



## Florida Department of Transportation

**CHARLIE CRIST**  
GOVERNOR

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Tallahassee, FL 32399-0450

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INTERIM SECRETARY

February 15, 2007

Mrs. Leslie McCarthy, PhD, P.E.  
Program Operations Engineer  
Federal Highway Administration  
545 John Knox Road, Suite 200  
Tallahassee, Florida 32303

Re: Office of Design, Specifications  
Section 700  
Proposed Specification: 7000000 Highway Signing

Dear Mrs. McCarthy:

We are submitting, for your approval, two copies of a proposed Special Provision for Highway Signing.

This change was proposed by Chester Henson of the State Roadway Design Office to comply with the 2001 AASHTO Code for Highway Signs, Luminaires and Traffic Signals, as well as the new wind speed charts for Florida.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to SP965DB or [duane.brautigam@dot.state.fl.us](mailto:duane.brautigam@dot.state.fl.us).

If you have any questions relating to this specification change, please call Duane F. Brautigam, State Specifications Engineer at 414-4110.

Sincerely,

Signature on File

Duane F. Brautigam, P.E.  
State Specifications Engineer

DFB/ft

Attachment

cc: General Counsel  
Florida Transportation Builders' Assoc.  
State Construction Engineer

**HIGHWAY SIGNING.****(REV ~~12-27-06~~2-13-07)**

SECTION 700 (Pages 724 – 731) is deleted and the following substituted:

**700-1 Description.**

Furnish and erect aluminum or steel roadway signs, with supporting posts or columns, at the locations shown in the plans, in accordance with the details shown in the plans. Reflectorize all signs, and, when so specified in the plans, provide overhead signs with lighting.

The Department designates ~~Ground~~**Roadside** Traffic Signs as all signs erected on the shoulders, slopes, or medians, but not extending over the traveled roadway.

The Department designates signs erected partially or completely over the traveled roadway or mounted on bridges as Overhead Traffic Signs, and may further classify some of these signs as Overhead Cantilever Traffic Signs.

**700-2 Sign Assembly Design Requirements.**

**700-2.1 General:** Sign assemblies as specified in the plans fall into ~~two~~**three** general categories: ~~frangible support ground sign assemblies, breakaway support~~ ground sign assemblies, and overhead sign assemblies.

Use any combination of sign materials described below. The Contractor may utilize different combinations for each type of sign assembly. However, ensure that the material combination used for each type is the same within the Contract.

**700-2.2 Sign Panels:** Use either aluminum or galvanized steel for any sign panel shown in the plans, regardless of its mounting type.

If using galvanized steel for the sign panels, provide the same dimensions, including the thickness, as those shown in the ~~Contract Documents~~**plans** for aluminum.

Fabricate standard sign panel messages in accordance with details included in the Standard Highway Signs Manual published by the U.S. Department of Transportation. The Engineer will not require the submittal of shop drawings for these signs or for non-standard sign panels and messages fabricated in accordance with details shown in the plans. Submit seven copies of shop drawings indicating detailed layout of the sign legend, spacing, and border for all other signs to the Engineer prior to fabrication.

If the size of a sign is not specified in the plans, provide the size sign for conventional roadways as shown in the MUTCD.

**700-2.3 ~~Roadside Sign Supports~~**Breakaway Support Mechanisms:****

**700-2.3.1 Frangible Supports:** Provide posts for all frangible sign assemblies consisting of aluminum tubes up to 3 1/2 inches outside diameter with 3/16 inch wall thickness, or galvanized steel U-Channel up to 3 lb/ft as listed on the Qualified Products List (*QPL*), ~~and in accordance with Design Standards, Index Nos. 11860 through 11865 for frangible sign supports.~~

**700-2.3.2 Breakaway Supports****Slip Bases:** For posts ~~for breakaway sign~~**with slip base** assemblies, ~~the Contractor may~~ use either aluminum or galvanized steel in accordance with the requirements ~~for breakaway signs~~ in the Design Standards. *Alternative slip plane, plastic hinge, fracture elements, or combination sign support systems meeting the requirements*

*of NCHRP 350 and Structures Manual wind load requirements may be used, subject to approval by the Department and listing on QPL. The QPL shall classify these systems as directional or omni-directional systems*

~~The Engineer will accept breakaway sign assemblies utilizing load concentrating couplers as an alternate to the slip base. Supply erection drawings with the assemblies. Supply evidence that the proposed couplers meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, prior to use on a project.~~

~~The Department lists alternate proprietary and non-proprietary breakaway assemblies on the Qualified Products List. For an acceptable non-proprietary breakaway lap splice for U-Channel steel posts, refer to the U-Channel Lap Splice Detail. The Engineer may accept other alternate breakaway designs if satisfactorily tested in accordance with the current AASHTO requirements.~~

~~700-2.43.3 Steel Posts~~**Temporary Construction Sign Supports:** ~~When using steel posts as the structural member in a full length support or breakaway base installation for a small roadway sign, provide~~*Provide* steel flanged U-channel consisting of rerolled rail steel or an equivalent billet steel, meeting the mechanical requirements of ASTM A 499, Grade 60, and meeting the chemical requirements of ASTM A 1. For each U-channel, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the U-post. Ensure that the weight per foot of a particular manufacturer's U-channel size does not vary more than  $\pm 3 \frac{1}{2}\%$  of its specified weight per foot. Taper the bottom end of the U-channel post for easier installation. Machine straighten the U-channel to a tolerance of 0.4% of the length. ~~Ensure that post configuration generally complies with the dimensions for Type F or Type M flanged U-channel, as shown on Design Standards, Index No. 11865.~~*U-channel sign supports are listed on QPL.*

~~Only provide~~*Provide* steel components that have been galvanized after fabrication in accordance with ASTM A 123 and have a smooth uniform finish free from defects affecting strength, durability, and appearance.

