



Solicitation Information
FEBRUARY 18, 2013

Continuous Recruitment #36

TITLE: Dynamic Message Signs (DMS) and Portable Variable Message Signs (PVMS) Services

SUBMISSION DEADLINE: Continuous Recruitment through February 28, 2014 at 11:30 am

PRE-BID/PROPOSAL CONFERENCE: NO

Questions concerning this solicitation may be e-mailed to the Division of Purchases at questions@purchasing.ri.gov. Please reference **CR #36** on all correspondence. Questions received, if any, will be posted on the Internet as an addendum to this solicitation. It is the responsibility of all interested parties to download this information.

SURETY REQUIRED: NO
BOND REQUIRED: NO

Lisa Hill 
Chief Buyer - DOT

Vendors must register on-line at the State Purchasing Website at www.purchasing.ri.gov.

NOTE TO VENDORS:

No offer will be considered that is not accompanied by a completed and signed Bidder Certification Cover Form.

THIS PAGE IS NOT A BIDDER CERTIFICATION FORM

**CR-36 - Continuous Recruitment for
Dynamic Message Signs (DMS) and Portable Variable Message Signs (PVMS)**

The State of Rhode Island, Department of Administration/ Division of Purchases (RIDOA), on behalf of the Rhode Island Department of Transportation (RIDOT) is seeking to establish a qualified service provider (PROVIDER) list to furnish and install **DYNAMIC MESSAGE SIGNS (DMS)** and/or **PORTABLE VARIABLE MESSAGE SIGNS (PVMS)** in accordance with the terms of this solicitation and the State's General Conditions of Purchase, which is available on-line at www.purchasing.ri.gov. Interested Respondents must meet the criteria, terms, and conditions, expressed in this solicitation in order to be included under this continuous recruitment listing. Firms are invited to submit their products for one or both types of signs. The technical specifications for **DMS (OVERHEAD MOUNT)** are listed on PAGES 5 to 11 and for **DMS (GROUND MOUNT)** on PAGES 20 to 25. The technical specifications for **PVMS** are listed on PAGES 11 to 19. RIDOT will separately approve and maintain lists of qualified firms for the three sign types.

PURPOSE:

General Contractors bidding on any RIDOT construction contract(s) which includes the furnishing and installation of DMS and/or PVMS line items must sub-contract with the qualified PROVIDER(S) listed under CR-36. Only products furnished by these pre-approved PROVIDER(S) that meet RIDOT'S Intelligent Transportation Systems (ITS) specifications will be eligible. This requirement will be incorporated into the project specific bid specification; failure to comply with this requirement will result in disqualification of the bid.

Interested PROVIDER(S) will be required to submit their technical qualifications in line with the direction cited in this RFP and will be required to also provide a live demonstration of DMS/PVMS product at the RIDOT headquarters for review by RIDOT personnel and ITS Consultant staff. All technical qualification submissions received by RIDOA in line with this request will be subsequently forwarded to RIDOT for qualification review; at that time, RIDOT will subsequently contact the candidate PROVIDER to schedule a live product demonstration. All transportation and related costs including lodging and per diem for RIDOT personnel and consultants to witness the DMS and/or PVMS performance demonstration shall be paid for by the PROVIDER.

PROVIDER(S) who satisfy all technical and performance requirements will be approved by RIDOT and recommended to RIDOA for inclusion on the active CR-36 listing. **There shall be no reference to any pricing included as part of this continuous recruitment solicitation.**

Only those firms that are qualified by this process will be approved to provide DMS and/or PVMS on all ITS related work items for RIDOT during the continuous recruitment qualification period. To ensure that the list of eligible firms is dynamic and allows for the addition of new firms, RIDOT in conjunction with RIDOA will issue a **Continuous Recruitment (CR)** that will allow for firms to submit their technical qualifications at any time during the active continuous recruitment period up through the scheduled expiration date of February 28, 2014 at 11:30 am.

INSTRUCTIONS AND NOTIFICATIONS TO RESPONDENTS:

- All Respondents shall register online at the RIVIP'S Internet website @ www.purchasing.ri.gov
- A fully completed signed **RIVIP Bidder Certification Cover Sheet** – All three pages shall accompany response submitted. Failure to make a complete submission inclusive of this three-page document may result in **disqualification**. A copy of this 3-PAGE certification form should be in all proposals (originals and copies) submitted to the State for consideration.
- Should there be a need for assistance in registering and/or downloading any document, call (401) 574-8100 for RIVIP HELP DESK technical assistance. Office Hours: 8:30 AM – 4:00 PM.

- The Rhode Island Department of Transportation, in accordance with Title VI of the Civil Rights Act of 1964, 42 U.S.C. §§ 2000d - 2000d-4 and 49 C.F.R. Part 21, Non-discrimination in Federally-Assisted Programs of the Department of Transportation Effectuation of Title VI of the Civil Rights Act of 1964, issued pursuant to such Act, hereby notifies all Respondents that it will affirmatively insure that in any contract entered into pursuant to this advertisement, Disadvantaged Business Enterprises will be afforded full opportunity to submit a response to this continuous recruitment and will not be discriminated against on the grounds of race, color, sex, national origin, age or disability in consideration for award.
- The State does not require E-VERIFY compliance in any of its purchasing and/or hiring of services; however, Respondents are hereby advised that in line with the Federal Acquisition Regulations any federal contract based on the services requested may require that the State obtain evidence of E-VERIFY compliance from the successful Respondent.
- In accordance with RI Gen. Laws 7-1.1-1401, no **foreign corporation** (a corporation established other than in Rhode Island) has the right to transact business in this State until it has procured a Certificate of Authority to do so from the Office of the Secretary of State (401) 222-2357. If applicable, a copy of Respondent's certificate of authority must be included as part of the submission.
- Potential Respondents are advised to review all sections of this CR solicitation carefully and to follow instructions completely, as failure to make a complete submission as described elsewhere herein may result in rejection of the proposal.
- All costs associated with developing or submitting a response to this CR solicitation, or to provide oral or written clarification of its content shall be borne by the Respondent. The State assumes no responsibility for these costs.
- Responses misdirected to other State locations or which otherwise are not received by the State Division of Purchases by the established due date for any cause will be determined to be late and will not be considered. The office clock, for the purpose of registering the arrival of a document, is in the reception area of the Department of Administration (DOA), Division of Purchases, One Capitol Hill, Providence, Rhode Island.
- Respondents are advised that all materials submitted to the State of Rhode Island for consideration in response to this CR solicitation will be considered to be public records, as defined in Title 38 Chapter 2 of the Rhode Island General Laws, without exception, and will be released for inspection immediately upon request, once a determination has been made.
- Interested parties are instructed to peruse the RIDOA/ Division of Purchases web site @ www.purchasing.ri.gov on a regular basis as additional information relating to this CR solicitation may be released in the form of an Addendum to this solicitation.
- RIDOT encourages the utilization of DBE firms on all projects and will monitor any and all DBE participation. A list of current Rhode Island State certified DBE firms may be obtained through the State's MBE Office website at www.mbe.ri.gov . Any questions should be directed to:

**RIDOT Office of Business and Community Resources
Two Capitol Hill, Room 109
Providence, RI 02903
(401) 222-3260**

EVALUATION AND SELECTION – PASS/FAIL

This is a Continuous Recruitment solicitation.

