ACI 310-16

- Section 2: Formwork and Formwork Accessories
- Section 3: Reinforcement and Reinforcement Supports

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ACI 301-16 Section 2 & 3

• Goals for Sections 2 & 3
  – Eliminate redundancy by removal of Submittal List and associated trigger language
  – Improve unclear language
  – Limit document to mandatory requirements
2.1.2.1(d) Reshoring and backshoring Procedure

Before using reshoring or backshoring that is required or permitted, submit procedure, including drawings signed and sealed by a licensed design engineer. Include on shop drawings formwork removal procedure and magnitude of construction loads permitted during reshoring or backshoring.
ACI 301-16 Section 2: Formwork

2.2.1.2 Formwork accessories

2.2.1.2 Formwork accessories—Use commercially manufactured formwork accessories, including ties and hangers. Where indicated in Contract Documents, use form ties in walls with integral water barrier plates or other acceptable positive water barriers. Unless otherwise specified or permitted for ferrous ties, the breakback distance of ties for Surface Finish-2.0 or Surface Finish-3.0 shall be at least 3/4 in.

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2.2.1.2 Formwork accessories—Use commercially manufactured formwork accessories, including ties and hangers. Use form ties with ends or end fasteners that can be removed without damage to concrete. Where indicated in Contract Documents, use form ties with integral water barrier plates or other acceptable positive water barriers in walls. Unless otherwise specified the breakback distance for ferrous ties shall be at least 3/4 in. for Surface Finish-2.0 or Surface Finish-3.0, as defined in Section 5.3.3.3. Where indicated in Contract Documents or if specified breakback distance is less than 3/4 in., use coated or corrosion-resistant ties.
Design formwork, shores, reshores, and backshores to support loads transmitted to them and to comply with applicable building code requirements. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.

For post-tensioned applications, ensure that formwork allows movement resulting from application of prestressing force.
ACI 301-16 Section 2: Formwork – 2.3.2 Removal of formwork

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2.3.2.2 Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform needed repairs or treatments required at once and follow immediately with specified curing.

2.3.2.4 Do not damage concrete during removal of vertical formwork for columns, walls, and sides of beams. Perform needed repair and treatment required on vertical surfaces that day and follow immediately with specified curing.

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2.3.2.2 Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection in accordance with Section 5.

2.3.2.3 Do not damage concrete during removal of vertical formwork for columns, walls, and sides of beams. Perform needed repair and finishing operations required on vertical surfaces. If forms are removed before end of specified curing period, provide curing and protection in accordance with Section 5.

2.3.2.6 For post-tensioned structures, do not remove formwork supports until stressing records have been accepted by Architect/Engineer.
ACI 301-16 Section 2: Formwork – 2.3.3 Reshoring and backshoring

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2.3.3.1 Submittals for reshoring and backshoring operations shall comply with 2.1.2.1.d and 2.1.2.2.b.  
2.3.3.2 During reshoring and backshoring, do not allow concrete in beam, slab, column, or any structural member to be loaded with combined dead and construction loads in excess of loads permitted by Architect/Engineer for concrete compressive strength at time of reshoring and backshoring.  
2.3.3.3 Place reshores or backshores in sequence with stripping operations.  
2.3.3.6 In multistory buildings, place reshoring or backshoring over a sufficient number of stories to distribute weight of newly placed concrete, forms, and construction live loads such that design loads of floors supporting shores, reshores, or backshores are not exceeded.

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2.3.3.1 If the reshoring and backshoring procedure described in 2.1.2.1(d) is submitted, do not allow structural members to be loaded with combined dead and construction loads in excess of loads indicated in the accepted procedure.  
2.3.3.2 If the reshoring and backshoring procedure described in 2.1.2.1(d) is submitted, install and remove reshores or backshores in accordance with accepted procedure.  
2.3.3.4 In multistory buildings, place reshoring or backshoring over a sufficient number of stories to distribute weight of newly placed concrete, forms, and construction live loads in accordance with reshoring and backshoring procedure in 2.1.2.1(d).
2.3.5.1 Establish and maintain survey controls and benchmarks in an undisturbed condition until completion of the concrete structure and its building envelope.
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— 3.2.1.9 Reinforcement supports

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3.2.1.10 Reinforcement supports— Provide reinforcement support types indicated within structure as required by Contract Documents. Unless otherwise permitted, reinforcement supports shall be of a type indicated in 3.2.1.10.a through 3.2.1.10.d as specified. Reinforcement supports shall secure and support the reinforcement within specified tolerances.

3.2.1.10.a Wire-reinforcement supports.
3.2.1.10.b Coated wire-reinforcement supports including epoxy, polymer, and galvanized coatings.
3.2.1.10.c Precast concrete reinforcement supports.
3.2.1.10.d All-plastic reinforcement supports.

3.2.1.11 Coated wire-reinforcement supports

3.2.1.11.a When specified, use wire-reinforcement supports coated with epoxy or another polymer a distance at least 2 in. from point of contact with epoxy-coated reinforcement.
3.2.1.11.b When specified, use galvanized wire-reinforcement supports or wire-reinforcement supports coated with epoxy or another polymer.

3.2.1.12 Precast concrete reinforcement support— When permitted, use precast concrete supports that have a surface area of not less than 4 in.2 and have a compressive strength equal to or greater than specified compressive strength of concrete being placed.

