

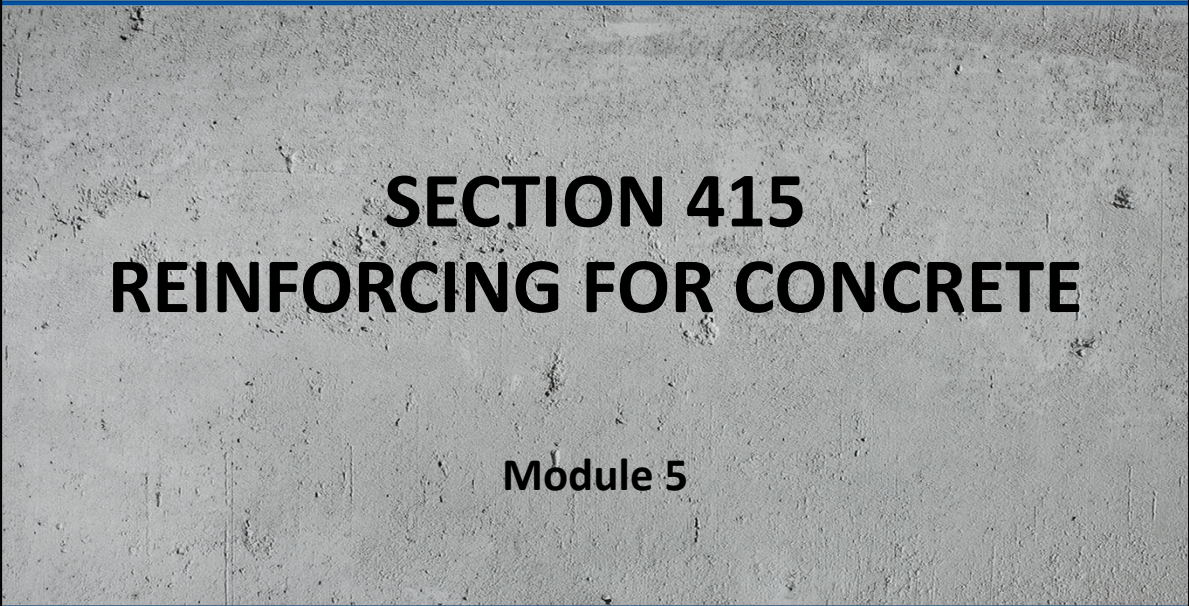


Florida Department of  
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**SECTION 415**  
**REINFORCING FOR CONCRETE**

Module 5

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October 2021

Concrete Field Inspector Specifications

Release 11, Module 5-1



## 415-1 Description

- Furnish and place steel and fiber reinforced polymer (FRP) reinforcing of the designated:
  - Quality
  - Type
  - Size
  - Quantity
- All steel must meet the requirements of Buy America in Section 6

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Concrete Field Inspector Specifications

Release 11, Module 5-2

The inspector should be aware that the contract requires all steel used in the permanent work to be made in America (Buy America - Specification 6). Foreign steel may be used up to 0.1% of the total contract amount or \$2500, whichever is greater. This includes reinforcing steel, steel supports and tie wire. The inspector must verify and document that all steel components meet this requirement.

### **415-1 Description.**

Furnish and place steel and fiber reinforced polymer (FRP) reinforcing of the quality, type, size, and quantity designated. Obtain all FRP reinforcing bars from a producer on the Department's Production Facility Listing.



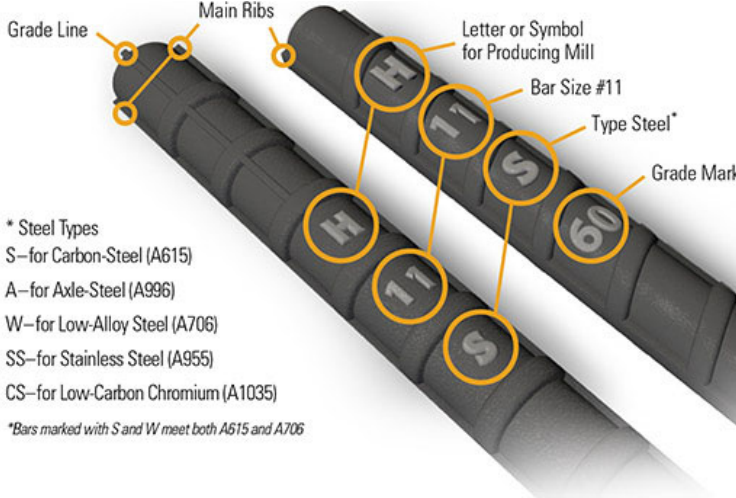
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## ASTM BAR MARKING SEQUENCE – MULTIPLE GRADES



**Grade 60 shown**

Grade 40 – No grade markings

Grade 60 – 60

Grade 75 – 75

Grade 80 – 80

Grade 100 – 100

Grade 120 – 120

**\* Steel Types**

S—for Carbon-Steel (A615)

A—for Axle-Steel (A996)

W—for Low-Alloy Steel (A706)

