

SECTION 03200 CONCRETE REINFORCING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for concrete reinforcing.

1.02 REFERENCE STANDARDS

- A. American Concrete Institute (ACI):
 - 1. 301 Specifications for Structural Concrete for Buildings.
 - 2. 315 Details and Detailing of Concrete Reinforcement.
- B. ASTM International (ASTM):
 - 1. A82 Specification for Steel Wire, Plain, for Concrete Reinforcement
 - 2. A185 Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 3. A497 Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
 - 4. A706 Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement
 - 5. A767 Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
 - 6. A775 Specification for Epoxy-Coated Reinforcing Steel Bars
 - 7. A884 Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
 - 8. C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
 - 9. D3963 Specification for Epoxy-Coated Reinforcing Steel
- C. American Welding Society (AWS):
 - 1. D1.4 Structural Welding Code – Reinforcing Steel
 - 2. QC1 Specification for AWS Certification of Welding Inspectors
- D. Concrete Research Standards Institute (CRSI):
 - 1. Manual of Standard Practice

2. Placing Reinforcing Bars
- E. State of California, Department of Transportation, Standard Specifications (Caltrans):
1. Section 52 Reinforcement
 2. Section 83 Railings and Barriers
 3. Section 90 Portland Cement Concrete
- F. State of California, Department of Transportation, Test Methods (Caltrans):
1. 417 Soils and Water for Sulfate Content
 2. 422 Testing Soils and Water for Chloride Content

1.03 SUBMITTALS

- A. Reinforcing Steel Shop Drawings: Indicate sizes, spacing, bending and cutting schedules, splices and laps, supporting and spacing devices, and quantities. Coordinate drawings to prevent reinforcing steel from interfering with the placement of embedded items.
- B. Mill Test Reports: Submit certified mill test reports (tensile and bending) for each heat or melt of steel showing physical and chemical analyses before delivery of reinforcing material to the job site.
- C. Certificates of Compliance: Submit in accordance with Caltrans Standard Specifications Section 52-1.04, Inspection. For galvanized reinforcing bars, submit certificates of compliance with ASTM A 767.
- D. Submit manufacturer's product data and installation instructions for proprietary mechanical coupler systems when such splicing methods are permitted.
- E. When galvanized or epoxy-coated reinforcing bars are indicated, furnish two 12-inch long samples and two additional samples bent to minimum radius of the rebar from each lot shipped to the work site.
- F. Qualifications of welding operators, welding processes, and procedures. For welders, furnish welding certificates or affidavits attesting to the welders' qualifications to perform the indicated welding in accordance with applicable requirements of AWS D1.4.

1.04 DELIVERABLES

- A. Submit copies of inspection and test reports for welding as required in this Section.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with the requirements of applicable building codes, CRSI Manual of Standard Practice, and CRSI Placing Reinforcing Bars.
- B. Perform work in accordance with the requirements of ACI 301 and ACI 315.
- C. Qualifications of Welding Inspector: Welds to be inspected by the Contractor shall be inspected and certified by a Contractor-employed AWS Certified Welding Inspector (CWI), certified in accordance with AWS QC 1.
- D. Qualification of Personnel Performing Nondestructive Testing: Personnel performing nondestructive testing, who are Contractor-employed, shall be qualified and certified in accordance with SNT-TC-1A. Only persons certified for NDT Level I and working under a NDT Level II person or persons certified for NDT Level II may perform nondestructive testing.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Ship and store reinforcement with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same designations as shown on the submitted placing drawings.
- B. Store reinforcement off the ground, protect from moisture, and keep free from dirt, oil, or other contaminants. Steel, which cannot be properly identified, will be rejected and shall be immediately removed from the work site.
- C. Handle and store galvanized and epoxy-coated reinforcement in a manner which will prevent damage to the coatings. For epoxy-coated reinforcement, comply with the requirements of ASTM D 3963.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel Bars: ASTM A706
- B. Reinforcing Steel Wire: ASTM A 82, cold drawn
- C. Welded Steel Wire Fabric – Plain Wire: ASTM A 185, uncoated finish
- D. Welded Steel Wire Fabric – Deformed Wire: ASTM A 497, uncoated finish
- E. Welded Steel Wire Fabric – Epoxy-Coated: ASTM A 884
- F. Epoxy-coated Reinforcing Bars: ASTM A 706 epoxy-coated in accordance with ASTM A 775 and ASTM D 3963. Coating material shall conform to ASTM A 775 and ASTM D 3963, Annex 1, green in color. Bars shall be cut and bent cold before applying coating material.
- G. Galvanized Reinforcing Bars: ASTM A 706 galvanized in accordance with ASTM A 767, Class I coating. Bars shall be cut and bent cold before galvanizing.

- H. Mechanical Splice Coupler: Provide bar splicing connections produced by threaded reinforcing bar ends and threaded coupler, or by sleeves hydraulically pressed or forged onto butt-ended reinforcing bars. Mechanical splice couplers shall be capable of being installed in the clear space indicated and to provide the required clearances. The strength of the splice in tension and compression shall be a minimum of 125 percent of the yield strength of the connected reinforcing bars.
- I. Welding Electrodes: E90 meeting the requirements of AWS D1.4.

