## New Jersey Turnpike Authority



P.O. Box 5042, Woodbridge, NJ 07095

December 05, 2016

# Document Change Announcement

2007 Design Manual Ground Mounted Signs DCA2016DM-01 Subject: Revisions to

Section 2 Structures Design, Subsection 2.5 Sign Supports

#### **Description of Change**

The ground mounted sign details have been updated to be in conformance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

#### Notice to NJTA Staff, Designers and Consultants

Effective immediately, the revisions contained in this announcement shall be applied to all projects that have not submitted Phase B of Final Design. Contact your NJTA Project Manager for further direction. See attached revisions.

Designers may access these revisions in the NJTA Design Manual, which is available on the Authority's Web Page: http://www.state.nj.us/turnpike/professional-services.html

**Recommended By:** 

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Approved By:

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Distribution: Senior Staff Engineering, Law, Maintenance Operations Depts., All Prequalified Consultant Firms, File

New Jersey Turnpike Authority						
DOCUMENT UPDATE REQUEST						
Forward to Assistant Chief Engineer, Design						
Initiator	Russell Saputo, PE	Submittal Date	6/21/16			
Firm	Stantec Consulting Services Inc.	Telephone	201-587-9040			
Document (cheo	ck one)					
<ul> <li>Procedures Manual</li> <li>Design Manual</li> <li>Sample Plans</li> <li>Standard Drawings</li> <li>Standard Specifications</li> </ul>						
Design Manual - Updated Section 2.5.1 to make reference to new Standard Drawings SI-43 through SI-47, and deletion of Exhibits 2-400 through 2-403.						
Reason for Change The ground mounted sign details have been updated to be in conformance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.						

## 2.4 CULVERTS

Culverts shall be constructed as box culverts or 3-sided rigid frames with reinforced concrete Class "B". As a minimum, culverts shall be of sufficient length so that the full roadway section, including shoulders and berms, can be maintained. Footings for culvert wingwalls shall either be placed at the same time as the culvert floor slab or shall be adequately keyed and doweled into it. Toe walls shall be provided along the edge of culvert floor slabs or apron slabs.

Precast culverts shall be permitted and the design shall conform to either the AASHTO LRFD Specification or the AASHTO Standard Specification for Highway Bridges. Engineers shall contact precast manufacturers during the design to discuss project specific design requirements and details to ensure there will be no conflicts during the construction phase. Precast culverts shall not be used when the top slab is to be used as a riding surface.

## 2.5 SIGN SUPPORTS

The various types of signs described in this section are either ground mounted or on overhead sign structures. Each of these general categories is sub-divided into various support methods:

- Ground Mounted Small Highway Signs (<50 square feet) Large Highway Signs (≥50 square feet)
- 2. Overhead Type Structures Span Type Structures Cantilever Type Structures Butterfly Type Structures Bridge Mounted Structures

#### 2.5.1 General Design Criteria

All Sign Support Structure designs shall be completed in accordance with the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and the current AASHTO Standard Specifications for Highway Bridges. For sign placement layout guidelines and sign panel requirements, see Sections 6\_A and 6B of this Manual.

- 1. Ground Mounted
  - a. Small Highway Signs (<50 square feet)

Turnpike – Channel/U Post See <u>Standard Drawing SI-26</u>-Section 6.

<u>Turnpike – Timber Post</u> <u>Standard signs utilizing timber posts are noted on Standard Drawings</u> <u>SL-1 to SL-7. The Engineer may also use timber posts as depicted</u> on Standard Drawings SI-43 to SI-46.

#### Parkway - Timber Post

Small highway sign supports shall be timber posts. Having the values of "H" and "W" of the sign panel, the Engineer can then use the Tables on Exhibits 2-401 for determining the size of the timber post as well as the depth of foundation embedments to be used on that installation.

#### Parkway - Timber Post

Small highway sign supports shall be timber posts. Having the values of "H" and "W" of the sign panel, the Engineer can refer to Standard Drawings SI-43 to SI-46 for determining the size of the timber post as well as the depth of foundation embedments to be used on that installation. Standard signs utilizing timber posts are noted on Standard Drawings SL-1 to SL-7. All timber post sign structures included in Standard Drawings SI-43 and SI-44 are designed for breakaway in a vehicular collision and do not require roadside protection.

b. Large Highway Signs (≥50 square feet)

#### Turnpike - Single Aluminum Post

Many signs are of sizes which require a single tubular post for support. Standard signs utilizing single posts are noted on Standard Drawings SI-1 to SI-3. Any signs not covered by the standards which have a panel width of at least 3' and no greater than 5'-6" shall be installed on a single extruded aluminum tube having an outside diameter of 4" and a wall thickness of 0.250". This type of post shall have a cast aluminum cap and a two-piece cast aluminum base of the same design as that used for the larger aluminum tubular posts (See Standard Drawings SI-13). For foundation details, see Standard Drawing SI-22.