Attach the sign to the structural member using hardware meeting the manufacturer's recommendations and as specified in the Design Standards. ~~Only use~~*Use* attachment hardware (nuts, bolts, clamps, brackets, braces, etc.) of a non-corrosive metal, aluminum, or galvanized steel, meeting the *vendor* requirements specified on the ~~Design Standards, Index Nos. 11860 through 11865~~*QPL Drawings.*

#### **700-2.54 Overhead Sign Structures:**

**700-2.54.1 Department's Design:** When the overhead sign structure is detailed in the plans, submit shop drawings to the Department for approval as specified in Section 5. Prior to the submittal of the shop drawings, determine the actual length of support columns for all sign structures on the basis of existing field conditions and include these lengths on the shop drawings.

**700-2.54.2 Contractor's Design:** When the overhead sign structure is not detailed in the plans, submit to the Department *a foundation design and* a sign structure design utilizing steel structural members. Meet the requirements of this Section and the ~~AASHTO Specification for the Design and Construction of Structural Supports for Highway Signs, Luminaires and Traffic Signals~~ *FDOT Structures Manual.*

~~Use a design wind speed as shown on the Contract drawings. When a sign structure is attached to a bridge or wall structure, ensure that the loads from the sign structure applied to the bridge or wall structure are equal to or less than those shown on the Contract drawings. When the sign support is not on a structure, the Contractor is responsible for the design of the foundation.~~

Have designs and shop drawings prepared by a Specialty Engineer or the Contractor's Engineer of Record, and submit them to the Department for review and approval in accordance with Section 5.

Determine the actual length of support columns for all sign structures on the basis of existing field conditions, and include these lengths in the shop drawings and calculations.

**700-2.54.3 Installation:** Install high strength ASTM A325 bolt, nut and washer assemblies for Span Sign Structure alternate splice connections in accordance with Section 460. Install nuts on anchor rod in accordance with 649-5. Install all other bolt (ASTM A307 or substitute ASTM A325), nut and washer assemblies in accordance with the following: Use bolt, nut and washer assemblies that are free of rust and corrosion. Tighten nuts, as necessary, to bring the faying surfaces of the assembly into full contact from the interior of the connection outwards in a symmetrical pattern. After bringing the faying surfaces of the assembly into full contact, tighten nuts to achieve the minimum torque as specified in Table A. Within 24 hours after final tightening, the Engineer will witness a check of the minimum torque using a calibrated torque wrench for no less than 3 bolts and a minimum of 10% of the fastener assemblies for each connection.

Table A	
Bolt Diameter (in.)	Minimum Torque (ft.-lbs.)
3/8	15
1/2	37
5/8	74
3/4	120
7/8	190
1	275
1 1/8	375
1 1/4	525

**700-2.65 Sign Background:** Meet the requirements of Section 994. Use Type III, IV, V or VII sheeting for background sheeting, white legends, borders and shields on all signs, excluding STOP, DO NOT ENTER, and WRONG WAY. Use Type VII sheeting for STOP, DO NOT ENTER and WRONG WAY signs. Use Type III, IV, V or VII yellow-green fluorescent sheeting for S1-1 school advance signs and supplemental panels used with S1-1, S3-1 and S4-5 school signs. Do not mix signs having fluorescent yellow-green sheeting with signs having yellow reflective sheeting.

Use fluorescent orange Type VI or VII for all orange work zone signs.

Mesh signs shall meet the color, daytime luminance and nonreflective property requirements of Section 994, Type VI.

**700-3 Materials.**

**700-3.1 General:** Meet the materials requirements shown below and any additional requirements which the plans might show.

**700-3.2 Concrete:** For footings, use Class II concrete meeting the requirements of Section 346.

**700-3.3 Reinforcing Steel:** For reinforcing steel in footings, meet the requirements of Section 415.

**700-3.4 Aluminum Materials:**

**700-3.4.1 General:** For aluminum materials, meet the general provisions of 965-1.

**700-3.4.2 Sheets and Plates:** For aluminum sheets and plates for sign panels, meet the requirements of ASTM B 209,, Aluminum Association Alloy 6061-T6, 5154-H38 or 5052-H38 and those shown in the plans.

**700-3.4.3 Extruded Tubing:** For extruded aluminum tubing, meet the requirements shown in the plans.

**700-3.4.4 Castings:** Provide aluminum castings of the alloys shown in the plans. For aluminum alternates the Engineer will allow a cast base, provided the Contractor submits test reports giving evidence that the base to be used for each pole size is as strong as the pole with which it is to be used. Perform physical tests and submit certified reports for one base to be used with each pole size. Use Alloy A 356-T6 for the castings. Use aluminum bolts for connecting parts of the cast base.