All responses received by RIDOA during the continuous recruitment period will be subsequently forwarded to RIDOT for review and evaluation. The determination of the qualified firms will be based on the technical qualifications and a visual demonstration (**PASS/FAIL**). RIDOT will then inform RIDOA in writing of all qualified firms eligible for inclusion on CR-36 as well as any firms who failed to attain eligibility status based on their technical qualifications submission and their visual demonstration. Unsuccessful firms will be formally notified by RIDOA.

RIDOA will create, augment, and maintain a qualified listing of eligible firms for the duration of the recruitment period for **CR-36 Dynamic Message Signs (DMS) and Portable Variable Message Signs (PVMS) Services.**

ACCEPTANCE CRITERIA

In addition to the technical requirements provided herein, Applicants must also satisfactorily meet all of the elements of the qualification process listed below; Qualification submissions must include completed responses to each of the following SEVEN (7) acceptance criteria.

1. **STAFFING:** Each Applicant shall have an established, fully staffed certified manufacturer's service representative office within 200 miles of RIDOT'S Transportation Management Center (TMC) located in Providence, RI. This office must provide SEVEN (7) DAY per week availability.
2. **EXPERIENCE:** Each Applicant shall provide a written description of the company and relevant experience, not to exceed THREE (3) pages and shall have a minimum of FIVE (5) years of experience in the business of manufacturing Light Emitting Diode (LED) signs used to manage vehicular roadway traffic. Applicants should provide a written summary of relevant experience for each type of sign they wish to be qualified to provide.
3. **EQUIPMENT:** Each Applicant shall have installed a minimum of FIVE (5) independent LED sign systems in the United States of America that have remained operational and accepted by the owning agency for a period of at least ONE (1) year. Each LED sign system shall comprise of a minimum of FIVE (5) signs of the type the Applicant wishes to be qualified to provide and that communicates to a remote control computer system using NTCIP 1203 Version 2.39b. Applicants should provide a relevant client list with contact information for each type of sign they wish to be qualified to provide.
4. **CORPORATION:** Each Applicant shall be in business under the same corporate name for a period of not less than TWO (2) years.
5. **QUALITY MANAGEMENT:** Each Applicant shall utilize a documented in-house quality management procedure that has been in place for not less than TWO (2) years.
6. **REFERENCES:** Each Applicant shall include all relevant professional references for the proposed DMS and/or PVMS including phone numbers and contact information and complete documentation to verify the DMS and/or PVMS manufacturer qualifications.
7. **ADDITIONAL REQUIRED FORMS:** Besides the RIVIP Bidder Certification Cover Sheet, as required at the State level and obtained through the RIVIP website, RIDOT also requires that the following **THREE (3) FORMS** be completed and included in your submission package in line with federal regulations and departmental policy.

- **CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY & VOLUNTARY EXCLUSION** - Signature sheet only must be completed by an authorized agent of your Firm and a copy must be submitted along with EACH response.
- **CERTIFICATION REGARDING DISCLOSURE OF LOBBYING ACTIVITIES (SFF-LLL)** - Enter known project information on PAGE 1 (DESCRIPTION, etc.). Agency must complete and submit FORM signed by an authorized agent of your Firm and a copy must be submitted along with EACH response.
- **W-9 FORM:** Must be completed and signed by CBO authorized agent. Form may be downloaded @ www.purchasing.ri.gov .

SUBMISSION INSTRUCTION AND DELIVERY LOCATION:

Qualification submissions ("Original" + FIVE (5) copies) should be either mailed or hand-delivered in a sealed envelope marked "**CR-36 – Continuous Recruitment for Dynamic Message Signs (DMS) and Portable Variable Message Signs (PVMS) Services** by **February 28, 2014 no later than 11:30 A.M.** to:

<p>BY COURIER OR MAIL: RI Department of Administration Division of Purchases (2nd fl) One Capitol Hill Providence, RI 02908-5855</p>
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NOTE: *Proposals received after the above-referenced due date and time will not be considered.*
SEE GENERAL INSTRUCTIONS AND NOTIFICATIONS.

The State reserves the right to reject any or all submissions based on failure to meet the criteria set forth herewith.

TECHNICAL REQUIREMENTS

<p>FULL COLOR, FULL MATRIX OVERHEAD DYNAMIC MESSAGE SIGN</p>
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Description

1. Work under this qualification shall consist of furnishing, installing, documenting, demonstrating, and testing of a full color, full matrix Dynamic Message Sign (DMS) including sign controller. At the conclusion of the DMS Qualification tests, the manufacturer (PROVIDER) shall remove the DMS and all associated equipment.

2. The full color DMS shall be demonstrated using both a wired and wireless connection to the existing Rhode Island Department of Transportation (RIDOT) Transportation Management Center (TMC) Dynamic Message Sign/Portable Variable Message Sign (DMS/PVMS) control system software. **The TMC'S software is currently Vanguard v4.8.**
 - a. The location of the demonstration will be at the sole discretion of RIDOT, and will require that the full color DMS be connected to a laptop computer with a copy of the exact copy of the DMS/PVMS control software installed at the RIDOT TMC.
 - b. All transportation and related costs including lodging and per diem for RIDOT personnel and consultants to witness the DMS performance and TMC DMS control software compatibility tests at the remote site shall be paid for by the DMS PROVIDER.
3. The DMS shall be designed to be installed on an overhead sign structure with power to be provided by the local commercial utility electrical service.
4. All costs to furnish, transport, install, connect to local utility power, test and remove the DMS shall be paid for by the DMS PROVIDER.
5. RIDOT reserves the right to relax, modify, or revise the requirements if it is in the best interest of the state.

Provisions for National Transportation Communications for ITS Protocol (NTCIP) Compliance and Requirements for Communications with the existing RIDOT TMC DMS/PVMS Control System

1. The DMS sign controller hardware and firmware shall comply with the AASHTO-ITE-NEMA Joint Committee standards for NTCIP.
2. The RIDOT TMC DMS/PVMS Control Software presently supports NTCIP 1203 Version 2.39b and the DMS shall fully support this version of NTCIP 1203.
3. The DMS shall be fully compatible with the existing RIDOT TMC DMS/PVMS Control Software, without changing or replacing the software.

Material, Manufacturing, and Design Standards

The DMS shall be fully compliant with the relevant provisions of the following Standards Publications, Manufacturing Standards, Electrical Codes and Regulatory Documentation:

1. NEMA Standards Publication TS 4-2005, "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements."
2. FHWA-HOP-07-088, "Testing Programs for Transportation Management Systems: A Technical Handbook"
3. National Transportation Communications for ITS Protocol (NTCIP) Standards
4. AASHTO 2009 5th Edition
 - o Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, latest standards, as well as the fatigue resistance requirements of NCHRP Report 412, Fatigue-Resistant Design of Cantilevered Signal, Sign, and Light Supports.
5. Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition, including Interim Approvals
6. National Electric Code (NEC)
7. SBC-5 Rhode Island State Electrical Code
8. National Electrical Manufacturer's Association (NEMA)
9. American Architectural Manufacturer's Association, AAMA 2604-98
10. Underwriter's Laboratory (UL)

Compliance with NEMA Standards Publication TS 4-2005, "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements."

