SECTION 032000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section covers materials, fabrication, placement, and tolerances of reinforcement and reinforcement accessories.

B. Related Sections:

1. 013300 – Submittal Procedures
2. 014500 – Structural Testing, Inspection, and Quality Assurance
3. 031000 – Concrete Forming and Accessories
4. 033000 – Cast-in-Place Concrete
5. 033800 – Post-Tensioned Concrete
6. 042000 – Unit Masonry

1.3 REFERENCE STANDARDS

A. The latest versions of the publications listed below form a part of this specification; comply with provisions of these publications except as otherwise shown or specified.

1. ACI 117 Standard Specification for Tolerances for Concrete
2. ACI 301 Standard Specifications for Structural Concrete, including other standards referred to in ACI 301, such as ASTM, AWS, etc.
3. CRSI MSP Manual of Standard Practice
4. International Code Council, Evaluation Services (ICC-ES): Evaluation Reports
5. International Association of Plumbing and Mechanical Officials: Uniform Evaluation Service (IAPMO-UES)

1.4 SUBMITTALS

A. General: Submit the following data and drawings for review and acceptance before fabrication and execution in accordance with Section 013300, "Submittal Procedures."

B. Placing Drawings: Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement supports. Indicate splicing, laps, details of reinforcing, and accessories.

1. Show embedded plates, bolts, etc., for purposes of checking for potential interferences.
2. Indicate locations of construction joints in the concrete construction.

C. Mechanical Splices: Submit the types of mechanical splices proposed for use. Include the latest ICC-ES (or IAPMO-ES equivalent) Reports for threaded or sleeve-type splices to verify compliance with specified requirements.

D. Headed Bars or Terminators: Submit the types of headed bars or terminators proposed for use. Include the latest ICC-ES (or IAPMO-ES equivalent) reports to verify compliance with the specified requirements.

E. Product Data: Include specifications and installation instructions for all proprietary materials and reinforcement accessories.

F. Welding Procedures and Qualifications: Submit description of reinforcement weld locations, welding procedures, and welder qualifications when welding is permitted.

G. Mill Certificates: Submit mill certificates for all reinforcing steel for information and record only.

1.5 QUALITY ASSURANCE

A. Allowable Tolerances: Fabrication and placement tolerances shall be in accordance with ACI 117.

B. Welder Qualifications: Welders shall be qualified in the last six months in accordance with the American Welding Society, AWS D1.4. Welding procedures qualified by others and welders qualified by another employer may be acceptable as permitted by AWS D1.4. If re-qualification is required, the cost of these qualification tests shall be borne by the Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Bundles of reinforcing bars shall be tagged showing quantity, grade, size, and suitable identification to allow checking, sorting, and placing. Identification of steel shall be maintained after bundles are broken.

1. Bundles of flat sheets and rolls of welded wire reinforcement shall be tagged showing quantity, style designation, width, and length.

B. Reinforcing steel shall be stored off the ground in a manner that will prevent bending and be protected from earth, oil, or any other material that might impair bond to concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: ASTM A615, Grade 60, deformed, unless otherwise indicated on drawings.

B. Reinforcing Bars for Welding and Reinforcing Bars Specified as "Special Ductile Quality": ASTM A706 Grade 60, deformed, unless otherwise indicated on drawings. ASTM A615 Grade 60

reinforcement may be used in lieu of ASTM 706 Grade 60 reinforcement if the following conditions apply:

1. The actual yield strength based on mill tests does not exceed the specified yield strength by more than 18,000 psi.
2. The ratio of the actual ultimate tensile strength to the actual tensile yield strength is not less than 1.25.
3. Minimum fracture elongation in 8 inches shall be at least 14 percent for bar sizes No. 3 through No. 6, at least 12 percent for bar sizes No. 7 through No. 11, and at least 10 percent for bar sizes No. 14 and No. 18.
4. Minimum uniform elongation shall be at least 9 percent for bar sizes No. 3 through No. 10, and at least 6 percent for bar sizes No. 11, No. 14, and No. 18.

C. Column Spirals (where noted): Plain, cold-drawn wire conforming to ASTM A82 or hot-rolled rods for spirals conforming to ASTM A615.

D. Welded Wire Reinforcement: ASTM A1064; mesh and wire sizes as noted on Structural drawings. When used in slabs, provide flat sheets, not rolls.

E. Bar Supports: In accordance with CRSI Manual of Standard Practice; types and sizes as required for the conditions of the installation.

1. For exposed to view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are hot-dipped, galvanized, plastic protected, or stainless steel, in accordance with CRSI Class 1 or Class 2 (Types A or B).
2. Provide precast concrete blocks not less than 4 inches square when supporting reinforcing steel on ground. Precast concrete blocks shall have a compressive strength equal to that of surrounding concrete.

F. Tie Wire: No. 16-gage minimum, annealed black wire.

G. Threaded Splices: See General Notes on Structural Drawings.

H. Headed Bars or Terminators: See General Notes on Structural Drawings.

I. Steel Stud Assemblies or Studrails: ASTM 1044; Size, length, and assembly configuration as noted on the Structural Drawings.

