7810100 ITS – DYNAMIC MESSAGE SIGNS
COMMENTS FROM INDUSTRY REVIEW

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Comments:

1. What're the requirements of wind loading for DMS housing for both freeway and arterial DMS?
2. The requirements for freeway DMS specify that the size of sign shall consist of three lines of 25 display modules per line, for 18 inches character. But the specifications for arterial DMS are not clear on the number of lines and number of characters per line, for 12 inch character.

Response:

1. *They are not specifically stated in the current draft. Document modified to add reference to FDOT Structures Manual for wind load requirements in sections 781-3.1.1 & 781-3.2.1.*

2. *The preference is that the exact matrix size, number of characters, lines, etc. be specified in the plans. This should allow designers greater freedom to choose and detail an appropriate display configuration for individual projects. The statement "…in accordance with the details specified in the Contract Documents" is intended to allow this variability. However, to add additional clarity, the text in section 781-3.2.3.1 has been modified to clarify that the display size must be as shown in the plans.*

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Name: Duane Brautigam, PE
State Specifications/Estimates Office

Comments:

Text: 781-1 - I disagree with the addition of "as directed by the Engineer". That is a vague phrase that can be interpreted as obligating the Contractor to do anything the Engineer requests as part of the original scope of work. The authority of the Engineer to direct the Contractor is established within the first 9 sections of our specs, but the Contractor's right to seek compensation is also discussed in those sections. There is no need to emphasize the Engineer's authority in Division II specs. Doing so only serves to muddle the intended scope of work.

Response:

Since the Division I language is adequate to enforce the authority of the Engineer, this reference has been removed.

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Carlo Adair
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Comments:
Text: 781-3.12.6 Operational Testing should be stricken and the following inserted in its place: 781-3.12.6 Operational Testing: After the ADMS system installation and system testing are successfully completed, conduct one continuous 72-hour, full-operating test prior to conducting the 60-day Acceptance Test. The Engineer will approve the type of tests to be conducted. Include in the tests all control, monitoring, and communication functions of the field equipment by the master equipment. 781-3.12.7 Acceptance Testing: Commence the 60-day test period on the first day after the successful completion of the approved 72-hour Operational test. During the 60-day test period, limit downtime due to mechanical, electrical, or other malfunctions to a maximum total of 5 calendar days. If the equipment fails to operate for a total of five or more calendar days, testing will be restarted. The Engineer will furnish the Contractor with a letter of approval and completion stating the first and last day of the 60-day test period.

Response:
Agree with most of the proposed changes. However, the ITS Section feels that the statements providing the option for the Engineer to extend an "in-progress" 60-day test period when total downtime has exceeded 5 days should remain. Text has been modified accordingly.

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Daktronics, Inc. **January 5, 2009**
Review and Comment of FDOT 781 DMS Specification

Comments:
Previous FDOT projects have mentioned specific LED manufacturers being approved for use in Florida. I do not see that language anywhere in the current specification. Does it need to state or require that the LED product must be listed on the APL list?

Response:
The Department has no desire or intention of approving the discrete components within product assemblies. They are reviewed during the product approval process, but not individually identified and certified. However, following successful device approval, the manufacturer is required to notify the

TERL of any design or component changes. The subsequent potential need to re-evaluate the device or the new component will be at the discretion of the Department.

In general, I would suggest that you title the freeway DMS requirements and the arterial DMS requirements as such. There are arterial signs with 18" characters, and freeway signs with 12" characters, and if a project requires such in the future I can see where contractors would be confused as to which spec applies.

Response:
Disagree. Due to the fact that these devices may be used for a variety of applications, the Department has chosen to instead differentiate the two current types by stating the minimum character size that they are able to produce using a minimum 5x7 pixel configuration for a single character. Companion documents and design guidance provided and/or adopted by the Department (such as the PPM, MUTCD, etc.) restricts the use of characters less than 18-inches in height on freeway applications. In addition, the pay item numbers used for procurement of these devices should also prevent confusion on which type is required.

781-3.1.2
The language in this section describes the sign external housing, and additional language describes cable attachments. Is the line "no adhesive attachments shall be allowed" apply only to the cable attachments? If it applies to the sign external housing, please read below in regard to chemical bonding.

Response:
The statement was originally intended to apply to the cable attachments. The ITS Section feels that adhesive bonding of other exterior sheeting, etc. is unproven and new to FDOT. FDOT therefore intends to require that welded construction remain the standard until such a time as adhesive techniques have been fully demonstrated and proven to the Department. Devices that utilize alternative construction methods should be submitted to the Traffic Engineering Research Laboratory for consideration.