1. The DMS shall be fully compliant with all Mandatory Requirements of NEMA Standards Publication TS 4-2005 as defined in Section 11; Item 11.5, Conformance Table.
2. The DMS shall be fully compliant with all Optional Requirements of NEMA Standards Publication TS 4-2005 as defined in Section 11; Item 11.5, Conformance Table; for all cases noted below.
3. As per the requirements of NEMA Standards Publication TS 4-2005, Paragraph 11.4, Conformance Documentation Requirements; the DMS PROVIDER shall include an authenticated statement of conformance with this Standard from the DMS manufacturer with the qualification submission. This conformance statement shall include a copy of the Conformance Table (Section 11.5 of NEMA TS 4-2005) that shall document which requirements are met with the DMS product proposed, and which requirements are not met by the DMS product proposed. This conformance statement shall be signed by an authorized representative of the DMS manufacturing company.
 - a. If any NEMA TS 4-2005 mandatory requirement cannot be met by the submitted DMS, the PROVIDER shall clearly document this in the completed Conformance Table and shall provide an explanation, if applicable.
 - b. At the request of RIDOT, backup documentation to verify compliance with the Standard shall be provided by the DMS manufacturer.
4. Optional requirements changed to mandatory requirements and non-applicable sections of NEMA Standards Publication TS 4-2005, Conformance Table:
 - a. Environmental – All Requirements Mandatory
 - b. Sign Mechanical Construction
 1. NEMA TS 4 Item 3.1.1.2, Access Panel and Gaskets – Mandatory
 2. NEMA TS 4 Item 3.1.1.3, Vents – Mandatory
 3. NEMA TS 4 Item 3.1.2.1, Ventilation Considerations for Housings that may be Entered – Mandatory
 4. NEMA TS 4 Item 3.1.2.2, Temperature Considerations for Continued Sign Operation – Mandatory
 5. NEMA TS 4 Item 3.1.3.1, Sign Face Material – Mandatory
 6. NEMA TS 4 Item 3.1.3.2, Sign Face Condensation – Mandatory
 7. NEMA TS 4 Item 3.1.4, Galvanic Protection – Mandatory
 - c. Fixed-Location DMS
 1. NEMA TS 4 Item 3.2.2.2, Exterior Housing Finish – Mandatory
 2. NEMA TS 4 Item 3.2.4, Front and Rear Access DMS – Not Applicable
 3. NEMA TS 4 Item 3.2.5, Front Access DMS – Not Applicable
 4. NEMA TS 4 Item 3.2.6, Rear Access DMS – Not Applicable
 5. NEMA TS 4 Item 3.2.7, Walk-in Access DMS – Mandatory
 6. NEMA TS 4 Item 3.2.8, Electrical Service Outlets – Mandatory
 - d. Portable DMS – Not Applicable

e. Controller to Sign Interface

1. NEMA TS 4 Item 4.4.1, Power Supply Locations – Mandatory
2. NEMA TS 4 Item 4.4.2, DMS Controller and Driver Module Locations – Mandatory

f. Display Properties

1. NEMA TS 4 Item 5.5.2, Chromaticity Uniformity – Mandatory, as applicable to full color RGB pixel types.
2. NEMA TS 4 Item 5.8, Moving Arrows – Mandatory

g. Optical Components

1. NEMA TS 4 Item 6.1.2.5, Character Module Spacing for Full Matrix Signs – Mandatory
2. NEMA TS 4 Item 6.1.3, Interchangeability of Character Modules – Mandatory

h. Control Cabinet – All Requirements Mandatory

i. Electronic and Electrical – All Requirements Mandatory

j. Performance Monitoring – All Requirements Mandatory

k. Power Requirements – All Requirements Mandatory

Dynamic Message Sign - Performance Requirements

1. The DMS display shall be a full matrix type to include a minimum of THIRTY SIX (36) full color pixels vertically and ONE HUNDRED TWENTY FIVE (125) full color pixels horizontally. DMSs with higher pixel quantities and denser pixel arrays are acceptable.
2. The DMS display shall provide 18" high characters on a display of THREE (3) rows of characters with a minimum of FIFTEEN (15) characters on each row. The standard character font sets shall include 7x5, 9x6, and 10x7 matrix type characters. Other type fonts may also be included, such as True Type or other specialty fonts.
3. The DMS display panel shall be composed of full color RGB LED's and the display panel shall have a minimum horizontal viewing angle of 30 degrees.
4. The DMS display panel shall incorporate full color pixels with an LED pixel pitch spacing between 21 mm and 46 mm. In order to determine the DMS display resolutions available, the PROVIDER shall identify all pixel pitch options available for their full color, full matrix DMSs.
5. The full color DMS sign display intensity shall meet or exceed 12,400 candelas/m², when the LEDs are displaying the color white.
6. The DMS display system shall be able to display ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location within a message line. In three line operation, the sign shall be able to display single stroke characters with double-column spacing between characters. The DMS shall also be able to display narrower, wider or double stroke character fonts and permit the adjustment of spacing between characters. The spacing options shall be selectable between one, two or three pixel columns.
7. Horizontal alignment of text on the display shall include left, center and right justification.

8. Vertical alignment of text on the display shall include top, middle and bottom justification.
9. The DMS shall be able to display messages utilizing the following methods and effects, at a minimum:
 - a. *Static Message* – The DMS message is displayed continuously until the sign is blanked or another message is commanded to be displayed.
 - b. *Flashing Message* – All or part of a DMS message is displayed and blanked alternately at rates between 0.1 second and 9.9 seconds; user selectable in increments of 0.1 second.
 - c. *Scrolling Message* – The DMS message moves across the display from side to side; user selectable from left-to-right or right-to-left, inclusive.
 - d. *Multi-Page Message* - The DMS message shall include a minimum of two (2) different pages of information, with the entire DMS display area available for each page. Each page's display time shall be selectable from 0.5 second to 25.5 seconds, user selectable in increments of 0.5 second.
10. The DMS shall be able to activate messages utilizing the following methods, at a minimum:
 - a. *Manual Activation* – An operator can select and display a DMS message both locally using the DMS controller's local control panel; and remotely at the TMC using the RIDOT TMC DMS/PVMS Control System.
 - b. *Scheduled Activation* – The DMS Controller shall be programmable from the central RIDOT TMC DMS/PVMS Control System to display selected messages at user defined dates and times. The format and operation of the message scheduler shall be compliant with the provisions of NTCIP 1201 and NTCIP 1203 standards.
 - c. *Event Based Activation* – Certain events such as loss of communications and intermittent power shall be utilized as a trigger for particular message displays and to blank the sign.
 - d. *Priority Activation* – Certain messages shall be able to be designated as "priority" messages and shall override other non-priority message displays.
11. The DMS shall include a DMS Controller to be installed in a separate ground mounted DMS Controller Cabinet. The DMS Controller shall control all features and functions of the DMS including message display, diagnostic testing, environmental monitoring and fault detection.
 - a. The DMS Controller shall include an integral Local Control Panel to permit field personnel to control the DMS locally at the installation site. The Local Control Panel shall permit field personnel to select and display DMS messages, command diagnostic tests, and display test results and fault data locally.
 - b. The DMS Controller shall be password protected.
 - c. The DMS Controller shall include 10/100 Base-T Ethernet port with RJ-45 jack for communications to the RIDOT TMC DMS/PVMS Control System.
 - d. The DMS Controller shall communicate with the DMS via fiber optic cable.
12. The DMS display system and controller shall be compliant with NTCIP 1203 v2.39b. Graphic type messages shall be able to be displayed.

