SECTION 03 20 00

CONCRETE REINFORCING AND EMBEDDED METAL ASSEMBLIES

PART 1 – GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 LESSONS LEARNED AND DESIGN CONSIDERATIONS

A. Curtainwall embedded materials is the ultimate responsibility of the curtainwall manufacturer. Shop drawings must be reviewed by all partied – design team and contractor/subcontractor.

1.3 REFERENCE STANDARDS

A. The Drawings and General Provisions of the contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to work specified in this Section.

1.4 DESCRIPTION OF WORK

A. Work Included: Furnish labor, materials, services, equipment, and appliances required in conjunction with design, fabrication, delivery and placement of reinforcement and embedded metal assemblies for cast-in-place concrete, including bars, welded wire fabric, ties and supports.

B. Extent of reinforcement and embedded metal assemblies for cast-in-place concrete is shown on Drawings and in schedules.

C. Related Work Specified in Other Sections:

1. Forms testing laboratory services: Division 01.
2. Reinforcement in conjunction with drilled piers: Section 31 63 29.
3. Reinforcement in conjunction with sitework concrete.
4. Post-tensioning tendons: Section 03 38 00.
5. Reinforcement in conjunction with masonry.

1.5 QUALITY ASSURANCE

A. Latest adopted edition of all standards referenced in this Section shall apply, unless noted otherwise. In case of conflict between Contract Documents and a referenced standard, Contract Documents shall govern. In case of conflict between Contract Documents and Building Code, the more stringent shall govern.

B. Testing Laboratory Services: Refer to Division 01.

C. Referenced Standards: Comply with provisions of the following Codes, Specifications and Standards, except as otherwise indicated:

1. American Welding Society, AWS D1.4, "Structural Welding Code - Reinforcing Steel," current edition.
2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice," current edition.
3. American Concrete Institute, ACI 318, "Building Code Requirements for Structural Concrete," current edition.
4. AISC, "Specification for Structural Steel Buildings," including the "Commentary" and supplements thereto as issued; current edition.
5. American Welding Society, AWS D1.1, “Structural Welding Code – Steel," current edition.
6. "Details and Detailing of Concrete Reinforcement," ACI 315; current edition.

1.6 SUBMITTALS

A. Product Data: Submit manufacturers' product data, Specifications, and installation instructions for proprietary materials and reinforcement accessories.

B. Mill Certificates: Submit, for Architect's record, steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel.

C. Shop Drawings:

1. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI SP-66, "ACI Detailing Manual." Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements, and assemblies, as required for fabrication and placement of concrete reinforcement.
2. Shop fabricator shall reproduce bar bending diagrams, beam, slab and joist notes, and cast-in-place concrete notes that concern proper placing of reinforcement and submit same with each set of shop drawings for field use. Use same bar marks indicated on bar bending diagrams as shown in beam, joist, and slab schedules.
3. Submit shop drawings for fabrication and placement of embedded metal assemblies and concrete accessories not completely described in product data information. Use standard AWS welding symbols.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement and embedded metal assemblies to project site bundled, tagged, and marked. Use metal tags indicating bar sizes, lengths, and other information corresponding to markings shown on placement diagrams.
B. Store concrete reinforcement materials and embedded metal assemblies at site in such a manner as to prevent damage and accumulation of dirt or excessive rust.

1.8 JOB CONDITIONS

A. Coordinate delivery and installation of reinforcement and embedded metal assemblies with work of other trades.

PART 2 – PRODUCTS

2.1 GENERAL

A. All paints, coatings, adhesives, sealants, stains, caulk, firestopping, etc. applied inside the weatherproofing systems and on site only in this specification must comply with the VOC limits in Division 01. In submittal, include product data sheet or MSDS clearly showing VOC content of product in grams/Liter.

