

ACI 318-14

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Building Code Requirements for Structural Concrete and Commentary



American Concrete Institute
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BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318-14)

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3.2—Referenced standards

3.2.1—American Association of State Highway and Transportation Officials (AASHTO)

3.2.2—American Concrete Institute (ACI)

3.2.3—American Society of Civil Engineers

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 - (c) Combined footings
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- 20.10 — Discontinuous deformed steel fiber reinforcement
- 20.5—Headed shear stud reinforcement
- 20.6—Embedments
- 20.7—Provisions for durability of steel reinforcement
 - 20.7.1—Specified concrete cover
 - 20.7.1.3—Specified concrete cover requirements
 - 20.7.1.4—Specified concrete cover requirements for corrosive environments
 - 20.7.2—Nonprestressed coated reinforcement
 - 20.7.3—Corrosion protection for unbonded prestressing reinforcement
 - 20.7.4—Corrosion protection for grouted tendons
 - 20.7.5—Corrosion protection for post-tensioning anchorages, couplers, and end fittings
 - 20.7.6—Corrosion protection for external post-tensioning

Chapter 21—Strength Reduction Factors

- 21.1—Scope
 - 21.1.1—This chapter shall apply to the selection of strength reduction factors used in design, except as permitted by Chapter 27.

21.2—Strength reduction factors for structural concrete members and connections

Chapter 22—Sectional Strength

22.1—Scope

22.1.1—This chapter shall apply to calculating nominal strength at sections of members, including (a) through (g):

- (a) Flexural strength
- (b) Axial strength or combined flexural and axial strength
- (c) One-way shear strength
- (d) Two-way shear strength
- (e) Torsional strength
- (f) Bearing
- (g) Shear friction.

22.2—Design assumptions for moment and axial strength

22.2.1—Equilibrium and strain compatibility

22.2.2—Design assumptions for concrete

22.2.3—Design assumptions for nonprestressed reinforcement

22.2.4—Design assumptions for prestressing reinforcement

22.3—Flexural strength

22.3.1—General

22.3.2—Prestressed concrete members

22.3.3—Composite concrete members

22.4—Axial strength or combined flexural and axial strength

22.4.1—General

22.4.2—Maximum axial strength

22.4.3—Maximum axial tensile strength

22.5—One-way shear strength

22.5.1—General

22.5.2—Geometric assumptions

22.5.3—Limiting material strengths

22.5.4—Composite concrete members

22.5.5— V_c for nonprestressed members without axial force

22.5.6— V_c for nonprestressed members with axial compression

22.5.7— V_c for nonprestressed members with significant axial tension

22.5.8— V_c for prestressed members

22.5.9— V_c for pretensioned members in regions of reduced prestress force

22.5.10—One-way shear reinforcement

22.6—Two-way shear strength

22.6.1—General

22.6.2—Effective depth

22.6.3—Limiting material strengths

22.6.4—Critical sections for two-way

members

22.6.5—Two-way shear strength provided by concrete

22.6.6—Maximum shear for two-way members with shear reinforcement

22.6.7—Two-way shear strength provided by single- or multiple-leg stirrups

22.6.8—Two-way shear strength provided by headed shear stud reinforcement

22.6.9—Design provisions for two-way members with shearheads

22.7—Torsion

22.7.1—General

22.7.2—Limiting material strengths

22.7.3—Factored design torsion

22.7.4—Threshold torsion

22.7.5—Cracking torsion

22.7.6—Torsional strength

22.7.7—Cross-sectional limits

22.8—Bearing

22.8.1—General

22.8.2—Required strength

22.8.3—Design strength

22.9—Shear friction

22.9.1—General

22.9.2—Required strength

22.9.3—Design strength

22.9.4—Nominal shear strength

22.9.5—Detailing for shear-friction reinforcement

Chapter 23—Strut-and-Tie Models

23.1—Scope

23.1.1—This chapter shall apply to the design of structural concrete members, or regions of members, where load or geometric discontinuities cause a nonlinear distribution of longitudinal strains within the cross section.

