# DIVISION 03 – CONCRETE

## SECTION 03215 − MICROCOMPOSITE PLAIN AND DEFORMED BARS FOR CONCRETE REINFORCEMENT

## PART 1 – GENERAL

### 1.01 RELATED DOCUMENTS

A. The General Provisions of the contract, including the General Provision for Construction Projects (2016), Special Provisions, and General Requirements of the Specifications, apply to the work specified in this Section.

### 1.02 SUMMARY

A. Section specification covers reinforcement steel for concrete pavement reinforcement on the second levels of the Ewa and Diamond Head concourse Roadways.

B. Description of work: Furnish and place reinforcement steel as shown in the plans and per this specification.

C. Related Sections

1. Section 03240 – FIBROUS REINFORCING for supplemental concrete reinforcement.

2. Section 03300 – STRUCTURAL CONCRETE for cast-in-place concrete.

### 1.03 REFERENCES

A. Codes and Standards

1. American Concrete Institute (ACI)

a. Building Code Requirements for Reinforced Concrete (ACI 318)

b. Details and Detailing of Concrete Reinforcement (ACI 315)

c. ACI Detailing Manual (ACIS SP-66)

d. Standard Tolerances for Concrete Construction and Materials (ACI 117)

2. American Society for Testing and Materials (ASTM)

a. ASTM A6/A6M-12a – Specification for General Requirements for Rolled Structural, Steel Bars, Plates, Shapes, and Sheet Piling

b. ASTM A82-07 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

c. ASTM A370-14 – Test Methods and Definitions for Mechanical Testing of Steel Products

d. ASTM A510/A 510M-11 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

e. ASTM A615 - 16 - Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

f. ASTM A1035/A1035M–16b - Specification for Deformed and Plain Low-Carbon, Chromium Steel Bars form Concrete Reinforcement

g. ASTM E29-08 - Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

3. Concrete Reinforcing Steel Institute (CRSI)

a. CRSI Manual of Standard Practice, 29th Edition

b. Placing Reinforcing Bars (CRSI), 10th Edition

c. CRSI – Specialty and Corrosion-Resistant Steel Reinforcement – Product Guide – July 2013

## 1.04 DESIGN REQUIREMENTS

A. Design of concrete elements reinforced with steel bars shall be based in accordance with the provisions of ACI 318 as modified by IBC 2018 with Hawaii State amendments.

## 1.05 SUBMITTALS

A. Comply with Section 01300 – SUBMITTALS

B. Product Data: Submit manufacturer's product data, including material and mechanical properties.

C. Test Reports: Submit manufacturer's mill certifications for material and mechanical properties for each bar size used by the project.

D. Shop Drawings: Submit bar placing drawings showing size and spacing of all cast-in-place concrete elements throughout the project.

E. Field Welding Procedures: Steel reinforcement bar shall not be welded except for tack welds as indicated in Section 3.03B.

F. Mechanical Couplers: Submit Manufacturer's product data for use with reinforcement bars.

## 1.06 DELIVERIES, STORAGE, AND HANDLING

A. General: Deliver, store, and handle reinforcement bar in accordance with manufacturer's instructions.

B. Delivery and Storage:

1. Do not store reinforcement bar on ground to keep them free from dirt and mud and to provide easy handling. It is recommended that reinforcement bars shall be covered when exposed to the elements for longer than 60 days, during transport from manufacturer, storage, fabrication and until placement; and as indicated in CRSI – Specialty and Corrosion - Resistant Steel Reinforcement – Product Guide.

2. Seams, surface irregularities, or mill scale oxidation shall not be cause for rejection, provided the weight, dimensions, and cross-sectional area of a hand-wired-brush test specimen are not less than the requirements of this specification.

3. Handling of reinforcement bar shall be in accordance with conventional steel bar as noted in CRSI Manual of Standard Practice, and CRSI – Specialty and Corrosion-Resistant Steel Reinforcement – Product Guide.