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Should the Engineer feel that if any of the standard signs or any other small signs which are to be erected on a 4" aluminum tubular post are considered to be in an area subject to frequent impact from vehicles, it should be proposed to the Authority's Engineering Department that these signs be erected on multiple galvanized steel wing channel posts or another type of support.

#### Turnpike - Multi-Aluminum Post

Many of the standard signs are of such a size they require two or more extruded aluminum tubular posts as indicated on standard Drawings SI-1 to SI-4. Further, contract signs of a certain size may also require a similar multi-post support system.

The number of posts required to support any sign panel is dependent on the width and height of the panel. In order to keep the stresses in the horizontal stringers, which hold the sheet sections together, within allowable limits, limiting panel sizes are shown on Standard Drawing SI-25 for either 2, 3 or 4 post mounting systems. To assist the Engineer in determining the proper size and number of posts to use on any particular ground mounted installation, the chart on Standard Drawing SI-25 has been provided. The intersection of a sign panel's height and width will fall within an area which will indicate whether 2, 3, or 4 supports are required. On this drawing there is a series of diagrams which show the proper spacing of the posts along the width of the panel expressed as decimal fractions of the panel width.

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The number of posts required to support any sign panel is dependent on the width and height of the panel. In order to keep the stresses in the horizontal stringers, which hold the sheet sections together, within allowable limits, limiting panel sizes are shown on Standard Drawing SI-26 for either 2, 3 or 4 post mounting systems. To assist the Engineer in determining the proper size and number of posts to use on any particular ground mounted installation, the chart on Standard Drawing SI-26 has been provided. The intersection of a sign panel's height and width will fall within an area which will indicate whether 2, 3, or 4 supports are required. On this drawing there are a series of diagrams which show the proper spacing of the posts along the width of the panel expressed as decimal fractions of the panel width.

Once the number of posts required to support the panel has been determined, the Engineer shall calculate "h". This dimension "h" is the height of the longest post used on that installation. It is measured from the middle of the sign panel to ground level, and is rounded off to the next 2-foot increment. In determining "h", the Engineer shall assume that the ground outside of the berm area slopes 1 foot vertically for every 2 feet horizontally, unless there is information available to substantiate using a flatter or a steeper side slope. It is desirable to provide posts of sufficient length to insure flush ground mounting.

Having the values of "h" and the area of the sign panel, the Engineer can then use the charts on Standard Drawing SI-25 for determining the post diameter to be used on that installation. The post size to be used will be indicated by the curve (properly selected as to required numbers of posts) which lies just above the intersection of "A" and "h". The post size indicated on that curve shall be the outside diameter and wall thickness of all tubular supports for that installation. In some instances, especially where large diameter and or heavy wall thicknesses are indicated for a particular installation, consideration should be given to the use of an additional post, whereby a tube of smaller diameter and thickness of wall may be utilized.

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On any ground mounted sign installation which will have two sign panels, one mounted above the other, the length of "h" shall be computed to the centerline of the combination, including the space separating the two panels. The area to be used when determining the post size shall be the total area of the two panels.

Each tubular aluminum post shall be equipped with an aluminum cap and base. The anchor bolts are installed as detailed on Standard Drawing SI-12. Foundation details are shown on Standard Drawing SI-21.

Each tubular aluminum post shall be equipped with an aluminum cap and base. The anchor bolts are installed as detailed on Standard Drawing SI-13. Foundation details are shown on Standard Drawing SI-22.

Turnpike - Multi-Timber Post

Standard signs utilizing timber posts are noted on Standard Drawings SL-1 to SL-7. Signs may also be supported on multiple timber posts as outlined in Section 2.5.1.1c and on Standard Drawings SI-44 and SI-45.

c. Parkway - Multi-Timber Post / Pole

Many of the standard signs are of such a size they require two or more timber posts or poles as indicated on Exhibits 2-402 and 2-403. Further, contract signs of a certain size may also require a similar multi-pole support system.

