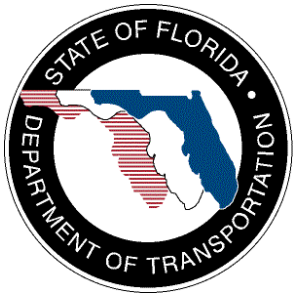
White Paper

Florida Department of Transportation
Special Project

Pedestal-mounted Structural Supports for Dynamic Message Signs

November 8, 2006
Final Version 2



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List of Acronyms

DMS ..... Dynamic Message Sign
DOT ..... Department of Transportation
FDOT ..... Florida Department of Transportation
GDOT ..... Georgia Department of Transportation
I-10 ..... Interstate 10
MODOT ..... Missouri Department of Transportation
MOT ..... Maintenance of Traffic
NCDOT ..... North Carolina Department of Transportation
U.S. ..... United States

1. Introduction

Florida Department of Transportation (FDOT) District 3 is currently installing three dynamic message signs (DMSs) in the Tallahassee area. Two of these DMSs will be installed on Interstate 10 (I-10), one on the eastbound side near Exit 192 and one on the westbound side near Exit 209. The third DMS will be installed on the southbound side of United States (U.S.) Highway 27, south of I-10 and just north of John Knox Road. If the DMSs are procured using the Statewide Procurement Contract, they can be bought for approximately $50,000 dollars each.

The two DMSs that are to be installed on I-10 will be mounted on full span structural supports. The full span structural supports will cost approximately $100,000 each. The DMS that will be installed on U.S. Highway 27 will be mounted on a cantilevered structural support and will cost approximately $60,000. The purpose of this document is to provide information on a pedestal-mounted support structure and its characteristics, as well as some DMS characteristics.

Some research into pedestal-mounted structures mounted on the side of the roadway revealed that many state departments of transportation (DOTs) use these structures. Five state DOTs, including Georgia, North Carolina, South Dakota, Missouri, and Colorado, and FDOT Districts 5 and 6 were contacted to obtain additional information regarding pedestal-mounted structures. Florida Department of Transportation District 5 uses pedestal-mounted structures to install small (i.e., 4 feet by 3 feet) DMS devices. Since these structures are small compared to the structures used by other DOTs, information on these structures have not been included in this technical memorandum. Although the structure used by FDOT District 6 is not a typical structure used by the other DOTs discussed in this document, infrastructure information has been included in this technical memorandum.

All five state DOTs indicated that there have been no complaints from motorists regarding the pedestal-mounted structures as compared to full-mount structures.

All five state DOTs also indicated that the lower cost of pedestal-mounted structures were one of the main reasons to use the structures. The other significant benefit of pedestal-mounted structures, according to the state DOTs, is that there are fewer maintenance of traffic (MOT) requirements for the installation and maintenance of pedestal-mounted structures.

Appendix A contains pictures of the DMS structures used in North Carolina, South Dakota, Missouri, and FDOT District 6.

The five state DOTs and FDOT District 6 were asked a set of questions relating to the placement and cost of the structures. Table 1.1 summarizes the responses. The following sections describe, in detail, each of the attributes of pedestal-mounted structures and the DMSs as summarized in Table 1.1.

Table 1.1 – Summary of State Department of Transportation Structure Placement and Cost Responses

	Mounting Height (to the Bottom of the DMS)	Horizontal Mounting Angle	Vertical Mounting Angle	Offset from Roadway	LED Visibility Cone	Modifications Needed to the DMS Structure	Visibility Problems	Display Width (Characters)	Cost (Materials and Installation)
North Carolina DOT	25’	0°	Same as a full span structure	Clear Zone (protected by the guardrail)	30°	None	None (used on up to 4 lanes in the same direction)	Not available	$25,000 to $35,000
Georgia DOT	17’ 6”	0°	3°	Clear Zone on Right Shoulder (sign’s left edge is at the right edge of the pavement)	45°	None	None	15	Not available
South Dakota DOT	17’	9°	3°	Clear Zone (30’ from the edge of the roadway)	15°	None	None	15	$20,000
Missouri DOT	18’	Variable	Variable	Clear Zone (protected by the guardrail)	15°	None	None (used on up to 3 lanes in the same direction)	20	$30,000
Colorado DOT	17’ 6” To 18’ 6”	0° - 5°	3°	5’ inside the Guardrail	15°	None	None	17	Not available
FDOT District 6	> 19’ 6”	0°	0°	At the median, in clear zone	30°	None	None	Not available	$200,000

1.1 Mounting Height

As indicated in Table 1.1, there is no standard DMS mounting height. The idea is to mount the DMS in such a way that the sign can be properly visible from all lanes of the highway. The mounting height varies from 17 feet to 25 feet for the state DOTs surveyed. The mounting height is to the bottom of the DMS cabinet.

To get a perspective on the mounting height for DMSs used by non-DOT customers — for example, billboard advertisers — a vendor who supplies DMSs to state DOTs and other customers was questioned. According to the vendor, billboard customers typically use bigger signs (i.e., 20 feet by 45 feet) and mount the signs at heights of 60 feet to 70 feet.