Add this statement…
Chemical Bonding

> An alternate method of attaching the aluminum sheet to the cabinet extrusion shall be the use of a two-part chemically bonding structural adhesive. The adhesive shall be applied in a continuous bead on all cabinet extrusion surfaces that contact the aluminum sheet. The adhesive shall provide the necessary structural bond between the aluminum sheet and the cabinet extrusion as required by the contract specifications and other pertinent standards and codes. The adhesive shall ensure a watertight seal is obtained around the entire perimeter of the cabinet and where any aluminum sheets are spliced.
>
> To ensure that appropriate procedures are followed to bond the aluminum sheet and cabinet extrusion, the structural adhesive manufacturer shall certify the VMS manufacturer. The VMS manufacturer is responsible for performing all necessary testing of the adhesive to meet all requirements of the contract specifications.

Response:
No changes will be made to the document at this time. Devices that utilize alternative construction methods should be submitted to the Traffic Engineering Research Laboratory for consideration.

781-3.1.2
The language states that the sign shall have brackets to adjust the vertical alignment from 0-10 degrees. If future contract documents require a 30-degree viewing cone, can these tilt brackets be excluded or can the 0-10 degree tilting mechanism requirement be removed from the standard specifications and only be required if show on the plans?

Response:
Document has been modified to remove the reference to a specific design that requires adjustable brackets to accommodate different vertical alignments in favor of a functional requirement for minimum legibility distance.

781.3.1.2.2.3
Leave the statement "The Engineer may approve alternate designs. Clear polycarbonate is more readily available than the opaque polycarbonate and provides clearer viewing of LED's cone of vision.

Response:
The opacity refers to the level of UV protection offered by a clear shielding layer (which is often clear polycarbonate, Lexan, etc., offering UV protection). This is not a requirement for a visibly opaque material. ITS Section feels that no change to the document is necessary at this time.

781.3.1.2.5
Remove snap disk and just state it needs a thermostat that is independent of the sign controller.

Response:
To date, there have been no known operational issues that would warrant such a change. If Daktronics wishes to submit alternate designs for consideration, then please provide the engineering rationale for such a change.

781.3.1.2.9
State that the timer should be 4-12 adjustable~~.~~.

Response:
FDOT does not wish to lower the stated requirement at this time.

781.3.1.3.4
Make a statement that all PCBs including power supplies, motherboards shall be conformal coated.

Response:
To date, there have been no known operational issues that would warrant such a change.

781.3.1.3.4
Remove the statement "do not epoxy to encapsulate the LED's"

Response:
To date, there have been no known operational issues that would warrant such a change. If Daktronics wishes to submit alternate designs for consideration, then please provide the engineering rationale for such a change to the FDOT Traffic Engineering Research Laboratory.

781.3.1.6
More detailed information or clarification is needed to define the UPS System. The location of the system, along with intent of what components required during back-up mode need to be clearly defined.

Response:
This is currently detailed in Sec 781-3.1.9 with the statement "Mount the following components inside the DMS walk-in housing: sign controller, display system interface circuits, display modules, power supplies, local and remote control switches, LED indicators, an Electronic Industries Alliance (EIA)-232 plug-in connection for laptop computers, EIA-232 null modem cables (minimum of 4 feet long for connecting laptop controller to sign controller), a UPS system, workspace for a laptop computer, and communication equipment and transient voltage surge suppressors."

Due to ongoing product evaluation activities at TERL and feeback from District users, we feel that the designer should also have the option to locate the UPS system in an alternate location if necessary and will add text to the document to allow this option. As part of DMS certification, the TERL has required that the UPS components be the same, regardless of their location and required DMS manufacturers to submit a representative example using either a ground or housing-mounted UPS system and design documentation that describes in sufficient detail how the alternative option would be configured using the same UPS components. Location of the UPS system, by default, should be within the housing for walk-in DMS. However, text has been modified to permit the designer to detail an alternate location in the plans when necessary.

781.3.1.7
3 each of the UPS, should be Power supplies not UPS systems. Please clarify what “three uninterruptible power supplies” means as to spare parts. Typically a UPS system includes four batteries and one control unit. For spare parts, does FDOT want spare batteries? Complete UPS systems?

Response:
The reference to Uninterruptible Power Supplies refers to a complete UPS system. However, the document has been modified to reduce the quantity required.

781.3.1.8
The statement “mount the controller within the sign housing using”…..Do you always want the controller in the sign housing??

Response:
The intent of this requirement is to afford physical protection and security for the main sign controller and to provide equivalent interfaces for local operation of the sign at 2 locations: first, inside the sign; and second, at ground level. Current specifications require that the primary sign controller be located within the sign housing. Compliance with this requirement will be determined during the evaluation and certification of the device by the TERL.