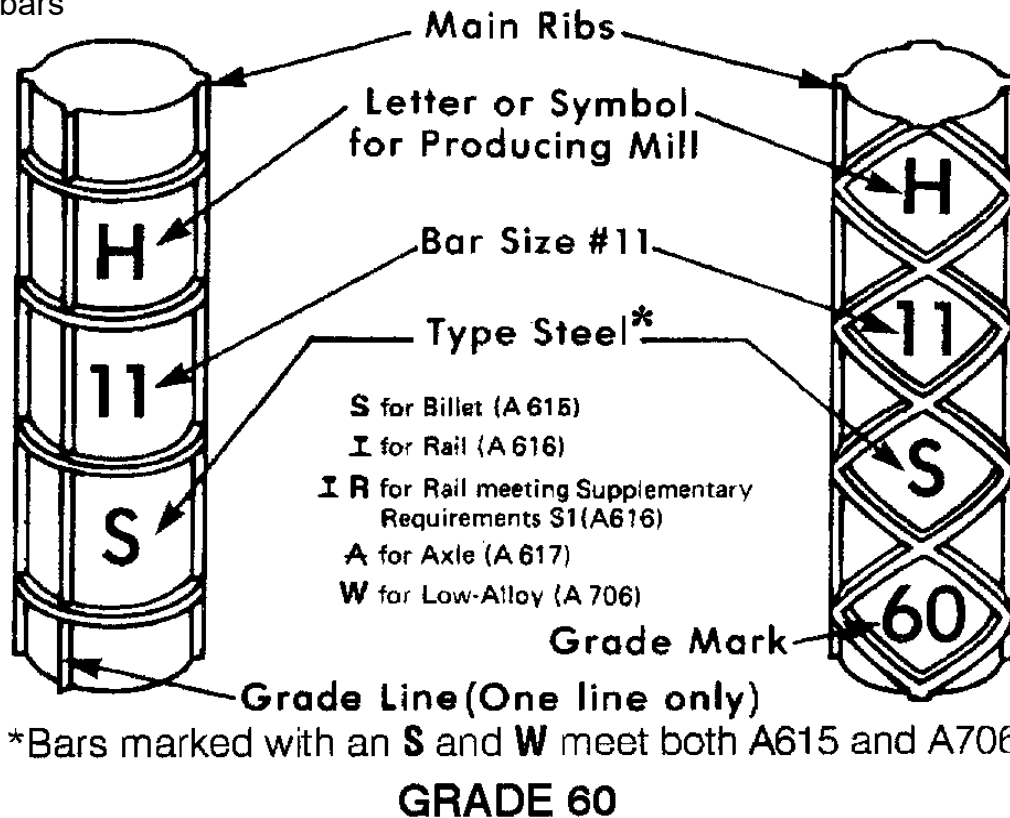
SS—for Stainless Steel (A955)

CS—for Low-Carbon Chromium (A1035)

*\*Bars marked with S and W meet both A615 and A706*

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The inspector should be aware and look for markings designating foreign countries on the bars





## Typical FRP bars



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Typical fiber reinforced polymer (FRP) bars do not have size or manufacturer on them.





## 415-1 Description

- This specification covers the placement and supply of steel and fiber reinforced polymer (FRP) reinforcement
- Reinforcing steel materials must meet the requirements of materials Specifications 931
- FRP bar reinforcement must meet the requirements of materials Specifications 932-3

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Concrete Field Inspector Specifications

Release 11, Module 5-5

### 415-1 Description.

Furnish and place steel and fiber reinforced polymer (FRP) reinforcing of the quality, type, size, and quantity designated. Obtain all FRP reinforcing bars from a producer on the Department's Production Facility Listing.

#### 1. 415-2 Materials.

Meet the following requirements:

|                                 |         |
|---------------------------------|---------|
| Steel Bar Reinforcement         | 931-1.1 |
| Steel Welded Wire Reinforcement | 931-1.2 |
| FRP Bar Reinforcement           | 932-3   |



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## 415-3 Protection of Material

- Steel and FRP reinforcement must be stored above the ground surface on supports and be protected from mechanical injury and environmental exposure that causes surface deterioration
- FRP reinforcement must be protected from direct exposure to UV light
- Steel and FRP reinforcement that is placed in the structure must be free of loose rust, scale, dirt, paint, oil, etc.



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Release 11, Module 5-6

### 415-3 Protection of Material.

**415-3.1 Steel Reinforcing:** Store steel reinforcement above the surface of the ground, upon platforms, skids, or other supports, and protect it from mechanical injury and surface deterioration. Ensure that the steel reinforcement is free from loose rust, scale, dirt, paint, oil, and other foreign material prior to incorporation into the work.

**415-3.2 Fiber Reinforcing Polymer (FRP) Reinforcing:** Store FRP reinforcement above the surface of the ground, in boxes or upon platforms, skids, or other supports, and protect it from mechanical injury and direct exposure to UV light. Ensure that the FRP reinforcement is free from dirt, paint, oil, and other foreign material prior to incorporation into the work.



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## 415-4 Bending, Splicing, and Cutting

- Steel and FRP reinforcement are fabricated in the shop.

**DO NOT:**

- Hot Bend\*
- Straighten
- Weld
- Thermal Cut
- Shear Cut (FRP reinforcing bars)

\*Minor cold bending of steel reinforcing may be performed in the field with approval of the Engineer



