



SPECIFICATION 032000: CONCRETE REINFORCEMENT

PART 1.0 GENERAL

1.1 DESCRIPTION

Furnish all labor, materials, equipment, and incidentals to install all steel bars, steel wire, fiber and wire fabric required for the reinforcement of concrete, as shown on the Construction Drawings and as specified herein.

1.2 REFERENCE DOCUMENTS

- American Concrete Institute (ACI)
- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- Concrete Reinforcing Steel Institute (CRSI)
- Codes and regulations of jurisdictional authorities.

1.3 SHOP DRAWINGS AND SUBMITTALS

- 1.3.1 Detail reinforcing in accordance with the requirements of ACI MNL-66 Detailing Manual
- 1.3.2 Shop drawing submittals must include bar lists and bending diagrams showing the individual weight of each bar; the total weight of each bar size; and the total weight of bars on the list. Bars to have special coatings and/or to be of special steel or special yield strength must be clearly identified.
- 1.3.3 Submit certified copies of mill tests on each steel proposed for use showing the physical properties of the steel and chemical analyses.
- 1.3.4 Have testing performed in accordance with ASTM A615 as modified by ACI 318 Building Code Requirements for Structural Concrete.
- 1.3.5 Submit certificates stating that materials meet the specified requirements.
- 1.3.6 Submit a copy of any design exception prior to installation. Design exceptions are issued by the Utility Design Section Manager. Any deviation from the specifications requires a design exception.
- 1.3.7 Welder certifications must be in accordance with AWS D1.4 when welding of reinforcement is required.

1.4 RELATED WORK

- Cast-In-Place Concrete, Specification 033000
- Forms and Formwork, Specification 031000
- Hillsborough County Standard Pump Station Drawings



PART 2.0 PRODUCT

2.1 GENERAL

- 2.1.1 All reinforcement steel must be of the grade and type as specified herein or indicated on the Construction Drawing. Bars must be bent cold to the shapes and dimensions as indicated in the Construction Drawings, or as required by the current "Manual of Standard Practice" of the CRSI. Steel must not be bent or straightened in a manner that will injure the material. Bars with kinks or improper bends must not be used.
- 2.1.2 Reinforcing steel must be substantially free from mill scale, rust, grease, or other foreign matter.
- 2.1.3 The diameter of bend measured on the inside of the bar for standard hooks, other than stirrups and tie hooks, must not be less than the values in the following table.

Bar Size	Minimum Diameter
#3 through #8	6 bar diameters
#9, #10, and #11	8 bar diameters
#14 and #18	10 bar diameters

2.2 QUALITY ASSURANCE

- 2.2.1 In no case must any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing, and position of the reinforcement, has been observed by the EOR, or Hillsborough County Project Manager or Inspector, and they accept the installation and authorize the Contractor to proceed with concrete placement.
- 2.2.2 All testing agencies must meet the requirements of "Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction", ASTM E329.
- 2.2.3 Qualifications:
 - 2.2.3.1 Welding Operators, processes and procedures to be qualified in accordance with AWS D1.4.
 - 2.2.3.2 Welding operators to have been qualified during the previous 12 months prior to commencement of welding.
- 2.2.4 Cut and bend reinforcing steel to conform to the dimensions shown and within the following tolerances:

Reinforced Steel	Tolerance
Sheared length	+1 inch
Stirrups, ties, and spirals	+1/2 inch
All other bends	+0, -1/2 inch

2.3 MATERIAL

- 2.3.1 Reinforcing Bars: Deformed and Plain Billet-Steel Bars:
 - ASTM A615, Grade 60, deformed of USA Manufacture.



- Low Alloy Steel Deformed Bars: ASTM A706.
- 2.3.2 Welded Wire Fabric: Conform to ASTM A185 or ASTM A497, with the gauge and mesh as indicated on the Plan.
- 2.3.3 Plain Tie Wire: Conform to Cold Drawn Steel Wire for Concrete Reinforcement, ASTM A82, 16 gauge minimum.
- 2.3.4 Coated Tie Wire: Epoxy-coated reinforcing bars must be tied with plastic-coated, epoxy-coated, or nylon-coated tie, 16 gauge minimum.
- 2.3.5 Metal Bar Supports
- 2.3.5.1 Type 1, Standard: All metal bar supports must be fabricated from cold-drawn steel wire in accordance with current CRSI Standards.
- 2.3.5.2 Type 2, Stainless Steel Protected: Must be Type 1, with stainless steel wire conforming to ASTM A493 attached to the tips of the support so the non-stainless wire will lie no closer than 1/4 inch from the form surface.
- 2.3.5.3 Type 3, Plastic Protected: Must be of Type 1, with plastic coating of polyethylene conforming to ASTM D1248 on the legs and tips.
- 2.3.6 Concrete Bar Supports: Precast Concrete Brick Supports Conform to ASTM C55, Type 1 Grade N.