2.02 ACCESSORIES

- A. Steel Tie Wire: No. 16 gage or heavier, black or galvanized, soft or commercial grade steel tie wire. For galvanized reinforcement, provide zinc-coated wire. For epoxy-coated reinforcement, provide nylon-, epoxy-, or plastic-coated wire.
- B. Chairs, bolsters, bar supports, and spacers:
 - 1. Metal, plastic tipped, in accordance with the requirements of CRSI Manual of Standard Practice for reinforced concrete construction.
 - 2. Sized and shaped for strength and support of reinforcement during installation and placement of concrete.
 - 3. For galvanized reinforcement, provide all galvanized accessories.
 - 4. For epoxy-coated reinforcement, provide accessories which are nylon-, epoxy-, or plastic-coated.

2.03 GROUT

- A. Bonding Material for Bonding Dowels: As specified in Caltrans Standard Specifications, Section 83-2.02D(1).
- B. Non-Shrink Grout: Grout shall be a premixed package blend of Portland cement, graded silica sand, and water reducing, plasticizing and time release expansion agents, which conforms to ASTM C1107, Grade B, and provides a minimum 5000 psi compressive strength at 28 days. Mix grout in accordance with the manufacturer's recommendations. Water shall comply with the provisions in Caltrans Standard Specifications, Section 90-2.03, Water.
 - 1. Admixtures shall not contain more than 0.05 percent soluble chlorides when tested in conformance with California Test 422 nor more than 0.25 percent soluble sulfates, as SO_4 , when tested in conformance with California Test 417.

2.04 FABRICATION

- A. Fabricate in accordance with the requirements of ACI 315.

- B. Locate splices not indicated on the Contract Drawings at point of minimum stress.
- C. Repair of Damaged Coatings:
 - 1. Epoxy: Repair in accordance with the provisions in Caltrans Standard Specifications, Section 52, Reinforcement.
 - 2. Galvanized: Repair as specified in ACI 301, ASTM A 767, ASTM A 775, ASTM A 884, and ASTM D 3963, as applicable.
- D. Welding:
 - 1. Welding of reinforcement, where indicated and approved, including preparation of bars, shall conform with applicable requirements of AWS D1.4.
 - 2. Clean bars of oil, grease, dirt, and other foreign matter and flame-dry before welding. Preheat bars welding in accordance with AWS D1.4, Chapter 5.
 - 3. Butt Welded Splices: Use full penetration butt welds in accordance with the provisions in Caltrans Standard Specifications, Section 52, Reinforcement, unless another weld splice type is indicated or approved.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before placing concrete, clean reinforcement of foreign particles, including mortar, oil, grease, dirt, loose mill scale, rust and any other coating that will prevent or reduce bond.
- B. Place in position, support, and secure reinforcement to prevent displacement during concrete placement. Do not deviate from alignment or spacing as shown on the Contract Drawings.

3.02 CLEANING, BENDING, PLACING, AND SPLICES

- A. Perform work in accordance with the provisions in Caltrans Standard Specifications, Section 52, Reinforcement, and as specified herein.
- B. Perform installation of mechanical coupler and tightening for joint assembly in accordance with the coupler manufacturer's installation instructions and recommendations.

3.03 DRILLING AND BONDING DOWELS

- A. Drilling and bonding dowels shall conform to the details shown on the Contract Drawings, the provisions in Caltrans Standard Specifications, Section 83-2.02D(1), and as specified herein.

- B. If reinforcement is encountered during drilling, before the specified depth is attained, notify the Engineer. Unless the Engineer approves coring through the reinforcement, the hole will be rejected. If hole is rejected, drill a new hole, in which reinforcement is not encountered, adjacent to the rejected hole to the depth shown on the Contract Drawings. Grout rejected hole.
- C. Dowels shall conform to the provisions for reinforcing steel bars specified herein.

3.04 DRILLING AND GROUTING DOWELS

- A. Drilling and grouting concrete shall consist of drilling through reinforced concrete bridge members, placing reinforcement and filling holes with non-shrink grout, and shall conform to the details shown on the Contract Drawings, the provisions in Caltrans Standard Specifications, Section 83-2.02D(1), and as specified herein.
- B. If reinforcement is encountered during drilling, before the specified depth is attained, notify Engineer. Unless the Engineer approves coring through the reinforcement, the hole will be rejected. If hole is rejected, drill new hole, in which reinforcement is not encountered, adjacent to the rejected hole to the depth shown on the Contract Drawings. Grout rejected hole.
- C. Dowels shall conform to the provisions for reinforcing steel bars specified herein.
- D. Clean concrete areas to be in contact with grout of all loose or foreign material that would in any way prevent bond between the concrete surfaces, flush flushed with water, and allow to dry to a surface dry condition immediately prior to grouting.
- E. After placement of reinforcement, seal ends of the drilled hole containing the reinforcement, with one vent tube and one injection feed tube. Place tubes in the hole in a manner which will allow the air to vent and the hole to be completely filled with grout. Achieve sufficient pressure to ensure that the hole is free of voids. Pump grout through the holes and continually waste grout until no visible slugs or other visible evidence of water or air are ejected and the efflux time of ejected grout is not less than 11 seconds.
- F. Prevent grout from falling into any waterway and on public traffic, from flowing across shoulders or lanes occupied by public traffic, and from flowing into gutters or other drainage facilities.

3.05 FIELD QUALITY CONTROL

- A. Inspection and testing of welds shall be performed by an approved Inspection and Testing Agency retained by the Contractor:
 - 1. Visually inspect reinforcing bar welds.
 - 2. Tension tests of welded butt joints shall be performed on sample welds produced by the Contractor in accordance with ASTM E8.
 - 3. Non destructive tests of installed welded butt joints shall be performed in accordance with ASTM E165.

4. Inspections and tests shall be performed in accordance with the applicable requirements of AWS D1.4, Chapters 6 and 7.

END OF SECTION