DYNAMIC MESSAGE SIGN TEST PLANS

1. DEVICE NAMING COORDINATION

1.1. The System Integrator shall coordinate with the TMC/ROC to identify the device names for each device.

1.2. The System Integrator shall then send a request to TOTS to identify the network name, IP address, and any pertinent configuration information.

2. EXPLANATION – STANDALONE (SALT) TESTING

2.1. The System Integrator shall work with the DEVICE VENDOR (if required by the testing form) and complete the NDOT specified SALT tests (non-network) on each unit of equipment after installation.

2.2. Conduct SALT testing on each unit of equipment as outlined on the NDOT provided testing form.

2.3. The System Integrator shall coordinate through the Resident Engineer and the Construction Crew to have an appropriate NDOT representative present for the onsite inspection.

2.4. The System Integrator shall submit the DEVICE vendor commissioning documents with the SALT testing to the Engineer for review and approval.

2.5. Supply a bucket truck and operator, or suitable equivalent equipment necessary to carry out procedures as required by the testing documents, at no direct payment.

DYNAMIC MESSAGE SIGN (DMS) SALT TEST PROCEDURE

TEST #	SALT TEST PROCEDURE	EXPECTED RESULT	PASS / FAIL

DMS Name:		**IP Address:**		**GPS:**	
TOTS Network Name:		**Associated Cabinet Name:**			

Purpose and General Verification

System Integrator: *This SALT tests the proper installation of a functional DMS. The system integrator will use a laptop to perform this test. Using the manufacture's software, the integrator will be able to verify the DMS is operational.*

General Verification*: For each test below, complete the DMS SALT Matrix, circling the "Pass" or "Fail" in the appropriate cell. Only indicate a "Pass" on this form if the entire matrix column related to the tested function passes for EACH DMS being tested.*

System DMS Information

1.	Verify DMS Information using the manufacturer software or device label.	**Manufacturer: _____** **Model: _____** **Serial Number: _____** **Firmware Ver: _____**	Pass / Fail
2.	Manufacturer's commissioning of DMS equipment.	Manufacturer confirmation of full operation of all DMS-associated equipment.	Pass / Fail

Manufacturer's Equipment Verification

Date of Test: _____

Manufacturer/Representative: _____

Test Performed By (Print Name): _____

Test Performed By (Signature): _____

Test Witnessed By (Print Name): _____

Test Witnessed By (Signature): _____

Agency/Firm: _____

Equipment Verification

3.	Verify DMS controller is securely mounted in cabinet.	DMS controller is securely mounted in cabinet.	Pass / Fail
4.	Using a meter, verify the system is properly bonded to earth ground.	Meter reading of 5 Ohms or less.	Pass / Fail
5.	Verify Ethernet cable length does not exceed 328 feet from the DMS controller to the PoE++ injector or PoE++ switch, using either a time domain reflectometer or beginning- and end-foot markers.	The Ethernet cable length is less than 328 feet. **Cable Length: _____**	Pass / Fail
6.	Verify power supply energizes the system.	System is energized.	Pass / Fail

7.	Verify all cabling is labeled with the to/from on each end and at any major transition point and is neatly managed throughout the cabinet.	All premise or inside plant cables originating and ending in the cabinet are properly terminated and labeled. Labeling material rated for Outside Plant (OSP) use. Cables are neatly managed using adjustable hook-and-loop fastener straps.	Pass / Fail
8.	Verify DMS controller is accessible via Web User Interface (UI).	DMS controller accessible via Web User Interface (UI).	Pass / Fail
9.	Verify DMS is set to local District's standard operating procedure (SOP) user datagram protocol (UDP) Port.	DMS is set to local District's UDP port. Port: _____	Pass / Fail
10.	Verify DMS system operations locally via Web User Interface (UI).	DMS system turns on/off via Web User Interface (UI).	Pass / Fail
11.	Conduct a continuity test on the flashing beacon contact.	Flashing beacon flashes during/after continuity test is performed.	Pass / Fail
12.	Using manufacturer's software, issue command to actuate the field device.	Visual confirmation of field device activation.	Pass / Fail
13.	Using manufacturer's software, issue command to display test messages, which are to be provided by the agency/firm representative. * Agency/Firm Representative reserves the right to request up to 20 test messages of varying length and type (multi-page message, flashing message, beacons, etc.)	Visual confirmation of DMS properly displays all test messages.	Pass / Fail
14.	Using manufacturer's software issue command to de-actuate the field device.	Visual confirmation of field device deactivation.	Pass / Fail
Verification of Settings			
15.	Verify Communication Settings are set to appropriate values per the IP plan.	**IP: _____** **MASK: _____** **GATEWAY: _____** **UDP/TCP PORT: _____**	Pass / Fail