Add this verbage as well to the controller section.

Front Panel User Interface

The sign controller's front panel shall include a keypad and LCD. These devices shall be used to perform the following functions with the sign controller and VMS:

- Monitor the current status of the sign controller, including the status of all sensors and a monochromatic what-you-see-is-what-you-get (WYSIWYG) representation of the message visible on the display face
- Perform diagnostics testing of various system components, including pixels, power systems, sensors, and more
- Activate messages stored in memory
- Configure display parameters, including display size and colors
- Configure communications port settings and NTCIP options

The front panel interface shall also include:

- Power switch to turn the controller on and off
- LED power "on" indicator
- "Local/remote" switch that places the controller in local mode such that it can be controlled from the front panel interface, instead of via the primary NTCIP communication channel
- LED to indicate state of the "local/remote" mode switch
- Reset switch to quickly restart the controller
- LED "Active" indicator that blinks when the controller is operating correctly
- LED to indicate when any of the NTCIP communication channels are active

Memory

The sign controller shall have non-volatile electronically changeable memory. This memory shall be formed by flash or battery-backed static RAM integrated circuits that retain the data in memory for a minimum of 30 days following a power loss. This changeable memory shall be used to store messages and schedules. The controller memory shall be capable of storing a minimum of 100 changeable messages in non-volatile RAM.

Internal Clock

The VMS sign controller shall contain a computer-readable clock that has a battery backup

circuit. The battery shall keep the clock operating properly for at least 5 years without external power, and the clock shall automatically adjust for daylight savings time and leap year using hardware, software, or a combination of both. The clock shall be set electronically by the sign controller microprocessor and shall be accurate to within one (1) minute per month.

Communications

All remote communication ports shall be NTCIP-compatible as defined in the "Requirements for NTCIP Compatibility" section of these specifications.

Communication Modes

The VMS sign controller shall be able to receive instructions from and provide information to a computer containing VMS control software using the following communication modes:

- Remotely via direct or dial-up communications with a remotely located computer. The system communications backbone, as well as all field modems or signal converters, shall provide the VMS sign controller with an RS232 signal.

- Locally via direct connection with a laptop computer that is connected directly to the sign controller using an RS232 null modem connection.

Serial Communication Ports

The VMS sign controller shall contain a minimum of three (3) NTCIP-compatible RS232 communication ports. These ports shall support multiple communication interfaces, including, but not limited to, direct null-modem (for local laptop control), dial-up and leased-line modems, radio systems, cellular modems, and fiber optic modems. The RS232 ports shall all have standard DB9M connectors.

The baud rate, connection type, and NTCIP communication protocol shall be configurable. Each port must support all typical serial baud rates ranging from 1200 to 115,200 baud. All three ports shall be capable of supporting either of the following sub network profiles: NTCIP 2101 (PMPP) or NTCIP 2103 (PPP). They shall also be capable of supporting either NTCIP 2201 (Null) or NTCIP 2202 (Internet) transport profiles. Only one each of the transport and sub network profiles shall be active at any time on each port.

Ethernet Port

The VMS sign controller shall contain a minimum of one (1) 10/100Base-T Ethernet communication port. This port shall be available for optional use for communicating from the central control system to the VMS sign controller when an Ethernet network is available. The Ethernet port shall have a standard RJ45 connector.

Communications on the Ethernet port shall be NTCIP-compatible using the NTCIP 2202 Internet transport profile and the NTCIP 2104 Ethernet sub network profile. This shall permit the controller to be operated on any typical Ethernet network using the TCP/IP and UDP/IP protocols.

Dial-Up Modem Communication Port

The VMS sign controller shall include one (1) built-in Hayes-compatible dial-up modem. The modem port shall have a standard RJ11 connector.

This modem shall be configured to support either the NTCIP 2101 (PMPP) or the NTCIP 2103 (PPP) sub network profile. At least one of the following transport profiles shall also be available for configuration: NTCIP 2201 (Null) or NTCIP 2202 (Internet). Only one each of the transport and sub network profiles shall be active at any time on the port.

The modem shall be configurable to support both incoming and outgoing calls as supported by NTCIP. The modem shall support a minimum communication speed range from 1200 baud to 28,800 baud. The modem shall support the following protocols at a minimum: Hayes-compatible “AT” command set, MNP5, MNP10, and V.42bis.

Controller Addressing

The VMS sign controller shall use whatever addressing scheme is appropriate for the NTCIP network types used for communications. The controller addressing shall be configurable through the front panel user interface.