13. The DMS shall include internal temperature monitoring and shall provide a high and low temperature alarm at the RIDOT TMC DMS/PVMS Control System.
14. The DMS shall include a door monitoring system to detect and report door openings on the DMS and DMS Controller Cabinet to the RIDOT TMC DMS/PVMS Control System.
15. The DMS shall include two (2) twelve (12) inch flashing yellow beacons that are controllable, per message, from the RIDOT TMC DMS/PVMS Control System. The flashing beacon heads shall be of an LED type.
16. All metal components shall be protected against rust, corrosion and degradation due to their use in a roadside environment and must be protected by a lead free powder coat guaranteed to withstand 5 years of UV Florida exposures as set forth in AAMA 2604-98.
17. All high voltage electrical components (exceeding 24 VDC) shall be UL listed.
18. The DMS display enclosure shall be rated NEMA Type 3R. The DMS display enclosure and assembly construction shall protect the internal components from falling rain, snow and sleet; and shall be undamaged by the external formation of ice on the display board.

Dynamic Message Sign – Service Access

1. The DMS shall include a walk-in enclosure for DMS service access to minimize distraction and disruption to motorists, as well as to ensure the safety of maintenance personnel.
2. The DMS walk-in enclosure shall provide safe and convenient access to all internal assemblies, components, wiring and subassemblies. All replaceable internal components of the DMS shall be removable by a single technician with the use of simple hand tools. The enclosure shall have a solid floor to ensure that no debris can fall to the roadway below.
3. Control and distribution boxes shall provide access to all components without having to remove other devices or cabling in order to perform service operations. All equipment and devices that require routine maintenance shall have clear access for the maintenance technicians.
4. Locking provisions shall be provided for all DMS Enclosures.

Power, Grounding, Transient Voltage Surge and Lightning Protection Requirements

The DMS PROVIDER shall provide and install all necessary power connections, grounding system and transient voltage surge protection systems for the DMS, DMS Controller and for all associated equipment.

1. Power, grounding, surge and lightning protection equipment shall be as described in these specifications and shall satisfy the following requirements:
 - a. Provide and install all required AC power equipment required for connections to utility and generator provided AC power. This shall include: disconnect switches, circuit breakers, surge suppressors, power distribution equipment and other equipment required to fully power the DMS equipment.
 - b. Provide and install a grounding system and transient voltage surge suppression system for all DMS equipment and associated devices installed in the field in order to protect all equipment from lightning, transient voltage surges and induced current.
 - c. Maintain a resistance to earth ground not to exceed five (5) ohms.

- d. Provide and install surge suppression devices for all incoming communications and power circuits.
- e. Adhere to the applicable requirements of UL 497B, UL 1449 and the NEC regarding grounding and transient surge protection.

2. Requirements for AC Line Power Surge Protectors

- a. The AC Power Line Surge Protector shall be sized for the incoming current and loads to be protected.
- b. The AC Power Line Surge Protector shall filter and absorb power line noise and switching transients.
- c. The AC Power Line Surge Protector shall provide a degree of lightning and lightning induced voltage surge protection.
- d. The AC Power Line Surge Protector shall meet or exceed the following technical specifications:

1. Total Peak Surge Current	80,000 Amps; 40kA L-N, 25kA L-G
2. Repetitive Surge Capacity	5000 Category (C3 High) Impulses with < 10% drift
3. Short Circuit Current Rating	200,000 rms symmetrical amperes (UL Listed)
4. Response Time	< 0.5 nanosecond
5. Temperature Range	-40°F to +140°F (-40°C to +60°C)
6. Regulatory Requirements	UL 1449 Listed

3. Requirements for DMS Sign Controller and Control Equipment AC Power Surge Protectors

- a. The Control Equipment AC Power Surge Protector shall meet or exceed the following technical specifications:

1. Total Peak Surge Current	50,000 Amps for an 8x20 microsecond waveform
2. Continuous Current Rating	15 Amps at 120 VAC, 60 Hz
3. Temperature Range	-40°F to +140°F (-40°C to +60°C)
4. Regulatory Requirements	UL 1449 Listed

- 4. Transient voltage surge protection devices shall be installed on all copper communications cables connecting the control equipment to off-site sources.

PORTABLE VARIABLE MESSAGE SIGN (PVMS)

Description

- 1. Work under qualification item shall consist of furnishing, installing, documenting, demonstrating and testing of a full matrix Portable Variable Message Sign (PVMS) including sign controller. At the conclusion of the PVMS Qualification tests, the PROVIDER shall remove the PVMS and all associated equipment.
- 2. The PVMS shall be demonstrated using both a wired and wireless connection to the existing Rhode Island Department of Transportation (RIDOT) Transportation Management Center (TMC) Dynamic Message Sign/Portable Variable Message Sign (DMS/PVMS) control system software. **The TMC'S software is currently Vanguard v4.8.**

- a. The location of the demonstration will be at the sole discretion of RIDOT, and will require that the PVMS be connected to a laptop computer with a copy of the exact copy of the DMS/PVMS control software installed at the RIDOT TMC.
- b. All transportation and related costs including lodging and per diem for RIDOT personnel and consultants to witness the PVMS performance and TMC PVMS control software compatibility tests at the remote site shall be paid for by the PVMS PROVIDER.
3. The PVMS shall be designed to be installed on a transportable trailer with power to be provided by photovoltaic (solar) power panels in combination with a battery storage and charging system.
4. All costs to furnish, install, test and remove the PVMS shall be paid for by the PVMS PROVIDER.

Provisions for National Transportation Communications for ITS Protocol (NTCIP) Compliance and Requirements for Communications with the existing RIDOT TMC Dynamic Message Sign/Portable Message Sign Control System

1. The PVMS sign controller hardware and firmware shall comply with the AASHTO-ITE-NEMA Joint Committee standards for NTCIP.
2. The RIDOT TMC DMS/PVMS Control Software presently supports NTCIP 1203 Version 2.39b and the PVMS shall fully support this version of NTCIP 1203.
3. The PVMS shall be fully compatible with the existing RIDOT TMC DMS/PVMS Control Software, without changing or replacing the software.

Material, Manufacturing, and Design Standards

The PVMS shall be fully compliant with the relevant provisions of the following Standards Publications, Manufacturing Standards, Electrical Codes and Regulatory Documentation:

1. NEMA Standards Publication TS 4-2005, "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements."
2. FHWA-HOP-07-088, "Testing Programs for Transportation Management Systems: A Technical Handbook"
3. National Transportation Communications for ITS Protocol (NTCIP) Standards
4. AASHTO Standards
5. Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition, including Interim Approvals
6. National Electric Code (NEC)
7. SBC-5 Rhode Island State Electric Code
8. National Electrical Manufacturer's Association (NEMA) Standards
9. American Architectural Manufacturer's Association, AAMA 2604-98
10. Underwriter's Laboratory (UL) Standards
11. UL 1703 Standard for Flat-plate Photovoltaic Modules and Panels

Compliance with NEMA Standards Publication TS 4-2005, "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements."

