Georgia Department of Transportation
Transportation Products
Qualified Products List (QPL)

By signing this form, the applicant declares that he/she has read and understood the provisions of Section 631 of the GDOT Minimum Specifications for Dynamic Message Signs and all implemented modifications. The requirements listed on this matrix are derived from Section 631, which in all cases will be the basis for determining a product's compliance and its acceptability for use on Georgia's roads.

Date: _____

Manufacturer: _____

Item, Model No: _____

Applicant's Name (print): _____

Signature: _____

GDOT Dynamic Message Sign Specification Compliance Matrix

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
☐ Type 1 ☐ Type 2 ☐ Type 3 ☐ Type 4 ☐ Type 5 ☐ Type 6 ☐ Type 7			
General			
1. Comply with ISO 9001 or Sigma Six quality manufacturing requirements.	N/A		1
2. Provide only equipment and materials that are new and of like kind and function provided by one manufacturer, using the same model, part number, revision, and firmware as shown and specified in the Contract documents.	N/A		1
3. Provide a DMS that is designed and tested to comply with the current version of NEMA TS 4 standards.	N/A		1
Display Matrix			
1. Type and Layout			
☐ Provide full-color LED display matrix capable of displaying continuous and uniform messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images across multiple message frames.	N/A		1
☐ Provide display matrix that are full matrix. ☐ Provide display matrix that support both fixed and proportional spaced fonts.			
2. Provide a modified Series D 2000 MUTCD typeface and fonts for DMS messaging.	N/A		1

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
3. Provide pixel pitch spacing of 0.787 in (20 mm), nominal, from the center of one pixel to the center of adjacent pixels, both horizontally and vertically. A variation in the pixel pitch spacing of up to ±3% is acceptable.	N/A		1
4. Provide nominal character and inter-line pixel spacing as shown in Table 1. A variation of up to ±1 pixel is acceptable.	N/A		1
5. Provide the capability to clear any display and post any new display in a time period not exceeding 500 ms.	N/A		1
6. Provide a DMS that is capable of displaying standard text applications shown in Table 1.	N/A		1
7. Display Legibility			
a. LED Cone of Vision			
☐ Provide LEDs with a minimum cone of vision of 30 degrees, with a half-power angle of 15 degrees measured from the longitudinal optical axis of the LED. ☐ Provide LED cone of vision with a tolerance that does not exceed ±5 degrees. ☐ Provide LED display face with color uniformity and consistency within the 30 degree cone of vision, with no visible inconsistent color shifts or intensity. Inconsistent color shifts or intensity will be cause for rejection.	N/A		1
b. Provide LED display matrix that is clearly visible and legible from distances between 150 ft (45.7 m) and 1,000 ft (305 m) from the DMS front face under normal freeway operating conditions during daylight hours with direct sunlight on the face and behind the DMS.	N/A		1
c. Provide LED display matrix that maintains a minimum of 12,000 candelas per square meter minimum (white) for full color displays when measured using a photometric meter through the DMS front face panel assembly. Do not utilize light enhancing lenses to achieve LED viewing angles.	N/A		1
☐ Provide LEDs that have no less than 50% of the normalized intensity at 50% of their maximum viewing angles. ☐ Provide LEDs that are from one luminous intensity bin from which the dimmest LED does not emit less than 70% of the luminous intensity of the brightest LED when driven with identical currents.	N/A		1