The number of posts or poles required to support any sign panel is dependent on the width and height of the panel. In order to keep the stresses in the horizontal stringers, which hold the sheet sections together, within allowable limits, limiting panel sizes are shown on Exhibits 2-402 and 2-403 for either 2 or 3 pole mounting systems. To

assist the Engineer in determining the proper size and number of poles to use on any particular ground mounted installation, the Tables on Exhibit 2-402 and 2-403 have been provided.

For sign areas greater than 50 sq. ft. and less than 100 sq. ft. timber posts shall be used in accordance with Exhibit 2-402. Having the values of "H" and "W" of the sign panel, the Engineer can than use the tables for determining the number of posts, size of the posts, as well as the depth of post embedment.

For sign areas greater than 100 sq. ft., timber poles shall be used in accordance with Exhibit 2-403. Once the number of poles required to support the panel has been determined, the Engineer shall calculate "A". This dimension "A" is the height of the longest pole used on that installation. It is measured from the underside of sign panel to ground level. In determining "A", the Engineer shall assume that the ground outside of the berm area slopes 1 foot vertically for every 2 feet horizontally, unless there is information available to substantiate using a flatter or a steeper side slope.

Having the values of "H" and "W" of the sign panel, the Engineer can then use the Tables on Exhibits 2-403 for determining the number of poles, Class of timber pole as well as the depth and size of foundation embedments to be used on that installation.

On any ground mounted sign installation which will have two sign panels, one mounted above the other, the height of "H" shall be taken as combination of both sign heights, including the space separating the two panels. The area to be used when determining the post size shall be the total area of the two panels.

Many of the standard signs are of such a size they require two or more timber posts or poles as indicated on Standard Drawings SI-44, SI-45, and SI-47. Standard signs utilizing multi-timber posts are noted on Standard Drawings SL-1 to SL-7. Further, contract signs of a certain size may also require a similar multi-pole support system.

For multi-timber post sign structures with areas less than 100 sq. ft., timber posts shall be used in accordance with Standard Drawings SI-44 and SI-45.

All timber double post sign structures included in Standard Drawing SI-44 are breakaway designs and are required when sign structures are placed within the roadway clear zone and lack roadside protection. Breakaway timber posts shall be comprised of preservatively treated Southern Yellow Pine Grade No. 2, and shall include the breakaway hole detail on Standard Drawing SI-46. All double and triple post sign structures included in Standard Drawing SI-45 are non-breakaway timber posts shall be comprised of preservatively treated Dense Select Structural grade Southern Yellow Pine. All non-breakaway signs shall require roadside protection or be located outside of the clear zone. The strength of breakaway sign structures is less than that of the nonbreakaway signs because of the material and sizing requirements of the breakaway posts. Maximum allowable sustained wind speeds normal to the sign panel that the breakaway sign structures can resist are provided in Exhibit 2 – 7. Non-breakaway sign structures are designed for a maximum sustained wind speed of 100 mph normal to the sign panel. The decision to use a breakaway or non-breakaway sign structure will be made during design. The designer shall consider using a breakaway sign structure when reasonable with regards to sign location, message and maximum allowable wind speed. Non-breakaway signs requiring additional roadside protection may only be installed within the roadway clear zone if directed by the Authority's Operations Department.