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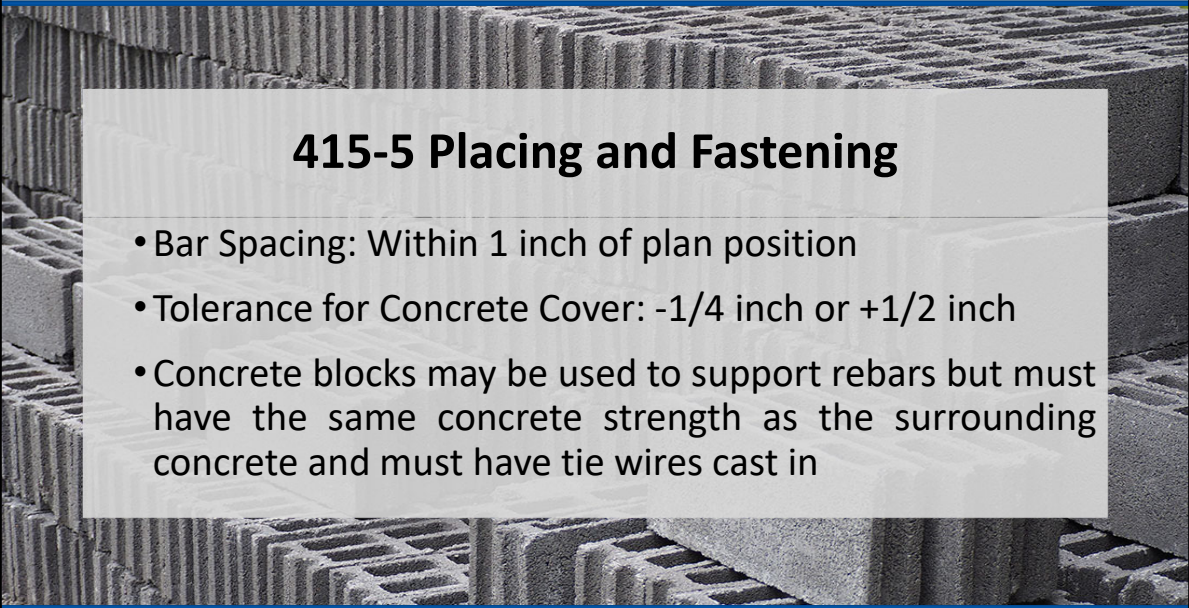
### 415-4 Bending, Splicing, and Cutting.

**415-4.1 Steel Reinforcing:** Fabricate reinforcing bars as prescribed in the CRSI Manual of Standard Practice. Shop bend the reinforcement cold to the shapes indicated in the Plans. Do not bend the reinforcement to shape in the field. Minor bending adjustments may be performed in the field with the approval of the Engineer.

Do not hot bend or straighten, weld, or thermal cut reinforcing steel.

**415-4.2 Fiber Reinforcing Polymer (FRP) Reinforcing:** No field fabrication of FRP reinforcing bars is permitted except tying and field cutting per ACI 440.5. Do not bend or straighten, couple, thermal cut, or shear cut FRP reinforcing bars.





## 415-5 Placing and Fastening

- Bar Spacing: Within 1 inch of plan position
- Tolerance for Concrete Cover: -1/4 inch or +1/2 inch
- Concrete blocks may be used to support rebars but must have the same concrete strength as the surrounding concrete and must have tie wires cast in

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### 415-5 Placing and Fastening.

**415-5.1 General:** Unless otherwise specified in the Contract Documents, the tolerance for bar spacing is plus or minus 1 inch from the plan position and the tolerance for concrete cover is minus 1/4 inch or plus 1/2 inch from the plan dimensions. Construct all tie patterns referenced by this Section in accordance with the CRSI Manual of Standard Practice.

**415-5.2 Concrete Blocks for Spacing:** Use precast concrete blocks to space and support the reinforcing bars. Use concrete blocks with a strength equal to or greater than the concrete in which they are to be placed and have wires cast into them for fastening to the reinforcing bars. Moist-cure the blocks for at least three days.

Submit a certification verifying the class of concrete used to fabricate the concrete blocks, and identifying the batch and load of concrete from which the concrete blocks were cast.

PHOTO SHOWS REBARS AND TIE WIRE.







- Tie wires must be easily worked with but strong enough to securely hold rebars in position
- Tie stainless reinforcing steel using plastic coated pliable steel wire or stainless steel wire
- Tie FRP reinforcing using self-locking plastic straps or plastic coated pliable steel wire



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### 415-5.3 Tying:

**415-5.3.1 Steel Reinforcing:** Tie steel reinforcing using pliable steel wire that readily bends and twists without breaking and that provides a tie of sufficient strength to hold the steel reinforcing in its proper position. Tie stainless reinforcing steel using plastic coated pliable steel wire; or stainless steel wire meeting the requirements of ASTM A276, UNS S31600. Non-metallic fasteners for steel reinforcing may be used in precast concrete products upon approval by the appropriate District Materials Office (DMO).

**415-5.3.2 Fiber Reinforcing Polymer (FRP) Reinforcing:** Tie FRP reinforcing using self-locking plastic straps; or plastic coated pliable steel wire that readily bends and twists without breaking and that provides a tie of sufficient strength to hold the FRP reinforcing in its proper position.

PHOTO SHOWS REBARS AND TIE WIRE.





## 415-5.4 Splices

- Where two lengths of rebar are spliced together, the splicing method must be approved by the Engineer
- Splice lengths should be shown in the plans
- Splice steel reinforcing with mechanical couplers or splice devices that are listed on the Department's Approved Product List (APL)
- Splice FRP reinforcing by lap splices only
- Pay careful attention that all mortar is cleaned from reinforcement before concrete placement

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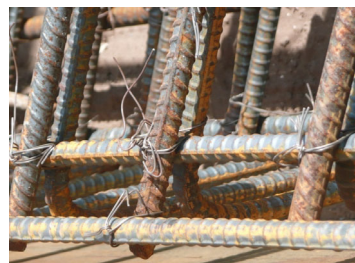
**415-5.4 Splices:** Where splices are authorized, rigidly clamp the bars or tie them in a manner meeting the Engineer's approval. Use the lap splice length as shown on the Plans.

**415-5.4.1 Steel Reinforcing:** Do not use welded splices for steel reinforcing except as specifically authorized by the Engineer and meeting the requirements of AWS D 1.4 Structural Welding Code - Reinforcing Steel.

Use mechanical couplers or splice devices for steel reinforcing that are listed on the Department's Approved Product List (APL).