1.2 Horizontal Mounting Angle

As shown in Table 1.1, the mounting angle ranges between 0 degrees and 9 degrees with respect to the roadway. This angle is achieved by placing the pedestal structure at an angle with the roadway. Visibility of the sign is primarily determined by the visibility angle of the light emitting diodes (LEDs) used for the sign. A small mounting angle of the structure is desired for better visibility of the sign when 15-degree visibility, cone LEDs are used. The DMS manufacturers recommend an angle of 3 degrees. The Missouri Department of Transportation (MODOT) uses a variable angle based on the sign height, roadway alignment, the distance the sign will be in relation to traffic, and the number of lanes that will be looking at the sign.

1.3 Vertical Mounting Angle

The vertical mounting angle recommended by sign manufacturers is 3 degrees. Some sign manufacturers design their signs so that this 3-degree angle is built into the sign's front face. (Refer to Figure A.2 in *Appendix A*.) For sign manufacturers who do not build this 3-degree angle into their signs, special mounting brackets are provided to mount the sign on the pedestal structure at this angle. The MODOT uses a variable angle based on the sign height, roadway alignment, and the distance the sign will be in relation to traffic.

1.4 Offset from the Roadway

As shown in Table 1.1, most state DOTs place a pedestal-mounted sign in the clear zone behind a guardrail. Georgia Department of Transportation (GDOT) signs are mounted on the shoulder so that the left edge of the sign is at the right edge of the pavement.

District 6 placed their two-sided structure in the median of the highway.

1.5 Visibility Cone for Light Emitting Diodes

As also shown in Table 1.1, the LED visibility cone varies from 15 degrees to 45 degrees for freeway signs. Most designers use either 15-degree or 30-degree visibility cones. A larger visibility cone provides a larger distance from which motorists can view a sign. This also means that the amount of time motorists can view a sign increases with a larger visibility cone. (Refer to Figure 1.1. supplied by Daktronics, Inc.[1])

Light emitting diodes are designed to be driven at a power level to produce 9,200 candelas per meter squared of illumination. When the angle gets wider, the LEDs have to be driven higher, which requires more power and, in turn, causes more heat. The DMS manufacturers design their cabinet ventilation to accommodate this higher heat dissipation. Hence, no cabinet modification is needed if a customer decides to use a 30-degree LED cone as opposed to a 15-degree cone for better visibility. More power supplies have to be added to accommodate the 30-degree cone.

1.6 Modification to the Dynamic Message Sign Structure for a Pedestal-mounted Structure

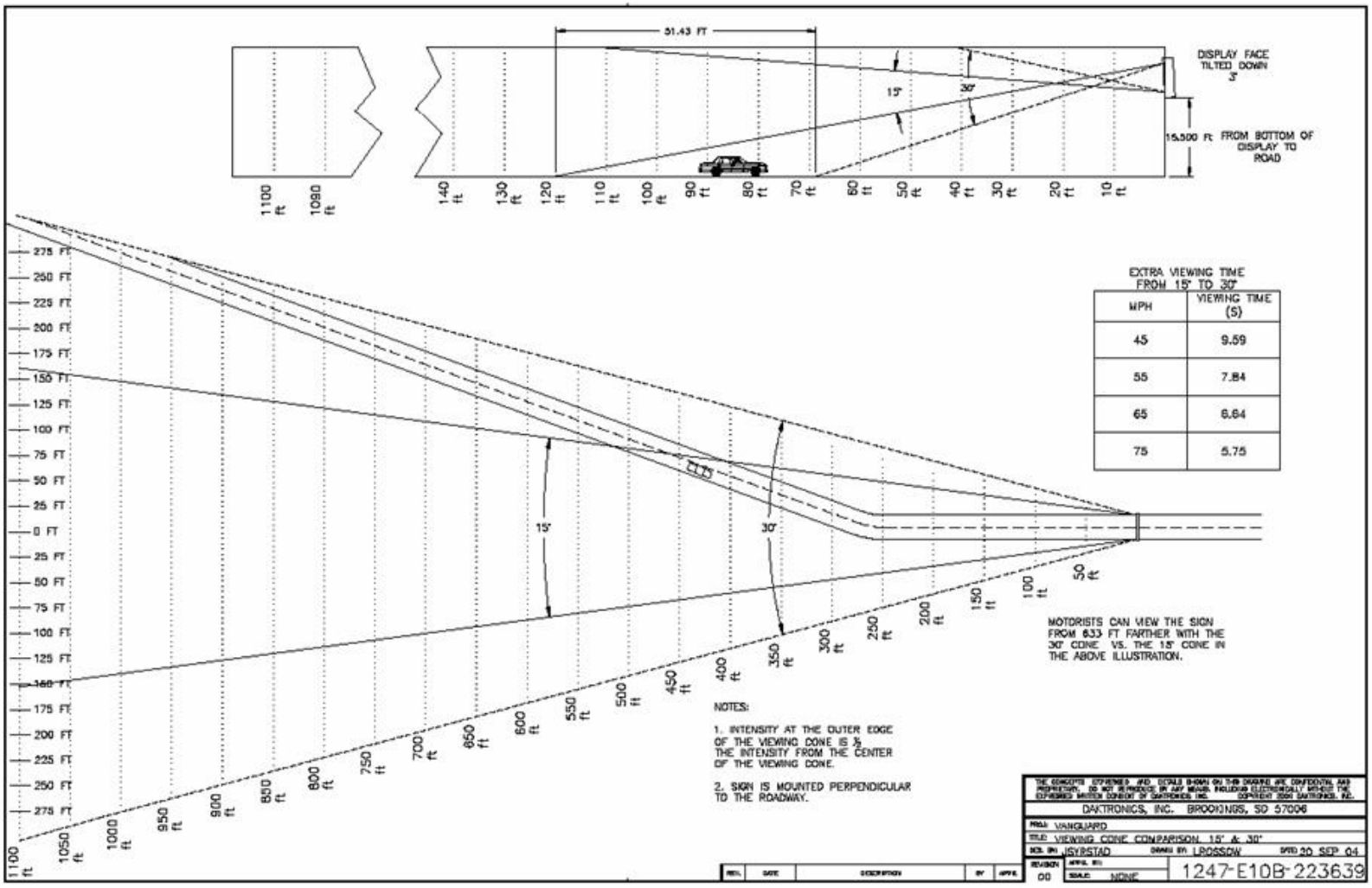
Table 1.1 indicates that none of the state DOTs made any modifications to mount the signs on pedestal-mounted structures as opposed to full span or cantilevered structures. The reason behind this is that the DMS cabinets come with recommended mounting points; the pedestal structures are designed to accept the DMS cabinet as is. Hence, the DMS cabinet requires no modification.