**700-3.4.5 Channels:** For aluminum channels, meet the requirements of ASTM B 308 for the alloys shown in the plans.

**700-3.4.6 Bolts, Nuts, and Lockwashers:** For aluminum bolts, nuts, and lockwashers, meet the requirements shown in the plans. Ensure that finished bolts and washers are given an anodic coating of at least 0.0002 inch in thickness and are chromate-sealed.

**700-3.5 Steel:**

**700-3.5.1 General:** Only use structural steel, including bolts, nuts, and washers, that have been hot dip galvanized or metalized after fabrication. Perform hot dip galvanizing in accordance with ASTM A 123 or ASTM A 153 and metalizing in accordance with Section 562. For galvanized steel members, except plate for sign panels, meet the general requirements of Section 962 and the specific requirements of 962-97. For steel plate for use as sign panels, meet the requirements of ASTM A 283 for either Grade C or Grade D.

**700-3.5.2 Specific Uses of Aluminum and Galvanized Steel:** Use aluminum bolts, nuts, and hardware to connect parts of the cast base.

Use galvanized steel anchor bolts for anchoring base plates to concrete bases and for the nuts and washers.

For all other metal parts, the Engineer will allow galvanized steel as an alternate to aluminum.

**700-3.6 Bearing Pads:** For bearing pads, meet the requirements of 932-2.

**700-3.7 Reflective Sheeting:** Meet the reflective sheeting requirements of Section 994.

**700-3.8 Process Colors:** Use transparent and black opaque process colors meeting the requirements of 994-4 on reflective and nonreflective sheeting.

**700-3.9 Demountable Sign Face Materials:** For demountable sign face materials, meet the requirements of Section 995.

#### **700-4 Preparation of Sign Blanks.**

##### **700-4.1 De-greasing and Etching for Aluminum Sign Blanks:**

**700-4.1.1 General:** Prior to the application of reflective sheeting, use any of the methods shown below to de-grease and etch the aluminum sign blanks.

**700-4.1.2 Hand Method:** Under this method, de-grease and etch the blanks in one operation, using steel wool (medium grade) with any of the following combinations of materials:

- (1) An abrasive cleanser of a commercial grade kitchen scouring powder.
- (2) Acid and a suitable detergent solution.
- (3) An alkaline solution.

Thoroughly rinse the blanks with clean water following all hand de-greasing operations.

**700-4.1.3 Power-Washer Method:** Under this method, de-grease the blanks with an inhibited alkaline cleanser, by spraying for 90 seconds with the solution between 135 and 249°F, the exact temperature to be as recommended by the manufacturer of the cleanser. After the spraying, rinse the blanks with clean water. Then etch the blanks by immersing them in a 6 to 8% solution of phosphoric acid at a temperature of 100 to 180°F for 60 seconds. After immersion, rinse the blanks in clean water.

**700-4.1.4 Immersion Method:** Under this method, de-grease the blanks by immersing them in a solution of inhibited alkaline cleanser at a temperature between 160 and 180°F for three to five minutes, and then rinsing with clean water. Then etch blanks by immersing them in a 6 to 8% solution of phosphoric acid at a temperature of 100°F for three minutes. After immersion, rinse the blanks in clean water.

**700-4.1.5 Vapor De-greasing Method:** Under this method, de-grease the blanks by totally immersing them in a saturated vapor of trichloroethylene. Remove trademark printing with lacquer thinner or a controlled alkaline cleaning system.

**700-4.1.6 Alkaline De-greasing Method:** De-grease the blanks by totally immersing them in a tank containing an alkaline solution, controlled and titrated in accordance with the solution manufacturer's directions. Adapt immersion time to the amount of soil present and the thickness of the metal. After immersion, thoroughly rinse the blanks with running water.

**700-4.1.7 Etching Method when De-greasing is Separate Operation:** If using either of the de-greasing methods described under 700-4.1.5 and 700-4.1.6, accomplish etching by one of the following alternate methods:

(1) Acid Etch: Etch well in a 6 to 8% phosphoric acid solution at 100°F, or in a proprietary acid etching solution. Rinse thoroughly with running cold water, which may be followed by a hot water rinse.

(2) Alkaline Etch: Etch aluminum surfaces in an alkaline etching material that is controlled by titration. Meet the time, temperature, and concentration requirements specified by the solution manufacturer. After completing etching is complete, rinse the panel thoroughly.

**700-4.2 Preparation of Surface for Steel Sign Blanks:** Clean and prepare galvanized steel sign blanks for painting or for application of reflective sheeting in accordance with the recommendations of the manufacturer of the material to be applied to the sign blanks.

**700-4.3 Drying:** Dry the panels using a forced-air drier. Use a device or clean canvas gloves, to handle the material between all cleaning and etching operations and the application of reflective sheeting. Do not allow the metal to come in contact with greases, oils or other contaminants prior to the application of reflective sheeting.

**700-4.4 Fabrication of Sign Blanks:** Fabricate all metal parts to ensure a proper fit of all sign components. Complete all fabrication, with the exception of cutting and punching of holes, prior to metal de-greasing and applying the reflective sheeting. Cut metal panels to size and shape and keep free of buckles, warp, dents, burrs, and defects resulting from fabrication. Provide all sign panels with a flat surface. Where signs are to be fabricated from galvanized steel, cut the plates to the required size and drill prior to galvanizing.