**415-5.4.2 Fiber Reinforcing Polymer (FRP) Reinforcing:** Do not use mechanical couplers for FRP reinforcing. Use lap splices only.

PHOTO SHOWS REBARS AND TIE WIRE.





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415-5 Reinforcing Bar requirements

| REINFORCING BAR TABLE                                                     |                               |                                                   |                                                        |                                                                                                                               |
|---------------------------------------------------------------------------|-------------------------------|---------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Application                                                               | Plan<br>Position<br>Tolerance | Specified<br>Clearance<br>Tolerance               | Supports                                               | Tying                                                                                                                         |
| <div>FOOTINGS</div> <div>415-5.5</div>                                    |                               | <div>Bottom: 1/2 in.</div> <div>Side: 1 in.</div> | <div>Concrete<br/>blocks</div> <div>4" x 4" max.</div> | <div>Double-strand single</div> <div>tie on all periphery</div> <div>and alternate on</div> <div>interior intersections</div> |
| <div>DOWEL BARS</div> <div>(COLUMNS &amp; WALLS)</div> <div>415-5.6</div> | 1/2 in.                       | Side: 1/4 in.                                     | <div>Rigid</div> <div>Template</div>                   |                                                                                                                               |

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Helpful table in the next five slides are provided to condense specification 415-5 reinforcing bar requirements.

### 415-5.5 Footings:

**415-5.5.1 Supports:** Support footing mat reinforcing with concrete blocks having dimensions not greater than 4 by 4 inches by plan clearance. Fasten concrete blocks to the steel using the cast-in wires.

**415-5.5.2 Tolerances:** Place footing mat reinforcing within 1/2 inch vertically from the plan bottom clearance and within 1 inch from the plan side clearance.

**415-5.5.3 Tying:** Tie footing mat reinforcing with a double-strand single tie at all intersections on the periphery and at alternate intersections within the mat.

### 415-5.6 Dowel Bars for Columns and Walls:

**415-5.6.1 Supports and Positioning:** Position dowel bars projecting into columns and walls so as to allow splicing of the vertical bars to the dowels and to tie the dowel bars in their plan position. Support the dowel bars by a rigid template such that concrete placement does not disturb their position. Support the reinforcing prior to placement of the footing concrete and do not insert dowel bars into the plastic concrete.

**415-5.6.2 Tolerances:** Place the dowels within 1/2 inch of their plan position and with a side clearance tolerance not exceeding 1/4 inch.



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## 415-5 Reinforcing Bar requirements

| REINFORCING BAR TABLE      |                               |                               |                                     |                                    |                                                                                             |
|----------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------|
| Application                |                               | Plan<br>Position<br>Tolerance | Specified<br>Clearance<br>Tolerance | Supports                           | Tying                                                                                       |
| <b>COLUMNS<br/>415-5.7</b> | Verticals                     | 1/2 in.                       | Side: 1/4 in.                       | Concrete<br>blocks<br>2" x 2" max. | Cross tie or "Figure 8"<br>tie at each<br>intersection                                      |
|                            | Hoops                         | 1 in.                         | Side: 1/2 in.                       |                                    |                                                                                             |
| <b>WALLS<br/>415-5.8</b>   | Retaining<br>Walls            | 1 in.                         |                                     | Concrete<br>blocks<br>2" x 2" max. | Cross tie or "figure 8"<br>tie on all periphery<br>and every third<br>interior intersection |
|                            | Noise &<br>Perimeter<br>Walls | 1 in.                         |                                     | Concrete<br>blocks<br>2" x 2" max. | Single tie on all<br>periphery and every<br>third interior<br>intersection                  |

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#### 415-5.7 Verticals and Hoops for Columns:

**415-5.7.1 Spacing-off from Side Forms:** Space column reinforcing bars from the side forms by concrete blocks of dimensions not exceeding 2 by 2 inches by clearance dimension. Securely fasten each block to the reinforcing.

#### 415-5.7.2 Tolerances and Clearance:

- (a) Column Verticals: Place column verticals within 1/2 inch of their plan position. Ensure that the side form clearance is within 1/4 inch of the specified clearance.
- (b) Column Hoops: Place every hoop within 1 inch of the plan position for the specific hoop, with no accumulation of such tolerance caused by the spacing between any two hoops. Ensure that side form clearance for any hoop is within 1/2 inch of its specified clearance.

**415-5.7.3 Tying:** Tie the column hoops to the column verticals at each intersection, by a cross tie or "figure 8" tie.

#### 415-5.8 Wall Steel (Not Including Dowel Bars):

**415-5.8.1 Supports:** Space wall reinforcing bars from the side forms by concrete blocks of dimensions not greater than 2 inches by 2 inches by clearance dimensions. Fix the spacing between wall mats by means satisfactory to the Engineer.

**415-5.8.2 Tolerance:** Except when necessary to clear a fixture, place reinforcing bars within 1 inch of plan position. Ensure that the number of bars in any affected unit is as specified, and place the remainder of the bars (not thus affected) within 1 inch of plan location.

**415-5.8.3 Tying:** Tie retaining wall reinforcing bars with a cross tie or figure 8 tie at each intersection on the periphery and at every third intersection within the mat. If workmen use the reinforcing as a ladder, provide additional ties as directed by the Engineer.

Tie noise and perimeter wall reinforcing bars with a single tie at each intersection on the periphery and at every third intersection within the mat.