2.2 MATERIALS

A. Reinforcing Bars: ASTM A 615, "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement." Use grades as indicated on Drawings.
B. Reinforcing Bars to Be Welded: ASTM A 706,”Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."
C. Bar and Rod Mats: ASTM A 184, "Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement."
D. Steel Wire: ASTM A 1064, "Specification for Steel Wire, Plain, for Concrete Reinforcement."
E. Deformed Wire: ASTM A 1064, "Specification for Steel Wire, Deformed, for Concrete Reinforcement."
F. Welded Smooth Wire Fabric: ASTM A 1064, "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete." Furnish in flat sheets, not rolls, except that No. 10 gauge (W1.4) and smaller wire may be rolled.
G. Column Spirals: Plain, cold-drawn wire, ASTM A 1064, or hot-rolled rods for spirals, ASTM A 615.
H. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place.
    1. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.
    2. For slabs-on-grade, use precast concrete blocks or wire supports with sand plates or horizontal runners which will not sink into subgrade or puncture vapor retarder.
    3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with plastic protected legs (CRSI, Class 1) or stainless steel protected legs (CRSI, Class 2).
    4. For abrasive-blasted or bush-hammered concrete provide plastic protected bar supports (CRSI, Class 1).
    5. Over waterproof membranes use precast concrete block bar supports to prevent penetration of membrane.

2.3 METAL ANCHORAGE AND EMBEDDED METAL ASSEMBLIES

A. Steel Shapes and Plates: Conform to ASTM A 36, "Standard Specification for Carbon Structural Steel."
B. Headed Stud Anchors: Headed studs welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division.

C. Bolts: Conform to ASTM A 307, "Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength." Furnish with carbon steel washers.
D. Anchor Bolts (Anchor Rods): For anchoring the structural frame, refer to frame section. For anchoring other materials and equipment, refer to trade requiring them for material properties. Sizes as indicated.
E. Welding Electrodes: AWS 5.5, Series E70.
F. Welded Deformed Bar Anchors: Welded by full-fusion process, as furnished by TRW Nelson Stud Welding Division.
G. Reinforcing Bars to be Welded: ASTM A 706.
H. All metal assemblies exposed to earth, weather or moisture shall be hot-dip galvanized. All other metal assemblies shall be either hot-dip galvanized or exposed surfaces shall be field painted with specified epoxy coating after completing any welds

2.4 INSERTS
A. Provide metal inserts, for anchorage of materials or equipment to concrete construction, not supplied by other trades and as required for work.
B. In vertical concrete faces, to transfer direct shear loads only, provide adjustable wedge inserts of malleable cast iron, complete with bolts, nuts, and washers; 3/4" bolt size, unless otherwise indicated.
   1. In horizontal concrete faces and whenever tension forces are applied, provide threaded inserts of malleable cast iron, furnished complete with full-depth bolts; 3/4" bolt size, unless otherwise indicated.

2.5 MECHANICAL SPLICES
A. Provide mechanical splices designed to develop, both in tension and compression, 125% of minimum ASTM specified yield strength of the smaller bar being coupled, as evidenced by published ICC-ES test reports. The Following Bar Splicing Systems Are Acceptable:
   1. Erico "Cadweld C-Series" or "Lenton" Splice Sleeves
   2. Dayton/Richmond "Bar-Grip", "Grip-Twist" or "Bar-Lock" Systems
   3. Bar Splice Products, Inc., "Zap Screwlok"

2.6 DOWEL BAR ANCHORS
A. Provide dowel bar anchors and threaded dowels designed to develop, both in tension and compression, 125% of the minimum ASTM specified yield strength of the dowel bars, as evidenced by published ICC-ES test reports. Unless otherwise indicated, anchors shall be furnished with ACI standard 90 degree hooks. Dowels shall be furnished by anchor supplier. The following dowel splicing systems are acceptable:
   1. Richmond Screw Anchor "Dowel Bar Splicer."
   2. Erico "Lenton Form Saver."
   3. Dayton Barsplice "Grip-Twist."

2.7 SHEAR HEADS
A. Shear head assemblies at columns in flat plate slabs, where indicated, shall be "Decon Studrails" as manufactured by Decon, Inc., Brampton, Ontario, Canada or Lenton. "Steel Fortress" strips by Erico Corporation, sizes as indicated.
B. Special inspection is required.