NTCIP 2101 (PMPP) networks shall be configured with an address in the range 1 to 255 with a default address of 1. NTCIP 2104 (Ethernet) networks shall use a static IP address. Both the IP address and subnet shall be configurable. NTCIP 2103 (PPP) networks shall not require network addressing.

Transient Protection

The RS232 and Ethernet communication ports in the VMS sign controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

A series/parallel two-stage suppression device shall protect the modem communication port from over-voltage and over-current conditions. This surge protection shall be integrated internally within the controller.

VMS CONTROL OUTPUTS

The VMS sign controller shall transmit and receive data packets to and from the VMS via dedicated fiber optic cables. Copper cables may be used if the controller is located within the sign housing. This network will communicate with all sensors, drivers, and other devices utilizing a CAN (controller area network) bus network running throughout the VMS.

Data transferred shall include pixel states, sensor values, and I/O readings from various devices, such as door sensors and power supply monitors. Pixel data shall include the states to be displayed on the sign face as well as diagnostic data retrieved from the LED drivers.

AUXILIARY CONTROL PANEL

The VMS shall include an auxiliary control panel that will provide a secondary user interface panel for VMS control, configuration, and maintenance. The auxiliary control panel shall meet the same electrical, mechanical, and environmental specifications as the VMS controller. It shall be powered independently from a 120 VAC outlet.

Interface Panel

The auxiliary control panel shall have an LCD panel and keypad identical to those found on the VMS controller. It shall also contain a local/remote switch, a reset switch, status LEDs, and one NTCIP compatible RS232 communication port that meet the same specifications as the VMS controller.

VMS Control Interface

The auxiliary control panel shall include an identical menu system to the VMS controller with all of its features and functionality.

Location

The auxiliary control panel shall be located in one of the following locations:

- If the VMS controller is located in a ground-mounted or pole-mounted cabinet, the auxiliary control panel will be located inside the VMS cabinet to facilitate operation by maintenance workers while working inside the VMS.
- If the VMS controller is located in the VMS cabinet, the auxiliary control panel shall be mounted inside a ground-mounted or pole-mounted cabinet for maintenance access from the ground.

MESSAGING

The VMS controller shall have the ability to display messages on the VMS display face as required herein.

Message Presentation on the VMS Display Matrix

The sign controller shall control the LED drivers in a manner that causes the desired message to display on the VMS sign. At a minimum, the sign controller shall support the following features as described in the VMS specification:

- Display of alpha numeric characters, including letters, numbers, and punctuation
- Selection of particular character fonts style
- Horizontal alignment of text on the display, including left, center, and right justification
- Vertical alignment of text on the display, including top, middle, and bottom justification

- Adjusting the spacing horizontally between characters or vertically between lines of text

- Alternating between pages of a multiple-page message

- Display of graphic bitmaps of various sizes ranging to very small to the size of the entire VMS matrix

Message Effects

The VMS shall be able to display messages using the following types of effects:

- **Static Message –** The selected message is displayed continuously on the sign face until the sign controller blanks the sign or causes the display of another message

- **Flashing Message –** All or part of a message is displayed and blanked alternately at rates between 0.1 seconds and 9.9 seconds. The flash rate is user programmable in increments of 0.1 seconds

- **Scrolling Message –** The message moves across the display face from one side to the other. The direction of travel is user selectable as either left-to-right or right-to-left

- **Multiple-Page Message –** A message contains up to six different pages of information, with each page filling the entire pixel matrix. Each page's display time is user programmable from 0.1 seconds to 25.5 seconds, and adjustable in increments of 0.1 seconds.

Message Activation

Messages shall be activated on a VMS in three ways:

- **Manual –** An operator using the front panel LCD/keypad interface or NTCIP-compatible control software manually instructs a particular message to be activated.

- **Schedule –** The internal time-based scheduler in the VMS may be configured to activate messages at programmable times and dates. Prior to activation, these messages and their activation times and dates shall be configured using the control software.

- **Events –** Certain events, like a power loss, may trigger the activation of pre-configured messages when they occur. These events must be configured using the control software.

A displayed message shall remain on the sign until one of the following occurs:

- The message's duration timeout expires
- The controller receives a command to change the message
- The controller receives a command to blank the sign

- The schedule stored in the controller's memory indicates that it is time to activate a different message
- A special event, such as a loss of communication, occurs that is linked to message activation

It shall be possible to confer a "priority" status onto any message, and a command to display a priority message shall cause any non-priority message to be overridden.

Schedule Activation

The VMS sign controller shall support the activation of messages based on a time/date-based schedule. The format and operation of the message scheduler shall be per the NTCIP 1201 and NTCIP 1203 standards.