### **700-5 Fabrication of Reflectorized Sign Faces.**

**700-5.1 Application of Sheeting:** Apply reflective sheeting to the base panels with mechanical equipment in a manner specified for the manufacture of traffic control signs by the sheeting manufacturer. Ensure that sheeting applied to extruded aluminum sections adheres over and around the side legs of all panels to a minimum distance of 1/16 inch beyond the radius of top edge.

Match sign faces comprising two or more pieces of reflective sheeting for color and reflectivity at the time of sign fabrication. Reverse and apply consecutively alternate successive width sections of either sheeting or panels to ensure that corresponding edges of sheeting lie adjacent on the finished sign. The Engineer will not accept nonconformance that may result in non-uniform shading and an undesirable contrast between adjacent widths of applied sheeting.

**700-5.2 Finish:** Seal reflective sheeting splices and sign edges with materials the sheeting manufacturer supplies in a manner the sheeting manufacturer specifies for traffic control signs.

**700-5.3 Screening-on Message:** Screen message and borders on reflective sheeting in accordance with the recommendations of the paint manufacturer. Process either before or after applying the sheeting to the base panels.

**700-5.4 Finished Sign Face:** Provide finished signs with clean cut and sharp messages and borders. Ensure that finished background panels are essentially a plane surface.

**700-5.5 Stenciling:** For permanent roadway signs, mark the back of all finished panels at the bottom edge with "FDOT", the date of fabrication, the date of installation, and the fabricator's initials. For construction signs, mark the back of all finished panels at the bottom edge with the date of fabrication and the fabricator's initials. Make the markings unobtrusive, but legible enough to be easily read by an observer on the ground when the sign is in its final position. Apply the markings in a manner that is at least as durable as the sign face.

**700-5.6 Product Changes:** If changes in the formulation of the sheeting occur, submit new samples for re-evaluation for continued approval.

**700-6 Acceptance of Signs.**

**700-6.1 Manufacturer's Certification and Recommendations:** Ensure that the sign manufacturer provides producer's certifications of materials incorporated into the signs. Ensure that the sign manufacturer certifies that the delivered signs conform to this Section and provides recommendations for storing and repairing signs.

**700-6.2 Packaging and Shipping:** Have the manufacturer package and ship the signs in a manner which will minimize possible damage.

**700-6.3 Storage of Signs:** If signs are stored prior to installation, store them in accordance with the manufacturer's recommendations.

**700-6.4 Sign Inspection:** Do not install signs until the Engineer inspects them for conformance with this Section. Provide all manufacturer certifications and recommendations prior to the Engineer's inspection. The Engineer will inspect the signs upon delivery to the storage or project site and again at the final construction inspection. Repair and replace signs deemed unacceptable by the Engineer at no expense to the Department.

**700-6.5 Imperfections and Repairs:** Repair and replace signs containing imperfections or damage regardless of the kind, type, or cause of the imperfections or damage. Make repairs according to the manufacturer's recommendations and to the satisfaction of the Engineer. Ensure that completed repairs provide a level of quality necessary to maintain the service life warranty of the sign and are satisfactory in appearance to the Engineer.

**700-7 Footings for Signs, Posts and Supports.**

**700-7.1 Excavation and Backfilling:** Perform excavation and backfilling for the footings in accordance with Section 125, with the exceptions that no specific density is required and that the backfill may be tamped in 4 inches maximum layers. Use material that is at near optimum moisture and neither dry or saturated, and tamp to the extent directed by the Engineer. The Department may require that the backfilling be done with poured concrete.

Install spread footings which support sign structures overhanging the roadway as required in 455-25 through 455-37.

**700-7.2 Mixing and Placing Concrete:** For batching and mixing of concrete for footings, meet the requirements of Section 346, except that the Engineer will allow hand mixing by approved methods where the quantity to be mixed does not exceed  $1/2 \text{ yd}^3$ . Use cast-in-place or precast concrete for the footings.

**700-7.3 Forms:** The Engineer will not require forms when the ground is sufficiently firm, in which case, sufficiently moisten the adjacent earth to prevent it from absorbing the moisture from the concrete. Where forms are required and the soil is not moist, place sufficient water, as directed by the Engineer, in the hole, and pour the concrete as soon as the water has been absorbed. Place at least 4 inches of loose earth, free from clods or gravel, over the top of the footing to effect curing.

**700-7.4 Finishing Concrete:** Trowel the top of the concrete to a smooth finish.

~~**700-7.5 Removal of Footing:** When the plans call for existing ground-mounted signs to be modified or removed, immediately remove supports and footings that project more than 6 inches above the ground surface after removing the sign panel from the assembly. Remove existing footings to a depth at least 12 inches below the ground~~

~~surface. The costs will be included in the Contract unit price of the item to which it is incidental.~~

### **700-8 Erection of Signs and Sign Supports.**

Do not erect overhead sign supports until the concrete in the support footing has cured for at least seven days. The Engineer may allow sign support erections prior to seven days provided the footing concrete strength is at least 2,500 psi. Determine concrete strength from tests on a minimum of two test cylinders, tested in accordance with Section 346.

Erect the signs and sign structures in accordance with the details shown in the plans. The Contractor may fabricate the structural steel sign trusses in sections that will fit into available galvanizing vats. Prior to galvanizing, weld the joints as specified in 460-6 and in accordance with the details shown in the plans. ~~Metalize~~ *Regalvanize* damaged parts as specified in Section 562.

