

Changes Between ACI 318-19 and ACI 318-19(22)

ACI Committee 318 voted to reapprove ACI 318-19. As part of the reapproval process, the references in both the Code (listed in Chapter 3) and Commentary (listed after the Appendices) were reviewed and updated as appropriate. The reapproved document is designated ACI 318-19(22). Reapproval of a document does not allow technical changes. Therefore, any reference updates that would have resulted in a technical change were delayed until the next planned Code revision in 2025. Except for changes to the references, ACI 318-19 and ACI 318-19(22) contain identical requirements.

The following lists show the references that were updated. Where a minor editorial change was required in the text, those changes are included at the end of this list.

If you own a copy of ACI 318-19, we suggest that you retain a copy of this file with your copy of ACI 318-19. If you are planning to purchase a new copy of ACI 318, we suggest that you purchase ACI 318-19(22) which includes the changes shown below.

In ACI 318-19(22), these changes are not marked in any way. The change bars in the text reflect the changes between ACI 318-14 and ACI 318-19. Therefore, if you wish to identify the changes in your copy of ACI 318-19(22), we suggest that you retain a copy of this file with your copy of ACI 318-19(22).

318-19 Chapter 3 – Code Referenced Standards: Document Designation and Title	318-19 (Reapproved 2022) Chapter 3 – Code Referenced Standards: Document Designation and Title
ACI 301-16—Specifications for Structural Concrete	ACI 301- 1620 —Specifications for Structural Concrete Construction
ACI 332-14—Requirements for Residential Concrete Construction and Commentary	ACI 332- 1420 — Code Requirements for Residential Concrete Construction and Commentary
ACI 355.4-11—Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary	ACI 355.4- 1119 —Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary
ACI 369.1-17—Standard Requirements for Seismic Evaluation and Retrofit of Existing Concrete Buildings (ACI 369.1-17) and Commentary	ACI 369.1-17—Standard Requirements for Seismic Evaluation and Retrofit of Existing Concrete Buildings (ACI 369.1-17) and Commentary
ACI 374.1-05—Acceptance Criteria for Moment Frames Based on Structural Testing and Commentary	ACI 374.1-05(<u>19</u>)—Acceptance Criteria for Moment Frames Based on Structural Testing and Commentary
ACI 550.5-18—Code Requirements for the Design of Precast Concrete Diaphragms for Earthquake Motions (ACI 550.5-18) and Commentary (ACI 550.5R-18)	ACI 550.5-18—Code Requirements for the Design of Precast Concrete Diaphragms for Earthquake Motions (ACI 550.5-18) and Commentary (ACI 550.5R-18)
ACI ITG-5.1-07—Acceptance Criteria for Special Unbonded Post-Tensioned Precast Structural Walls Based on Validation Testing and Commentary	ITG 5.1-07—Acceptance Criteria for Special Unbonded Post-Tensioned Precast Structural Walls Based on Validation Testing and Commentary