Display of Alphanumeric Text

The VMS sign controller shall support the storage and use of a minimum of twelve (12) font sets with which messages can be formatted and displayed. Each font shall support up to 255 characters. All text font files shall include the following characters:

- The letters "A" through "Z", in both upper and lower case
- Decimal digits "0" through "9"
- A blank space
- Eight (8) directional arrows
- Punctuation marks, such as: . , ! ? – ‘ ’ “ ” : ;
- Special characters, such as: # & * + / ( ) [ ] < > @

The VMS supplier shall provide the VMS controller with the following fonts preinstalled. The controller shall support changing or replacing these fonts from the central software using NTCIP.

Font Name	Character Height	Character Width (avg.)	Variable or Fixed Width	Stroke Width
7x4	7	4	Variable	Single (1)
7x5	7	5	Fixed	Single (1)
7x6	7	6	Variable	Double (2)
Graphic 7	7	N/A	Variable	N/A
8x4	8	4	Variable	Single (1)
8x6	8	6	Variable	Double (2)
9x6	9	6	Variable	Double (2)
11x7	11	7	Fixed	Double (2)
14x8	14	8	Fixed	Double (2)
14x10	14	10	Variable	Triple (3)
16x8	16	8	Variable	Double (2)
16x10	16	10	Variable	Triple (3)

Table 1: *Font Table*

Display of Graphic Images

The VMS control software shall support the inclusion of graphics in messages. If the NTCIP 1203 v2 standard has not reached a “recommended” or “approved” state by the time of contract award, the vendor shall support graphics using manufacturer-specific objects and MULTI tags.

If a manufacturer-specific means of supporting graphics is used, the vendor shall commit to provide NTCIP 1203 v2 firmware updates at no cost to the customer. These updates will include all current requirements of these specifications and also standard graphics support. The vendor shall install the updates no later than six months after the NTCIP 1203 v2 standard reaches the “approved” state.

VMS INTENSITY CONTROL

The VMS controller shall provide means to change the brightness of the display matrix manually or automatically. The manual control will allow the user to select one of at least 100 intensity levels, which will be communicated to the LED drivers in the VMS. The brightness shall remain at that level until the user changes the level or sets the controller to automatic mode.

The automatic intensity control mode will monitor the ambient light sensors of the VMS and will use a mathematical algorithm to automatically select one of the 100 or more intensity levels. The intensity level will then be transmitted to the LED drivers in the VMS. The algorithm used to calculate the intensity level shall be determined by the manufacturer and tested under real-world lighting conditions.

The intensity control mode, manual or automatic, shall be settable via NTCIP using the control software or via the front panel interface. The manual brightness level shall be settable via the software or front panel. The mode and brightness level shall be monitored from both the software or front panel interfaces.

SYSTEM STATUS MONITORING AND DIAGNOSTIC TESTING

The VMS controller shall be capable of monitoring the status of many of the VMS components and subsystems in real-time and/or manual modes, depending on the component or system. The following sections detail the status and diagnostic information that shall be provided by the controller. All of this status and diagnostic data shall be available via the front panel LCD screen and shall be transmitted via NTCIP to control software upon request.

Message Display Status

The VMS controller shall be capable of monitoring and displaying the currently active message (if any) on the controller’s front panel LCD display. This display shall be in a WYSIWYG format.

LED Pixel Testing

Upon command from either the front panel control interface or via NTCIP from remote control

software, the sign controller shall direct all of the LED modules to perform diagnostic tests of all their pixels. The controller shall then collect and report the results of the pixel testing.

The controller shall also be capable of automatically detecting in real-time the status of each of the display's pixels and reporting their on/off status. This monitoring shall take place without interfering with the display of data on the VMS face.

Power Supply Operation

The sign controller shall monitor and report the functional status of regulated DC power supplies located in the VMS by monitoring diagnostic outputs located on the supplies. The controller shall monitor the output voltage of each power supply and the status of each output fuse. The power supply voltages shall be measured to the nearest tenth of a volt and the fuse status shall be indicated as pass or fail.

Door States

If the VMS or control equipment cabinet is equipped with access doors and sensors to monitor their open status, the controller shall monitor the status of those doors.

Fan Operation

If the VMS is equipped with fan diagnostic systems, the controller shall monitor and report the status of the fans.

Environmental Conditions

The VMS controller shall monitor the readings of all light, temperature, and humidity sensors installed in the VMS housing.

ERROR NOTIFICATION

The VMS sign controller shall be capable of automatically informing a maintenance operator (via the local LCD panel) and a central control system (via NTCIP communication) of the occurrence of important events and subsystem failures.

