

## **WRONG WAY DRIVER WARNING SYSTEM 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..

## WRONG WAY DRIVER WARNING SYSTEM (WWD) SALT PROCEDURE

| TEST #   | SALT TEST PROCEDURE  | EXPECTED RESULT  | PASS / FAIL |
|--|--|--|-------------|
| <b>WWD Name:</b>   |  | <b>IP Address:</b>   | <b>GPS:</b> |
| <b>TOTS Network Name:</b>  |  | <b>Associated Cabinet Name:</b>  |             |
| <b><i>Purpose and General Verification</i></b>   |  |  |             |
| <p><b>System Integrator:</b> This SALT tests the proper installation of a functional WWD. The system integrator will use a laptop to perform this test. Using the manufacture's software, the integrator will be able to verify the WWD is operational.</p> <p><b>General Verification:</b> For each test below, complete the WWD 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 WWD being tested.</p> |  |  |             |
| <b><i>WWD Information</i></b>  |  |  |             |
| <b>1.</b>  | Verify WWD Information using the manufacturer software or device label.  | <b>Manufacturer:</b> _____<br><b>Model:</b> _____<br><b>Serial Number:</b> _____<br><b>Firmware Ver:</b> _____   | Pass / Fail |
| <b>2.</b>  | Manufacturer's commissioning of WWD equipment.   | Manufacturer confirmation of full operation of all WWD -associated equipment.  | Pass / Fail |
| <b><i>Equipment Verification</i></b>   |  |  |             |
| <b>3.</b>  | Verify WWD controller is securely mounted in cabinet.  | WWD controller is securely mounted in cabinet.   | Pass / Fail |
| <b>4.</b>  | Verify power supply energizes the system.  | System is energized.   | Pass / Fail |
| <b>5.</b>  | 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.<br><br>Labeling material rated for Outside Plant (OSP) use.<br><br>Cables are neatly managed using adjustable hook-and-loop fastener straps. | Pass / Fail |
| <b>6.</b>  | Using a meter, verify the system is properly bonded to earth ground.   | Meter reading of 5 Ohms or less.   | Pass / Fail |
| <b>7.</b>  | Verify operation of the Rectangular Rapid Flashing Beacon (RRFB) test button and the full Wrong Way Alert test button.                     | When respective test button is pressed, an alert is issued.  | Pass / Fail |
| <b>8.</b>  | Verify WWD User Interface (UI) is accessible.  | WWD UI is accessible   | Pass / Fail |

|     |   |   |             |
|-----|---|---|-------------|
| 9.  | Verify WWD operations locally via User Interface (UI).                      | WWD turns on/off via User Interface (UI).         | Pass / Fail |
| 10. | Using manufacturer's software, issue command to actuate the field device.   | Visual confirmation of field device activation.   | Pass / Fail |
| 11. | Using manufacturer's software issue command to de-actuate the field device. | Visual confirmation of field device deactivation. | Pass / Fail |

**Verification of Settings**

|     |  |   |             |
|-----|--|---|-------------|
| 12. | Verify Communication Settings are set to appropriate values per the IP plan. | <b>IP:</b> _____<br><b>MASK:</b> _____<br><b>GATEWAY:</b> _____<br><b>UDP/TCP PORT:</b> _____ | Pass / Fail |
|-----|--|---|-------------|

**Signatures**

| DATE                        | AGENCY/FIRM | PERFORMED BY<br>(Print Name) (Integrator) | INTL | AGENCY/FIRM | WITNESSED BY<br>(Print Name) (NDOT) | INTL |
|-----------------------------|-------------|---|------|-------------|-------------------------------------|------|
|                             |             |   |      |             |                                     |      |
| <b>Integrator Signature</b> |             |   |      |             |                                     |      |
| <b>NDOT RE Signature</b>    |             |   |      |             |                                     |      |
| <b>NDOT TOTS Signature</b>  |             |   |      |             |                                     |      |

### 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 may require the SST be restarted if any major failure occurs. A major failure for the Wrong Way Driver System is defined as:
  - 3.5.1. Failure of any individual hardware component or equipment associated with the detection, notification, monitoring, control, or operation of the Wrong Way Driver System.
  - 3.5.2. Five false detections or more within any consecutive seven-day period during the SST period.
  - 3.5.3. One false validation or more within any consecutive seven-day period during the SST period.
  - 3.5.4. One delayed notification or more taking longer than 60-seconds to the TMC/ROC within any consecutive seven-day period during the SST period.
  - 3.5.5. One missed notification or more to the TMC/ROC within any consecutive seven-day period during the SST period.
  - 3.5.6. Any missed detection or validation of a true (confirmed) wrong way driver event during the SST period.
- 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.

