

Section 52 Reinforcement

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4-5201 General

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Items used for reinforcement include bars, welded wire fabrics, and wires.

4-5202 Before Work Begins

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The Office of 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 or reinforcement delivered to the job site.

Refer to the contract specifications and Section 3-605, “Certificates of Compliance,” of the *Construction Manual* (manual) regarding Buy America requirements. Section 6-1.08 of the *Standard Specifications* covers the use of foreign materials.

During this preliminary inspection, also take the following steps:

- Verify the receipt and proper distribution of Form CEM-3101, “Notice of Materials to Be Used,” which lists reinforcement materials.
- For each lot of material delivered to the project, require the contractor to conform to Section 6-1.07 of the *Standard Specifications* by providing Form TL-6046, “Fabricators Certificate of Compliance.” Form TL-6046 can be obtained from METS.
- Inspect hook details to ensure they conform to specifications. Refer to the *Bridge Construction Records and Procedures Manual*, Volume II, Section 165, for hook details (which conform to the building code requirements of the American Concrete Institute). Also, examine the bars to detect damage from bending, for example, kinks or cracking of the steel on the surfaces of the hooks.
- Check the steel for general cleanliness, ensuring it does not have loose mill scale, excessive rust, or other deleterious coatings. Decide whether such coatings will destroy or reduce bonding, and if cleaning is necessary, advise the contractor.
- Check some of the ends of larger bars to detect any evidence of “piping.” (Piping is a cavity in the core of a bar.) Also check for such rolling defects as scabs, seams, and laminations.
- As specified in Section 52-1.02B, “Epoxy-Coated Reinforcement,” of the *Standard Specifications*, require repair or replacement of damaged epoxy-coated, bar reinforcing steel.
- The contractor may substitute welded wire fabric for reinforcing bars in certain concrete work shown in the *Standard Specifications*. The *Bridge Construction Records and Procedures Manual*, Volume II, Section 165, contains information that may be used to determine equivalent areas of the steel.

- 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 52-1.03, “Steel Lists,” of the *Standard Specifications*.
- 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.
- Before using butt welding to splice bar reinforcing steel, refer to your contract documents and the *Bridge Construction Records and Procedures Manual*, Volume II, Section 180.
- Before mechanically splicing bar reinforcing steel, refer to your contract documents and the *Bridge Construction Records and Procedures Manual*, Volume II, Section 165.

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

4-5203 During the Course of Work

During the course of work, take the following steps:

- Examine the rolled-in grade marks to ensure the contractor is using the specified grade of reinforcing steel for the given structure. Refer to the *Bridge Construction Records and Procedures Manual*, Volume II, Section 165, for information about identifying marks on American-made bar reinforcing steel.
- Ensure the placing of the reinforcement in the forms conforms to the plans and specifications.
- Ensure that all reinforcement is securely wired at intersections and securely held in place and that bundle bars are tied at proper intervals. Also, ensure 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 the Caltrans reviews and approves. Use the approved prestressing details to ensure that, when placing concrete, the contractor provides the required clearances to various items, including the tendons and anchorages. In particular, ensure the proper placement of grillages at end anchorages.
- When the contractor uses mesh reinforcement, check that it is rolled flat and held firmly in place during placement of concrete or shotcrete.
- After the contractor places the reinforcement, ensure it is free of any coating (such as form oil, dust, or dirt) that would destroy or reduce bonding.
- To protect epoxy-coated reinforcing steel against sunlight, salt spray, and weather, ensure the contractor uses a secure covering. The contractor must repair any visible damage to the coating as specified in accordance with the manufacturer’s recommended patching material.
- Vibrators used to consolidate concrete containing epoxy-coated reinforcing steel must have a resilient covering to prevent damage to the epoxy coating.

- Prefabricated epoxy-coated reinforcing steel (purple or gray in color) is cut to size and bent to shape before applying the coating. Prefabricated epoxy-coated rebars must not be bent or rebent after the coating.
- Postfabricated epoxy-coated reinforcement (green in color) 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 the *Bridge Construction Records and Procedures Manual*, Volume II, Section 180, for guidelines.
- Bar reinforcing steel is spliced by lapping bars, by butt welding bars, or by using mechanical couplers. Mesh reinforcement, reinforcing wire, or plain bars are generally spliced by lapping. Inspect all lapped splices to ensure the minimum lengths of lap and stagger distances conform to the plans and specifications. In particular, notice that the size of a bar and the grade of steel will determine the length of lap required. Ensure the laps are securely wired to maintain the alignment of the bars. Lap splices of mesh reinforcement must be tied securely with wire to prevent distortion of the mesh.
- All mechanical butt splices, butt welds, and lap welds on epoxy-coated reinforcing steel must be protected from corrosion with an approved mastic-lined shrink tube protective cover. You can find the METS list of approved coverings to protect against corrosion at:

http://svhqsg4.dot.ca.gov:80/hq/esc/approved_products_list/SpliceCover.html

The mastic-lined shrink tubing must be used as specified in accordance with manufacturer and Caltrans requirements. Ensure the shrink tubing is installed as a continuous tube with sufficient diameter and length to achieve an adequate seal and bond length. The tubing must not have any dirt, grease, sharp edges, tears, or pinholes. After the tubing is heated as specified, ensure it extends a minimum of 50 mm onto the epoxy-coated reinforcing steel.

4-5204 Measurement and 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 actually in place in the structure. Also, calculate any changes that result in increases or decreases in quantities of reinforcement.

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