All major component and subsystem errors shall be indicated on the controller's LCD front panel.

The controller shall be capable of sending event notifications to the central control system via SNMP "traps" as allowed by NTCIP. When one of these events occurs, the sign controller shall create a data packet for transmission to the central controller that shall contain details about the event. The transmission of traps shall be governed by the NTCIP standards. The controller shall be configurable to enable or disable the transmission of traps for each event or error type. This configuration will include the automatic initiation of these traps, including establishing telephone modem connections if appropriate, when the NTCIP network permits transmission initiation by the sign controller.

The following sections list errors and events that the controller shall report as defined above.

Over Temperature Shutdown

The VMS controller shall continuously monitor the VMS housing's temperature sensors and shall automatically shut down the VMS if the internal cabinet temperature exceeds a safety threshold. This threshold shall have a default value of +140ºF (60ºC) and shall be configurable at the controller.

If the temperature approaches the threshold the controller shall reduce the brightness of the sign face. If the temperature continues to increase and exceeds that threshold, the controller shall trigger a warning notification event and blank the face of the sign. The sign face will remain blank until the temperature begins to drop. As the temperature drops, the controller will gradually increase the brightness of the display face, eventually returning to full brightness.

The sign controller shall employ an algorithm to control the above brightness reductions and increases utilizing hysteresis to ensure that the display face does not visibly flicker as the temperature changes.

The event notifications sent for over temperature situations will include visual indication on the controller's front panel LCD, as well as a trap notification sent to the central control system.

Controller Restart

When the VMS controller detects that it has been restarted due to a manual reset or error condition, it shall send a trap notification to the central system. It shall also automatically activate the NTCIP reset message if it is configured to do so.

Power Loss

When the VMS controller detects that it has lost power, it shall automatically indicate that on the front panel LCD. It shall also send a trap notification to the central system and activate the NTCIP power loss message if configured to do so.

Power System Failure

The VMS controller shall automatically monitor the major power systems in the sign and detect when one of them has failed. These failures will be reported on the front panel LCD and transmitted to the central system in the form of a trap.

Door Opened

When the sign controller detects that one of the sign cabinet or control cabinet doors has been opened, it will transmit a trap to the central system indicating which door has opened.

Communication Loss

The VMS controller shall monitor the frequency of communication packets from the central system. If the controller detects that communication has not occurred

between the controller and central system for longer than a configurable timeout, then the controller will automatically activate a communication loss message as defined by NTCIP. This communication loss message shall be configurable and may be disabled as allowed by NTCIP.

Response:
To date, there have been no known operational issues that would warrant such changes.

781-3.1.9
Define location of UPS system as mounted in sign or traffic cabinet, as defined in plans.

Response:
Document modified to require UPS be installed in housing unless shown otherwise in plans within section 781-3.1.6 (UPS).

781-3.2
Include option for Chemical Bonding as an alternate method of attaching aluminum sheeting. The chemical bonding method will eliminate a portion of the distortion that occurs during the welding process. (See walk-in section 781-3.1.2 for details for alternate of chemical bonding).

Response:
The ITS Section feels that adhesive bonding of other exterior sheeting, etc. is unproven and new to FDOT. The document will remain unchanged and require that welded construction remain the standard until such a time as adhesive techniques have been demonstrated and proven to the Department. Devices that utilize alternative construction methods should be submitted to the Traffic Engineering Research Laboratory for consideration.

781-3.2.2
Please ask FDOT to clarify the statement “non-display external skin of the sign housing”. What is it? Where is it? Why does the walk in require a thickness of 0.125” and the arterial is 0.090”?

Response:
The statement refers to all external surfaces other than the display. The difference in thickness was a result of initial review of currently offered products in the marketplace. Since the specification contains minimum requirements, thicker material would be acceptable.

781-3.2.3.2
This language states that no encapsulated LEDs are to be used.

Response:
Duplicate text. Text has been modified to remove "Do not use pixels in which the LEDs are encapsulated." from sec. 781-3.1.3.3 and 3.2.3.2 since the prohibition of epoxy-encapsulate LEDs is stated elsewhere.

781-3.2.2.2.3
Leave in “Engineer may approve alternate” for opaque polycarbonate.

Response:
The opacity refers to the level of UV protection offered by a clear shielding layer (which is often clear polycarbonate, Lexan, etc., offering UV protection). This is not a requirement for a visibly opaque material. ITS Section feels that no change to the document is necessary at this time.

781-3.2.2.5
I would delete the language that states "if a ventilation system is required". It would appear that a ventilation would be required, based on the following items:

781-3.2.2.2.3 This language states the arterial DMS is to have a front masking, specific aperture size, environmental protection, etc.