23.2—General

23.3—Design strength

23.4—Strength of struts

23.5—Reinforcement crossing bottle-shaped struts

23.6—Strut reinforcement detailing

23.7—Strength of ties

23.8—Tie reinforcement detailing

23.9—Strength of nodal zones

Chapter 24—Serviceability Requirements

24.1—Scope

24.1.1—This chapter shall apply to member design for minimum serviceability, including (a) through (d):

- (a) Deflections due to service-level

- gravity loads
- (b) Distribution of flexural reinforcement in one-way slabs and beams to control cracking
- (c) Shrinkage and temperature reinforcement
- (d) Permissible stresses in prestressed flexural members.

24.2—Deflections due to service-level gravity loads

24.2.3—Calculation of immediate deflections

24.2.4—Calculation of time-dependent deflections

24.2.4.1—Nonprestressed members

24.2.4.2—Prestressed members

24.2.5—Calculation of deflections of composite concrete construction

24.3—Distribution of flexural reinforcement in one-way slabs and beams

24.4—Shrinkage and temperature reinforcement

24.4.3—Nonprestressed reinforcement

24.4.4—Prestressed reinforcement

24.5—Permissible stresses in prestressed concrete flexural members

24.5.1—General

24.5.2—Classification of prestressed flexural members

24.5.3—Permissible concrete stresses at transfer of prestress

24.5.4—Permissible concrete compressive stresses at service loads

25.4.3—Development of standard hooks in tension

25.4.4—Development of headed deformed bars in tension

25.4.5—Development of mechanically anchored deformed bars in tension

25.4.6—Development of welded deformed wire reinforcement in tension

25.4.7—Development of welded plain wire reinforcement in tension

25.4.8—Development of pretensioned seven-wire strands in tension

25.4.9—Development of deformed bars and deformed wires in compression

25.4.10—Reduction of development length for excess reinforcement

25.5—Splices

25.5.1—General

25.5.2—Lap splice lengths of deformed bars and deformed wires in tension

25.5.3—Lap splice lengths of welded deformed wire reinforcement in tension

25.5.4—Lap splice lengths of welded plain wire reinforcement in tension

25.5.5—Lap splice lengths of deformed bars in compression

25.5.6—End-bearing splices of deformed bars in compression

25.5.7—Mechanical and welded splices of deformed bars in tension or compression

25.6—Bundled reinforcement

25.6.1—Nonprestressed reinforcement

25.6.2—Post-tensioning ducts

25.7—Post-tensioning anchorages and couplers

25.8—Transverse reinforcement

25.8.1—Stirrups

25.8.2—Ties

25.8.3—Spirals

25.8.4—Hoops

25.9—Anchorage zones for post-tensioned tendons

25.9.1—General

25.9.2—Required strength

25.9.3—Local zone

25.9.4—General zone

25.9.4.3—Analysis of general zones

25.9.4.4—Reinforcement limits

25.9.4.5—Limiting stresses in general zones

25.9.5—Reinforcement detailing

Chapter 25—Reinforcement Details

25.1—Scope

25.1.1—This chapter shall apply to reinforcement details, including:

(a) Minimum spacing

(b) Standard hooks, seismic hooks, and crossties

(c) Development of reinforcement

(d) Splices

(e) Bundled reinforcement

(f) Post-tensioning anchorages and couplers

(g) Transverse reinforcement.

25.2—Minimum spacing of reinforcement

25.3—Standard hooks, seismic hooks, and crossties, and minimum inside bend diameters

25.4—Development of reinforcement

25.4.1—General

25.4.2—Development of deformed bars and deformed wires in tension

Chapter 26—Construction Documents and Inspection

26.1—Scope

26.1.1—This chapter shall apply to (a) through (c):

(a) Applicable design information that the licensed design professional shall specify in the construction documents

(b) Applicable compliance requirements that the licensed design professional shall specify in the construction documents

(c) Applicable inspection requirements that the licensed design professional shall specify in the construction documents.