#### EXHIBIT 2 - 7 MAXIMUM ALLOWABLE WIND SPEEDS FOR BREAKAWAY TIMBER GROUND MOUNTED SIGNS

Breakaway Double Post Sign Structures				
<u>Sign</u> <u>Height,</u> <u>H (Ft.)</u>	<u>Sign</u> <u>Width,</u> <u>W (Ft.)</u>	<u>Post</u> Size	<u>Maximum</u> <u>Allowable</u> Wind Speed	
<u>4</u>	<u>5</u>	<u>4" x 6"</u>	<u>90</u>	
<u>4</u>	<u>6</u>	<u>4" x 6"</u>	<u>80</u>	
<u>4</u>	<u>8</u>	<u>4" x 6"</u>	<u>70</u>	
4	<u>10</u>	<u>6" x 8"</u>	<u>95</u>	
5	5	<u>4" x 6"</u>	<u>80</u>	
5	6	<u>4" x 6"</u>	<u>75</u>	
<u>5</u>	<u>6.5</u>	<u>4" x 6"</u>	<u>70</u>	
5	8	<u>4" x 6"</u>	<u>65</u>	
5	<u>10</u>	<u>6" x 8"</u>	<u>85</u>	
5	<u>10.5</u>	<u>6" x 8"</u>	<u>80</u>	
<u>5</u>	<u>12</u>	<u>6" x 8"</u>	<u>75</u>	
<u>6</u>	<u>6</u>	<u>4" x 6"</u>	<u>65</u>	
<u>6</u>	<u>8</u>	<u>4" x 6"</u>	<u>55</u>	
<u>6</u>	<u>10</u>	<u>6" x 8"</u>	<u>75</u>	
<u>6</u>	<u>12</u>	<u>6" x 8"</u>	<u>70</u>	
<u>7</u>	<u>7</u>	<u>4" x 6"</u>	<u>55</u>	
<u>7</u>	<u>8</u>	<u>4" x 6"</u>	<u>50</u>	
<u>7</u>	<u>10</u>	<u>6" x 8"</u>	<u>70</u>	
<u>7</u>	<u>12</u>	<u>6" x 8"</u>	<u>65</u>	
<u>8</u>	<u>6</u>	<u>4" x 6"</u>	<u>55</u>	
<u>8</u>	<u>8</u>	<u>4" x 6"</u>	<u>45</u>	
<u>8</u>	<u>10</u>	<u>6" x 8"</u>	<u>65</u>	
<u>8</u>	<u>12</u>	<u>6" x 8"</u>	<u>60</u>	
<u>9</u>	<u>6</u>	<u>4" x 6"</u>	<u>50</u>	
<u>9</u>	<u>8</u>	<u>4" x 6"</u>	<u>45</u>	
<u>9</u>	<u>10</u>	<u>6" x 8"</u>	<u>60</u>	

Breakaway Double Post Sign Structures				
With Exit Overpanel				
<u>Sign</u>	Sign	Post	<u>Maximum</u>	

Height,	Width,	<u>Size</u>	<u>Allowable</u>
<u>H (Ft.)</u>	<u>W (Ft.)</u>		Wind Speed
<u>4</u>	<u>10</u>	<u>6" x 8"</u>	<u>70</u>
<u>5</u>	<u>10</u>	<u>6" x 8"</u>	<u>65</u>
<u>5</u>	<u>12</u>	<u>6" x 8"</u>	<u>60</u>
<u>6</u>	<u>10</u>	<u>6" x 8"</u>	<u>60</u>
<u>6</u>	<u>12</u>	<u>6" x 8"</u>	<u>55</u>
<u>7</u>	<u>10</u>	<u>6" x 8"</u>	<u>55</u>
<u>7</u>	<u>12</u>	<u>6" x 8"</u>	<u>50</u>
<u>8</u>	<u>10</u>	<u>6" x 8"</u>	<u>50</u>
8	12	<u>6" x 8"</u>	<u>45</u>
9	10	<u>6" x 8"</u>	<u>50</u>

Sign areas greater than 100 sq. ft. may be mounted on overhead sign structures as outlined in Section 2.5.1.2. or mounted on timber poles as depicted on Standard Drawing SI-47.

On any ground mounted sign installation which will have two sign panels, one mounted above the other, the height of "H" shall be taken as combination of both sign heights, including the space separating the two panels. The area to be used when determining the post size shall be the total area of the two panels.

#### 2. Overhead Type Structures

## a. Span-type Sign Structures

Turnpike Sign Structures General Criteria

These are to be used to support signs such that the panels hang directly over the roadway lane to which the sign applies. The layout of the sign structure shall be in accordance with Exhibits 2-405 to 2-407. As depicted on these exhibits, the centerline of the end frame and foundation shall be placed in the median between any adjacent roadways whenever possible and practical. The use of single span sign structures **that** span over multiple mainline roadways is prohibited. Additionally, sign structures located in any adjacent roadways shall be spaced apart, or staggered, a minimum of 35' - 0" measured centerline to centerline of end frames in a direction parallel to traffic.

Span-type sign structures shall be four chord box trusses of cylindrical tubes supported on tubular trussed end frames. The box truss shall support the signs. Standard Drawings are provided for aluminum and weathering steel structures. Only weathering steel sign structures shall be permitted. Aluminum Standard Drawings are for reference, only when performing work on pre-existing aluminum sign structures.

The Standard Drawings for the span-type sign structures provide three (3) standard heights of end frames and six (6) standard lengths for box truss sections. Span lengths from 45 ft. to 135 ft., in increments of 5 ft., may be obtained by using the standard box truss