Weld aluminum structures in accordance with 965-3.

### ~~7100-9~~ *Removal or Relocation of Signs.*

*Relocation of signs shall consist of removing the existing sign assembly and installing the sign on a new foundation.*

*When the plans call for existing ground-mounted signs to be relocated or removed, immediately remove supports and footings that project more than 6 inches above the ground surface after removing the sign panel from the assembly. Remove existing footings to a depth at least 12 inches below the ground surface. The costs will be included in the Contract unit price of the item to which it is incidental.*

### **700- 910 Method of Measurement.**

The quantities to be paid for will be:

(1) The number of ~~ground~~ *roadside* traffic signs of each designated class of assembly, complete.

~~(2) The number of overhead traffic signs of each designated class of assembly, complete.~~

~~(23)~~ The number of lighted overhead traffic signs of each designated class of assembly, complete.

~~(34)~~ The number of existing signs removed, relocated, modified, ~~lighted, placed on breakaway or nonbreakaway supports,~~ of each designated class of assembly, complete.

~~(5) The number of each existing sign refurbished, existing sign panel removed, pole installed, exit numbering panel, and mile post, complete.~~

~~(46)~~ The number of overhead signs span wire mounted, bridge mounted, and lighted sequential, of each designated class of assembly, complete.

~~(7) The number of lighted roadside signs of each designated class of assembly, complete.~~

For the purpose of payment, a sign assembly consists of all the signs mounted on a single structure (one, two or three posts, or overhead structure) or all the signs on a bridge mounted sign structure and the sign structure.

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**700-~~1011~~ Basis of Payment.**

Price and payment will be full compensation for furnishing and installation of all materials necessary to complete the signs in accordance with the details shown in the plans; including sign panels complete with sheeting, painting, and message; sign posts and supports, footings, excavation, etc.; for the lighted signs, all costs of the electrical installation for lighting, up to the point of connection by others; and all other work specified in this Section, including all incidentals necessary for the complete item.

**HIGHWAY SIGNING.****(REV 2-13-07)**

SECTION 700 (Pages 724 – 731) is deleted and the following substituted:

**700-1 Description.**

Furnish and erect aluminum or steel roadway signs, with supporting posts or columns, at the locations shown in the plans, in accordance with the details shown in the plans. Reflectorize all signs, and, when so specified in the plans, provide overhead signs with lighting.

The Department designates Ground Traffic Signs as all signs erected on the shoulders, slopes, or medians, but not extending over the traveled roadway.

The Department designates signs erected partially or completely over the traveled roadway or mounted on bridges as Overhead Traffic Signs, and may further classify some of these signs as Overhead Cantilever Traffic Signs.

**700-2 Sign Assembly Design Requirements.**

**700-2.1 General:** Sign assemblies as specified in the plans fall into two general categories: ground sign assemblies, and overhead sign assemblies.

Use any combination of sign materials described below. The Contractor may utilize different combinations for each type of sign assembly. However, ensure that the material combination used for each type is the same within the Contract.

**700-2.2 Sign Panels:** Use either aluminum or galvanized steel for any sign panel shown in the plans, regardless of its mounting type.

If using galvanized steel for the sign panels, provide the same dimensions, including the thickness, as those shown in the Contract Documents for aluminum.

Fabricate standard sign panel messages in accordance with details included in the Standard Highway Signs Manual published by the U.S. Department of Transportation. The Engineer will not require the submittal of shop drawings for these signs or for non-standard sign panels and messages fabricated in accordance with details shown in the plans. Submit seven copies of shop drawings indicating detailed layout of the sign legend, spacing, and border for all other signs to the Engineer prior to fabrication.

If the size of a sign is not specified in the plans, provide the size sign for conventional roadways as shown in the MUTCD.

**700-2.3 Breakaway Support Mechanisms:**

**700-2.3.1 Frangible Supports:** Provide posts for all frangible sign assemblies consisting of aluminum tubes up to 3 1/2 inches outside diameter with 3/16 inch wall thickness, or galvanized steel U-Channel up to 3 lb/ft as listed on the Qualified Products List (QPL).

**700-2.3.2 Slip Bases:** For posts with slip base assemblies, use either aluminum or galvanized steel in accordance with the requirements in the Design Standards. Alternative slip plane, plastic hinge, fracture elements, or combination sign support systems meeting the requirements of NCHRP 350 and Structures Manual wind load requirements may be used, subject to approval by the Department and listing on QPL. The QPL shall classify these systems as directional or omni-directional systems

**700-2.4 Temporary Construction Sign Supports:** Provide steel flanged U-channel consisting of rerolled rail steel or an equivalent billet steel, meeting the mechanical requirements of ASTM A 499, Grade 60, and meeting the chemical requirements of ASTM A 1. For each U-channel, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the U-post. Ensure that the weight per foot of a particular manufacturer's U-channel size does not vary more than  $\pm 3 \frac{1}{2}\%$  of its specified weight per foot. Taper the bottom end of the U-channel post for easier installation. Machine straighten the U-channel to a tolerance of 0.4% of the length. U-channel sign supports are listed on QPL.