781-3.2.3.3 This language states that the arterial DMS LEDs are to be protected from the environment without hoods, louvers, cylinders, etc.

Response:
No change necessary. A forced air ventilation system is not mandated but is also not prohibited.

781-3.2.6
As in walk-in section, please provide definition of intent for operation of back-up system along with location of batteries, or need for traffic cabinet as defined in plans.

Response:
Due to size constraints for Smaller, non-walk-in DMS, the expectation is that the UPS system will not be installed in the sign housing. However, should technology allow this to occur, it would not be prohibited.

781-3.2.7
3 each of the UPS, should be Power supplies not UPS systems. Please clarify what "three uninterruptible power supplies" means as to spare parts. Typically a UPS system includes four batteries and one control unit. For spare parts, does FDOT want spare batteries? Complete UPS systems?

Response:
The reference to Uninterruptible Power Supplies refers to a complete UPS system. However, the text has been modified to reduce the quantity required.

781-3.2.8
Add comments from 781-3.1.8 under walk-in section.

Remove "mount the sign controller within the sign housing" or add that it is mounted per the plans.

Response:
The ITS section has determined that the document will remain unchanged at this time. Devices

that utilize alternative configurations should be submitted to the Traffic Engineering Research Laboratory for further consideration.

781-3.11
I would ask FDOT to delete the word "preferably" from the on-site technical assistance. This would make on-site manufacturer assistance a mandatory requirement.

Response:
To date, there have been no known problems with this requirement that would warrant such a change.

781.3.2.3.2
The statement about 40 candelas per pixel…In the 12" spec…

Daktronics display will produce an overall luminous intensity of 9200cd/m2 which equals 40cd/pixel with a pitch of 2.6" on the 18" signs. Using this same calculation, the Daktronics VF-2420 will produce a minimum luminous intensity of 9200 cd/m2 using a 1.75" pitch, however, due to the number of pixels per square area, the display will be produce 19cd/pixel.

Calculation:

(1000mm/46mm pixel pitch)=21.74^2
=472 pixels /$meter^2$
=9200/472
=19.5 candelas/pixel

(1000mm/66mm pixel pitch)=15.15^2
=229 pixels/$meter^2$
=9200/229
=40 candela/pixel

This is due to the requirement of 30-degree LEDs in arterial signs.

Response:
This issue is currently under further investigation by the Traffic Engineering Research Laboratory. The requirement will be revisited during product approval and modified at a later date if necessary.

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Comments:

1) 781-3.12.1.1 Pre shipment factory demonstration testing. This used to be the Factory Acceptance Test that FDOT reps would travel to Wisconsin, N. Dakota, etc. to view the sign operation. It is unnecessary to have the manufacturer notify the engineer a minimum of 30 days prior to the start of the test. Why do we care if it works in their building under perfect conditions? This is only an excuse for someone to travel out of town. When you buy a car you don't care if it worked at the factory only that it works for you day to day. We should not write specifications that tie us into responsibility that the manufacturer should shoulder alone. Furthermore, this specification states that upon satisfactory completion of all pre shipment testing the engineer will release the sign for shipment. We then take on additional liability. The shipment and handling in transit often causes

internal damage to components that require repair prior to placing the sign on the structure. This should be on the contractor since we don't pay for something until they demonstrate that it is working properly. It appears that we keep trying to "insert" ourselves into the process and this creates shared liability in the eyes of a contractor.

2) 781-3.12.3 These items are addressed during the pre install field testing when we are present at the contractor's yard to view the sign and observe the sign operation, auto dimming for night time (photocell), etc. We had one that passed this fine and then required attention once it was mounted. Shipping and handling play a big part in what we get in the field. We only care if it runs properly once it is on the structure. With the manufacturer's warranty in place after construction and burn-in, we are covered if there is a defect, but anything till final acceptance should be 100% on the contractor.

Response:

1) *Agreed. The need for a representative to travel to the factory is not necessary if the TERL certifies the design of the device. Document has been modified accordingly.*

2) *Agree that the installed field tests are the most crucial, particularly if the product has already been demonstrated/delivered to FDOT-TERL, evaluated, certified, and placed on the APL. However, there have been occassions when testing at the contractor facility prior to intallation has allowed an opportunity to identify and correct damage done in transit, etc. prior to installation over the roadway, so the ITS section feels that the language requiring inspection and testing at the contractor's facility remain. It is the opinion of the ITS Section that successful completion of these tests and acknowledgement that testing results have been received by the Engineer does not remove responsibility for providing a fully-functional, properly installed and working system from the manufacturer or contractor.*

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Comments:

Comments pertaining to 7810100:

1- Section 781-3.1.1, third paragraph: why specifying the fifth edition of this AASHTO Spec? FDOT has not adopted that version. The latest Structures Design Guidelines, section I.6, refers to the 4th edition plus Interims.

