

## **Section 52 Reinforcement**

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### Section 52 Reinforcement

#### 4-5201 General

Section 52, “Reinforcement,” of the *Standard Specifications* provides requirements for fabricating and placing reinforcement. Items used for reinforcement include bars, welded wire, and wire. For details about reinforcement, refer to Structure Construction’s *Bridge Construction Records and Procedures* manual at:

<https://dot.ca.gov/programs/engineering-services/manuals>

Refer to the contract specifications, Sections 3-604, “Buy America,” and 6-202, “Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products,” of this manual regarding Buy America requirements. Requirements for mandatory use of domestic materials are found in Section 6-1.04, “Buy America,” of the *Standard Specifications*.

Refer to Section 6-1.06, “Buy Clean California Act” (California Public Contract Code, Sections 3500, 3501, and 3503), of the contract specifications and Section 3-606, “Buy Clean California Act,” of this manual for material requirements including environmental product declaration submittal requirements.

#### 4-5202 Before Work Begins

Materials Engineering and Testing Services (METS) is responsible for monitoring reinforcement materials at the source of supply. The fabricator will provide a certificate of compliance with shipments of reinforcement delivered to the job site.

Before work begins, do the following:

- Verify that Form CEM-3101, “Notice of Materials to Be Used,” includes reinforcement materials. Refer to Section 6-202, “Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products,” of this manual for additional information.
- For each lot of material delivered to the project, require the contractor to conform to Section 6-2.03C, “Certificates of Compliance,” of the *Standard Specifications*.
- Inspect hook details to ensure they conform to specifications. Refer to the *Bridge Construction Records and Procedures* manual, Vol. 2, Section 165, for hook details. Also, examine the bars to detect damage from bending, for example, kinks or cracking of the steel on the surfaces of the hooks.
- Check that steel does not have mortar, oil, dirt, excessive mill scale, scabby rust, or other harmful coatings. Decide whether these coatings will destroy or reduce bonding. If cleaning is necessary, advise the contractor.
- Check some of the ends of larger bars to detect any evidence of piping, which is a cavity in the core of a bar. Also check for such rolling defects as scabs, seams, and laminations.

- As specified in Section 52-2.02, “Epoxy-Coated Reinforcement,” of the *Standard Specifications*, require repair or replacement of damaged epoxy-coated, bar reinforcing steel.
- Note the following:
  1. The contractor may substitute welded wire reinforcement for bar reinforcement in certain concrete work as specified in the *Standard Specifications*; however, welded wire may not be substituted for epoxy-coated reinforcement. Section 165, “Reinforcing Steel,” of the *Bridge Construction Records and Procedures* manual, Vol. 2, contains information that may be used to determine equivalent areas of the steel.
  2. Steel lists are required only if specifically requested by the engineer. It is Caltrans policy to not request such lists except for specific reasons, as described in Section 52, “Reinforcement,” of the *Standard Specifications*.
  3. Steel lists are not to be requested for the convenience of assistant resident engineers in checking items such as sizes, dimensions, locations, clearances, and coverages. The contract plans and specifications serve this purpose.
  4. Before allowing butt welding to splice bar reinforcement, refer to the contract documents and Section 180, “Welding,” of the *Bridge Construction Records and Procedures* manual, Vol. 2.
  5. Before allowing mechanical splicing of bar reinforcing steel, refer to the contract documents and Section 165 of the *Bridge Construction Records and Procedures* manual, Vol. 2.

#### **4-5203      During the Course of Work**

During the course of work, do the following:

- Examine the rolled-in grade marks to verify the contractor is using the specified grade of reinforcing steel for the given structure. Refer to Section 165, “Reinforcing Steel,” of the *Bridge Construction Records and Procedures* manual, Vol. 2, for information about identifying marks on American-made bar reinforcing steel.
- Make sure the placing of the reinforcement in the forms conforms to the plans and specifications.
- Check that all reinforcement is securely wired at intersections and securely held in place and that bundle bars are tied at proper intervals. Also, check that the reinforcement is placed in the forms in a way that will not require the contractor to add or adjust bars during the placing of concrete.
- On cast-in-place, prestressed, post-tensioned structures, it may be necessary to adjust or relocate reinforcement to conform to the prestressing system the contractor selected. It may also be necessary to place additional steel. These details are shown on contractor drawings that Caltrans reviews and authorizes. Use the authorized prestressing details to assure that, when placing concrete, the contractor provides the required clearances to various items, including the

tendons and anchorages. In particular, verify the proper placement of grillages at end anchorages.

- When the contractor uses welded wire reinforcement, check that it is rolled flat and held firmly in place during placement of concrete or shotcrete.
- After the contractor places the reinforcement, verify that it is free of any harmful coating that would destroy or reduce bonding.
- The contractor must protect epoxy-coated reinforcing steel against sunlight, salt spray, and weather with a secure covering. The contractor must repair any visible damage to the coating as specified, in accordance with the manufacturer's recommended patching material.
- Note the following:
  1. Vibrators used to consolidate concrete containing epoxy-coated reinforcing steel must have a resilient covering to prevent damage to the epoxy coating.
  2. Purple or gray epoxy-coated prefabricated reinforcement is cut to size and bent to shape before the coating is applied. Epoxy-coated prefabricated reinforcement must not be bent or rebent after coating application.
  3. Green epoxy-coated reinforcement is more flexible. It is applied to straight rebar, which is subsequently cut and bent to shape.
- Until the engineer approves the proper submittals, do not permit welding of any type on reinforcing steel. Refer to Section 180, "Welding," of the *Bridge Construction Records and Procedures* manual, Vol. 2, for guidelines.
- Bar reinforcing steel is spliced by lapping bars, by butt welding bars, or by using mechanical couplers. Welded wire reinforcement, reinforcing wire, or plain bars are generally spliced by lapping. Inspect all lapped splices to verify that the minimum lengths of lap and stagger distances conform to the plans and specifications. Note that the size of a bar and the grade of steel will determine the length of lap required. Check that the laps are securely wired to maintain the alignment of the bars. Lap splices of welded wire reinforcement must be tied securely with wire to prevent distortion.
- Verify that all mechanical butt splices, butt welds, and lap welds on epoxy-coated reinforcing steel are protected from corrosion with a corrosion-protection system that is on the METS Authorized Material List for corrosion-protection coverings. METS Authorized Material Lists are available at:  
<https://dot.ca.gov/programs/engineering-services>
- The corrosion-protective system must be used in accordance with manufacturer and Caltrans requirements. Verify the cover is installed as a continuous piece with sufficient diameter and length to achieve an adequate seal and bond length. The cover must be free of dirt, grease, sharp edges, tears, or pinholes. After the cover is heated as specified, check that it extends a minimum of 2 inches onto the epoxy-coated reinforcing steel.

#### **4-5204      Payment**

Refer to appropriate sections of the special provisions and *Standard Specifications* for the basis of measurement and payment. If payment is on a unit basis, you may need to keep records of reinforcement that is placed in the structure. Also, calculate any changes that result in increases or decreases in quantities of reinforcement.