	<u>ACI 550.6-19—Acceptance Criteria for Special Unbonded Post-Tensioned Precast Structural Walls Based on Validation Testing and Commentary</u>
ACI ITG-5.2-09—Requirements for Design of a Special Unbonded Post-Tensioned Precast Shear Wall Satisfying ACI ITG-5.1 (ACI 5.2-09) and Commentary	ITG-5.2-09—Requirements for Design of a Special Unbonded Post-Tensioned Precast Shear Wall Satisfying ACI ITG-5.1 (ACI 5.2-09) and Commentary <u>ACI 550.7-19—Requirements for Design of a Special Unbonded Post-Tensioned Precast Shear Wall Satisfying ACI 550.6 and Commentary</u>
ASTM A184/A184M-17—Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement	ASTM A184/A184M- 17 <u>19</u> —Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A307-14 ^{e1} —Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength	ASTM A307- 14 ^{e1} <u>21</u> —Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A370-18—Standard Test Methods and Definitions for Mechanical Testing of Steel Products	ASTM A370- 18 <u>21</u> —Standard Test Methods and Definitions for Mechanical Testing of Steel Products
<u>Title correction:</u> <u>ASTM A421/A421M-15—Standard Specification for Stress-Relieved Steel Wire for Prestressed Concrete</u>	<u>Title correction:</u> <u>ASTM A421/A421M-15—Standard Specification for Stress-Relieved Steel Wire for Prestressed Concrete</u>
<u>Title correction:</u> ASTM A722/A722M-18—Standard Specification for Uncoated High-Strength Steel Bars for Prestressed ed ing Concrete	<u>Title correction:</u> ASTM A722/A722M-18—Standard Specification for Uncoated High-Strength Steel Bars for Prestressed ed ing Concrete
ASTM A767/A767M-16—Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement	ASTM A767/A767M- 16 <u>19</u> —Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775/A775M-17—Standard Specification for Epoxy-Coated Steel Reinforcing Bars	ASTM A775/A775M- 17 <u>19</u> —Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884/A884M-14—Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement	ASTM A884/A884M- 14 <u>19</u> ^{e1} —Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934/A934M-16—Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars	ASTM A934/A934M- 16 <u>19</u> —Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A955/A955M-18b—Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement	ASTM A955/A955M- 18b <u>20a</u> —Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement
ASTM A1035/A1035M-16b—Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement	ASTM A1035/A1035M- 16b <u>20</u> —Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM C31/C31M-19—Standard Practice for Making and Curing Concrete Test Specimens in the Field	ASTM C31/C31M- 19 <u>21a</u> —Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39/C39M-18—Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens	ASTM C39/C39M- 18 <u>21</u> —Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C42/C42M-18a—Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete	ASTM C42/C42M- 18a20 —Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94/C94M-18—Standard Specification for Ready-Mixed Concrete	ASTM C94/C94M- 1821b —Standard Specification for Ready-Mixed Concrete
ASTM C150/C150M-19a—Standard Specification for Portland Cement	ASTM C150/C150M- 19a21 —Standard Specification for Portland Cement
ASTM C192/C192M-18—Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory	ASTM C192/C192M- 1819 —Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C469/C469M-14—Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression	ASTM C469/C469M-14 ^{e1} —Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression
ASTM C494/C494M-17—Standard Specification for Chemical Admixtures for Concrete	ASTM C494/C494M- 1719 —Standard Specification for Chemical Admixtures for Concrete
ASTM C567/C567M-14—Standard Test Method for Determining Density of Structural Lightweight Concrete	ASTM C567/C567M- 1419 —Standard Test Method for Determining Density of Structural Lightweight Concrete
ASTM C595/C595M-19—Standard Specification for Blended Hydraulic Cements	ASTM C595/C595M- 1921 —Standard Specification for Blended Hydraulic Cements
<u>Title correction:</u> ASTM C1140/ C1140M -11—Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels	ASTM C1140/C1140M-11(2019)—Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels
<u>Title correction:</u> ASTM C1141/ C1141M -15—Standard Specification for Admixtures for Shotcrete	No Change
ASTM C1157/C1157M-17—Standard Performance Specification for Hydraulic Cement	ASTM C1157/C1157M- 1720a —Standard Performance Specification for Hydraulic Cement
ASTM C1218/C1218M-17—Standard Test Method for Water-Soluble Chloride in Mortar and Concrete	ASTM C1218/C1218M- 1720 —Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240-15—Standard Specification for Silica Fume Used in Cementitious Mixtures	ASTM C1240- 1520 —Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1580-15—Standard Test Method for Water-Soluble Sulfate in Soil	ASTM C1580- 1520 —Standard Test Method for Water-Soluble Sulfate in Soil
<u>Title correction:</u> ASTM C1604/ C1604M -05(2012)—Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete	ASTM C1604/C1604M-05(2012 2019)—Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete
ASTM C1609/C1609M-12—Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)	ASTM C1609/C1609M- 1219a —Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)
AWS D1.1/D1.1M:2015—Structural Welding Code – Steel	AWS D1.1/D1.1M: 2015 2020—Structural Welding Code – Steel
<u>Title correction:</u>	No Change

AWS D1.4/D1.4M:2018—Structural Welding Code – <u>Steel Reinforcing Bars Steel</u>	
318-19 Commentary References: Document Designation and Title	318-19 (Reapproved 2022) Commentary References: Document Designation and Title
ACI 117-10—Specification for Tolerances for Concrete Construction and Materials and Commentary	ACI 117-10 (15) —Specification for Tolerances for Concrete Construction and Materials and Commentary
ACI 201.2R-08—Guide to Durable Concrete	ACI 201.2R- 08 <u>16</u> —Guide to Durable Concrete
<u>Strike:</u> 213R-03—Guide for Structural Lightweight-Aggregate Concrete	No change
ACI 214R-11—Guide to Evaluation of Strength Test Results of Concrete	ACI 214R-11 (19) —Guide to Evaluation of Strength Test Results of Concrete
ACI 216.1-07—Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies	ACI 216.1- 07 <u>14(19)</u> —Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies
ACI 222R-01—Protection of Reinforcing Steel in Concrete against Corrosion	ACI 222R- 01 <u>19</u> — <u>Guide to</u> Protection of Reinforcing Steel in Concrete against Corrosion
ACI 223R-10—Guide for the Use of Shrinkage-Compensating Concrete	223R-10—Guide for the Use of Shrinkage-Compensating Concrete <u>ACI PRC-223-21—Shrinkage-Compensating Concrete—Guide</u>
ACI 228.1R-03—In-Place Methods to Estimate Concrete Strength	ACI 228.1R- 03 <u>19</u> — <u>Report on In-Place</u> Methods for to Estimate <u>ing In-Place</u> Concrete Strength
ACI 233R-03—Slag Cement in Concrete and Mortar	ACI 233R- 03 <u>17</u> — <u>Guide to the Use of</u> Slag Cement in Concrete and Mortar
ACI 234R-06—Guide for the Use of Silica Fume in Concrete	ACI 234R-06 (12) —Guide for the Use of Silica Fume in Concrete
237R-07—Self-Consolidating Concrete	237R-07 (19) —Self-Consolidating Concrete
ACI 301-16—Specifications for Structural Concrete	ACI 301- 16 <u>20</u> —Specifications for Structural Concrete <u>Construction</u>
ACI 305.1-06—Specification for Hot Weather Concreting	ACI 305.1- 06 <u>14(20)</u> —Specification for Hot Weather Concreting
ACI 305R-10—Guide to Hot Weather Concreting	ACI 305R- 10 <u>20</u> —Guide to Hot Weather Concreting
ACI 306R-10—Guide to Cold Weather Concreting	ACI 306R- 10 <u>16</u> —Guide to Cold Weather Concreting
ACI 308R-01(08)—Guide to Curing of Concrete	ACI 308R- 01(08) <u>16</u> —Guide to <u>External</u> Curing of Concrete
ACI 311.6-09—Specification for Ready-Mixed Concrete Testing Services	ACI 311.6- 09 <u>18</u> —Specification for <u>Testing</u> Ready-Mixed Concrete Testing Services
ACI 313-97—Standard Practice for Design and Construction of Concrete Silos and Stacking Tubes for Storing Granular	ACI 313- 97 <u>16</u> — Standard Practice for Design <u>Specification and Construction of</u> for Concrete Silos and Stacking Tubes for Storing Granular <u>Materials and Commentary</u>