## WRONG WAY DRIVER WARNING SYSTEM (WWD) SST TEST PROCEDURE

| TEST #   | SST TEST PROCEDURE  | EXPECTED RESULT  | PASS / FAIL |                            |             |
|--|---|--|-------------|----------------------------|-------------|
| <b>WWD Name:</b>   |   | <b>IP Address:</b>   | <b>GPS:</b> |                            |             |
| <b>TOTS Network Name:</b>  |   | <b>Associated Cabinet Name:</b>  |             |                            |             |
| <b><i>Purpose and General Verification</i></b>   |   |  |             |                            |             |
| <p><b>System Integrator:</b> This SST tests the proper installation of a functional WWD. The system integrator will use an Operator Workstation at the TMC/ROC to perform this test.</p> <p><b>General Verification:</b> For each test below, complete the WWD 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 WWD being tested.</p> |   |  |             |                            |             |
| <b><i>System WWD Information</i></b>   |   |  |             |                            |             |
| <b>1.</b>  | Verify network connectivity by issuing a ping test from the WWD workstation located at the TMC/ROC.   | WWD responds to the ping test.   | Pass / Fail |                            |             |
| <b>2.</b>  | Verify field device operation with system turned on from the WWD workstation located at the TMC/ROC.  | Visual confirmation of field device activation.  | Pass / Fail |                            |             |
| <b>3.</b>  | Verify SMTP functionality by sending a test email.  | WWD correctly sends an email to the TMC/ROC.   | Pass / Fail |                            |             |
| <b>4.</b>  | Verify field device operation with system turned off from TMC/ROC.  | Visual confirmation of field device deactivation.  | Pass / Fail |                            |             |
| <b>5.</b>  | Verify access to the Web User Interface (UI) from the TMC/ROC.  | Web User Interface (UI) is accessible.   | Pass / Fail |                            |             |
| <b>6.</b>  | <p>Verify notification of a true positive event occurrence (an actual vehicle is driving against the intended flow of traffic) to the TMC/ROC.</p> <p>***This procedure shall be performed with 4 vehicles (motorcycle, small-, medium- and large vehicle) at 3 different speeds (5 mph, 25 mph, and 45 mph, unless determined unsafe by the engineer)</p> <p>***This test shall be performed on SST Day 1 with all listed vehicles and speeds. On SST Day 45 it shall be tested with a motorcycle at 25 mph (unless directed otherwise by the Engineer).</p> | WWD properly sends a notification, consisting of a time stamp, location, and supporting video of the event, of a true positive event to the TMC/ROC. | Pass / Fail |                            |             |
| <b>SST DAY</b>   | <b>DATE</b>   | <b>PERFORMED BY</b> (Integrator)   | <b>INTL</b> | <b>WITNESSED BY</b> (NDOT) | <b>INTL</b> |
| <b>1</b>   |   |  |             |                            |             |

|           |  |  |  |  |  |
|-----------|--|--|--|--|--|
| <b>8</b>  |  |  |  |  |  |
| <b>15</b> |  |  |  |  |  |
| <b>22</b> |  |  |  |  |  |
| <b>29</b> |  |  |  |  |  |
| <b>36</b> |  |  |  |  |  |
| <b>45</b> |  |  |  |  |  |

| <b>Wrong Way Driver (WWD) Vehicle Matrix</b> |                      |             |                      |                   |  |
|--|----------------------|-------------|----------------------|-------------------|--|
| <b>SST Day 1 Date:</b>                       |                      |             | <b>WWD Location:</b> |                   |  |
| <b>Vehicle Type</b>                          | <b>Vehicle Model</b> | <b>5MPH</b> | <b>25MPH</b>         | <b>45MPH</b>      |  |
| Motorcycle                                   |                      | Pass / Fail | Pass / Fail          | Pass / Fail / N/A |  |
| Small Vehicle                                |                      | Pass / Fail | Pass / Fail          | Pass / Fail / N/A |  |
| Medium Vehicle                               |                      | Pass / Fail | Pass / Fail          | Pass / Fail / N/A |  |
| Large Vehicle                                |                      | Pass / Fail | Pass / Fail          | Pass / Fail / N/A |  |

| <b>Wrong Way Driver (WWD) Vehicle Matrix</b> |                      |                   |                      |                               |
|--|----------------------|-------------------|----------------------|-------------------------------|
| <b>SST Day 45 Date:</b>                      |                      |                   | <b>WWD Location:</b> |                               |
| <b>Vehicle Type</b>                          | <b>Vehicle Model</b> | <b>25MPH</b>      |                      | <b>Reason (if applicable)</b> |
| Motorcycle                                   |                      | Pass / Fail / N/A |                      |                               |
| <b>Integrator Signature</b>                  |                      |                   |                      |                               |
| <b>NDOT RE Signature</b>                     |                      |                   |                      |                               |
| <b>NDOT TOTS Signature</b>                   |                      |                   |                      |                               |