof and floor levels and at the top of walls.
 2. At the bottom of load-bearing walls or in the top of foundations where doweled to the wall.
 3. At a maximum spacing of 120 inches (3048 mm).

Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 3 above, shall be continuous in the wall.

1905.1.7 ACI 318, Section 14.1.4.

Delete ACI 318, Section 14.1.4 and replace with the following:

14.1.4 – Plain concrete in structures assigned to Seismic Design Category C, D, E or F.

14.1.4.1 – Structures assigned to Seismic Design Category C, D, E or F shall not have elements of structural plain concrete, except as follows:

- Structural plain concrete basement, foundation or other walls below the base as defined in ASCE 7 are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D or E, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall be not less than 7½ inches (190 mm), and the wall shall retain no more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with 14.6.1.
- Isolated footings of plain concrete supporting pedestals or columns are permitted, provided the projection of the footing beyond the face of the supported member does not exceed the footing thickness.

Exception: In detached one- and two-family dwellings three stories or less in height, the projection of the footing beyond the face of the supported member is permitted to exceed the footing thickness.

- Plain concrete footings supporting walls are permitted, provided the footings have at least two continuous longitudinal reinforcing bars. Bars shall not be smaller than No. 4 and shall have a total area of not less than 0.002 times the gross cross-sectional area of the footing. For footings that exceed 8 inches (203 mm) in thickness, a minimum of one bar shall be provided at the top and bottom of the footing. Continuity of reinforcement shall be provided at corners and intersections.

Exceptions:

1. In Seismic Design Categories A, B and C, detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement.
2. For foundation systems consisting of a plain concrete footing and a plain concrete stemwall, a minimum of one bar shall be provided at the top of the stemwall and at the bottom of the footing.
3. Where a slab on ground is cast monolithically with the footing, one No. 5 bar is permitted to be located at either the top of the slab or bottom of the footing.

1905.1.8 ACI 318, Section 17.10.

Modify ACI 318 Sections 17.10.5.2, 17.10.5.3(d) and 17.10.6.2 to read as follows:

- 17.10.5.2 – Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.10.5.3. The anchor design tensile strength shall be

Copyright © 2024 International Code Council, Inc., or its licensors (ALL RIGHTS RESERVED).

Accessed by Venkatesh Shanmugam on 11/14/2024 pursuant to License Agreement with ICC. No further reproduction or distribution authorized. Any Unauthorized reproduction or distribution is a violation of the federal copyright, and subject to civil and criminal penalties thereunder.

determined in accordance with 17.10.5.4.

Exception: Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy Section 17.10.5.3(d).

- 17.10.5.3(d) – The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include E , with E increased by Ω_0 . The anchor design tensile strength shall be calculated from 17.10.5.4.
- 17.10.6.2 – Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.10.6.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with 17.7.

Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.7.2 and 17.7.3 need not be computed and 17.10.6.3 shall be deemed to be satisfied provided all of the following are met:
 - 1.1. The allowable in-plane shear strength of the anchor is determined in accordance with ANSI/AWC NDS Table 12E for lateral design values parallel to grain.
 - 1.2. The maximum anchor nominal diameter is $5/8$ inch (16 mm).
 - 1.3. Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).
 - 1.4. Anchor bolts are located a minimum of $1\frac{3}{4}$ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.
 - 1.5. Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.
 - 1.6. The sill plate is 2-inch (51 mm) or 3-inch (76 mm) nominal thickness.
2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or nonbearing walls of light-frame construction to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.7.2 and 17.7.3 need not be computed and 17.10.6.3 shall be deemed to be satisfied provided all of the following are met:
 - 2.1. The maximum anchor nominal diameter is $5/8$ inch (16 mm).
 - 2.2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).
 - 2.3. Anchors are located a minimum of $1\frac{3}{4}$ inches (45 mm) from the edge of the concrete parallel to the length of the track.
 - 2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.
 - 2.5. The track is 33 to 68 mil (0.84 mm to 1.73 mm) designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete, shall be permitted to be determined in accordance with AISI S100 Section J3.3.1.
3. In light-frame construction bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch [25 mm] in diameter attaching sill plate or track to foundation or foundation stem wall need not satisfy 17.10.6.3(a) through (c) when the design strength of the anchors is determined in accordance with 17.7.2.1(c).