Response:

The Department is releasing a number of other specifications that are updating requirements to reference the fifth edition. This change is being made to harmonize content across multiple specifications due for implementation July09.

~~1-~~

1- Section 781-3.2: same comment as above. We are still using the 4th Edition, with Interims through 2006.

Response:
Same as above.

~~1-~~

1- 781-3.7: why do the sign support structures meet 700-2.4? Specifications Section 700-2.4 is "Temporary Construction Sign Supports".

Response:

~~1-~~ *Section 700-2.4 is in the process of revision and 700-2.4 will be the section dealing with "Overhead Sign Structures" (currently 700-2.5). The reference will be correct when all changes are implemented in July09.*

~~Response:~~

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Comments:
This proposed specification requires all 18" signs to be a walk-in type. May want to consider removing walk-in type requirement for arterial signs.

Response:
The specification is currently written to define the technical requirements for typical devices. If a designer wishes to utilize a specialized device, such as an arterial DMS with an 18" 5x7 character, then the preference of the ITS Section would be for these exceptions to be evaluated and approved on a case-by-case basis using the MSP request process.

Page 8: • Delete last sentence: "Ensure that capacitors are mechanically supported by a clamp or fastener that is resistant to cracking, peeling, and discoloration." In the past 10 years, film capacitors are attached to the circuit boards using surface mount technology which makes the use of clamps impossible.

Response:
Agree that surface mount film capacitors do not require mechanical support. Text has been modified accordingly.to read "Ensure capacitors that are not surface mount components are mechanically supported by a clamp or fastener that is resistant to cracking, peeling, and discoloration."

Page 9:
• Delete second sentence: “Ensure all transistors, integrated circuits, and diodes are a standard type, listed by the EIA, and clearly identifiable.” This requirement is a standard methodology in electronic design.

Response:
Agree. This language was originally included in order to ensure that certain practices and characteristics of professionally produced non-prototype products are required. There is no harm in stating certain requirements which may seem obvious in order to provide the Department an opportunity to accept or reject devices based on non-conformance to standard methodologies. Since the text has not been known to have any negative impact from a Department perspective, we feel that no change is required.

• For section 781-3.1.8 Sign Controller may want to consider adding a time frame.

Response:
NTCIP Specifies timeframes for responses to communication requests, etc. There is no current requirement for a set time limit for devices to reach an operational state following the initial application of power (POST, recovery from watchdog resets, etc.). To date, there have been no known problems with excessive recovery time or other timeframes that we feel would warrant a change at this time. We encourage the commenter to contact and provide additional information to the Traffic Engineering Research Laboratory if she has specific concerns regarding timeframes or observed operational difficulties with a particular device or product.

Page 11: • For 781-3.1.11 Sign Controller Communication Interface section may want to ensure that the logged events can be sorted on date, sign, name and location.

Response:
The comment appears more applicable to the central control system software rather than events logged internally in the sign controller. Comment has been noted for future consideration, but no change will be made to the document at this time.

Page 12: • Delete first sentence because it was mentioned previously “In the event of a power or sign controller failure, ensure that the sign controller blanks any message displayed.”

Response:
The duplication is due to the statement being in both requirements for the 12" and 18" sign sections. Both are required to blank, however, the text has been revised to indicate that the devices can be programmed to display a user-defined message, including a blank page, in the event of power loss.

Page 26-27: • Sections 781-3.12.1.1 Temperature and Condensation, 781-3.12.1.2 Primary Power Variation, 781-3.12.1.3 Relative Humidity, 781-3.12.1.4 Vibration, and 781-3.12.1.5 Water Spray Hose Test could be removed. Once the manufacturer provides documents for these test results to TERL and TERL puts the manufacturer on APL/QPL it is enough.

Response:
The APL approval process uses these specifications as a basis for device evaluation and approval. Unless these requirements are relocated to another document published by the Department, then they must remain here in order for the TERL to evaluate products against these criteria.

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Comments:
Recommend that this section include a statement to clarify the requirement that the devices described by these specifications be listed on the Approved Product List. While many already understand that this is the case, there have been a number of inquiries to our office on the topic of "is APL required for [insert device here]?". While Section 780 does already in fact require APL of all ITS devices, having it reinforced in each ITS section would be an improvement and would be similar to similar language in other sections of the State Specifications for Road and Bridge Construction that require APL or QPL listing.

Response:
Agreed. Document modified accordingly.