Requirement								Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
Table 1 – Display Characteristic Requirements for Standard Text Applications									Type 1	
Requirement	**Type 1**	**Type 2**	**Type 3**	**Type 4**	**Type 5**	**Type 6**	**Type 7**			
Usage (Pixels)	Text and/or Graphics	Text and/or Graphics	Text and/or Graphics	Text and/or Graphics	Text and/or Graphics	Text and/or Graphics	Text and/or Graphics			
Inter-line Vertical Spacing	12	12	12	8	N/A	N/A	N/A			
Character Horizontal Spacing	4	4	4	3	4	4	3	N/A		1
Rows, nominal	96	96	96	64	24	24	16			
Columns, nominal	400	352	288	208	64	160	112			
Default Text Character Font Array	24 x 15	24 x 15	24 x 15	16 x 11	24 x 15	24 x 15	16 x 11			
Sign Border	Yes	Yes	Yes	Yes	Yes	No	No			
LED Requirements										
1. Provide DMS that groups discrete LEDs into pixels arranged in a full continuous matrix display with individual pixel addressability. Character-based matrix arrangements are not acceptable.								N/A		1
2. Provide LEDs that are from the same manufacturer and of the same part number, except for the variations in the part number for color and intensity.								N/A		1
3. Provide a minimum MTBF of 10 years as defined by NEMA TS 4 Section 6.2.2.								N/A		1
4. Mount LEDs secured in perpendicular alignment to the display panel along the 0 degree centerline of the LED.								N/A		1
5. Provide multiple individual red, green, and blue LEDs conforming to the following requirements:										

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
☐ Provide red LEDs utilizing aluminum indium gallium phosphide semiconductor technology and emitting red light with a peak wavelength of 615 to 635 nm. ☐ Provide green LEDs utilizing indium gallium nitride semiconductor technology and emitting green light with a peak wavelength of 519 to 539 nm. ☐ Provide blue LEDs utilizing indium gallium nitride semiconductor technology and emitting blue light with a peak wavelength of 460 to 480 nm.	N/A		1
6. Provide LED display modules that meet the following minimum requirements:			
a. Provide LED display modules, LED pixel boards, and driver circuit boards that are identical and interchangeable throughout the LED pixel matrix.	N/A		1
b. Provide individual LED display modules conforming to the following requirements:			
☐ Provide printed circuit boards of laminated fiberglass material that comply with IPC-A-610 Class B. ☐ Mount LED display modules such that LEDs emit light through the face panels, with the face panel not blocking any portion of the individual LED viewing cones in the pixel. ☐ Provide quick-disconnect locking connector types for LED display module power and signal connections. ☐ Mount each LED display module to the rear of the display front face panel(s) using durable non-corrosive hardware. ☐ Maintenance removal or the replacement of an individual LED module, or a pixel board or a driver circuit board from its LED module, shall not require soldering. ☐ Provide a minimum of one LED driver per display module unless otherwise approved by the Department. ☐ The failure of one display module driver shall not cause a failure of the other display module drivers. ☐ The maintenance removal or the failure of any LED module shall not affect the operation of any other LED module or sign component. ☐ Provide LED display module that consists of one printed circuit board with header connections constructed such that the LED module cannot be incorrectly connected upside down or in an otherwise incorrect position within the matrix. ☐ The current flow through the LEDs shall not exceed manufacturers' stated current for non-surface and surface mount components.	N/A		1
Redundancy			
1. Provide the minimum number of LEDs per pixel as specified in the NEMA TS 4 standard.	N/A		1
2. Provide LED power supply redundancy in compliance with Section 631.2.01.H.6.	N/A		1
DMS Controller			
1. Provide a DMS controller that meets the following message library and memory requirements:			

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
☐ Provide controller with both permanent and changeable memory. ☐ Provide changeable memory in the form of NVRAM. 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 calendar days following a power loss or failure. This memory shall be used to store messages and schedules.	N/A		1
2. Local User Interface			
☐ Provide a graphical LCD and keypad interface for direct operation, configuration, and diagnostics of the DMS. ☐ Provide the capability to display test patterns on the sign, blank the current message, and perform other available canned tests (pixel, power supplies, etc.). ☐ Provide a sign controller that requires login credentials for access and supports multiple user configurable passwords.	N/A		1
3. Failure mode in the sign controller shall be in compliance with NEMA TS 4 and, in the event of a controller failure or loss of communications or power, any displayed message will be blanked and the sign face will remain blank when the controller communications or power is restored.	N/A		1
4. Provide DMS controller that indicates when a sign display power supply has failed and identifies the specific power supply that has failed.	N/A		1
Communications and Network Requirement			
1. Equip the DMS controller assembly with a minimum of the following communications ports:			
☐ Provide a minimum of one 10/100 Ethernet port for connectivity to the GDOT network. ☐ Provide a minimum of one 10/100 Ethernet port or serial port for technician local access.	N/A		1
☐ Provide a minimum of one SFP fiber-optic channel connection port for communication to the DMS housing electronics via SM or MM fiber. It is acceptable to provide a fiber optic media converter with power supply that is environmentally hardened along with patch cables and associated materials to connect fiber optic cabling to the appropriate port on the DMS controller.			
2. Comply with NTCIP 1203 v02 or later.	N/A		1
3. Support authentication and restricted access to the built-in web server through usernames and passwords at a minimum of three different levels.	N/A		1
4. Provide a DMS that meets the following network configuration requirements:			
☐ Provide secure access through the DMS controller local user interface and remotely through an SSH login or HTTP browser or web-based interface. ☐ Provide access to user-programmed features and settings, including but not limited to, configuration parameters, sign controller settings, sign status, and security functions.	N/A		1