ACI 332-14—Requirements for Residential Concrete Construction and Commentary	ACI 332- 1420 — Code Requirements for Residential Concrete Construction and Commentary
ACI 347.2R-05—Guide for Shoring/Reshoring of Concrete Multistory Buildings	ACI 347.2R- 0517 —Guide for Shoring/Reshoring of Concrete Multistory Buildings
ACI 347R-04—Guide to Formwork for Concrete	ACI 347R- 0414 —Guide to Formwork for Concrete
ACI 350-06—Code Requirements for Environmental Engineering Concrete Structures (ACI 350-06) and Commentary	ACI 350- 0620 —Code Requirements for Environmental Engineering Concrete Structures (ACI 350-0620) and Commentary
ACI 359-13—Code for Concrete Containments	359-13—Code for Concrete Containments ASME BPVC Section III – Rules for Construction of Nuclear Facility Components – Division 2 – Code for Concrete Containments
ACI 435R-95(00)—Control of Deflection in Concrete Structures	ACI 435R- 95(00)20 — Report on Control of Deflection in of Nonprestressed Concrete Structures
ACI 506.2-13—Specification for Shotcrete	ACI 506.2-13(18)—Specification for Shotcrete
ACI 562-19—Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary (ACI 562-19).	562-19—Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary (ACI 562-19). <u>ACI CODE-562-21—Assessment, Repair, and Rehabilitation of Existing Concrete Structures—Code and Commentary</u>
ACI CPP 660.1-17—American Concrete Institute Certification Policies for Shotcrete Nozzleman and Shotcrete Nozzleman-in-Training. doi: 10.14359/51716915	ACI CPP 660.1- 1721 —American Concrete Institute Certification Policies for Shotcrete Nozzleman and Shotcrete Nozzleman-in-Training.
ACI CT-18—Concrete Terminology	ACI CT- 1821 — <u>ACI</u> Concrete Terminology
ACI SP-2(07)—Manual of Concrete Inspection, Tenth Edition	SP-2(07) <u>ACI MNL-2(19)</u> —Manual of Concrete Inspection, Tenth <u>11th</u> Edition
ACI SP-4(05)—Formwork for Concrete, Seventh Edition	SP-4(0514)—Formwork for Concrete, Seventh <u>Eighth</u> Edition
ACI 355.4-11—Qualification of Post-Installed Adhesive Anchors in Concrete (ACI 355.4-11) and Commentary	ACI 355.4- 1119 —Qualification of Post-Installed Adhesive Anchors in Concrete (ACI 355.4-11(19)) and Commentary
ACI 362.1R-97(02)—Guide for the Design of Durable Parking Structures	ACI 362.1R- 97(02)12 —Guide for the Design <u>and Construction</u> of Durable Parking Structures
ACI 440.1R-06—Guide for the Design and Construction of Structural Concrete Reinforced with FRPBars	ACI 440.1R- 0615 —Guide for the Design and Construction of Structural Concrete Reinforced with FRP <u>Fiber-Reinforced Polymer</u> Bars
ACI 440.2R-08—Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures	ACI 440.2R- 0817 —Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures
ACI 506.4R-94(04)—Guide for the Evaluation of Shotcrete	ACI 506.4R- 94(04)19 —Guide for the Evaluation of Shotcrete
ACI SP-66(04)—ACI Detailing Manual	SP-66(04) <u>MNL-66(20)</u> —ACI Detailing Manual
ACI 214.4R-10—Guide for Obtaining Cores and Interpreting Compressive Strength Results—Guide	<u>ACI PRC 214.4R-1021</u> — Guide for Obtaining Cores and Interpreting <u>Core</u> Compressive Strength Results—Guide
ACI SP-17(09)—ACI Design Handbook	SP-17(09) — ACI Design Handbook <u>ACI MNL-17(21)</u> <u>ACI Reinforced Concrete Design Handbook</u>

