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| --- | --- | --- |
|  | FDOT Traffic Engineering Research Laboratory (TERL)  Light Detection and Ranging (LiDAR) Vehicle Detection System (LVDS) Compliance Matrix | By signing this form, the applicant declares that he/she has read and understands the provisions of Sections 660 and 995 of the FDOT *Standard Specifications for Road and Bridge Construction* and all implemented modifications. The requirements listed on this matrix are derived from Sections 660 and 995, and are the basis for determining a product’s compliance and its acceptability for use on Florida’s roads. |

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| --- | --- | --- | --- |
| Date: | Click here to enter a date. | Applicant’s  Name (print): |  |
| Manufacturer: |  |  |  |
| Item, Model No.: |  | Signature: |  |

| **ID No** | **Section** | **Requirement** | **Item Comply? (Yes/No/NA)** | **Comments (Applicant must provide information as indicated)** | **TERL Evaluation Method** |
| --- | --- | --- | --- | --- | --- |
| The following compliance matrix criteria are for all LVDS. | | | | | |
| 1 | 995-1.1 | Equipment is permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 2 | 995-2.1 | All parts are made of corrosion-resistant materials, such as UV stabilized or UV resistant plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Physical Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 3 |  | All fasteners exposed to the elements are Type 304 or 316 passivated stainless steel. |  | *Provide statement of conformance from hardware supplier that shows the product meets this requirement* | Document Review and Physical Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 4 |  | If the assembly includes a cabinet, the cabinet meets the requirements of Section 676. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Physical Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 5 |  | Detector meets the environmental requirements of NEMA TS-2-2021. |  | *Provide a third party test report that demonstrates the device performs all required functions during and after being subjected to the environmental testing as described in NEMA TS2-2021 section 2.2.7, 2.2.8, and 2.2.9. The test report must be less than 5 years old and meet the requirements of FDOT Product Certification Handbook, section 7.2.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 6 | 995-2.8.1 | LVDS is provided with software that allows local and remote configuration and monitoring. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 7 |  | LVDS software can display detection zones and detection activations superimposed on live images of the point cloud data produced by the system. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 8 |  | LVDS allows a user to edit previously defined configuration parameters, including size and placement of detection zones. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 9 |  | LVDS retains its programming in nonvolatile memory. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 10 |  | LVDS configuration data can be saved to a computer and restored from a saved file. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 11 |  | All communication addresses are user programmable. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 12 |  | An open Application Programming Interface (API) and software development kit are available to the Department at no cost for integration with third party software and systems. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 13 | 995-2.8.2 | If used for Advance Detection, the detection range extends up to at least 200 feet from the sensor. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 14 |  | Multiple sensors are used to reduce occlusion and generate an accurate point cloud representation of the installation environment and detected objects. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 15 | 995-2.8.3 | The LiDAR system includes a processor that combines data from multiple LiDAR sensors into a single point cloud for object detection, classification, presence detection, and data collection. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 16 |  | The processor is a rugged industrial PC with CPU, memory, storage, a commercially available host operating system, and all software required for system operation. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 17 |  | The processor includes physical interfaces for connection of sensors, system inputs, and outputs. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Physical Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 18 | 995-2.8.4 | All major system components include an Ethernet communications interface that provides a 10/100 Base TX connection. |  | *Applicant may provide comments in this field.* | Physical Inspection and  Functional Inspection |
| 19 |  | All unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA 568. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for LVDS with wireless communication. | | | | | |
| 20 |  | Wireless communications are secure and FCC certified. The FCC identification number is displayed on an external label and all LVDS devices operate within the FCC frequency allocation. |  | *Provide FCC certificate that shows the product meets this requirement.* | Document Review and Physical Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for LVDS with cellular communication. | | | | | |
| 21 |  | Cellular communication devices are compatible with the cellular carrier used by the agency responsible for system operation and maintenance. |  | *Provide product literature, specifications, user manual, or similar information that describes any cellular devices that are part of the system and indicates carrier(s) supported.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for LVDS to be used as presence detectors. | | | | | |
| 22 | 995-2.8.5 | Detection output meets the requirements of NEMA TS2-2021, 6.5.2.26. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for all LVDS. | | | | | |
| 23 | 995-2.8.6 | LVDS operates with a nominal input voltage of 12 VDC and with an input voltage ranging from to 89 to 135 VAC. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 24 |  | If any system device requires an operating voltage other than 120 VAC, a voltage converter is supplied. |  | *Environmental test reports must demonstrate that voltage converters required for 120V*AC *operation were subjected to NEMA TS2 environmental testing as part of the functional system.* | Document Review and Physical Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for LVDS to be used as presence detectors. | | | | | |
| 25 | 995-2.9 | Detector provides a minimum detection accuracy of 98%. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 26 |  | Detector meets the requirements for modes of operation in NEMA TS2-2021, 6.5.2.17. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for LVDS to be used as traffic data detectors. | | | | | |
| 27 | 660-4.2.1 | Vehicle detection meets the minimum total roadway segment accuracy levels of 95% for volume, 90% for occupancy, and 90% for speed for all lanes, up to the maximum number of lanes that the device can monitor as specified by the manufacturer. Traffic detection data is calculated in accordance with all criteria as detailed in 995-2.9. |  | *Provide product literature, specifications, user manual, or similar information that shows the product meets this requirement.* | Document Review and Functional Inspection |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| The following compliance matrix criteria are for all LVDS. | | | | | |
| 28 | 660-5 | The detection system has a manufacturer’s warranty covering defects for a minimum of 1 year from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608. |  | *Provide a statement of conformance in this field.* | Compliance Matrix Review |
| 29 |  | The warranty includes providing replacements, within 10 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the Department or the maintaining agency. |  | *Provide a statement of conformance in this field.* | Compliance Matrix Review |

**Document History for:**

**LiDAR Vehicle Detection System Compliance Matrix**

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| Rev | Description | Authored and Checked | Reviewed | Approved | Approval Date | Rev More Stringent? |
| 1.0 | New CM | W. Geitz | L. Audisio  M. DeWitt | D. Vollmer | 12/8/2023 | No |
|  |  |  |  |  |  |  |