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
Mechanical			
1. Structural Frame			
☐ Construct sign with 6061-T6 or 6063-T6 aluminum alloy extrusions. ☐ Provide a minimum of two lifting eyes attached directly to the DMS housing structural frame with strength to allow sign lifting and moving without damage to the sign. ☐ Provide a sealant to lifting eye intrusions to prevent water infiltration.	N/A		1
2. Sign Housing			
☐ Construct with 5052-H32 aluminum alloy sheeting with a minimum thickness of 0.125 in (3.17 mm). ☐ Provide structurally capable metal hex nuts and flat washers, which meet the manufacturer's recommendations, located on each side of the sign housing (interior and exterior). ☐ Provide a sealant to lifting eye intrusions to prevent water infiltration.	N/A		1
3. Types 1 through 5 only: Provide sign border with yellow, retro-reflective, fluorescent self-adhesive tape on all four sides for display clarity and background contrast. Provide tape width of 2 in (50 mm). Provide border tape material that meets the requirements of Section 647.	N/A		1
4. Provide bare-aluminum mill finish (without paint) for both exterior and interior surfaces, excluding the front face of the sign housing.	N/A		1
5. Weight and Dimension			
a. Total weight, including internal and external components for walk-in signs, shall not exceed 3,400 lb (1,542 kg) for signs up to 15 characters wide, and 4,100 lb (1,859 kg) for signs greater than 15 characters wide.	N/A		1
b. Individually limit the maximum outside dimensions, excluding minor appurtenances, of the sign to the following:			
☐ Width 31 ft (9.45 m) ☐ Height 10 ft (3.05 m) ☐ Depth 4.5 ft (1.37 m)	N/A		1
6. The polycarbonate sheeting shall be attached to the inside of the aluminum face panel and contains UV inhibitors to prevent premature aging of the material and to protect the LED display matrix from the effects of UV light exposure.	N/A		1
7. Welding shall be performed and inspected in accordance with the requirements of AWS D1.2.	N/A		1
8. Use non-corrosive attachment hardware such as aluminum and stainless steel and provide corrosion protection between dissimilar metals, including sign mounting hardware and materials.	N/A		1
9. Provide a minimum of two (2) weep or drain holes at the bottom of the housing with replaceable screens to prevent entrance of insects and small animals.	N/A		1