ACI 318.2-14—Building Code Requirements for Concrete Thin Shells and Commentary	ACI 318.2- 1419 —Building Code Requirements for Concrete Thin Shells and Commentary
ACI 334.2R-91—Reinforced Concrete Cooling Tower Shells – Practice and Commentary	334.2R-91—Reinforced Concrete Cooling Tower Shells –Practice and Commentary
ACI 551.2R-10—Design Guide for Tilt-Up Concrete Panels	ACI 551.2R- 1015 — Design Guide for <u>the Design of</u> Tilt-Up Concrete Panels
ACI 318-63—Commentary on Building Code Requirements for Reinforced Concrete	318-63—Commentary on Building Code Requirements for Reinforced Concrete <u>SP-10 (1965) – Commentary on Building Code Requirements for Reinforced Concrete (ACI 318-63)</u>
ACI 421.1R-08—Guide to Shear Reinforcement for Slabs	ACI 421.1R- 0820 —Guide to <u>for</u> Shear Reinforcement for Slabs
ACI 445R-99(09)—Recent Approaches to Shear Design of Structural Concrete	ACI 445R-99(0915)—Recent Approaches to Shear Design of Structural Concrete
ACI 336.2R-88—Suggested Analysis and Design Procedures for Combined Footings and Mats	ACI 336.2R-88(02)—Suggested Analysis and Design Procedures for Combined Footings and Mats
ACI 336.3R-93(06)—Report on Design and Construction of Drilled Piers	ACI 336.3R- 93(06)14 —Report on Design and Construction of Drilled Piers
ACI 543R-00—Guide to Design, Manufacture, and Installation of Concrete Piles	ACI 543R- 0012 —Guide to Design, Manufacture, and Installation of Concrete Piles
ACI 374.1-05—Acceptance Criteria for Moment Frames Based on Structural Testing and Commentary	ACI 374.1-05(19)—Acceptance Criteria for Moment Frames Based on Structural Testing and Commentary
ACI ITG-5.1-07—Acceptance Criteria for Special Unbonded Post-Tensioned Precast Structural Walls Based on Validation Testing and Commentary	ITG-5.1-07—Acceptance Criteria for Special Unbonded Post-Tensioned Precast Structural Walls Based on Validation Testing and Commentary <u>ACI 550.6-19—Acceptance Criteria for Special Unbonded Post-Tensioned Precast Structural Walls Based on Validation Testing and Commentary</u>
ACI ITG-5.2-09—Requirements for Design of a Special Unbonded Post-Tensioned Precast Shear Wall Satisfying ACI ITG-5.1 (ACI 5.2-09) and Commentary	ITG-5.2-09—Requirements for Design of a Special Unbonded Post-Tensioned Precast Shear Wall Satisfying ACI ITG-5.1 (ACI 5.2-09) and Commentary <u>ACI 550.7-19—Requirements for Design of a Special Unbonded Post-Tensioned Precast Shear Wall Satisfying ACI 550.6 and Commentary</u>
ACI 352R-02—Recommendations for Design of Beam-Column Connections in Monolithic Reinforced Concrete Structures	ACI 352R-02(10)—Recommendations for Design of Beam-Column Connections in Monolithic Reinforced Concrete Structures
ACI 423.3R-05—Recommendations for Concrete Members Prestressed with Unbonded Tendons	ACI 423.3R- 0517 —Recommendations for Concrete Members Prestressed with <u>Single-Strand</u> Unbonded Tendons
ANSI/AISC 341-10—Seismic Provisions for Structural Steel Buildings	ANSI/AISC 341- 1016 —Seismic Provisions for Structural Steel Buildings
ANSI/AISC 360-10—Specification for Structural Steel Buildings	ANSI/AISC 360- 1016 —Specification for Structural Steel Buildings
AISI D100-08—Cold-Formed Steel Design Manual	AISI D100- 0817 —Cold-Formed Steel Design Manual
AISI S100-07—North American Specification for the Design of Cold-Formed Steel Structural Members	AISI S100- 0716 —North American Specification for the Design of Cold-Formed Steel Structural Members
ASCE 61-14—ASCE/COPRI Standard for the Seismic Design of Piers and Wharves	ASCE 61-14— ASCE/COPRI Standard for the Seismic Design of Piers and Wharves
ASME B1.1-03—Unified Inch Screw Threads(UN, UNR, and UNJ Thread Forms)	ASME B1.1- 0319 —Unified Inch Screw Threads(UN, UNR, and UNJ Thread Forms)