1. The PVMS shall be fully compliant with all Mandatory Requirements of NEMA Standards Publication TS 4-2005 as defined in Section 11; Item 11.5, Conformance Table.
2. The PVMS shall be fully compliant with all Optional Requirements of NEMA Standards Publication TS 4-2005 as defined in Section 11; Item 11.5, Conformance Table; for all cases noted below.

3. As per the requirements of NEMA Standards Publication TS 4-2005, Paragraph 11.4, Conformance Documentation Requirements; the PVMS PROVIDER shall include an authenticated statement of conformance with this Standard from the PVMS manufacturer with the qualification submission. This conformance statement shall include a copy of the Conformance Table (Section 11.5 of NEMA TS 4-2005) that shall document which requirements are met with the PVMS product proposed, and which requirements are not met by the PVMS product proposed. This conformance statement shall be signed by an authorized representative of the PVMS manufacturing company.
 - a. If any NEMA TS 4-2005 mandatory requirement cannot be met by the submitted PVMS, the vendor shall clearly document this in the completed Conformance Table and shall provide an explanation, if applicable.
 - b. At the request of RIDOT, backup documentation to verify compliance with the Standard shall be provided by the PVMS PROVIDER.
4. Optional requirements changed to mandatory requirements; and non-applicable sections of NEMA Standards Publication TS 4-2005, Conformance Table:
 - a. Environmental – All Requirements Mandatory
 - b. Sign Mechanical Construction
 1. NEMA TS 4 Item 3.1.1.2, Access Panel and Gaskets – Mandatory
 2. NEMA TS 4 Item 3.1.1.3, Vents – Mandatory
 3. NEMA TS 4 Item 3.1.2.2, Temperature Considerations for Continued Sign Operation – Mandatory
 4. NEMA TS 4 Item 3.1.3.1, Sign Face Material – Mandatory
 5. NEMA TS 4 Item 3.1.3.2, Sign Face Condensation – Mandatory
 6. NEMA TS 4 Item 3.1.4, Galvanic Protection – Mandatory
 - c. Fixed-Location DMS – Not Applicable
 - d. Portable DMS
 1. NEMA TS 4 Item 3.3.5.1 Photovoltaic Panels – Mandatory
 2. NEMA TS 4 Item 3.3.5.2 Batteries – Mandatory for Gel Cell Batteries
 3. NEMA TS 4 Item 3.3.5.3 – Mandatory
 - e. Controller to Sign Interface
 1. NEMA TS 4 Item 4.4.1, Power Supply Locations – Mandatory
 2. NEMA TS 4 Item 4.4.2, DMS Controller and Driver Module Locations – Mandatory
 - f. Display Properties
 1. NEMA TS 4 Item 5.5.2, Chromaticity Uniformity – Mandatory
 2. NEMA TS 4 Item 5.8, Moving Arrows – Mandatory
 - g. Optical Components
 1. NEMA TS 4 Item 6.12, Character Module Spacing – Mandatory
 2. NEMA TS 4 Item 6.14, Character Module Replacement – Mandatory

- h. Control Cabinet – Not Applicable
- i. Electronic and Electrical – All Requirements Mandatory
- j. Performance Monitoring – All Requirements Mandatory
- k. Power Requirements – All Requirements Mandatory

General Requirements

1. The PVMS display shall provide 18" high characters on a display of three (3) rows of characters with a minimum of eight (8) characters on each row. The character font sets shall include the standard 5 by 7 pixel type font.
2. The PVMS display panel shall be composed of amber (592 nm) LED's and shall have a minimum horizontal viewing angle of 30 degrees.
3. The PVMS display panel shall be a full matrix type and shall utilize pixel spacing (center-to-center) of 2.75-inch, maximum.
4. The PVMS message display system shall be able to display:
 - a. both alphanumeric text and graphics
 - b. text in variable widths and heights
5. The PVMS shall include a PVMS Controller to control all features and functions of the PVMS including message display, test pattern displays and temperature monitoring.
 - a. The PVMS Controller shall be fully NTCIP compliant.
 - b. The PVMS Controller shall include all hardware and software required to operate the PVMS both locally on-site and remotely via the DMS/PVMS central control system at the RIDOT TMC.
 - c. The PVMS Controller shall include an integral Local Control Unit to permit field personnel to control the PVMS locally at the installation site
 - d. The Local Control Unit shall permit field personnel to select and display PVMS messages, display test messages, display test patterns and turn all pixels off.
 - e. The PVMS Controller shall include a serial data communications port for the connection of an external laptop computer, with PVMS control software, to operate the PVMS locally.
6. The PVMS display enclosure and assembly construction shall protect the internal components from falling rain, snow and sleet; and shall be undamaged by the external formation of ice on the display board.
7. The PVMS, including PVMS Controller and Solar Power System shall have an operational temperature range from -20° F to +165° F (-29°C to 74°C), or better.

PVMS Trailer Chassis

1. Frame Construction
 - a. Shall be constructed of ASTM A500 (B) UNS KO300 2" x 4" x 3/16" rectangular structural tubing, or equivalent.
 - b. Shall include tie down points for transport on a flat bed trailer or truck deck

2. Suspension and Braking System
 - a. Shall include an independent suspension with 3500 lb capacity torsion axle, minimum
 - b. Shall include hydraulic surge brakes for trailer braking to be in tandem with the towing vehicle.
 - c. The trailer ground clearance shall be a minimum of 10 inches

3. Hitch
 - a. The trailer shall include a heavy duty hitch to accept 1 and 7/8-inch and 2-inch multi-fit ball couplers.
 - b. The trailer shall include safety chains with secure hooks for attachment to the vehicle hitch.
 - c. Hitch height shall be a nominal 17 and 1/2 inch above pavement.

4. Trailer Lighting
 - a. Shall include a complete roadway lighting set to fully comply with all Rhode Island Division of Motor Vehicles regulations.

5. Leveling Jacks
 - a. The trailer shall include four leveling jacks with a minimum capacity of 2,000 lbs, mounted at the four corners of the trailer.

6. Tongue Jack
 - a. A tongue jack shall be provided.

7. Tires and Wheels
 - a. Tires shall be 15-inch, 6-ply, load range C; minimum
 - b. Wheels and tires shall be sized in accordance with the load requirements of the trailer and axle.

8. Fenders
 - a. Fenders shall be heavy duty; 10-gauge steel with non slip treads on top.

9. Trailer Enclosures

- a. Trailer enclosures for controllers, batteries and other trailer components shall be of heavy duty, steel construction.
- b. Enclosures shall be lockable.
- c. Enclosures shall be designed for walk-on duty.

10. Finish and Paint

- a. The PVMS trailer shall be deburred, phosphate cleaned, and powder coated highway safety orange to a thickness of 2.5 to 3.0 mil, minimum.

- 11. The PVMS Trailer shall be fully compliant with all Rhode Island Division of Motor Vehicles regulations.