26.2—Design criteria

26.2.1—Design information

26.3—Member information

26.3.1—Design information

26.4—Concrete materials and mixture requirements

26.4.1—Concrete materials

26.4.1.1—Cementitious materials

26.4.1.1.1—Compliance requirements

26.4.1.2—Aggregates

26.4.1.2.1—Compliance requirements

26.4.1.3—Water

26.4.1.3.1—Compliance requirements

26.4.1.4—Admixtures

26.4.1.4.1—Compliance requirements

26.4.1.5—Steel fiber reinforcement

26.4.1.5.1—Compliance requirements

26.4.2—Concrete mixture requirements

26.4.2.1—Design information

26.4.2.2—Compliance requirements

26.4.3—Proportioning of concrete mixtures

26.4.3.1—Compliance requirements

26.4.4—Documentation of concrete mixture characteristics

26.4.4.1—Compliance requirements

26.5—Concrete production and construction

26.5.1—Concrete production

26.5.1.1—Compliance requirements

26.5.2—Concrete placement and consolidation

26.5.2.1—Compliance requirements

26.5.3—Curing concrete

26.5.3.1—Design information

26.5.3.2—Compliance requirements

26.5.4—Concreting in cold weather

26.5.4.1—Design information

26.5.4.2—Compliance requirements

26.5.5—Concreting in hot weather

26.5.5.1—Design information

26.5.5.2—Compliance requirements

26.5.6—Joints in concrete

26.5.6.1—Design information

26.5.6.2—Compliance requirements

26.5.7—Construction of concrete members

26.5.7.1—Design information

26.5.7.2—Compliance requirements

26.6—Reinforcement materials and construction requirements

26.6.1—General

26.6.1.1—Design information

26.6.1.2—Compliance requirements

26.6.2—Placement

26.6.2.1—Design information

26.6.2.2—Compliance requirements

26.6.3—Bending

26.6.3.1—Compliance requirements

26.6.4—Welding

26.6.4.1—Compliance requirements

26.7—Anchoring to concrete

26.7.1—Design information

26.7.2—Compliance requirements

26.8—Embedments

26.8.1—Design information

26.8.2—Compliance requirements

26.9—Additional requirements for precast concrete

26.9.1—Design information

26.9.2—Compliance requirements

26.10—Additional requirements for prestressed concrete

26.10.1—Design information

26.10.2—Compliance requirements

26.11—Formwork

26.11.1—Design of formwork

26.11.1.1—Design information

26.11.1.2—Compliance requirements

26.11.2—Removal of formwork

26.11.2.1—Compliance requirements

26.12—Concrete evaluation and acceptance

26.12.1—General

26.12.1.1—Compliance requirements

26.12.2—Frequency of Testing

26.12.2.1—Compliance requirements

26.12.3—Acceptance criteria for standard-cured specimens

26.12.3.1—Compliance requirements

26.12.4—Field-cured specimens for determining adequacy of curing and protection

26.12.4.1—Compliance requirements

26.12.5—Investigation of low strength-test results

26.12.5.1—Compliance requirements

26.12.6—Acceptance of steel fiber-reinforced concrete

26.12.6.1—Compliance requirements

26.13—Inspection

26.13.1—General

26.13.2—Inspection reports

26.13.3—Items requiring inspection

Chapter 27—Strength Evaluation of Existing Structures

27.1—Scope

27.1.1—Provisions of this chapter shall apply to strength evaluation of existing structures by analytical means or by load testing.

27.2—General

27.3—Analytical strength evaluation

27.3.1—Verification of as-built condition

27.3.2—Strength reduction factors

27.4—Strength evaluation by load test

27.4.1—General

27.4.2—Test load arrangement and load factors

27.4.3—Test load application

27.4.4—Response measurements

27.4.5—Acceptance criteria

27.5—Reduced load rating

318.1—Code Requirements for Thin Shells and Commentary

1.1—Scope

1.1.1—Provisions of this Code shall govern for thin shell concrete structures, including ribs and edge members.

2.1—Definitions

3.1— Analysis and design

4.1—Design strength

5.1—Specified concrete cover for thin shells

6.1—Shell reinforcement

7.1—Construction



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