Provide steel components that have been galvanized after fabrication in accordance with ASTM A 123 and have a smooth uniform finish free from defects affecting strength, durability, and appearance.

Attach the sign to the structural member using hardware meeting the manufacturer's recommendations and as specified in the Design Standards. Use attachment hardware (nuts, bolts, clamps, brackets, braces, etc.) of a non-corrosive metal, aluminum, or galvanized steel, meeting the vendor requirements specified on the QPL Drawings.

#### **700-2.5 Overhead Sign Structures:**

**700-2.5.1 Department's Design:** When the overhead sign structure is detailed in the plans, submit shop drawings to the Department for approval as specified in Section 5. Prior to the submittal of the shop drawings, determine the actual length of support columns for all sign structures on the basis of existing field conditions and include these lengths on the shop drawings.

**700-2.5.2 Contractor's Design:** When the overhead sign structure is not detailed in the plans, submit to the Department a foundation design and a sign structure design utilizing steel structural members. Meet the requirements of this Section and the FDOT Structures Manual.

Have designs and shop drawings prepared by a Specialty Engineer or the Contractor's Engineer of Record, and submit them to the Department for review and approval in accordance with Section 5.

Determine the actual length of support columns for all sign structures on the basis of existing field conditions, and include these lengths in the shop drawings and calculations.

**700-2.5.3 Installation:** Install high strength ASTM A325 bolt, nut and washer assemblies for Span Sign Structure alternate splice connections in accordance with Section 460. Install nuts on anchor rod in accordance with 649-5. Install all other bolt (ASTM A307 or substitute ASTM A325), nut and washer assemblies in accordance with the following: Use bolt, nut and washer assemblies that are free of rust and corrosion. Tighten nuts, as necessary, to bring the faying surfaces of the assembly into full contact from the interior of the connection outwards in a symmetrical pattern. After bringing the faying surfaces of the assembly into full contact, tighten nuts to achieve the minimum torque as specified in Table A. Within 24 hours after final tightening, the Engineer will witness a check of the minimum torque using a calibrated torque wrench for no less than 3 bolts and a minimum of 10% of the fastener assemblies for each connection.

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**700-2.6 Sign Background:** Meet the requirements of Section 994. Use Type III, IV, V or VII sheeting for background sheeting, white legends, borders and shields on all signs, excluding STOP, DO NOT ENTER, and WRONG WAY. Use Type VII sheeting for STOP, DO NOT ENTER and WRONG WAY signs. Use Type III, IV, V or VII yellow-green fluorescent sheeting for S1-1 school advance signs and supplemental panels used with S1-1, S3-1 and S4-5 school signs. Do not mix signs having fluorescent yellow-green sheeting with signs having yellow reflective sheeting.

Use fluorescent orange Type VI or VII for all orange work zone signs.

Mesh signs shall meet the color, daytime luminance and nonreflective property requirements of Section 994, Type VI.

### 700-3 Materials.

**700-3.1 General:** Meet the materials requirements shown below and any additional requirements which the plans might show.

**700-3.2 Concrete:** For footings, use Class II concrete meeting the requirements of Section 346.

**700-3.3 Reinforcing Steel:** For reinforcing steel in footings, meet the requirements of Section 415.

#### 700-3.4 Aluminum Materials:

**700-3.4.1 General:** For aluminum materials, meet the general provisions of 965-1.

**700-3.4.2 Sheets and Plates:** For aluminum sheets and plates for sign panels, meet the requirements of ASTM B 209, Aluminum Association Alloy 6061-T6, 5154-H38 or 5052-H38 and those shown in the plans.

**700-3.4.3 Extruded Tubing:** For extruded aluminum tubing, meet the requirements shown in the plans.

**700-3.4.4 Castings:** Provide aluminum castings of the alloys shown in the plans. For aluminum alternates the Engineer will allow a cast base, provided the Contractor submits test reports giving evidence that the base to be used for each pole size is as strong as the pole with which it is to be used. Perform physical tests and submit certified reports for one base to be used with each pole size. Use Alloy A 356-T6 for the castings. Use aluminum bolts for connecting parts of the cast base.

**700-3.4.5 Channels:** For aluminum channels, meet the requirements of ASTM B 308 for the alloys shown in the plans.

**700-3.4.6 Bolts, Nuts, and Lockwashers:** For aluminum bolts, nuts, and lockwashers, meet the requirements shown in the plans. Ensure that finished bolts and washers are given an anodic coating of at least 0.0002 inch in thickness and are chromate-sealed.

**700-3.5 Steel:**

**700-3.5.1 General:** Only use structural steel, including bolts, nuts, and washers, that have been hot dip galvanized or metalized after fabrication. Perform hot dip galvanizing in accordance with ASTM A 123 or ASTM A 153 and metalizing in accordance with Section 562. For galvanized steel members, except plate for sign panels, meet the general requirements of Section 962 and the specific requirements of 962-9. For steel plate for use as sign panels, meet the requirements of ASTM A 283 for either Grade C or Grade D.

**700-3.5.2 Specific Uses of Aluminum and Galvanized Steel:** Use aluminum bolts, nuts, and hardware to connect parts of the cast base.

Use galvanized steel anchor bolts for anchoring base plates to concrete bases and for the nuts and washers.

For all other metal parts, the Engineer will allow galvanized steel as an alternate to aluminum.