ASME B18.2.1-96—Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)	ASME B18.2.1- 9612(21) —Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
ASME B18.2.6-96—Fasteners for Use in Structural Applications	ASME B18.2.6- 9619 —Fasteners for Use in Structural Applications
ASME B31.1-92—Power Piping	ASME B31.1- 9220 —Power Piping
ASME B31.3-90—Chemical Plant and Petroleum Refinery Piping	ASME B31.3- 9020 — Chemical Plant and Petroleum Refinery-Process Piping
ASTM A36/A36M-14—Standard Specification for Carbon Structural Steel	ASTM A36/A36M- 1419 —Standard Specification for Carbon Structural Steel
ASTM A307-14 ^{e1} —Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength	ASTM A307- 14^{e1}21 —Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A370-18—Standard Test Methods and Definitions for Mechanical Testing of Steel Products	ASTM A370- 1821 —Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A421/A421M-15—Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete, including Supplementary Requirement SI, Low-Relaxation Wire and Relaxation Testing	ASTM A421/A421M- 1521 — Standard Specification for Uncoated Stress-Relieved Steel Wire for Prestressed Concrete, including Supplementary Requirement SI, Low-Relaxation Wire and Relaxation Testing <u>Standard Specification for Stress-Relieved Steel Wire for Prestressed Concrete</u>
ASTM A767/A767M-16—Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement	ASTM A767/A767M- 1619 —Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775/A775M-17—Standard Specification for Epoxy-Coated Steel Reinforcing Bars	ASTM A775/A775M- 1719 —Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934/A934M-16—Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars	ASTM A934/A934M- 1619 —Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A955/A955M-18b—Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement NOTE: This document is not referenced in the commentary and is deleted from the commentary reference list. This document is referenced in the Code and thus will remain listed in Chapter 3 of the Code.	ASTM A955/A955M-18b—Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement NOTE: This document is not referenced in the commentary and is deleted from the commentary reference list. This document is referenced in the Code and thus will remain listed in Chapter 3 of the Code.
ASTM A1035/A1035M-16b—Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement	ASTM A1035/A1035M- 16b20 —Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM A1077/A1077M-14—Standard Specification for Structural Steel with Improved Yield Strength at High Temperature for Use in Buildings NOTE: This document is not referenced in the commentary and should be deleted.	ASTM A1077/A1077M-14—Standard Specification for Structural Steel with Improved Yield Strength at High Temperature for Use in Buildings NOTE: This document is not referenced in the commentary and should be deleted.
ASTM C31/C31M-19—Standard Practice for Making and Curing Concrete Test Specimens in the Field	ASTM C31/C31M- 1921a —Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39/C39M-18—Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens	ASTM C39/C39M- 1821 —Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C42/C42M-18a—Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete	ASTM C42/C42M- 18a <u>20</u> —Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94/C94M-18—Standard Specification for Ready-Mixed Concrete	ASTM C94/C94M- 18 <u>21b</u> —Standard Specification for Ready-Mixed Concrete
ASTM C150/C150M-19a—Standard Specification for Portland Cement	ASTM C150/C150M- 19a <u>21</u> —Standard Specification for Portland Cement
ASTM C457/C457M-16—Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete NOTE: Typo in 318-19. Correct both -19 and reapproved 2022.	ASTM C457/C457M-16—Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete NOTE: Typo in 318-19. Correct both -19 and reapproved 2022.
ASTM C469/C469M-14—Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression	ASTM C469/C469M-14 ^{e1} —Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression
ASTM C494/C494M-17—Standard Specification for Chemical Admixtures for Concrete	ASTM C494/C494M- 17 <u>19</u> —Standard Specification for Chemical Admixtures for Concrete
ASTM C567/C567M-14—Standard Test Method for Determining Density of Structural Lightweight Concrete	ASTM C567/C567M- 14 <u>19</u> —Standard Test Method for Determining Density of Structural Lightweight Concrete
ASTM C595/C595M-19—Standard Specification for Blended Hydraulic Cements	ASTM C595/C595M- 19 <u>21</u> —Standard Specification for Blended Hydraulic Cements
ASTM C685/C685M-17 ^a —Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing NOTE: Typo in ACI 318-19. Correct both -19 and reapproved 2022.	ASTM C685/C685M-17 ^a —Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing NOTE: Typo in ACI 318-19. Correct both -19 and reapproved 2022.
ASTM C900-15—Standard Test Method for Pullout Strength of Hardened Concrete	ASTM C900- 15 <u>19</u> —Standard Test Method for Pullout Strength of Hardened Concrete
ASTM C1074-17—Standard Practice for Estimating Concrete Strength by the Maturity Method	C1074- 17 <u>19</u> ^{e1} —Standard Practice for Estimating Concrete Strength by the Maturity Method
ASTM C1140-1—Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels	ASTM C1140/ C1140M-11 (<u>2019</u>)—Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels
ASTM C1152/C1152M-04(2012) ^{e1} —Standard Test Method for Acid-Soluble Chloride in Mortar and Concrete	ASTM C1152/C1152M- 04(2012) ^{e1} <u>20</u> —Standard Test Method for Acid-Soluble Chloride in Mortar and Concrete
ASTM C1157/C1157M-17—Standard Performance Specification for Hydraulic Cement	ASTM C1157/C1157M- 17 <u>20a</u> —Standard Performance Specification for Hydraulic Cement
ASTM C1218/C1218M-17—Standard Test Method for Water-Soluble Chloride in Mortar and Concrete	ASTM C1218/C1218M- 17 <u>20</u> —Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240-15—Standard Specification for Silica Fume Used in Cementitious Mixtures	ASTM C1240- 15 <u>20</u> —Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1604-05(2012)—Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete	ASTM C1604/ C1604M-05 (<u>2012</u> <u>2019</u>)—Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete

