

ROAD WEATHER INFORMATION SYSTEM TEST PROCEDURES

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.

ROAD WEATHER INFORMATION SYSTEM (RWIS) SALT PROCEDURE

TEST #	SALT TEST PROCEDURE	EXPECTED RESULT	PASS / FAIL
RWIS Name:		IP Address:	GPS:
TOTS Network Name:		Associated Cabinet Name:	
<i>Purpose and General Verification</i>			
<p>System Integrator: This SALT tests the proper installation of a functional RWIS. The system integrator will use a laptop to perform this test. Using the GUI of the RWIS, the integrator will be able to verify all sensors are reporting data to the System Controller.</p> <p>General Verification: For each test below, complete the RWIS SALT Matrix, circling the "Pass", "Fail" or "N/A" in the appropriate cell. Only indicate a "Pass" on this form if the entire matrix column related to the tested function passes for EACH RWIS being tested.</p>			
<i>System Controller Information</i>			
1.	Verify RWIS Controller Information using the manufacturer software or device label.	Manufacturer: _____ Model: _____ Serial Number: _____ Firmware Ver: _____	Pass / Fail
2.	Verify RWIS Sensor Information using the manufacturer software or device label.	All required sensor information has been recorded using the RWIS Sensor Information List sheet at the end of the SALT procedure.	Were additional sheets needed? Yes / No
<i>Equipment Verification</i>			
3.	Verify components are securely mounted on the RWIS backplane.	Components are securely mounted.	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 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

TEST #	SALT TEST PROCEDURE	EXPECTED RESULT		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 hook-and-loop fasteners.		Pass / Fail	
8.	Verify RWIS controller operations locally via Web User Interface (UI).	RWIS controller turns on/off via Web UI.		Pass / Fail	
<i>Verification of Settings</i>					
9.	Verify Communication Settings are set to appropriate values per the IP plan.	IP: _____ MASK: _____ GATEWAY: _____ UDP/TCP PORT: _____		Pass / Fail	
<i>Verification of Sensors</i>					
10.	Use the table below to verify the sensors are reporting data back to the central system. Record the sensor type, model, and data value.	Sensors are reporting accurate data.		Pass / Fail	
<i>Sensor Type</i>		<i>Sensor model #</i>	<i>Control Sensor Value</i>	<i>RWIS Sensor Value</i>	<i>Pass / Fail / N/A</i>
Ultrasonic Wind Speed and Direction Sensor					
Temperature, humidity, barometric pressure sensor					
Visibility sensor (Output of rain and snow)					
Deep roadway temperature sensor (subsurface probe)					
Embedded Surface sensors (road surface temperature, road condition (moisture), and freezing point)					

TEST #	SALT TEST PROCEDURE	EXPECTED RESULT			PASS / FAIL	
	Non-invasive Surface sensors (road surface temperature, road condition (moisture), and freezing point)					
	Precipitation detector					
	Other Sensor #1 _____					
	Other Sensor #2 _____					
	Other Sensor #3 _____					
<p>It is the contractor's responsibility to provide control test equipment to test against the values reported by the RWIS sensors. All control test equipment must be reviewed and approved by NDOT prior to testing. All Control Test Equipment must have a manufacturer -certified calibration certificate dated within the past 12 months. To achieve a passing rating the RWIS Sensor Values must be within +/- 5% of the Control Sensor Values.</p>						
<i>Signatures</i>						
DATE	AGENCY/FIRM	PERFORMED BY (Print Name) (Integrator)	INTL	AGENCY/FIRM	WITNESSED BY (Print Name) (NDOT)	INTL
Integrator Signature						
NDOT RE Signature						
NDOT TOTS Signature						

Road Weather Information System (RWIS) Sensor Information List

If additional sheets are required for recording RWIS sensors, print and number the sheets in numerical order in the space provided above and staple/paperclip as a packet.

If fields are identical, it is acceptable to indicate as such:

EXAMPLE ONLY – Information in this table is purely fictitious and may not accurately represent real information found on the device label				
Sensor Type	Manufacturer	Model	Manufacture Date (MM/DD/YYYY)	Serial Number
Wind Sensor	Sensor Manufacturer A	Sensor Model 25B	01/01/2050	FG812678G
Humidity Sensor	“ “	Sensor Model 1B	01/05/2050	FH812854U
Visibility Sensor	Sensor Manufacturer B	Sensor Model BF30	“ “	EB493248J

RWIS Name:			IP Address:		GPS:	
TOTS Network Name:			Associated Cabinet Name:			
Sensor Type	Manufacturer	Model	Manufacture Date (MM/DD/YYYY)	Serial Number		

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.
- 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 Road Weather Information System is defined as:
 - 3.5.1. Any failure of the equipment associated with the PRIMARY FUNCTION of the Road Weather Information System.
- 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.

ROAD WEATHER INFORMATION SYSTEM (RWIS) SST PROCEDURE

TEST #	SST TEST PROCEDURE	EXPECTED RESULT	PASS / FAIL		
RWIS Name:		IP Address:	GPS:		
TOTS Network Name:		Associated Cabinet Name:			
<i>Purpose and General Verification</i>					
<p>System Integrator: This SST tests the proper installation of a functional RWIS. The system integrator will use an Operator Workstation at the TMC/ROC to perform this test.</p> <p>General Verification: For each test below, complete the RWIS 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 RWIS being tested.</p>					
<i>System Controller Information</i>					
1.	Verify network connectivity by issuing a ping test	RWIS controller responds to the ping test	Pass / Fail		
2.	Verify access to the Web User Interface (UI) from the TMC/ROC.	Web UI is accessible.	Pass / Fail		
3.	Verify system turns on by issuing a command to turn "on" the system through the Freeway Management System (FMS).	System responds and turns on.	Pass / Fail		
4.	Verify system operation with system turned on from TMC/ROC.	Visual confirmation of field device activation.	Pass / Fail		
5.	Verify system turns off by issuing a command to turn "off" the system through the FMS.	System responds and turns off.	Pass / Fail		
6.	Verify system operation with system turned off from TMC/ROC.	Visual confirmation of field device deactivation.	Pass / Fail		
<i>Verification of Sensors in TMC/ROC</i>					
7.	Use the table below to verify the sensors are reporting data back to the central system. Record the sensor type, model, and data value.	Sensors are reporting accurate data.	Pass / Fail		
<i>Sensor Type</i>		<i>Sensor model #</i>	<i>Control Sensor Value</i>	<i>RWIS Sensor Value</i>	<i>Pass / Fail / N/A</i>
Ultrasonic Wind Speed and Direction Sensor					
Temperature, humidity, barometric pressure sensor					

TEST #	SST TEST PROCEDURE	EXPECTED RESULT			PASS / FAIL
	Visibility sensor (Output of rain and snow)				
	Deep roadway temperature sensor (subsurface probe)				
	Embedded Surface sensors (road surface temperature, road condition (moisture), and freezing point)				
	Non-invasive Surface sensors (road surface temperature, road condition (moisture), and freezing point)				
	Precipitation detector				
	Other Sensor #1 _____				
	Other Sensor #2 _____				
	Other Sensor #3 _____				

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Signatures

SST DAY	DATE	PERFORMED BY (Print Name) (Integrator)	INTL	WITNESSED BY (Print Name) (NDOT)	INTL
1					
8					
15					
22					
29					

36					
45					
Integrator Signature					
NDOT RE Signature					
NDOT TOTS Signature					