J. Epoxy-Coated Reinforcing: ASTM A775, Grade 60, deformed, unless otherwise indicated on drawings.

2.2 FABRICATION

A. Reinforcement: Bend reinforcement cold. Fabricate and detail to shapes and dimensions shown on drawings in accordance with CRSI Manual of Standard Practice and with fabricating tolerances in accordance with ACI 117.

B. Welding: Welding or tacking of reinforcing bars is not permitted unless specifically indicated in the Contract Documents. When welding of reinforcement is indicated and required, provide welds in accordance with AWS D1.4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: When concrete is placed, reinforcement shall be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory provided the minimum nominal dimensions, nominal weight, and the minimum average height of deformation of a hand-wire-brushed test specimen are not less than the applicable ASTM specification requirements.

B. Reinforcement: Place, support, and fasten reinforcement as indicated in the Contract Documents. Do not exceed the placing tolerances specified in ACI 117 before concrete is placed. When necessary to move reinforcement beyond the specified placing tolerances to avoid interference with other reinforcement or embedded items, submit the resulting arrangement of reinforcement for acceptance.

C. Cover: Allowable concrete cover for reinforcement is indicated in the project drawings. Tolerances on concrete cover shall meet the requirements of ACI 117.

D. Tie Wires: After cutting tie wires, turn wires to the inside of section and bend so that concrete placement will not force ends to exposed concrete surfaces.

E. Welded Wire Reinforcement: Place, support, and fasten welded wire reinforcement as indicated in the Contract Documents and ACI 301. Placement tolerance shall maintain specified cover within +1/2 and -1/4.

1. Slabs on Grade: Extend welded wire reinforcement to within 2 inches of the concrete edge. Lap edges and ends of reinforcement sheets a minimum of one mesh spacing plus 2 inches, not less than 6 inches. Support welded wire reinforcement during placing of concrete to ensure required position in the slab. Do not place welded wire reinforcement on grade and subsequently raise into position in concrete.
2. Slabs on Steel Deck: Extend welded wire reinforcement to within 2 inches of the concrete edge. Lap edges and ends of reinforcement sheets a minimum of one mesh spacing plus 2 inches, not less than 6 inches. Support welded wire reinforcement during placing of concrete to ensure required position in the slab. Do not place welded wire reinforcement on deck and subsequently raise into position in concrete.

F. Splicing: Make splices as indicated in the project drawings. Lapped bars shall be placed in contact and securely tied, or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than 1/5 the required length of lap, and not to exceed 6 inches.

1. Mechanical Splices: Mechanical splices for reinforcement not shown on the project drawings shall be submitted for review and accepted prior to use. Mechanical splices shall be in accordance with the recommendations of the manufacturer of the mechanical splicing device.

G. Reinforcement shall not be field bent or straightened except when specifically permitted.

H. Reinforcement shall not be cut in the field except when specifically permitted.

I. Epoxy-Coated Reinforcing:

1. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable materials. Wire bar supports shall be coated with dielectric material for a minimum distance of 2 inches from the point of contact with the epoxy coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy coated.
2. Epoxy-coated reinforcing bars shall be fastened with nylon-, epoxy-, or plastic-coated tie wire or other acceptable materials.
3. Splices of reinforcing bars shall be made only as required or permitted by the Contract Documents, or as authorized by the Architect/Engineer.
4. Reinforcing bars partially embedded in concrete shall not be field bent, except as indicated on the Contract Documents or permitted by the Architect/Engineer. When epoxy-coated reinforcing bars are field bent, coating damage shall be repaired in accordance with Article 3.2 B of this section.
5. Unless permitted by the Architect/Engineer, epoxy-coated reinforcing bars shall not be cut in the field. When epoxy-coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.
6. Equipment for handling epoxy-coated bars shall have protected contact areas. Bundles of coated bars shall be lifted at multiple pickup points to minimize bar-to-bar abrasion from sags in the bundles. Coated bars or bundles of coated bars shall not be dropped or dragged. Coated bars shall be stored on protective cribbing. Fading of the color of the coating shall not be cause for rejection of epoxy coated reinforcing bars.

3.2 DEFECTIVE WORK

A. General: The following reinforcing steel work will be considered defective and shall be removed and replaced by the Contractor at no additional cost to the Owner:

1. Bars with kinks or bends not shown on drawings.
2. Bars injured due to bending or straightening.
3. Bars heated for bending.
4. Reinforcement not placed in accordance with the drawings and/or specifications.

B. Epoxy-Coated Reinforcing: When required, damaged epoxy coating shall be repaired with patching material conforming to ASTM A775. Repair shall be done in accordance with the patching material manufacturer’s recommendations. The contractor shall coordinate the quantity of patching material furnished to the construction site. The following will be considered defective work and shall be replaced, removed, or repaired by the Contractor at no additional cost to the Owner:

1. Coating damage upon any bar greater than 0.1 square inch shall be repaired.
2. Bars shall be removed and replaced where the total damaged area (including repaired and unrepaired areas) exceeds 2 percent of the surface area of the bar.

END OF SECTION