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
10. Maintenance Features			
a. Controller Operation Access			
☐ Provide software operational access to DMS operations from the DMS controller inside the field cabinet and from inside walk-in DMS housings through a remote auxiliary control panel or local Ethernet communication port in the sign housing. ☐ The remote auxiliary control panel or an Ethernet interface located in the sign housing shall have the same capabilities as a laptop computer used for maintenance purposes connected to the local port of the DMS controller. It is acceptable to provide a hardened maintenance laptop computer left inside the walk-in DMS housing for maintenance purposes when working inside the walk-in housing.	N/A		1
b. Provide internal DMS access for maintenance to provide unobstructed viewing, removal, and replacement of any non-structural component within the sign case and ground- or pole-mounted field cabinets.	N/A		1
c. Provide replacement and serviceability capabilities as follows:			
☐ Types 1 and 2 only: Provide display modules and panels that are replaceable from the inside rear of the display without the need for specialized tools. ☐ Types 3 through 7 only: Provide display modules and panels from the outside of the enclosures without the need for specialized tools. ☐ Provide display modules that are interchangeable between signs employing the same display technology and pixel pitch furnished by a DMS manufacturer. ☐ Provide a design that upon replacement of panels and other internal components the sign remains weathertight as specified in NEMA TS 4 Section 3.1.1. ☐ Provide a design so that the removal of any combination of one or more display modules will not alter the structural strength of the sign display assembly or sign case or adversely affect the operation of the remaining functional modules. ☐ Provide LED driver boards that are replaceable with simple hand tools and hot swappable within the sign housings.	N/A		1
11. Types 1 and 2 only: provide walk-in access door type sign that meets the following minimum requirements:			
☐ **Access Door Keys**: Provide two No. 2 Corbin keys for each DMS provided. Alternative access methods are provided in Section 939. ☐ **Access Door Braces**: Provide hold-open braces and access door stops designed to withstand a minimum of 30 mph (48 kph) winds that allow the door to be held in the 180 (full), 90, 45, or 30 degree open positions without the use of tools.	N/A		1
12. Types 3 to 7 only: provide front access type sign that meets the following minimum requirements:			

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
☐ Provide a design that allows for the access panels or hinged doors to be open and held open at an angle that permits the sign to be fully accessed and serviced by one technician from a bucket truck. ☐ Provide a design so that regular opening and closing of the access panels or hinged doors does not cause warping or misaligned fit/closure. ☐ Provide gaskets to provide a weathertight seal when the access panels or hinged doors are closed.	N/A		1
Electrical			
1. Provide electrical power, signal, data, board-to-board, board-to-connector, and grounding connections that are non-corrosive, low loss, and vibration resistant that are compliant with NEMA TS 4 environmental requirements.	N/A		1
2. Provide AC electrical power to the DMS that meets the following minimum requirements:			
☐ Provide a power load center or electrical panel with multiple separate thermomagnetic equipment circuit breakers and a two-pole main breaker. ☐ Size breakers in accordance with the NEC for the anticipated loads that will be experienced by equipment interior lighting, ventilation, and power receptacles located within the sign housing.	N/A		1
3. Electrically bond the DMS to the support structure at mounting bolt locations, consisting of an electrical bond wire or properly prepared electrical contact points.	N/A		1
4. Provide driver boards and electronic circuit boards installed in the sign housing that have been coated with an acrylic or urethane conformal coating for moisture-resistance.	N/A		1
5. Provide UL-listed auto-ranging regulated DC power supplies for the LED pixel display modules.	N/A		1
6. Provide a sign that meets the following DC power supply requirements:			
☐ Provide power supplies that operate from 120 VAC power. ☐ Provide power supplies that provide N+1 redundancy, or approved equivalent method. Provide power supplies that are rated so that if one supply fails the other(s) can operate the entire LED section under nominal load conditions.	N/A		1
☐ Provide power supplies that meet NEMA TS 4 temperature requirements. ☐ Provide power supplies with over-voltage protection devices that supplement the DMS assembly's overvoltage, surge, and transient voltage protection devices.			
☐ Provide power supplies with short circuit protection by turning the DC power off and resetting automatically after five seconds of AC power off. ☐ Protect power supplies by a minimum overload allowance of 125% and have an efficiency rating of at least 80%.			