2.8 COATINGS
A. Epoxy coating for metal assemblies shall be "Hi-Build Epoxoline II," by Tnemec Co., Kansas City, MO., applied in accordance with manufacturer's recommendations. Coating shall qualify as low VOC material under LEED 2009 for Healthcare requirements.
B. Field repair of epoxy coating shall be done using paint specified above.
C. Hot-dip galvanizing shall conform to ASTM A 123, "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products."
D. Field repair of galvanizing shall be done with "ZRC Zero VOC Cold Galvanizing Compound," by ZRC Chemical Products Co., Marshfield, MA. Coating shall qualify as low VOC material under LEED 2009 for Healthcare requirements

2.9 FABRICATION OF REINFORCEMENT
A. General: Fabricate reinforcing bars to required shapes and dimensions, with fabrication tolerances

complying with CRSI "Manual of Standard Practice." Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material.

B. Unacceptable Materials: Reinforcement with any of the following defects will not be permitted in work:
   1. Bar lengths, depths, and bends exceeding specified tolerances.
   2. Bends or kinks not indicated on drawings or final shop drawings.
   3. Bars with reduced cross-section due to excessive rusting or other cause.

2.10 FABRICATION OF METAL ACCESSORIES AND EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of metal and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Welded construction shall conform to AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," and AWS D1.1. Welding shall be done by AWS certified welders.

B. Welding of deformed bar anchors and headed stud anchors shall be done by full-fusion process equal to that of TRW Nelson Stud Welding Division or KSM Welding Services Division, Omark, Ind. A minimum of 2 headed studs shall be tested at start of each production period for proper quality control. Studs shall be capable of being bent 45 degrees without weld failure.

C. Welding of reinforcement shall be done in strict accordance with AWS requirements, using recommended preheat temperature and electrode for type of reinforcement being welded. Bars larger than No. 9 shall not be welded. Welding shall be performed subject to the observance and testing of testing laboratory.

D. Coatings, where required, shall be applied after fabrication and prior to casting concrete.

PART 3 – EXECUTION

3.1 INSPECTION

A. Installer shall inspect excavations, fills, vapor retarders, forms, and any other items of related construction upon which proper installation of reinforcement is dependent and report any unsatisfactory conditions to Contractor.

3.2 INSTALLATION

A. Comply with specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports.

B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Before casting, accurately position, support, and secure all reinforcement against displacement caused by workmen, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Do not "stab in" dowels after casting concrete.
   1. Place reinforcement to obtain minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so twisted ends are directed away from exposed concrete surfaces.
   2. Hold bars in beams and slabs in exact locations during placing of concrete within following tolerances:
      a) Top and bottom bars in slabs, girders, beams and joists:
         1) Members 8" deep or less: + 3/8".
         2) Members more than 8" deep: + ½".
      b) Lengthwise of members: + 2".
      c) Concrete cover to formed or finished surfaces: + 3/8" for members 8" deep or less; + ½" for members over 8" deep; except tolerance for cover shall not exceed 1/3 of the specified cover.
      d) Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel.
         1) Do not place bar support against exposed faces of precast beams, columns, walls, or copings.
         2) Tie wire shall be bent away from exposed surfaces so it is never closer to surface than specified cover.
         3) Minimum concrete cover for reinforcing steel shall be as shown on the Drawings.

D. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire. Do not make end laps midway between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps.
E. Provide adequate numbers of supports having sufficient strength to carry reinforcement. Do not place reinforcement bars more than 2" beyond last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
F. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Comply with requirements of ACI 318, for minimum lap of spliced bars. Bars No. 14 and larger shall not be lap spliced.
G. Use mechanical splices for splicing of bars larger than No. 11, or where No. 11 bars are spliced to larger size bars, and elsewhere as shown. Comply with manufacturer's directions for preparation of bars and installation procedures.
H. Welding of Reinforcing Steel: Comply with requirements of AWS D1.4, for field welding. Prior to field welding, determine weldability of reinforcing bars by laboratory chemical analysis of steel. Only steel conforming to ASTM A 706 may be welded.
I. Field Welding of Embedded Metal Assemblies: All paint and galvanizing shall be removed, in areas to received field welds, prior to making welds. All areas where paint or galvanizing has been removed or damaged shall be field repaired with two coats of specified field coating.

3.3 CLEANUP

A. Clean up all debris caused by the work of this Section, keeping the area clean and neat at all times.

END OF SECTION