2.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- 2.4.1 Ship reinforcing steel in bundles.
- 2.4.2 Tag each bundle at the mill with a waterproof tag, in accordance with "Manual of Standard Practice" of the CRSI, showing the name of the mill, heat number, grade, size and identifying number. Mark designation must be the same as those shown on the submitted placement drawings.
- 2.4.3 Concrete reinforcement must be stored above ground on platforms or other supports, in an orderly manner to facilitate inspection and checking, and be protected from physical damage, moisture, and kept free from dirt, oil, or other injurious contaminants.

PART 3.0 EXECUTION

3.1 CUTTING AND BENDING – REINFORCEMENT

Do not bend bars in the field except to correct minor errors or damage in shipment or handling, or to make shipment of certain bars practicable. Bending must be in accordance with Part 2.1. Welding of reinforcement will not be permitted.

3.2 BAR SUPPORTS AND SPACERS

- 3.2.1 Support bars by means of bolsters or chairs with no less than the minimum required by ACI MNL-66 Detailing Manual.
- 3.2.2 Reinforcing steel in slabs resting on earth must be supported by bolsters or chairs with a base plate to prevent any sinking. Welded wire fabric supports must be spaced at 3 feet or less. Spacing must be reduced if the reinforcement deflects by more than 1/2 inch.



- 3.2.3 Hold reinforcing steel in position in walls, columns, piers, and abutments by means of bar supports, or spacers wired to reinforcing steel.
- 3.2.4 Do not use stones, clay bricks, wood blocks, or pieces of broken concrete to support reinforcing steel.
- 3.2.5 Do not place bars or fabricated mats on layers of fresh concrete as the work progresses.
- 3.2.6 Place reinforcement a minimum of two inches from any metal pipe or fitting.

3.3 STEEL REINFORCEMENT

- 3.3.1 Arrange and place reinforcing steel as shown on the Construction Drawings.
- 3.3.2 Secure reinforcement positively against displacement during placing of concrete.
- 3.3.3 Wire or clip bars together as recommended in Concrete Reinforcing Steel Institute, "Recommended Practice for Placing Reinforcing Bars."
- 3.3.4 Place steel which is free from dirt, rust and mill scale, oil, grease, and other foreign matter.
- 3.3.5 Placing Reinforcing Steel

Reinforced Steel	Tolerance
Variation of protective coating two-inch cover	+ 1/4inch
Variation of protective coating three-inch cover	+1/2 inch
Variation from indicating space	+1 inch

3.4 SPLICING

- 3.4.1 Furnish reinforcing bars in full lengths as shown on the Construction and Shop Drawings.
- 3.4.2 Do not splice bars unless approved by the Project Manager or the Hillsborough County Inspector in writing.
- 3.4.3 No splices less than 48 bar diameters or less than one-foot whichever is greater.
- 3.4.4 Welded wire fabric: Splice lap length measured between the outermost cross wires of each fabric sheet must not be less than 1 spacing of cross wires plus 2 inches, nor less than 6 inches.

3.5 CONCRETE PROTECTION FOR REINFORCEMENT

- 3.5.1 Reinforcement must be protected by the thickness of concrete indicated in the Construction Drawings.
- 3.5.2 Where not otherwise shown, the thickness of concrete over the reinforcement must be as follows.
 - 3.5.2.1 Where concrete is deposited against the ground without the use of forms other than flat slabs - not less than three inches.
 - 3.5.2.2 Where concrete is exposed to weather, ground, sewage, or sewage gases, but placed in forms - not less than two inches for bars larger than No. 5 and 1-1/2 inches for No. 5 bars



- and smaller, except in beams, girders and columns.
- 3.5.2.3 In slabs and walls not exposed to ground, weather, sewage or sewage gases – not less than 3/4 inch.
 - 3.5.2.4 In beams, girders, and columns not exposed to ground, weather, sewage, or sewage gases - not less than 1-1/2 inches all sizes.
 - 3.5.2.5 In slabs on grade - not less than 1-1/2 inches.

3.6 FIELD QUALITY CONTROL

- 3.6.1 Construct elements to meet the allowable tolerances of the dimensions, elevations, and positions shown and specified in Specification 033000 Cast-In-Place Concrete.
- 3.6.2 Deposit concrete only when the forms and placement of the reinforcement steel has been checked and approved by the Project Manager or the Hillsborough County Inspector. The Contractor must provide notice to the Project Manager or the Hillsborough County Inspector at least 24 hours in advance of any contemplated concrete pour.