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3.2.1.9 Reinforcement supports— Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports shall conform to CRSI RB4.1
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3.3.2.4 Reinforcement supports—Unless permitted otherwise, use reinforcement supports indicated in 3.3.2.4.a through 3.3.2.4.i.

3.3.2.4.a Use precast concrete reinforcement supports to support reinforcement above ground or a mud mat.
3.3.2.4.b Use reinforcement supports made of concrete, metal, or plastic to support uncoated reinforcement.
3.3.2.4.c Use wire reinforcement supports that are galvanized, coated with epoxy or another polymer, or made of plastic to support zinc-coated (galvanized) reinforcement.
3.3.2.4.d Reinforcement supports and embedded steel items used with zinc-coated (galvanized) reinforcement shall be zinc-coated (galvanized) or coated with nonmetallic materials.
3.3.2.4.e Support epoxy-coated reinforcement on coated wire reinforcement supports or on reinforcement supports made of plastic. Use coatings or materials compatible with concrete.
3.3.2.4.f When precast concrete reinforcement supports with embedded tie wires or dowels are used with epoxy-coated reinforcement, use wires or dowels coated with epoxy or another polymer.
3.3.2.4.g Reinforcement used as supports for epoxy coated reinforcement shall be epoxy coated.
3.3.2.4.h In walls reinforced with epoxy-coated reinforcement, use epoxy-coated spreader bars. Proprietary combination bar clips and spreaders used in walls with epoxy coated reinforcement shall be made of corrosion-resistant material or coated with epoxy or another polymer.
3.3.2.4.i Fasten epoxy-coated reinforcement with tie wires coated with epoxy or other polymer.

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3.3.2.4 Reinforcement supports—Install reinforcement supports in accordance with CRSI RB4.1.
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3.3.2.5 **Welded wire reinforcement**—For slabs-on-ground, extend welded wire reinforcement to within 2 in. of concrete edge. Lap splice edges and ends of welded wire reinforcement sheets as indicated in Contract Documents. Unless otherwise specified or permitted, do not extend welded wire reinforcement through control joints. Place, support, and secure welded wire reinforcement to maintain positioning in slab during concrete placement. Do not place welded wire reinforcement on grade and subsequently raise it into position during placement of concrete.

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3.3.2.5 **Welded wire reinforcement**—Support welded wire reinforcement in accordance with CRSI RB4.1 to maintain positioning during concrete placement.  
3.3.2.5(a) **Welded wire reinforcement in slabs on composite steel deck and slabs on ground**—Reinforcement shall be placed into position prior to concrete placement. Unless otherwise specified, do not extend welded wire reinforcement through movement joints. Place reinforcement as indicated in Contract Documents. If reinforcement less than W4.0 or D4.0 is specified, the continuous support spacing shall not exceed 12 in. Reinforcement nearest edge of slab shall be no farther from edge of slab than greater of specified cover or 2 in. Unless otherwise specified, overlap parallel wires at edges of reinforcement not less than 2 in.  
3.3.2.5(b) **Welded wire reinforcement in elevated formed slabs, slabs on noncomposite steel deck, and members not covered in 3.3.2.5.a**—Use sheets of welded wire reinforcement. Place and support reinforcement before concrete placement to maintain location within tolerances indicated for nonprestressed reinforcement in ACI 117 2.2.1. If reinforcement less than W4.0 or D4.0 is specified, the continuous support spacing shall not exceed 12 in. perpendicular to the direction of span. Lap splice edges and ends of welded wire reinforcement sheets as indicated in Contract Documents.
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3.3.2.5 Welded wire reinforcement—Support welded wire reinforcement in accordance with CRSI RB4.1 to maintain positioning during concrete placement.

3.3.2.5(a) Welded wire reinforcement in slabs on composite steel deck and slabs on ground—Reinforcement shall be placed into position prior to concrete placement. Unless otherwise specified, do not extend welded wire reinforcement through movement joints. Place reinforcement as indicated in Contract Documents. If reinforcement less than W4.0 or D4.0 is specified, the continuous support spacing shall not exceed 12 in. Reinforcement nearest edge of slab shall be no farther from edge of slab than greater of specified cover or 2 in. Unless otherwise specified, overlap parallel wires at edges of reinforcement not less than 2 in.

3.3.2.5(b) Welded wire reinforcement in elevated formed slabs, slabs on noncomposite steel deck, and members not covered in 3.3.2.5.a—Use sheets of welded wire reinforcement. Place and support reinforcement before concrete placement to maintain location within tolerances indicated for nonprestressed reinforcement in ACI 117 2.2.1. If reinforcement less than W4.0 or D4.0 is specified, the continuous support spacing shall not exceed 12 in. perpendicular to the direction of span. Lap splice edges and ends of welded wire reinforcement sheets as indicated in Contract Documents.
3.3.2.8 Field bending or straightening—Field bending or straightening—Field bending or straightening—Field bending of reinforcing bars reinforcement partially embedded in concrete shall not be permitted, except as indicated in the Contract Documents. When bending is permitted and unless other methods are specified, bend or straighten reinforcing bars partially embedded in concrete in accordance with procedures 3.3.2.8(a) through 3.3.2.8(d).

3.1.2.1(f) Field bending or straightening—Submit request and procedure to field-bend or straighten reinforcing bars partially embedded in concrete at locations not indicated in on Contract Documents.