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
☐ Provide power supplies that are UL listed and compliant with RoHS Directive 2011/65/EU. ☐ Provide power supplies with a visible means of determining power status of individual supplies via the DMS controller and the supplies themselves. ☐ Provide power supplies with indicators that identify whether the supplies are functioning properly and outputting power at the correct and calibrated levels.			1
7. **Types 1 and 2 only**: Provide a sign that meets the following ventilation system requirements:			
☐ Provide thermostatically controlled fans meeting NEMA TS 4 ventilation requirements for walk-in housings. ☐ Provide multiple temperature sensors used to activate the system including an additional sensor located to accurately measure the ambient temperature outside the sign housing.	N/A		1
8. Provide a circuit breaker protected, shielded, LED lighting system on the interior of the walk-in sign housing activated by a two hour timer switch located on the interior near the door.	N/A		1
9. Provide a circuit breaker to protect a minimum of one duplex 120 VAC GFI receptacles rated for 15A inside the sign housing for the use of maintenance personnel.	N/A		1
Field Cabinet			
1. Provide system components that are compatible with the field cabinet as shown in the Contract documents. The field cabinet is not included in the pay items defined in Section 631.5.	N/A		1
Mounting and Support Structure			
1. Provide DMS housing that is designed for the support structure and access platform (for walk-in sign types). The support structure and access platform (for walk-in sign types) are included in the pay items defined in Section 638.5.	N/A		1
2. Provide DMS housing with the mounting and attachment hardware necessary to attach the sign assembly to the DMS support structure and the access platform (for walk-in sign types) to the sign structure.	N/A		1
3. Provide DMS housing access door design that provides adequate access to the DMS housing, in coordination with the structure and access platform.	N/A		1
4. Provide DMS housing that is designed to accommodate an access platform with safety rails extending from the supporting sign structure. Safety rails shall be installed flush with the sign housing and in compliance with OSHA safety requirements.	N/A		1
Cabling and Surge Protection			
1. Provide fiber optic cable in accordance with manufacturer requirements for communications between the sign controller inside the DMS field cabinet and the DMS enclosure communications and interface electronics. No communications interfaces with the DMS shall use non-fiber conductors.	N/A		1

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
2. Terminate and secure the fiber strands with factory installed connectors on both ends of the cable.	N/A		1
3. Provide power service cabling to the DMS enclosure and DMS field cabinet as specified and recommended by the DMS manufacturer and in accordance with the NEC.	N/A		1
4. Use stranded copper electrical conductors that are sized as required by load and distance for connecting 120 VAC circuits between the DMS controller and the DMS housing equipment power distribution area.	N/A		1
5. Provide a sign with surge protection that meets the following SPD requirements:			
☐ DMS Housing: Protect incoming power within the DMS housing with surge protection as recommended by the DMS manufacturer and in compliance with UL 1449. ☐ DMS Field Cabinet: Comply with the minimum SPD requirements in Section 939.2.06.B.6 and as recommended by the DMS manufacturer.	N/A		1
Environmental			
1. Provide a DMS system that meets NEMA TS 4 environmental requirements and conditions.	N/A		1
2. Provide a DMS system that meets current NEMA TS 4 diagnostics requirements and has third-party testing certification from the DMS manufacturer.	N/A		1
3. Comply with FCC Part 15 emission standard, FCC Public Notice 2019-01, and FCC Public Notice 2019-02.	N/A		1
DMS Spare Components			
1. Provide the following spare components:			
☐ Two LED modules for every four DMS installed. ☐ Two LED driver cards for every four DMS installed, unless incorporated in the LED module. ☐ One DC power supplies (including surge protectors) for every four DMS installed. ☐ One complete fan assemblies (for sign housing), including thermostats, for every four DMS installed. ☐ One temperature sensor for every four DMS installed. ☐ One light sensor (photocell) for every four DMS installed. ☐ One DMS controller for every four DMS installed.	N/A		1
2. The spare components listed above shall be identical to those that are provided within each type of DMS assembly.	N/A		1

Requirement	Item Comply? (Yes, No, N/A)	Comments	Evaluation Method[1]
3. Package each spare component individually with a label attached to the package that includes a description of the item, date of manufacture, part number, and manufacturer or vendor of the item. A description of the item's function and installation or replacement (remove and install) procedures shall be included with each item on 8.5 in (216 mm) by 11 in (279 mm) sheets of paper. If multiple sheets are required, the sheets shall be stapled together in sequential order. The top sheet shall have the item name and vendor's name at the top of the sheet. The sheets shall be placed in the boxes with the item.	N/A		1

Note 1:

Evaluation Method:

1. **Physical Inspection** – a vision inspection of the product
2. **Compliance Matrix Review** – a review of the matrix comments column itself to see if all required statements were made
3. **Document Review** – a review of all specs, lab test reports, etc.
    a. Independent 3rd Party Facility Test results
    b. 1st Party (Manufacturer) Test results
4. **Functional Review / Inspection –** GDOT Lab and/or Field Trial testing