PVMS Sign Support and Structure

1. Telescoping Mast and Hydraulic Power Unit

- a. The lift mechanism shall be constructed of ASTM A513 Type 5, 6 and 1/2 x 7 gauge wall DOM tube, or equivalent.
- b. The lift shall provide for a nominal 58" total lifting distance.
- c. The lifting mechanism shall use an electro-hydraulic pump with hydraulic cylinder.
- d. The hydraulic power unit shall be able to raise the message display panel to its full operational height in less than 40 seconds.
- e. In addition, a manual lowering mechanism or hand pump shall be provided to permit manual lowering of the sign support mast.
- f. The mast shall include a locking mechanism to secure the message display panel in its proper orientation to prevent any movement and slippage even in high winds.

PVMS Message Display Panel

1. Positioning

- a. The PVMS message display panel shall pneumatically rotate 360° at the top of the lift mechanism for proper orientation.
- b. The PVMS message display panel shall be lockable at the desired display position.
- c. When towed, the PVMS message display panel shall be lockable in a position parallel to the direction of travel to minimize wind loading.

2. Display Characteristics

- a. The PVMS display shall be of a full matrix type.
- b. Each pixel shall be composed of multiple LED's to achieve the required legibility and brightness.

- c. Each 18-inch character shall be legible at a distance of 1200 feet under clear weather conditions.
 - d. The PVMS display brightness shall meet or exceed NEMA TS 4 Luminance Intensity Requirements per Table 5-8 (Yellow) of 7440 candela per square meter; with a sign illuminance of 40,000 lx, at the full connected power level; during autonomous solar and battery bank power operation. Please Note: This exceeds NEMA TS 4 luminance requirements for solar powered PVMS. Notes 2, 3 and 4 under NEMA TS 4 Section 5.4; do not apply to this PVMS Qualification.
3. Display Modules
- a. Display modules shall be able to be removed and replaced individually.
 - b. Display modules shall be interchangeable such that they can be installed and operate in any position within the message display panel.
4. Cables and Wiring
- a. All message display panel wiring and cables shall include modular connectors to permit convenient removal for components for servicing.
 - b. All cables and wiring shall be suitable for the environment within which the sign will operate.
5. Finish and Painting
- a. The PVMS message display panel sign case shall be cleaned, deburred and finished with one coat of a corrosion resistant primer and one coat of flat black UV inhibited powder coat, minimum.

Portable Variable Message Sign Controller

1. General Requirements
- a. The PVMS Controller shall include all hardware and software required to operate the PVMS both locally on-site and remotely via the DMS/PVMS central control system at the RIDOT TMC.
 - b. The PVMS Controller shall be password protected.
 - c. The PVMS Controller shall include a separate battery backup system.
 - d. The PVMS Controller shall include a temperature sensing system.
 - e. The PVMS Controller shall monitor ambient lighting conditions and adjust the brightness level of the PVMS display for optimum legibility.
2. Communications Requirements
- a. The PVMS Controller shall include a 10 Base-T (minimum) Ethernet communications interface available via an RJ-45 jack for communications with the RIDOT TMC.
 - b. The PVMS Controller shall include an RS-232 communications interface.
 - c. The PVMS Controller shall include 4 digital inputs and 4 digital outputs, typical.

3. Software Requirements

- a. The PVMS Controller shall be able to store 99 user created messages, minimum
 - i) Each message shall contain of up to 6 pages per message, minimum.
 - ii) Each message page shall be individually configurable to control flashing, fonts and justification.
- b. Message Display Specifications
 - i) Message Display Times 0.4 to 9.9 seconds, in 0.1 second increments, typical.
 - ii) Arrow Board Presentation Full-sign and single line embedded in text
 - iii) Selective Line Blink One or more lines, programmable
 - iv) Fault Messages Programmable message and blank display
 - v) Fault Conditions Loss of communications and low battery
 - vi) Scheduled Messages Programmable by date and time
 - vii) Event Messages Programmable, triggered via digital input

Solar Power System for Portable Variable Message Sign

- 1. The PVMS shall be solar powered with a battery reserve. Each sign shall be powered by a multi-panel solar array and bank of gel cell maintenance free rechargeable batteries designed for photovoltaic applications.
- 2. Solar powered PVMS signs shall operate; and maintain the specified legibility and brightness (Refer to PVMS Message Display Panel – Display Characteristics); year-round, 24 hours per day, with a nominal load of 50 percent of pixels ON, with no external charge required.
- 3. The PVMS shall also include power inputs and all required power distribution equipment to permit connections to external power sources from both utility company AC line service and generator supplied power; in order to operate the PVMS independently of the Solar Power System.
- 4. The solar power system shall furnish enough energy to supply the total daily power consumption of the sign and to recharge batteries in the temperature and solar exposure environment to be found in the State of Rhode Island. (Solar power calculations shall be supplied by the PROVIDER).
- 5. The PVMS solar power system shall be designed for optimum efficiency utilizing a proper balance between batteries and solar panels. A solid state charge controller shall be used to control the charging of the batteries from the solar panels.
- 6. The solar power system shall conform to the following:
 - a. The solar panel array shall provide sufficient power to meet all PVMS operational performance specifications identified in this Specification.
 - b. The solar panels shall be provided with a power range of 80 to 120 watts each, nominal.
 - c. A photovoltaic controller shall be provided to monitor batteries and maintain the maximum power level without over-charging the batteries. The photovoltaic controller shall provide an automatic load disconnect if a low voltage condition is detected and shall automatically reconnect the load upon power restoration.

- d. The solar panel array shall be inclinable in two axes to optimize the solar collection and charging capabilities of the solar panels. The solar panels shall rotate a full 360° and shall tilt up a minimum of 35° from horizontal, independently of the message display panel's orientation.
7. The battery bank shall supply enough energy to provide the PVMS with at least 21 days of operational autonomy without any charge from any device (solar panels disconnected) considering all environmental impacts (heat and cold) on the battery bank. (Battery bank calculations shall be supplied by the vendor).
 - a. Batteries shall be gel cell type, suitable for solar power applications.
 - b. The battery box shall be designed to contain spills from leaking and damaged battery cases and to prevent the intrusion of water.
 - c. The battery box shall be ventilated to evacuate any gas generated by the batteries.
 8. Charge Controller System
 - a. Shall be solid state designed to operate outdoors
 - b. The charge controller shall monitor solar array voltage, solar array current, battery voltage, battery current and ambient temperature.
 - c. Shall regulate energy flow from the solar array into the battery bank so as to avoid overcharging the batteries.
 - d. A low battery voltage warning shall be provided should the battery bank voltage drop below a defined threshold level.
 - e. The charge controller shall automatically switch current off to the PVMS display should the battery bank voltage drop below a defined threshold level, in order to prevent damage to the battery bank due to over-discharging the batteries.
 9. Instrumentation
 - a. Provide a system voltmeter.
 - b. Provide a system ammeter.

PVMS Service Access

1. Control and distribution boxes shall provide access to all components without having to remove other devices or cabling in order to perform service operations. All equipment and devices that require routine maintenance shall have clear access for the maintenance technicians.
2. Locking provisions shall be provided for all PVMS Enclosures.

Power, Grounding, Transient Voltage Surge and Lightning Protection Requirements

1. The PVMS PROVIDER shall include grounding provisions and transient voltage surge suppression devices for all PVMS equipment in order to provide protection from lightning, transient voltage surges and induced currents.
2. The PVMS PROVIDER shall provide and install surge suppression devices for all incoming communications and power circuits.