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Construction Training Qualification Program

415-5 Reinforcing Bar requirements

| REINFORCING BAR TABLE   |                         |                                        |                                                                          |                                               |
|-------------------------|-------------------------|----------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------|
| Application             | Plan Position Tolerance | Specified Clearance Tolerance          | Supports                                                                 | Tying                                         |
| BEAMS & CAPS<br>415-5.9 | 1" for stirrups         | Top & Bottom: 1/4 in.<br>Side: 1/2 in. | Heavy beam bolsters on the bottom and concrete blocks 2" x2" on the side | Double-strand single tie at each intersection |

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Concrete Field Inspector Specifications

Release 11, Module 5-13

### 415-5.9 Beams and Caps:

**415-5.9.1 Supports:** Maintain bottom clearances by approved heavy beam bolsters. Support additional layers of main longitudinal steel from the lower layers by heavy upper-beam bolsters, placed directly over low supports.

Begin the spacing of beam bolsters at not more than 2 feet from the end of the beams or caps and space the additionally required bolsters at not more than 4 feet.

Use concrete blocks, having dimensions not greater than 2 by 2 inches by specified clearance, fastened to the steel by the cast-in wires, for spacing the upper main longitudinal steel below the top bars. Maintain the side clearance by concrete blocks, having dimensions not greater than 2 by 2 inches by required clearance, fastened to the reinforcing steel by the cast-in wires.

**415-5.9.2 Tolerances:** Place the main longitudinal steel so as to provide a bottom and top clearance within 1/4 inch of the plan vertical dimensions for all layers. Space the steel from side forms within 1/2 inch of the specified spacing.

Place stirrups within 1 inch of the plan position for each individual stirrup and do not allow the tolerance to accumulate.

**415-5.9.3 Tying:** Tie all intersecting bars with a double-strand single tie.



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## 415-5 Reinforcing Bar requirements

| REINFORCING BAR TABLE              |                |                               |                                              |                                                        |                                                                                          |
|------------------------------------|----------------|-------------------------------|----------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------|
| Application                        |                | Plan<br>Position<br>Tolerance | Specified<br>Clearance<br>Tolerance          | Supports                                               | Tying                                                                                    |
| <b>DECK<br/>SLABS<br/>415-5.10</b> | General        | 1/4 in. for<br>curb bars      | Top & Bottom: 1/4 in.<br>End & Edge: 1/4 in. |                                                        | Double-strand single<br>tie on all periphery<br>and every third<br>interior intersection |
|                                    | Bottom<br>Mats |                               |                                              | Slab bolsters<br>or concrete<br>blocks<br>2" x 2" max. |                                                                                          |
|                                    | Top Mats       |                               |                                              | High chairs                                            |                                                                                          |
|                                    | Truss Bars     |                               |                                              | High Chairs                                            |                                                                                          |

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### 415-5.10 Deck Slabs:

#### 415-5.10.1 Supports:

1. Bottom Mats: Support the bottom mat of reinforcing bars using slab bolsters or concrete blocks. Use one row of slab bolsters placed 6 inches from the edge of the slab and two rows down each deck section between beams. Do not allow the spacing between rows to exceed 4 feet, measured center to center.

Use concrete blocks 2 inches by 2 inches by clearance dimensions. Space concrete blocks 4 feet on center as a maximum.

2. Top Mats: Support the top mats of reinforcing bars by either continuous or individual high chairs. Provide high chairs along both sides of each beam and approximately 6 inches back from the edge of the beam. Place the outside row of high chairs 6 inches from the edge of the slab. If using individual high chairs, do not allow the longitudinal spacing to be greater than 4 feet.

As an alternate to the above, on prestressed beam construction, the Contractor may support the top mat of reinforcing bars on the shear connectors bent to the proper elevation with one line of high chairs centered between the beams.

3. Truss Bars: Support truss bars at each end of the top bends by continuous high chairs or by individual high chairs spaced longitudinally at not more than 4 feet.

**415-5.10.2 Tolerances:** Ensure that top and bottom clearances are within 1/4 inch from those shown on the plans.

Ensure that end and bottom clearances are within 1/4 inch from those shown on the plans.

Ensure that end and edge clearances are within 1/4 inch of the clearance specified.

Place curb bars within 1/4 inch in any direction of the plan position.

**415-5.10.3 Tying:** Tie all reinforcing bars in each layer with a double-strand single tie at every intersection on the periphery and at every third intersection in the interior area. Alternatively, at the Contractor's option, tie all reinforcing bars in each layer with a single-strand single tie at every intersection on the periphery and at every other intersection within the interior area. If encountering difficulty in maintaining the reinforcing bars in position during the placing of concrete, tie additional intersections as necessary to hold the reinforcing bars secure.



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## 415-5 Reinforcing Bar requirements

| REINFORCING BAR TABLE                |              |                               |                                              |                                                        |                                                                                 |
|--------------------------------------|--------------|-------------------------------|----------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------|
| Application                          |              | Plan<br>Position<br>Tolerance | Specified<br>Clearance<br>Tolerance          | Supports                                               | Tying                                                                           |
| <b>BOX<br/>CULVERTS<br/>415-5.11</b> | General      |                               |                                              |                                                        | Double-strand single tie on all periphery and every third interior intersection |
|                                      | Bottom Slabs |                               | Top & Bottom: 1/4 in.<br>End & Edge: 1/4 in. | Concrete blocks<br>4" x 4" max.                        |                                                                                 |
|                                      | Top Slabs    |                               | Top & Bottom: 1/4 in.<br>End & Edge: 1/4 in. | Slab bolsters<br>or concrete<br>blocks<br>2" x 2" max. |                                                                                 |
|                                      | Walls        | 1 in.                         |                                              | Concrete blocks<br>2" x 2" max.                        |                                                                                 |
|                                      | Truss Bars   |                               |                                              | High Chairs                                            |                                                                                 |

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### 415-5.11 Box Culverts:

#### 415-5.11.1 Supports:

1. Bottom Slabs: In the bottom slabs of box culverts, provide supports for single-mat reinforcing bars and for bottom-mat reinforcing bars, including placement and spacing, as specified for footing mat steel in 415-5.5. In addition, where the Plans call for more than one mat of reinforcing bars in the bottom slab of the culvert, support the top mat away from the bottom mat, either by upper beam bolsters or by other means satisfactory to the Engineer.
2. Walls: Place, space and support the reinforcing bars in walls of box culverts in accordance with the requirements of 415-5.8.
3. Top Slabs: In the top slabs of box culverts, support the bottom mats of reinforcing bars by a row of slab bolsters 12 inches from the inside face of the walls and with additional rows of bolsters at spacings not exceeding 4 feet, center to center. As an exception, unless the Engineer deems the use of the slab bolsters as necessary to obtain proper support, the Contractor may use concrete blocks as the supporting device. Use blocks of dimensions not greater than 2 inches by 2 inches by the required clearance, with spacings not exceeding 4 feet in any direction. Fasten blocks to the reinforcing steel by the cast-in wires.
4. Truss Bars: Support truss bars as specified in 415-5.10.1

**415-5.11.2 Tolerances:** Use tolerances in placing the reinforcing bars in box culvert slabs as specified for deck slabs in 415-5.10. Use tolerances for placing bars in walls as specified in 415-5.8.

**415-5.11.3 Tying:** Tie reinforcing bars in box culverts as specified for deck slabs in 415-5.10.



## 415-5.13 Bar Supports

- Manufactured in accordance with CRSI Manual of Standard Practice
- Adequate strength to withstand 300 pound concentrated load without permanent deformation or breakage and deflection less than 5% of support height
- No more than 5% of bar supports can have unsatisfactory performance without reducing average spacing or changing to another
- Tie supports to reinforcing steel to prevent movement
- Bar supports used on stay-in-place forms must be designed for use with those forms
- Metal bar supports in contact with forms or floor surfaces must not be used when the environmental category is extremely aggressive

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Release 11, Module 5-16

### 415-5.13 Bar Supports:

**415-5.13.1 General:** Provide reinforcing bar supports manufactured in accordance with all requirements of the CRSI Manual of Standard Practice. Use bar supports of adequate strength to withstand a 300 pound concentrated load without permanent deformation or breakage, with deflection less than 5% of the support height.

Ensure that no more than 5% of the reinforcing steel bar supports exhibit unsatisfactory performance, breakage, or permanent deformation during rebar tying and/or concrete placement operations. If a bar support does not achieve this level of performance, reduce the average spacing between bar supports by 15%, or remove that product from use on the job.

Ensure that bar supports do not move during concrete placing operations. To prevent movement, tie supports to the reinforcing bars.

When using bar supports on corrugated metal stay-in-place forms, use supports specifically designed for the form being used.

For structural elements located in extremely aggressive environments, do not use metal bar supports in contact with forms or floor surfaces to support reinforcing bars.





## 415-5.13.2 Metal Bar Supports

- Supports with plastic legs or protected steel legs shall be used
- Exposed metal of the bar support should be no closer than ½ inch from boundary surface of concrete
- The Contractor must submit a certification that the bar supports meet the Specification
- Do not use metal bar supports to support FRP reinforcing bars

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**415-5.13.2 Metal Bar Supports:** For metal bar supports in contact with removable forms, provide supports constructed with molded plastic legs or plastic protected metal legs or bolster rails. Do not allow any portion of the bar support other than the molded plastic leg or plastic protected portion of the metal leg or bolster rail to be closer than 1/2 inch from the removable form surface for concrete to be cast.

Submit certification verifying that all metal bar supports meet the following requirements:

1. That they are manufactured from cold drawn steel wire in accordance with the wire sizes and geometrical dimensions shown in the CRSI Manual of Standard Practice, Chapter 3.
2. That the plastic used for protection of the steel legs or bolster rails has a thickness of 3/32 inch or greater at points of contact with the form work.

Provide plastic protection by a dipping operation, by adding premolded plastic tips to the legs of the support or by molding plastic to the top wire of the support. Ensure that the plastic material used for protection of steel legs does not chip, crack, deform, or peel during use.

Do not use metal bar supports to support FRP reinforcing bars.



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### 415-5.13.3 Plastic Bar Supports and Spacers

- Plastic wheel spacers must provide sufficient strength to support reinforcing steel in the required position without deformation and relaxation
- Must be protected from sunlight and allow free flow of concrete
- Wheel spacers for drilled shafts must have a smooth perimeter surface



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Release 11, Module 5-18

**415-5.13.3 Plastic Bar Supports and Spacers:** Use non-stackable plastic bar supports and spacers. Bar supports shall be able to meet the concentrated load requirements of 415-5.13 within a working temperature range of 20 to 150°F. Spacers shall be able to provide sufficient strength to support reinforcing steel in the required position without deformation and relaxation under job conditions. For drilled shafts, use wheel spacers with a smooth perimeter surface.

Submit protection from sunlight until placed in the form and mold in a configuration which does not restrict concrete flow and consolidation.

All plastic bar supports and spacers shall have a maximum water absorption of 0.5% at 7 days as per ASTM D570. Plastic bar supports and spacers made of recycled plastic products must meet the additional requirements of Section 972.

Submit to the Engineer independent lab test data and certification verifying that the plastic spacers meet the requirements specified herein.

Use plastic bar supports listed on the Department's APL. Provide each individual bar support with an identification number unique to the particular model permanently marked on the surface as included in the APL. Manufacturers seeking evaluation of products for inclusion on the APL must submit an application in accordance with Section 6 and include certified test reports from an independent laboratory showing that the plastic bar supports meet all the requirements specified herein.