Signatures

DATE	**AGENCY/FIRM**	**PERFORMED BY** (Print Name) (Integrator)	**INTL**	**AGENCY/FIRM**	**WITNESSED BY** (Print Name) (NDOT)	**INTL**
Integrator Signature						
NDOT Signature						

3. EXPLANATION - SUBSYSTEM (SST) TESTING

3.1. At the beginning of the SST phase, the System Integrator shall submit, in PDF format and original signed hard copies of the certified SALT results for approval by the Engineer.

3.2. The Engineer shall approve all SALT testing prior to the System Integrator starting the SST testing.

3.3. Conduct SST testing in accordance with NDOT's testing documentation for all field and related equipment once the system has been interconnected to form a complete subsystem (i.e. Network connectivity).

3.4. The SST test shall demonstrate connectivity to all field equipment utilizing NDOT's current freeway management system (FMS).

3.5. The SST test consists of a 45-day period of operations without major failure of equipment. The Resident Engineer can require the SST be restarted if any major failure occurs. A major failure for the Dynamic Message Sign is defined as:

3.5.1. Any failure of the equipment associated with the PRIMARY FUNCTION of the Dynamic Message Sign.

3.6. Demonstrate that the total system (hardware, firmware, software, materials, and construction) are properly installed, free from problems, exhibits stable and reliable performance, and meets project requirements.

3.7. Once per week, the System Integrator shall demonstrate that all system functions tested in the SST are operational and meets requirements.

3.8. The System Integrator shall coordinate through the Resident Engineer and the Construction Crew to have an appropriate NDOT representative present for the onsite inspection.

3.9. The System Integrator must provide proof that each device has been tested each week for the duration of the testing period witnessed by an NDOT representative.

3.10. The testing time must be scheduled a minimum of one week prior and coordinated and approved by the Resident Engineer and the Construction Crew.

DYNAMIC MESSAGE SIGN (DMS) SST PROCEDURE

TEST #	SST TEST PROCEDURE	EXPECTED RESULT	PASS / FAIL

DMS Name:		**IP Address:**		**GPS:**	
TOTS Network Name:		**Associated Cabinet Name:**			

Purpose and General Verification

System Integrator: *This SST tests the proper installation of a functional DMS. The system integrator will use an Operator Workstation at the TMC/ROC to perform this test.*

General Verification*: For each test below, complete the DMS SST Matrix, circling the "Pass" or "Fail" in the appropriate cell. Only indicate a "Pass" on this form if the entire matrix column related to the tested function passes for EACH DMS being tested.*

System DMS Information

1.	Verify network connectivity by issuing a ping test.	DMS responds to the ping test.	Pass / Fail
2.	Verify access to the Web User Interface (UI) from the TMC/ROC.	Web User Interface (UI) is accessible.	Pass / Fail
3.	Verify system turns on by issuing a test message(s) to the system through the Freeway Management System (FMS) and Web User Interface (UI) or manufacturer's software. *Agency/Firm Representative reserves the right to request up to 20 test messages of varying length and type (multi-page message, flashing message, beacons, etc.)	System responds and properly displays all test messages. Visual confirmation of DMS properly displays all test messages.	Pass / Fail
4.	Verify system turns on by issuing a blank message to the system through the Freeway Management System (FMS) and Web User Interface (UI) or manufacturer's software.	System responds and properly displays a blank sign after each individual test message. Visual confirmation of DMS properly displays a blank message after each individual test message.	Pass / Fail
5.	Verify system manual dimming functionality through Freeway Management (FMS) and Web User Interface (UI) or manufacturer's software.	System responds and properly displays dimmed lighting appropriate for the chosen dimming level.	Pass / Fail
6.	Verify system is operating within range of vendor-specific operation diagnostics.	System falls within the expected range of operation as stated by the vendor.	Pass / Fail

Signatures

SST DAY	DATE	PERFORMED BY(Integrator)	INTL	WITNESSED BY(NDOT)	INTL
1					

8					
15					
22					
29					
36					
45					
Integrator Signature					
NDOT Signature					