ASTM C1609/C1609M-12—Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)	ASTM C1609/C1609M- 12 19a—Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)
ASTM C1778-16—Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete	ASTM C1778- 16 20—Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete
ASTM E8/E8M-16a—Standard Test Methods for Tension Testing of Metallic Materials	ASTM E8/E8M- 16a 21—Standard Test Methods for Tension Testing of Metallic Materials
ASTM F1554-18—Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength	ASTM F1554- 18 20—Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
AWS D1.1/D1.1M:2015—Structural Welding Code – Steel	AWS D1.1/D1.1M: 2015 2020—Structural Welding Code – Steel
AWS D1.4/D1.4M:2005—Structural Welding Code – Reinforcing Steel	AWS D1.4/D1.4M: 2005 2018—Structural Welding Code – <u>Steel</u> Reinforcing <u>Bars</u> <u>Steel</u>
FEMA P-749-10—Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Provisions Seismic Provisions <u>for New Buildings and Other Structures</u>	FEMA P-749-10—Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Provisions Seismic Provisions <u>for New Buildings and Other Structures</u>
NOTE: Title correction in both -19 and reapproved 2022.	NOTE: Title correction in both -19 and reapproved 2022.
FEMA P-750- 10 09—NEHRP Recommended Seismic Provisions for New Buildings and Other Structures	P-750- 10 09—NEHRP Recommended Seismic Provisions for New Buildings and Other Structures
NOTE: Year correction in both -19 and reapproved 2022.	NOTE: Year correction in both -19 and reapproved 2022.
	<u>Add:</u> <u>2021 IBC—International Building Code</u>
NFPA 5000-2012—Building Construction Safety Code	NFPA 5000- 2012 2021—Building Construction <u>and</u> Safety Code
CGRGCR 17-917-46—Guidelines for Nonlinear Structural Analysis for Design of Buildings	CGRGCR 17-917-46—Guidelines for Nonlinear Structural Analysis for Design of Buildings
NOTE: Typo in ACI 318-19. Correct both -19 and reapproved 2022.	NOTE: Typo in ACI 318-19. Correct both -19 and reapproved 2022.
NZS 3101-2006—Concrete Structure Standard, Part 1: The Design of Concrete Structures (<u>NZS3101.1</u>); Part 2: Commentary on the Design of Concrete Structures (<u>NZS3101.2</u>)	NZS 3101-2006—Concrete Structure Standard, Part 1: The Design of Concrete Structures (<u>NZS3101.1</u>); Part 2: Commentary on the Design of Concrete Structures (<u>NZS3101.2</u>)
NOTE: Title correction in both -19 and reapproved 2022.	NOTE: Title correction in both -19 and reapproved 2022.
PCA EB001.15-11—Design and Control of Concrete Mixtures, 16th edition	PCA EB001.15- 11 21—Design and Control of Concrete Mixtures, 16 17th edition
PCA 100-2017—Prescriptive Design of Exterior Concrete Walls <u>for One- and Two-Family Dwellings</u>	PCA 100-2017—Prescriptive Design of Exterior Concrete Walls <u>for One- and Two-Family Dwellings</u>
NOTE: Title correction in both -19 and reapproved 2022.	NOTE: Title correction in both -19 and reapproved 2022.