**700-3.6 Bearing Pads:** For bearing pads, meet the requirements of 932-2.

**700-3.7 Reflective Sheeting:** Meet the reflective sheeting requirements of Section 994.

**700-3.8 Process Colors:** Use transparent and black opaque process colors meeting the requirements of 994-4 on reflective and nonreflective sheeting.

**700-3.9 Demountable Sign Face Materials:** For demountable sign face materials, meet the requirements of Section 995.

**700-4 Preparation of Sign Blanks.**

**700-4.1 De-greasing and Etching for Aluminum Sign Blanks:**

**700-4.1.1 General:** Prior to the application of reflective sheeting, use any of the methods shown below to de-grease and etch the aluminum sign blanks.

**700-4.1.2 Hand Method:** Under this method, de-grease and etch the blanks in one operation, using steel wool (medium grade) with any of the following combinations of materials:

(1) An abrasive cleanser of a commercial grade kitchen scouring powder.

(2) Acid and a suitable detergent solution.

(3) An alkaline solution.

Thoroughly rinse the blanks with clean water following all hand de-greasing operations.

**700-4.1.3 Power-Washer Method:** Under this method, de-grease the blanks with an inhibited alkaline cleanser, by spraying for 90 seconds with the solution between 135 and 249°F, the exact temperature to be as recommended by the manufacturer of the cleanser. After the spraying, rinse the blanks with clean water. Then etch the blanks by immersing them in a 6 to 8% solution of phosphoric acid at a

temperature of 100 to 180°F for 60 seconds. After immersion, rinse the blanks in clean water.

**700-4.1.4 Immersion Method:** Under this method, de-grease the blanks by immersing them in a solution of inhibited alkaline cleanser at a temperature between 160 and 180°F for three to five minutes, and then rinsing with clean water. Then etch blanks by immersing them in a 6 to 8% solution of phosphoric acid at a temperature of 100°F for three minutes. After immersion, rinse the blanks in clean water.

**700-4.1.5 Vapor De-greasing Method:** Under this method, de-grease the blanks by totally immersing them in a saturated vapor of trichloroethylene. Remove trademark printing with lacquer thinner or a controlled alkaline cleaning system.

**700-4.1.6 Alkaline De-greasing Method:** De-grease the blanks by totally immersing them in a tank containing an alkaline solution, controlled and titrated in accordance with the solution manufacturer's directions. Adapt immersion time to the amount of soil present and the thickness of the metal. After immersion, thoroughly rinse the blanks with running water.

**700-4.1.7 Etching Method when De-greasing is Separate Operation:** If using either of the de-greasing methods described under 700-4.1.5 and 700-4.1.6, accomplish etching by one of the following alternate methods:

(1) Acid Etch: Etch well in a 6 to 8% phosphoric acid solution at 100°F, or in a proprietary acid etching solution. Rinse thoroughly with running cold water, which may be followed by a hot water rinse.

(2) Alkaline Etch: Etch aluminum surfaces in an alkaline etching material that is controlled by titration. Meet the time, temperature, and concentration requirements specified by the solution manufacturer. After completing etching is complete, rinse the panel thoroughly.

**700-4.2 Preparation of Surface for Steel Sign Blanks:** Clean and prepare galvanized steel sign blanks for painting or for application of reflective sheeting in accordance with the recommendations of the manufacturer of the material to be applied to the sign blanks.

**700-4.3 Drying:** Dry the panels using a forced-air drier. Use a device or clean canvas gloves, to handle the material between all cleaning and etching operations and the application of reflective sheeting. Do not allow the metal to come in contact with greases, oils or other contaminants prior to the application of reflective sheeting.

**700-4.4 Fabrication of Sign Blanks:** Fabricate all metal parts to ensure a proper fit of all sign components. Complete all fabrication, with the exception of cutting and punching of holes, prior to metal de-greasing and applying the reflective sheeting. Cut metal panels to size and shape and keep free of buckles, warp, dents, burrs, and defects resulting from fabrication. Provide all sign panels with a flat surface. Where signs are to be fabricated from galvanized steel, cut the plates to the required size and drill prior to galvanizing.

## **700-5 Fabrication of Reflectorized Sign Faces.**

**700-5.1 Application of Sheeting:** Apply reflective sheeting to the base panels with mechanical equipment in a manner specified for the manufacture of traffic control signs by the sheeting manufacturer. Ensure that sheeting applied to extruded aluminum sections adheres over and around the side legs of all panels to a minimum distance of 1/16 inch beyond the radius of top edge.

Match sign faces comprising two or more pieces of reflective sheeting for color and reflectivity at the time of sign fabrication. Reverse and apply consecutively alternate successive width sections of either sheeting or panels to ensure that corresponding edges of sheeting lie adjacent on the finished sign. The Engineer will not accept nonconformance that may result in non-uniform shading and an undesirable contrast between adjacent widths of applied sheeting.

**700-5.2 Finish:** Seal reflective sheeting splices and sign edges with materials the sheeting manufacturer supplies in a manner the sheeting manufacturer specifies for traffic control signs.

**700-5.3 Screening-on Message:** Screen message and borders on reflective sheeting in accordance with the recommendations of the paint manufacturer. Process either before or after applying the sheeting to the base panels.

**700-5.4 Finished Sign Face:** Provide finished signs with clean cut and sharp messages and borders. Ensure that finished background panels are essentially a plane surface.