# PART 2 – PRODUCTS

## 2.01 BAR MATERIAL

A. General: Reinforcement bar shall have a minimum chromium composition as indicated in paragraph C. "Material Composition" Table 1; and have either a minimum yield strength of 100,000 psi for Grade 100 by using the 0.2% offset test method of ASTM A370.

B. Manufacturer Process and Bar Sizes: Reinforcement bar shall be hot rolled from properly identified mold or stand cast steel.

C. Material Composition: Steel reinforcement bars shall meet the requirements of Table 1.

Table 1. Maximum Chemical Constituents (Weight %)

| Element | Carbon | Chromium | Manganese | Nitrogen | Phosphorus | Sulfur | Silicon |
|---|---|---|---|---|---|---|---|
| Maximum Amount[1] | 0.15% | 8 to 10.9% | 1.5% | 0.05% | 0.035% | 0.045% | 0.5% |

Note [1] – Maximum unless range indicated'

D. Bar weight, dimensions, spacing, height, and cover depth shall be as noted in Contract Documents.

E. Reinforcement bars shall conform to the weight, dimensions and deformation spacing, height, and gap requirements prescribed in ASTM A1035 Table 1

F. Permissible Variation in Weight: Reinforcement bars shall conform to the requirements for bar deformations in ASTM A1035 Section 11.

G. Tensile Properties:

1. Reinforcement bars shall conform to the requirements for tensile properties prescribed in Table 2.

2. The yield strength shall be determined by the offset method (0.2% offset), described in Test Methods and Definitions A370.

Table 2. Tensile Properties Requirements

| | Grade 100 |
|---|---|
| Tensile Strength, min, psi | 150,000 |
| Yield Strength (0.2% Offset), min, psi | 100,000 |
| Bar Designation No. | |
| 3 through 11 | 7 |
| 14, 18 | 6 |

H. Bend Test Properties: Reinforcement bar bent test specimens shall withstand being bent around a pin without cracking on the outside radium of the bent portion. The requirements for degree of bending and sizes of pins are prescribed in Table 3. When material is furnished in coils, the test sample shall be straightened prior to placement in the bent tester.

Table 3. Bend Test Requirements

| Bar Designation No. | Pin Diameter[1] |
|---|---|
| 3, 4, 5 | 3½d[2] |
| 6, 7, 8 | 5d |
| 9, 10, 11 | 7d |
| 14, 18 (90°) | 9d |

Note[1] – Test bends 180° unless otherwise noted in ( ).
Note[2] – d = nominal diameter of specimen.

I. Bar identification:

1. Reinforcement bars shall meet the requirements of ASTM A615 Grade-100, ASTM A1035-13. Reinforcement bars, except plain round bars, which shall be tagged for grade, shall be identified by distinguishing set of marks legibly rolled onto the surface of one side of the bar to denote the specification in the following order:

   a. Bar Identifiers – Bars shall have an identification mark to distinguish between manufacturer products.

   b. Point of Origin – Letter or symbol established as the manufacturer's mill designation.

   c. Size Designation – Arabic number corresponding to bar designation number of Table 2.

   d. Type of Steel – Letters "CS" indicating that the bar was produced to ASTM A1035 Type CS specifications. Letters "CM" indicating that the bar was produced to ASTM A1035 Type CM. Letters "CL" indicating that the bar was produced to ASTM A1035 Type CL.

   e. Minimum Yield Designation – For Grade 100, either the number 100 or three continuous longitudinal lines through at least five spaces offset each direction from the center of the bar.

2.02 BAR SUPPORTS

A. Bar supports and spacers shall be per recommendations set forth by Chapter 3 of the CRSI Manual of Standard Practice.

B. Ferrous metal bar supports in concrete areas where soffits are exposed to view or are painted shall be Class 1.

2.03 TIE WIRE

A. Metallic ties shall be 16 gauge or heavier, black-annealed ferrous metal wire.

B. Non-metallic ties shall be appropriate for the intended application.

2.04 MECHANICAL BAR SPLICE COUPLERS

A. Couplers shall be made from similar material of reinforcement bar and be approved by reinforcement bar manufacturer to be used with reinforcement bar.