PCI MNL 116-99—Manual for Quality Control for Plants and Production of Structural Precast Concrete Products	PCI MNL 116- 99 <u>21</u> —Manual for Quality Control for Plants and Production of Structural Precast Concrete Products
PCI MNL 120-10—Design Handbook: Precast and Prestressed Concrete, Seventh Edition NOTE: This document is not referenced in the commentary and should be deleted.	PCI MNL 120-10—Design Handbook: Precast and Prestressed Concrete, Seventh Edition NOTE: This document is not referenced in the commentary and should be deleted.
PCI MNL 133-04—Bridge Design Manual NOTE: This document is not referenced in the commentary and should be deleted.	PCI MNL 133-04—Bridge Design Manual NOTE: This document is not referenced in the commentary and should be deleted.
PTI DC10.5-12—Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils	PTI DC10.5- 12 <u>19</u> —Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive <u>and Stable</u> Soils
PTI M50.3-12—Guide Specification for Grouted Post-Tensioning	PTI M50.3- 12 <u>19</u> — <u>Guide</u> Specification for <u>Multistrand and</u> Grouted Post-Tensioning
PTI M55.1-12—Specification for Grouting of Post-Tensioned Structures	PTI M55.1- 12 <u>19</u> —Specification for Grouting of Post-Tensioned Structures
SDI C-2011—Standard for Composite Steel Floor Deck – Slabs	C-2011—Standard for Composite Steel Floor Deck—Slabs <u>ANSI/SDI SD-2022 Standard for Steel Deck</u> NOTE: SDI consolidated their two separate standards on composite and non-composite steel floor deck in 2022.
SDI NC-2010—Standard for Non-Composite Steel Floor Deck	NC-2010—Standard for Non-Composite Steel Floor Deck <u>ANSI/SDI SD-2022—Standard for Steel Deck</u> NOTE: SDI consolidated their two separate standards on composite and non-composite steel floor deck in 2022.
Various editorial changes in text to accommodate reference updates	
18.11.2.2 Special structural walls constructed using precast concrete and unbonded post-tensioning tendons and not satisfying the requirements of 18.11.2.1 are permitted provided they satisfy the requirements of ACI ITG-5-1 <u>550.6</u> .	
R1.4.2 Specific provisions for assessment, repair, and rehabilitation of existing concrete structures are provided in ACI CODE <u>562-1921</u> . Existing structures in ACI 562 are defined as structures that are complete and permitted for use.	
R1.4.3 Structures such as arches, bins and silos, blast-resistant structures, chimneys, underground utility structures, ... Recommendations for design and construction of some of these structures are given in the following: “Code Requirements for Reinforced Concrete Chimneys and Commentary” (ACI 307-08) “Standard Practice for Design and Construction of Concrete Silos and Stacking Tubes for Storing Granular Materials” (ACI 313-97) “Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary” (ACI 349) “Code for Concrete Containments” (ACI-359 <u>ASME BPVC</u>)	
R1.4.5 In its most basic application, the noncomposite steel deck serves as a form, and the concrete slab is designed to resist all loads, while in other applications the concrete slab may be designed to resist only the superimposed loads. The design of a steel deck in a load-resisting application is given in “Standard for Non-	

~~Composite-Steel Floor Deck~~” (SD+~~NC~~). The SDI standard refers to this Code for the design and construction of the structural concrete slab.

R1.4.6 ACI 332 addresses only the design and construction of cast-in-place footings, foundation walls supported on continuous footings, and slabs-on-ground for limited residential construction applications.

The ~~2015~~2021 IBC requires design and construction of residential post-tensioned slabs on expansive soils to be in accordance with PTI DC10.5-12, which provides requirements for slab-on-ground foundations, including soil investigation, design, and analysis. Guidance for the design and construction of post-tensioned slabs-on-ground that are not on expansive soils can be found in ACI 360R. Refer to R1.4.8.

R1.4.10 In this type of construction, the steel deck serves as the positive moment reinforcement. The design and construction of concrete-steel deck slabs is described in “Standard for ~~Composite Steel Floor Deck Slabs~~Steel Deck” (SD+~~C~~). The standard refers to the appropriate portions of this Code for the design and construction of the concrete portion of the composite assembly. SD+~~C~~ also provides guidance for design of composite-concrete-steel deck slabs. The design of negative moment reinforcement to create continuity at supports is a common example where a portion of the slab is designed in conformance with this Code.

R5.2.2 Seismic Design Categories (SDCs) in this Code are adopted directly from ASCE/SEI 7. Similar designations are used by the International Building Code (~~2018 IBC~~ 2021 IBC) and the National Fire Protection Association (~~NFPA 5000 2012~~ NFPA 5000 2021). ...no changes in 2nd paragraph...

In the absence of a general building code that prescribes earthquake effects and seismic zoning, it is the intent of Committee 318 that application of provisions for earthquake-resistant design be consistent with national standards or model building codes such as ASCE/SEI 7, ~~2012~~ 2021 IBC, and NFPA 5000. The model building codes also specify overstrength factors Ω_o that are related to the seismic-force-resisting system used for the structure and design of certain elements.

R5.3.1...

Model building codes and design load references refer to earthquake forces at the strength level, and the corresponding load factor is 1.0 (ASCE/SEI 7; BOCA 1999; SBC 1999; UBC (ICBO 1997); ~~2018 IBC~~ 2021 IBC). In the absence of a general building code that prescribes strength level earthquake effects, a higher load factor on E would be required...

R7.1.1 The design and construction of composite slabs on steel deck is described in “Standard for ~~Composite Steel Floor Deck Slabs~~Steel Deck” (SD+~~C~~).

Provisions for one-way joist systems are provided in Chapter 9.

R9.5.4.6 An example of an alternative design that satisfies this provision can be found in Zia and Hsu (2004), which has been extensively and successfully used for design of precast, prestressed concrete spandrel beams with $h/b_f \geq 3$ and closed stirrups. The ~~seventh edition of the~~ *PCI Design Handbook* (PCI MNL-120) describes the procedure of Zia and Hsu (2004). This procedure was experimentally verified by the tests described in Klein (1986).

R18.1...

Chapter 18 contains provisions considered to be the minimum requirements for a cast-in-place or precast concrete structure capable of sustaining a series of oscillations into the inelastic range of response without critical deterioration in strength. The integrity of the structure in the inelastic range of response should be maintained because the design earthquake forces defined in documents such as ASCE/SEI 7, the ~~2018 IBC~~ 2021 IBC, the UBC (ICBO 1997), and the NEHRP (FEMA P749) provisions are considered less than those corresponding to linear response at the anticipated earthquake intensity (FEMA P749; Blume et al. 1961; Clough 1960; Gulkan and Sozen 1974).