**700-5.5 Stenciling:** For permanent roadway signs, mark the back of all finished panels at the bottom edge with "FDOT", the date of fabrication, the date of installation, and the fabricator's initials. For construction signs, mark the back of all finished panels at the bottom edge with the date of fabrication and the fabricator's initials. Make the markings unobtrusive, but legible enough to be easily read by an observer on the ground when the sign is in its final position. Apply the markings in a manner that is at least as durable as the sign face.

**700-5.6 Product Changes:** If changes in the formulation of the sheeting occur, submit new samples for re-evaluation for continued approval.

## **700-6 Acceptance of Signs.**

**700-6.1 Manufacturer's Certification and Recommendations:** Ensure that the sign manufacturer provides producer's certifications of materials incorporated into the signs. Ensure that the sign manufacturer certifies that the delivered signs conform to this Section and provides recommendations for storing and repairing signs.

**700-6.2 Packaging and Shipping:** Have the manufacturer package and ship the signs in a manner which will minimize possible damage.

**700-6.3 Storage of Signs:** If signs are stored prior to installation, store them in accordance with the manufacturer's recommendations.

**700-6.4 Sign Inspection:** Do not install signs until the Engineer inspects them for conformance with this Section. Provide all manufacturer certifications and recommendations prior to the Engineer's inspection. The Engineer will inspect the signs upon delivery to the storage or project site and again at the final construction inspection. Repair and replace signs deemed unacceptable by the Engineer at no expense to the Department.

**700-6.5 Imperfections and Repairs:** Repair and replace signs containing imperfections or damage regardless of the kind, type, or cause of the imperfections or damage. Make repairs according to the manufacturer's recommendations and to the satisfaction of the Engineer. Ensure that completed repairs provide a level of quality necessary to maintain the service life warranty of the sign and are satisfactory in appearance to the Engineer.

**700-7 Footings for Signs, Posts and Supports.**

**700-7.1 Excavation and Backfilling:** Perform excavation and backfilling for the footings in accordance with Section 125, with the exceptions that no specific density is required and that the backfill may be tamped in 4 inches maximum layers. Use material that is at near optimum moisture and neither dry or saturated, and tamp to the extent directed by the Engineer. The Department may require that the backfilling be done with poured concrete.

Install spread footings which support sign structures overhanging the roadway as required in 455-25 through 455-37.

**700-7.2 Mixing and Placing Concrete:** For batching and mixing of concrete for footings, meet the requirements of Section 346, except that the Engineer will allow hand mixing by approved methods where the quantity to be mixed does not exceed 1/2 yd<sup>3</sup>. Use cast-in-place or precast concrete for the footings.

**700-7.3 Forms:** The Engineer will not require forms when the ground is sufficiently firm, in which case, sufficiently moisten the adjacent earth to prevent it from absorbing the moisture from the concrete. Where forms are required and the soil is not moist, place sufficient water, as directed by the Engineer, in the hole, and pour the concrete as soon as the water has been absorbed. Place at least 4 inches of loose earth, free from clods or gravel, over the top of the footing to effect curing.

**700-7.4 Finishing Concrete:** Trowel the top of the concrete to a smooth finish.

**700-8 Erection of Signs and Sign Supports.**

Do not erect overhead sign supports until the concrete in the support footing has cured for at least seven days. The Engineer may allow sign support erections prior to seven days provided the footing concrete strength is at least 2,500 psi. Determine concrete strength from tests on a minimum of two test cylinders, tested in accordance with Section 346.

Erect the signs and sign structures in accordance with the details shown in the plans. The Contractor may fabricate the structural steel sign trusses in sections that will fit into available galvanizing vats. Prior to galvanizing, weld the joints as specified in 460-6 and in accordance with the details shown in the plans. Re-galvanize damaged parts as specified in Section 562.

Weld aluminum structures in accordance with 965-3.

**700-9 Removal or Relocation of Signs.**

Relocation of signs shall consist of removing the existing sign assembly and installing the sign on a new foundation.

When the plans call for existing ground-mounted signs to be relocated or removed, immediately remove supports and footings that project more than 6 inches above the ground surface after removing the sign panel from the assembly. Remove existing footings to a depth at least 12 inches below the ground surface. The costs will be included in the Contract unit price of the item to which it is incidental.

**700- 10 Method of Measurement.**

The quantities to be paid for will be:

(1) The number of ground traffic signs of each designated class of assembly, complete.

(2) The number of lighted overhead traffic signs of each designated class of assembly, complete.

(3) The number of existing signs removed, relocated, modified of each designated class of assembly, complete.

(4) The number of overhead signs span wire mounted, bridge mounted, and lighted sequential, of each designated class of assembly, complete.

For the purpose of payment, a sign assembly consists of all the signs mounted on a single structure (one, two or three posts, or overhead structure) or all the signs on a bridge mounted sign structure and the sign structure.

**700-11 Basis of Payment.**

Price and payment will be full compensation for furnishing and installation of all materials necessary to complete the signs in accordance with the details shown in the plans; including sign panels complete with sheeting, painting, and message; sign posts and supports, footings, excavation, etc.; for the lighted signs, all costs of the electrical installation for lighting, up to the point of connection by others; and all other work specified in this Section, including all incidentals necessary for the complete item.