1.7 Visibility Problems

All of the state DOTs surveyed indicated that the signs do not have any visibility issues. All of them said that there have been no complaints received from their customers. The North Carolina Department of Transportation (NCDOT) uses the pedestal-mounted signs for a maximum of four freeway lanes in the same direction without receiving any customer visibility complaints. The MODOT indicated the use of pedestal-mounted signs on a maximum of three freeway lanes in the same direction without any customer visibility issues.

[1] More information regarding Daktronics, Inc., is available online at http://www.daktronics.com/.

Figure 1.1 – Viewing Cone for 15- and 30-Degree Light Emitting Diodes



1.8 Display Width

Table 1.1 indicates that the display width ranges from 15 characters to 20 characters long. This length assumes a standard font size of 7 pixels high by 5 pixels wide. All the DMSs have three line displays. Most of the DMSs are line matrix, although some are full matrix. All of them used a standard 18-inch character height.

1.9 Cost of a Pedestal-mounted Structure

Table 1.1 indicates that the cost of pedestal-mounted structures ranges from $20,000 to $35,000. This cost includes all material and installation costs, and is substantially lower than the cost of a full span mount or cantilever mount structure. There is substantial material savings as well as installation savings when using pedestal-mounted structures.

The median-mounted structure used by District 6 in the Florida Keys costs approximately $200,000. (Refer to Figure A.6.)This structure is significantly different from the roadside-mounted pedestal structures used by the other states discussed herein because it houses two DMSs, one for each direction of traffic. That is why the structural cost is higher than the cost of the structures used by the other states.

2. Conclusions

Pedestal-mounted DMS structures placed on the side of the highway provide as good a support structure for DMSs as full-span or cantilevered structures placed above the lanes of a highway. According to this survey, there is no visibility problem with pedestal-mounted structures when compared to the full-mounted and cantilevered overhead structures.

The biggest advantage of pedestal-mounted structures is the cost. Pedestal-mounted structures are substantially cheaper than full span or cantilevered structures. The other great benefit of pedestal-mounted structures is that there are less MOT requirements for installation and maintenance. If MOT costs are factored into the planning for a pedestal-mounted structure on a life-cycle basis, it becomes even more attractive than the full-mounted or cantilevered structure.

3. Recommendations

As more DMS devices are installed on Florida's highways, FDOT planners should further explore pedestal-mounted support structures for these devices due to the cost advantage these structures can provide and the satisfactory performance reported by the states presently using this type of structures.

Appendix A

Dynamic Message Sign Support Structures used by Various State Departments of Transportation

Figure A.1 – Front of a North Carolina DMS Structure

Figure A.2 – Side of a North Carolina DMS Structure

Figure A.3 – Back of a North Carolina DMS Structure

Figure A.4 – South Dakota DMS Structure[i]

[i] Photos from the *Daktronics 2004-2005 Intelligent Transportation Systems Applications Guide and Product Catalog*, page 5. More information is available online at http://www.daktronics.com/

Figure A.5 – Missouri DMS Structure[i]

Figure A.6 – FDOT District 6 DMS Structure