**FULL MATRIX GROUND-MOUNTED
DYNAMIC MESSAGE SIGN**

Description

1. Work under this qualification shall consist of furnishing, installing, documenting, demonstrating, and testing of a full matrix Dynamic Message Sign (DMS) including sign controller. At the conclusion of the DMS Qualification tests, the PROVIDER shall remove the DMS and all associated equipment.
2. The DMS shall be demonstrated using both a wired and wireless connection to the existing Rhode Island Department of Transportation (RIDOT) Transportation Management Center (TMC) Dynamic Message Sign/Portable Variable Message Sign (DMS/PVMS) control system software.
The TMC'S software is currently Vanguard v4.8.
 - c. The location of the demonstration will be at the sole discretion of RIDOT, and will require that the DMS be connected to a laptop computer with a copy of the exact copy of the DMS/PVMS control software installed at the RIDOT TMC.
 - d. All transportation and related costs including lodging and per diem for RIDOT personnel and consultants to witness the DMS performance and TMC DMS control software compatibility tests at the remote site shall be paid for by the DMS PROVIDER.
3. The DMS shall be designed to be installed on a ground-mounted sign structure with power to be provided by the local commercial utility electrical service.
4. All costs to furnish, transport, install, connect to local utility power, test and remove the DMS shall be paid for by the DMS PROVIDER.
5. RIDOT reserves the right to relax, modify, or revise the requirements if it is in the best interest of the state.

Provisions for National Transportation Communications for ITS Protocol (NTCIP) Compliance and Requirements for Communications with the existing RIDOT TMC DMS/PVMS Control System

1. The DMS sign controller hardware and firmware shall comply with the AASHTO-ITE-NEMA Joint Committee standards for NTCIP.
2. The RIDOT TMC DMS/PVMS Control Software presently supports NTCIP 1203 Version 2.39b and the DMS shall fully support this version of NTCIP 1203.
3. The DMS shall be fully compatible with the existing RIDOT TMC DMS/PVMS Control Software, without changing or replacing the software.

Material, Manufacturing, and Design Standards

The DMS shall be fully compliant with the relevant provisions of the following Standards Publications, Manufacturing Standards, Electrical Codes and Regulatory Documentation:

1. NEMA Standards Publication TS 4-2005, "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements."
2. FHWA-HOP-07-088, "Testing Programs for Transportation Management Systems: A Technical Handbook"
3. National Transportation Communications for ITS Protocol (NTCIP) Standards

4. AASHTO 2009 5th Edition
 - o Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, latest standards, as well as the fatigue resistance requirements of NCHRP Report 494
5. Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition, including Interim Approvals
6. National Electric Code (NEC)
7. SBC-5 Rhode Island State Electrical Code
8. National Electrical Manufacturers Association (NEMA)
9. American Architectural Manufacturers Association, AAMA 2604-98
10. Underwriter's Laboratory (UL)

Compliance with NEMA Standards Publication TS 4-2005, "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements."

1. The DMS shall be fully compliant with all Mandatory Requirements of NEMA Standards Publication TS 4-2005 as defined in Section 11; Item 11.5, Conformance Table.
2. The DMS shall be fully compliant with all Optional Requirements of NEMA Standards Publication TS 4-2005 as defined in Section 11; Item 11.5, Conformance Table; for all cases noted below.
3. As per the requirements of NEMA Standards Publication TS 4-2005, Paragraph 11.4, Conformance Documentation Requirements; the DMS PROVIDER shall include an authenticated statement of conformance with this Standard from the DMS manufacturer with the qualification submission. This conformance statement shall include a copy of the Conformance Table (Section 11.5 of NEMA TS 4-2005) that shall document which requirements are met with the DMS product proposed, and which requirements are not met by the DMS product proposed. This conformance statement shall be signed by an authorized representative of the DMS manufacturing company.
 - a. If any NEMA TS 4-2005 mandatory requirement cannot be met by the submitted DMS, the PROVIDER shall clearly document this in the completed Conformance Table and shall provide an explanation, if applicable.
 - b. At the request of RIDOT, backup documentation to verify compliance with the Standard shall be provided by the DMS PROVIDER.
4. Optional requirements changed to mandatory requirements and non-applicable sections of NEMA Standards Publication TS 4-2005, Conformance Table:
 - a. Environmental – All Requirements Mandatory
 - b. Sign Mechanical Construction
 1. NEMA TS 4 Item 3.1.1.2, Access Panel and Gaskets – Mandatory
 2. NEMA TS 4 Item 3.1.1.3, Vents – Mandatory
 3. NEMA TS 4 Item 3.1.2.2, Temperature Considerations for Continued Sign Operation – Mandatory
 4. NEMA TS 4 Item 3.1.3.1, Sign Face Material – Mandatory
 5. NEMA TS 4 Item 3.1.3.2, Sign Face Condensation – Mandatory
 6. NEMA TS 4 Item 3.1.4, Galvanic Protection – Mandatory
 - c. Fixed-Location DMS
 1. NEMA TS 4 Item 3.2.2.2, Exterior Housing Finish – Mandatory
 2. NEMA TS 4 Item 3.2.4, Front and Rear Access DMS – Mandatory
 3. NEMA TS 4 Item 3.2.5, Front Access DMS – Mandatory if Front Access DMS
 4. NEMA TS 4 Item 3.2.6, Rear Access DMS – Mandatory if Rear Access DMS
 5. NEMA TS 4 Item 3.2.7, Walk-in Access DMS – Not Applicable
 6. NEMA TS 4 Item 3.2.8, Electrical Service Outlets – Mandatory

- d. Portable DMS – Not Applicable
- e. Controller to Sign Interface
 - 1. NEMA TS 4 Item 4.4.1, Power Supply Locations – Mandatory
 - 2. NEMA TS 4 Item 4.4.2, DMS Controller and Driver Module Locations – Mandatory
- f. Display Properties
 - 1. NEMA TS 4 Item 5.5.2, Chromaticity Uniformity – Mandatory
 - 2. NEMA TS 4 Item 5.8, Moving Arrows – Mandatory
- g. Optical Components
 - 1. NEMA TS 4 Item 6.1.2.5, Character Module Spacing for Full Matrix Signs – Mandatory
 - 2. NEMA TS 4 Item 6.1.3, Interchangeability of Character Modules – Mandatory
- h. Control Cabinet – All Requirements Mandatory
- i. Electronic and Electrical – All Requirements Mandatory
- j. Performance Monitoring – All Requirements Mandatory
- k. Power Requirements – All Requirements Mandatory

Dynamic Message Sign - Performance Requirements

1. The DMS display shall be a full matrix type to include a minimum of TWENTY-SEVEN (27) pixels vertically and SEVENTY-FIVE (75) pixels horizontally. DMSs with higher pixel quantities and denser pixel arrays are acceptable.
2. The DMS display shall provide 18" high characters on a display of THREE (3) rows of characters with a minimum of TWELVE (12) characters on each row. The standard character font sets shall include 7x5, 9x6, and 10x7 matrix type characters. Other type fonts may also be included, such as True Type or other specialty fonts.
3. The DMS display panel shall be composed of amber LEDs and the display panel shall have a minimum horizontal viewing angle of 30 degrees. DMSs capable of displaying additional colors are acceptable.
4. In order to determine the DMS display resolutions available, the vendor shall identify all pixel pitch options available for their amber full matrix DMSs.
5. The DMS sign display intensity shall meet or exceed 7,440 candelas/m², when the LEDs are displaying the color amber.
6. The DMS display system shall be able to display ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location within a message line. In three line operation, the sign shall be able to display single stroke characters with double-column spacing between characters. The DMS shall also be able to display narrower, wider or double stroke character fonts and permit the adjustment of spacing between characters. The spacing options shall be selectable between one, two or three pixel columns.
7. Horizontal alignment of text on the display shall include left, center and right justification.