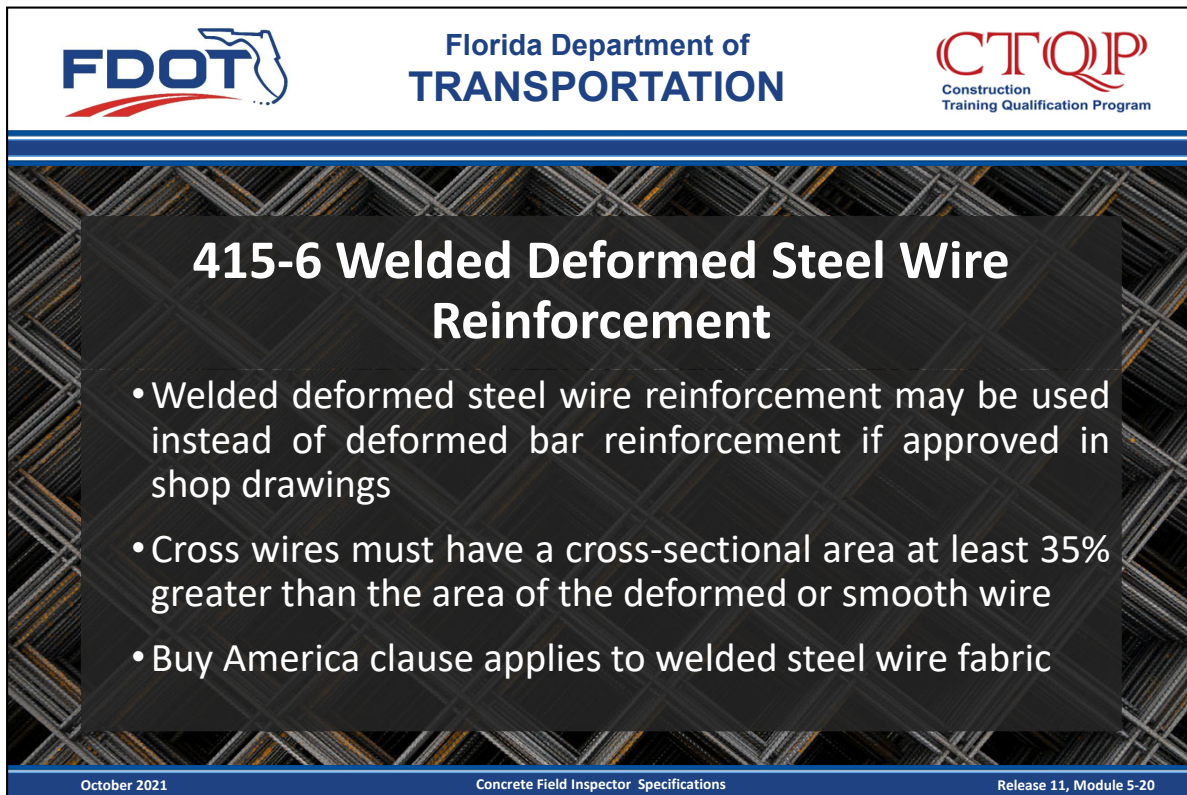


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### **415-5.13.3 Plastic Bar Supports and Spacers**

- Plastic bar supports must be on the APL and recycled plastic products must meet Section 972
- Plastic bar supports must have a permanently marked APL identification number
- Contractor must submit lab test data and certification that plastic spacers meet the specification



The slide features a background image of a steel wire mesh. At the top, there are three logos: the FDOT logo on the left, the Florida Department of Transportation text in the center, and the CTQP (Construction Training Qualification Program) logo on the right. The main title '415-6 Welded Deformed Steel Wire Reinforcement' is centered in a large, bold, white font. Below the title, there is a list of three bullet points in white text. At the bottom of the slide, there is a blue footer bar containing the date 'October 2021', the text 'Concrete Field Inspector Specifications', and 'Release 11, Module 5-20'.

**FDOT** Florida Department of **TRANSPORTATION** **CTQP** Construction Training Qualification Program

## 415-6 Welded Deformed Steel Wire Reinforcement

- Welded deformed steel wire reinforcement may be used instead of deformed bar reinforcement if approved in shop drawings
- Cross wires must have a cross-sectional area at least 35% greater than the area of the deformed or smooth wire
- Buy America clause applies to welded steel wire fabric

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### **415-6 Welded Deformed Steel Wire Reinforcement.**

**415-6.1 General:** Provide welded deformed steel wire reinforcement as shown in the Plans or as a substitute for deformed bar reinforcement when approved on the shop drawings.

Propose substitutions of welded deformed steel wire reinforcement in a manner that provides a cross-sectional area per foot of welded deformed steel wire equal to that provided in the Plans for deformed bar reinforcement. Orient the deformed wires of welded deformed steel wire reinforcement in the same position as bar reinforcement detailed in the Plans. Cross wires of welded deformed steel wire reinforcement may be deformed or smooth and must have a cross-sectional area at least 35% greater than the area of the deformed wire.

**415-6.2 Design:** When welded deformed steel wire reinforcement is substituted for deformed bar reinforcement, ensure that the development length, splices, shear reinforcement, and distribution meet the requirements of the AASHTO LRFD Bridge Design Specifications.