R18.2—General

...

The proportioning and detailing requirements in Chapter 18 are based predominantly on field and laboratory experience with monolithic reinforced concrete building structures and precast concrete building structures designed and detailed to behave like monolithic building structures. Extrapolation of these requirements to other types of cast-in-place or precast concrete structures should be based on evidence provided by field experience, tests, or analysis. The acceptance criteria for moment frames given in ACI 374.1 can be used in conjunction with Chapter 18 to demonstrate that the strength, energy dissipation capacity, and deformation capacity of a proposed frame system equals or exceeds that provided by a comparable monolithic concrete system. ACI ~~ITG-5-1550.6~~ provides similar information for precast wall systems.

...

R18.10.8...

The design shear force determined according to 18.7.6.1 may be unrealistically large in some cases. As an alternative, 18.10.8.1(a) permits the design shear force to be determined using factored load combinations in which the earthquake effect has been amplified to account for system overstrength. Documents such as the NEHRP provisions (FEMA P749), ASCE/SEI 7, and the ~~2018 IBC 2021 IBC~~ represent the amplified earthquake effect using the factor Ω_o .

R18.11.2.2 Experimental and analytical studies (Priestley et al. 1999; Perez et al. 2003; Restrepo 2002) have demonstrated that some types of precast structural walls post-tensioned with unbonded tendons, and not satisfying the prescriptive requirements of Chapter 18, provide satisfactory seismic performance characteristics. ACI ~~ITG-5-1550.6~~ defines a protocol for establishing a design procedure, validated by analysis and laboratory tests, for such walls, with or without coupling beams.

ACI ~~ITG-5-2550.7~~ defines design requirements for one type of special structural wall constructed using precast concrete and unbonded post-tensioning tendons, and validated for use in accordance with 18.11.2.2.

R18.12.7.6 In documents such as the NEHRP Provisions (FEMA P750), ASCE/SEI 7, the ~~2018 IBC 2021 IBC~~, and the Uniform Building Code (ICBO 1997), collector elements of diaphragms are designed for forces amplified ...

R18.14.6.1 Section 18.10.8 requires that the design shear force be determined according to 18.7.6.1, which in some cases may result in unrealistically large forces. As an alternative, the design shear force can be determined as the product of an overstrength factor and the shear induced when the wall pier is displaced by δu . The overstrength factor Ω_o included in FEMA P749, ASCE/SEI 7, and the ~~2018 IBC 2021 IBC~~ can be used for this purpose.

R22.5.6.3 Two types of inclined cracking occur in concrete beams: web-shear cracking and flexure-shear cracking.

...

The nominal shear strength provided by the concrete, V_c , is assumed equal to the lesser of V_{ci} and V_{cw} . The derivations of Eq. (22.5.6.3.1a) and Eq. (22.5.6.3.2) are summarized in ~~ACI Committee 318-SP-10~~(1965).

R25.1—Scope

Recommended methods and standards for preparing design drawings, typical details, and drawings for the fabrication and placing of steel reinforcement in reinforced concrete structures are given in the *ACI Detailing Manual* (~~SP-66MNL-66~~).

...

R26.4.1.5.1(c) In some cases, the use of admixtures in concrete containing ASTM C845 expansive cements has resulted in reduced levels of expansion or increased shrinkage values. Refer to ACI ~~PRC~~ 223R.

R26.10.1(f) Guidance for specifying duct requirements for bonded tendons is provided in PTI M50.3 ~~and PTI M55.1~~.

R26.10.2(e) Elongation measurements for prestressing should be in accordance with the procedures outlined in the *Manual for Quality Control for Plants and Production of Structural Precast Concrete Products* ([PCI MNL 116447](#)), published by the Precast/Prestressed Concrete Institute.

R26.13.1.1 By inspection, this Code does not intend that the inspector should supervise the construction. Rather, it means the inspector should visit the project as necessary to observe the various stages of Work and determine that it is being performed in conformance with the construction documents. The frequency of inspections should follow 26...

...ACI 311.4R describes the recommended procedure for organizing and conducting concrete inspection and serves as a guide to owners, architects, and engineers. ACI [SP-2MNL-2](#) describes methods of inspecting concrete construction that are generally accepted as good practice and serves as a guide in matters not covered by construction documents.

R26.13.1.5 The International Building Code ([IBC 2018 2021](#)) requires inspection of all post-installed anchors. For post-installed expansion (torque-controlled and displacement-controlled), screw, and undercut ...

R26.13.3.1 Table 1705 in Chapter 17 of the [2012 2018](#) IBC was used to determine which items of Work require continuous or periodic inspection.

R27.3.1.3 Guidance on estimating equivalent f_c' from original cylinder data can be found in Bartlett (2012).

ACI Committee 214 has developed two methods for determining an equivalent f_c' from cores taken from an existing structure. These methods are described in ACI [PRC](#) 214.4R and rely on statistical analysis techniques. The procedures described are only appropriate where the determination of an ...