2.05 MATERIAL QUALITY CONTROL

A. Quality Control Testing:

1. Reinforcement bars shall be furnished with material certifications in accordance with Section 1.05 Submittals.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas to receive reinforcement bars. Notify DOT-A if areas are not acceptable. Do not begin placing reinforcement bars until unacceptable conditions have been corrected. See also paragraph 1.06 Deliveries, Storage, and Handling.

B. Seams, surface irregularities, or mill scale oxidation shall not be cause for rejection, provided the weight, dimensions, and cross-sectional areas of a hand-wired-brush test specimen are not less than the requirements of this specification.

3.02 PLACING DRAWINGS

A. Place reinforcing bars accurately in accordance with approved shop drawings, schedules, typical details, and notes.

## 3.03 FABRICATION

A. Reinforcing steel shall be accurately fabricated to the dimensions shown in the Contract Documents.

1. Bends shall conform to the dimensions and details in accordance with ACI 315 Chapter 3, ACI SP-66 and/or CRSI Manual of Standard Practice – Chapter 6, unless otherwise shown, with fabricated bends conforming to Table 4 per ACI 315 – Table 7.2

Table 4. Minimum Fabricated Bend Diameters

| Bar Size | Minimum Bend Diameter |
|---|---|
| 3, 4, 5, 6, 7, 8 | 6d |
| 9, 10, 11 | 8d |
| 14, 18 | 10d |

2. Bars shall be bent cold and shall not be bent or straightened in a manner that will injure the material. Heating of the bars to facilitate bending shall not be permitted.

3. Bar cutting shall be accomplished by shearing or with fluid-cooled- saw. Torch cutting shall not be permitted.

4. Bars shall be fabricated within the tolerances shown in the ACI 315 figures 8 and 9, and/or CRSI Manual of Standard Practice – Chapter 7 and/or CRSI – Chapter 6

B. Field Tack Welding as an aid to fabrication and/or installation is permitted but not allowed if weld is required for structural applications.

## 3.04 INSTALLATION

A. Placement: Place reinforcement bars in accordance with CRSI PRB – Chapter 10, and to the tolerances given in ACI 117 and/or CRSI PRB, unless otherwise specified or approved by DOT-A. Bars shall be free from loose mill scale oxidation, dirt, oil or other deleterious coatings that could reduce bond with the concrete. When bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits, or embedded items, the resulting arrangement of the bars shall meet the structural requirements of the project as approved by DOT-A.

B. Field Cutting and Bending: When required, field cutting and bending of reinforcement bars shall be per Section 3.03 Fabrication. Reinforcing bars partially embedded in concrete shall not be field bent. Fabricated bent bars shall not be straightened and re-bent in the field.

C. Securing:

1. Secure reinforcement bars in formwork to prevent displacement by concrete placement or workers Supports and Spacers.

2. Place and support reinforcement bars accurately using specified supports before concrete placement is started and placed in accordance with the provisions of ACI 315 – Chapter 5 or CRSI PRB.

D. Splicing: All splicing of reinforcement shall be as indicated in the Contract Documents, unless otherwise permitted. Concrete cover and bar spacing shall conform to ACI 318. Mechanical connections shall be made only at locations shown in the Contract Documents or as permitted by DOT-A.

1. When required, mechanical coupler connections shall develop 125 percent of the specified minimum tensile strength of the bars being spliced; and shall be installed per coupler manufacturer's recommendations.

E. Fastening: Fasten reinforcing bars with approved tie wire, or snap ties, in accordance with ACI 315.

F. Cleaning: Remove form oil or other deleterious materials from reinforcing bars before placing concrete

## 3.05 TESTING AND INSPECTION

A. Upon request a certified copy of a mill certification report showing physical and chemical analysis for each heat or reinforcing bars delivered shall be provided.

# PART 4 – BASIS FOR MEASUREMENT AND PAYMENT

## 4.01 BASIS OF MEASUREMENT AND PAYMENT

A. Work under this section will not be measured nor paid for separately, but shall be considered incidental to and included in the prices bid for the various items of work in this project.

END OF SECTION