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| SYMBOL | BAR SUPPORT ILLUSTRATION | BAR SUPPORT ILLUSTRATION<br>PLASTIC CAPPED OR DIPPED | TYPE OF<br>SUPPORT    | TYPICAL SIZES                                                                |
|--------|--------------------------|------------------------------------------------------|-----------------------|------------------------------------------------------------------------------|
| SB     |                          | <br>CAPPED                                           | Slab Bolster          | ¾, 1, 1½, and 2<br>in. heights in 5 ft<br>and 10 ft lengths                  |
| SBU*   |                          |                                                      | Slab Bolster<br>Upper | Same as SB                                                                   |
| BB     |                          | <br>CAPPED                                           | Beam Bolster          | 1, 1½, 2 to 5 in.<br>heights in increments<br>of ¼ in. in lengths<br>of 5 ft |
| BBU*   |                          |                                                      | Beam Bolster<br>Upper | Same as BB                                                                   |

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|    |                                                                                   |                                                                                                  |                      |                                                    |
|----|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------|
| BC |  | DIPPED          | Individual Bar Chair | ¾, 1, 1½, and 1¾ in. heights                       |
| JC |  | DIPPED  DIPPED | Joist Chair          | 4, 5, and 6 in. widths and ¾, 1 and 1½ in. heights |

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|       |  |  |                                      |                                              |
|-------|--|--|--------------------------------------|----------------------------------------------|
| HC    |  |  | Individual High Chair                | 2 to 15 in. heights in increments of 1/4 in. |
| HCM*  |  |  | High Chair for Metal Deck            | 2 to 15 in. heights in increments of 1/4 in. |
| CHC   |  |  | Continuous High Chair                | Same as HC in 5 ft and 10 ft lengths         |
| CHCU* |  |  | Continuous High Chair Upper          | Same as CHC                                  |
| CHCM* |  |  | Continuous High Chair for Metal Deck | Up to 5 in. heights in increments of 1/4 in. |

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| SYMBOL | BAR SUPPORT ILLUSTRATION | TYPE OF SUPPORT                                          | TYPICAL SIZES                  | DESCRIPTION                                                                                                                                                                 |
|--------|--------------------------|----------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BS     |                          | Bottom Spacer                                            | Heights,<br>¾" to 6"           | Generally for horizontal work. Not recommended for ground or exposed aggregate finish.                                                                                      |
| BS-CL  |                          | Bottom Spacer                                            | Heights,<br>¾" to 2"           | Generally for horizontal work, provides bar clamping action. Not recommended for ground or exposed aggregate finish.                                                        |
| HC     |                          | High Chair                                               | Heights,<br>¾" to 5"           | For use on slabs or panels.                                                                                                                                                 |
| HC-V   |                          | High Chair,<br>Variable                                  | Heights<br>2½" to 6¼"          | For horizontal and vertical work. Provides for different heights.                                                                                                           |
| WS     |                          | Wheel Spacer                                             | Concrete<br>Cover<br>¾" to 3"  | Generally for vertical work. Bar clamping action and minimum contact with forms. Applicable for column reinforcing steel.                                                   |
| DSWS   |                          | Side Spacer for<br>drilled shaft<br>applications         | Concrete<br>Cover<br>2½" to 6" | Generally used to align rebar in a drilled shaft. Two piece wheel that closes and locks on to the stirrup or spiral assuring proper clearance from the shaft wall surface.  |
| VLWS   |                          | Locking Wheel<br>Spacer for all<br>vertical applications | Concrete<br>Cover<br>¾" to 6"  | Generally used in both drilled shaft and vertical applications where excessive loading occurs. Surface spines provide minimal contact while maintaining required tolerance. |

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| SYMBOL | BAR SUPPORT ILLUSTRATION | TYPE OF SUPPORT                            | TYPICAL SIZES                                                        | DESCRIPTION                                                                                                                                                                            |
|--------|--------------------------|--------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PB     |                          | Plain Block                                | A— $\frac{3}{4}$ " to 6"<br>B—2" to 6"<br>C—2" to 48"                | Used when placing rebar off grade and formwork. When "C" dimension exceeds 16" a piece of rebar should be cast inside block.                                                           |
| WB     |                          | Wired Block                                | A— $\frac{3}{4}$ " to 4"<br>B— $\frac{3}{4}$ " to 3"<br>C—2" to 3"   | Generally 16 ga. tie wire is cast in block, commonly used against vertical forms or in positions necessary to secure the block by tying to the rebar.                                  |
| TWB    |                          | Tapered Wired Block                        | A— $\frac{3}{4}$ " to 3"<br>B— $\frac{3}{4}$ " to 2½"<br>C—1½" to 3" | Generally 16 ga. tie wire is cast in block, commonly used where minimal form contact is desired.                                                                                       |
| CB     |                          | Combination Block                          | A—2" to 4"<br>B—2" to 4"<br>C—2" to 4"<br>D—fits #3 to #5 bar        | Commonly used on horizontal work.                                                                                                                                                      |
| DB     |                          | Dowel Block                                | A—3"<br>B—3" to 5"<br>C—3" to 5"<br>D—hole to accommodate a #4 bar   | Used to support top mat from dowel placed in hole. Block can also be used to support bottom mat.                                                                                       |
| DSSS   |                          | Side Spacer - Wired                        | Concrete cover, 2" to 6"                                             | Used to align the rebar cage in a drilled shaft. Commonly 16 ga. tie wires are cast in spacer. Items for 5" to 6" cover have 9 ga. tie wires at top and bottom of spacer.              |
| DSBB   |                          | Bottom Bolster - Wired                     | Concrete cover, 3" to 6"                                             | Used to keep the rebar cage off of the floor of the drilled shaft. Item for 6" cover is actually 8" in height with a 2" shaft cast in the top of the bolster to hold the vertical bar. |
| DSWS   |                          | Side spacer for drilled shaft applications | Concrete cover, 3" to 6"                                             | Generally used to align rebar in a drilled shaft. Commonly manufactured with two sets of 12 ga. annealed wires, assuring proper clearance from the shaft wall surface.                 |

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**Any  
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