8. Vertical alignment of text on the display shall include top, middle and bottom justification.
9. The DMS shall be able to display messages utilizing the following methods and effects, at a minimum:
 - a. *Static Message* – The DMS message is displayed continuously until the sign is blanked or another message is commanded to be displayed.
 - b. *Flashing Message* – All or part of a DMS message is displayed and blanked alternately at rates between 0.1 second and 9.9 seconds; user selectable in increments of 0.1 second.
 - c. *Scrolling Message* – The DMS message moves across the display from side to side; user selectable from left-to-right or right-to-left, inclusive.
 - d. *Multi-Page Message* - The DMS message shall include a minimum of two (2) different pages of information, with the entire DMS display area available for each page. Each page's display time shall be selectable from 0.5 second to 25.5 seconds, user selectable in increments of 0.5 second.
10. The DMS shall be able to activate messages utilizing the following methods, at a minimum:
 - a. *Manual Activation* – An operator can select and display a DMS message both locally using the DMS controller's local control panel; and remotely at the TMC using the RIDOT TMC DMS/PVMS Control System.
 - b. *Scheduled Activation* – The DMS Controller shall be programmable from the central RIDOT TMC DMS/PVMS Control System to display selected messages at user defined dates and times. The format and operation of the message scheduler shall be compliant with the provisions of NTCIP 1201 and NTCIP 1203 standards.
 - c. *Event Based Activation* – Certain events such as loss of communications and intermittent power shall be utilized as a trigger for particular message displays and to blank the sign.
 - d. *Priority Activation* – Certain messages shall be able to be designated as "priority" messages and shall override other non-priority message displays.
11. The DMS shall include a DMS Controller to be installed in a separate ground mounted DMS Controller Cabinet. The DMS Controller shall control all features and functions of the DMS including message display, diagnostic testing, environmental monitoring and fault detection.
 - a. The DMS Controller shall include an integral Local Control Panel to permit field personnel to control the DMS locally at the installation site. The Local Control Panel shall permit field personnel to select and display DMS messages, command diagnostic tests, and display test results and fault data locally.
 - b. The DMS Controller shall be password protected.
 - c. The DMS Controller shall include 10/100 Base-T Ethernet port with RJ-45 jack for communications to the RIDOT TMC DMS/PVMS Control System.
 - d. The DMS Controller shall communicate with the DMS via fiber optic cable.
12. The DMS display system and controller shall be compliant with NTCIP 1203 v2.39b. Graphic type messages shall be able to be displayed.

13. The DMS shall include internal temperature monitoring and shall provide a high and low temperature alarm at the RIDOT TMC DMS/PVMS Control System.
14. The DMS shall include a door monitoring system to detect and report door openings on the DMS and DMS Controller Cabinet to the RIDOT TMC DMS/PVMS Control System.
15. The DMS shall include two (2) twelve (12) inch flashing yellow beacons that are controllable, per message, from the RIDOT TMC DMS/PVMS Control System. The flashing beacon heads shall be of an LED type.
16. All metal components shall be protected against rust, corrosion and degradation due to their use in a roadside environment and must be protected by a lead free powder coat guaranteed to withstand 5 years of UV Florida exposures as set forth in AAMA 2604-98.
17. All high voltage electrical components (exceeding 24 VDC) shall be UL listed.
18. The DMS display enclosure shall be rated NEMA Type 3R. The DMS display enclosure and assembly construction shall protect the internal components from falling rain, snow and sleet; and shall be undamaged by the external formation of ice on the display board.

Dynamic Message Sign – Service Access

1. The DMS enclosure shall provide safe and convenient access to all internal assemblies, components, wiring and subassemblies. All replaceable internal components of the DMS shall be removable by a single technician with the use of simple hand tools.
2. Control and distribution boxes shall provide access to all components without having to remove other devices or cabling in order to perform service operations. All equipment and devices that require routine maintenance shall have clear access for the maintenance technicians.
3. Locking provisions shall be provided for all DMS Enclosures.

Power, Grounding, Transient Voltage Surge and Lightning Protection Requirements

The DMS PROVIDER shall provide and install all necessary power connections, grounding system and transient voltage surge protection systems for the DMS, DMS Controller and for all associated equipment.

1. Power, grounding, surge and lightning protection equipment shall be as described in these specifications and shall satisfy the following requirements:
 - a. Provide and install all required AC power equipment required for connections to utility and generator provided AC power. This shall include: disconnect switches, circuit breakers, surge suppressors, power distribution equipment and other equipment required to fully power the DMS equipment.
 - b. Provide and install a grounding system and transient voltage surge suppression system for all DMS equipment and associated devices installed in the field in order to protect all equipment from lightning, transient voltage surges and induced current.
 - c. Maintain a resistance to earth ground not to exceed five (5) ohms.
 - d. Provide and install surge suppression devices for all incoming communications and power circuits.
 - e. Adhere to the applicable requirements of UL 497B, UL 1449 and the NEC regarding grounding and transient surge protection.

2. Requirements for AC Line Power Surge Protectors

- a. The AC Power Line Surge Protector shall be sized for the incoming current and loads to be protected.
- b. The AC Power Line Surge Protector shall filter and absorb power line noise and switching transients.
- c. The AC Power Line Surge Protector shall provide a degree of lightning and lightning induced voltage surge protection.
- d. The AC Power Line Surge Protector shall meet or exceed the following technical specifications:
 - 1. Total Peak Surge Current 80,000 Amps; 40kA L-N, 25kA L-G
 - 2. Repetitive Surge Capacity 5000 Category (C3 High) Impulses with < 10% drift
 - 3. Short Circuit Current Rating 200,000 rms symmetrical amperes (UL Listed)
 - 4. Response Time < 0.5 nanosecond
 - 5. Temperature Range -40°F to +140°F (-40°C to +60°C)
 - 6. Regulatory Requirements UL 1449 Listed

3. Requirements for DMS Sign Controller and Control Equipment AC Power Surge Protectors

- a. The Control Equipment AC Power Surge Protector shall meet or exceed the following technical specifications:
 - 1. Total Peak Surge Current 50,000 Amps for an 8x20 microsecond waveform
 - 2. Continuous Current Rating 15 Amps at 120 VAC, 60 Hz
 - 3. Temperature Range -40°F to +140°F (-40°C to +60°C)
 - 4. Regulatory Requirements UL 1449 Listed
- 4. Transient voltage surge protection devices shall be installed on all copper communications cables connecting the control equipment to off-site sources.