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| --- | --- | --- | --- |
|  | FDOT Traffic Engineering Research Laboratory (TERL)  Digital Video Encoder (DVE) Compliance Matrix | By signing this form, the applicant hereby declares that he/she has read and understands the provisions of Sections 684 and 996 of the FDOT *Standard Specifications for Road and Bridge Construction* and all implemented modifications. The requirements listed on this matrix are derived from Sections 684 and 996, 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: |  |

|  |  | **\*\* Greyed out rows in table below are for TERL use only \*\*** |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 encoders. | | | | | |
| 1 | 996-3.5.13 | DVE is permanently marked with manufacturer name or trademark, part number, date of manufacture and serial number. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 2 | 996-3.5.1 | Digital video encoder (DVE) is a specialized network-based hardware device/software which allows video and data signals to be transmitted across Internet Protocol (IP) networks. |  | *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 |  | Video and data packets produced by the DVE and placed onto the network allow reconstruction of digital video signals by hardware-based and software-based digital video decoders (DVD) that are also attached to the network. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 4 | 996-3.5.2 | All setup, control programs, and diagnostic software related to the DVE including equipment licenses, where required for any software or hardware in the system, are provided. |  | *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 encoders that support MPEG-2 Format. | | | | | |
| 5 | 996-3.5.3 | DVE utilizes the Moving Picture Experts Group’s MPEG-2 video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 13818 Standard. |  | *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.* |  |
| 6 |  | DVE is capable of unicast and multicast 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.* |  |
| 7 |  | DVE supports the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974. |  | *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 |  | DVE provides 99.999 percent error-free operation. |  | *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.* |  |
| 9 |  | MPEG-2 DVE supports programmable bit rates. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 10 |  | MPEG-2 DVE supports fixed bit rate mode. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| The following compliance matrix criteria are for encoders that support H.264 Format. | | | | | |
| 11 | 996-3.5.4 | DVE utilizes video compression technology in accordance with the ISO and IEC requirements detailed in the ISO/IEC 14496-10:2009 standard. |  | *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.* |  |
| 12 |  | DVE is capable of unicast and multicast 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.* |  |
| 13 |  | DVE supports the SAP as recommended by the IETF RFC 2974, and Real Time Streaming Protocol (RTSP). |  | *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 |  | DVE provides 99.999 percent error-free operation. |  | *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.* |  |
| 15 |  | H.264 DVE equipment supports programmable bit rates. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 16 |  | H.264 equipment supports fixed bit rate mode. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| The following compliance matrix criteria are for all encoders. | | | | | |
| 17 | 996-3.5.5 | DVE is a hardware-based network device able to accept a minimum of one analog NTSC video input and digitize it for transport across IP networks. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 18 |  | DVE provides a minimum of one serial data interface for transmission of command and control data to other devices (typically camera PTZ commands), as well as console and configuration functions. |  | *Applicant may provide comments in this field.* | Physical Inspection and Functional Inspection |
| 19 |  | Compatible decoder software provided along with the DVE. |  | *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.* |  |
| 20 | 996-3.5.7 | DVE is compatible and fully interoperable with software and hardware DVDs from the DVE manufacturer, as well as a minimum of two software and hardware DVDs from other manufacturers. |  | *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.* |  |
| 21 |  | DVE can be controlled using SunGuide® or supports stream selection and switching using ONVIF commands. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 22 | 996-3.5.8 | Composite video inputs utilize BNC connectors. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 23 |  | Analog video inputs support one volt peak-to-peak (Vp-p) NTSC composite video. |  | *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.* |  |
| 24 |  | DVE operates with both color and monochrome video, and allows the user to select and adjust video resolution. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 25 |  | DVE is capable of delivering color and monochrome video at 30 fps regardless of resolution. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 26 |  | Encoders that support MPEG-2 format support resolutions that include but are not limited to: 352 x 240, 352 x 480, 720 x 480; Encoders that support H.264 format support resolutions that include but are not limited to: 176 x 120, 352 x 240, 720 x 480. |  | *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.* |  |
| 27 | 996-3.5.9 | DVE is hardware-based and has a minimum of one serial data interface that supports EIA/TIA-232 and TIA-422. |  | *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.* |  |
| 28 |  | Serial port(s) supports data rates up to 115 kbps; error detection procedures utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2). |  | *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.* |  |
| 29 |  | DVE provides a TCP/IP interface to its serial port using a network socket connection with configurable IP address and port number. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 30 |  | Serial interface ports utilize RJ-45 connectors, D-sub connectors, or screw terminals. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 31 | 996-3.5.10 | DVE local area network (LAN) connection supports the requirements detailed in the Institute of Electrical and Electronics Engineers (IEEE) 802.3 Standard for 10/100 Ethernet connections. |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 32 |  | DVE has a minimum of one Ethernet port, which is a 10/100 Base-TX connection or a 100 Base-FX ST, SC, LC or FC interface. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 33 |  | Connector complies with applicable EIA and Telecommunications Industry Association (TIA) requirements. |  | *Provide a statement of conformance in this field.* | Compliance Matrix Review |
| 34 |  | Network interface ports are copper-based and utilize RJ-45 connectors. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 35 |  | Fiber ports are single mode with a minimum link budget of 30dB. |  | *Fiber ports are not mandatory, and type and power may be detailed in plans based upon project needs. If the encoder can be configured with optical ports, then provide product literature that indicates the optics and link budgets that are available.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 36 |  | Network communication conforms to UDP, Version 4 of the IP and IGMP Version 2. |  | *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.* |  |
| 37 | 996-3.5.11 | DVE has LED displays, Liquid Crystal Displays (LCD), or similar illuminated displays to indicate status for power and data activity. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 38 | 996-3.5.12 | DVE supports local and remote configuration and management functions with access to all user-programmable features, including but not limited to addressing, serial port configuration, video settings, device monitoring, and security functions via serial login and telnet, web browser, or Simple Network Management Protocol (SNMP). |  | *Applicant may provide comments in this field.* | Functional Inspection |
| 39 | 996-2.5.13 | There are no self-tapping screws on the exterior of the assembly. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 40 |  | Equipment is made of parts made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 41 | 996-3.5.14 | Equipment operates on a nominal voltage of 120 volts alternating current (VAC). |  | *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.* |  |
| 42 |  | If the device requires operating voltages of less than 120 VAC, the appropriate voltage converter is supplied. |  | *Applicant may provide comments in this field.* | Physical Inspection |
| 43 | 996-3.5.15 | DVEs installed in roadside cabinets perform all required functions during and after being subjected to the environmental testing procedures described in NEMA TS2 2021, Sections 2.2.7, 2.2.8, and 2.2.9. |  | *Provide a first or third party test report that demonstrates compliance with testing procedures described in NEMA TS2 2021, Sections 2.2.7, 2.2.8, and 2.2.9. If a voltage converter is required for the device to operate with a 120VAC input voltage, then the voltage converter must be tested with the device, i.e. in the temperature chamber. The test report must be less than 5 years old and meet the requirements of FDOT Product Certification Handbook (PCH), section 7.2.* | Document Review |
|  |  |  |  | *Indicate location of requested information in submittal.* |  |
| 44 | 684-5.1 | DVE has a manufacturer’s warranty covering defects for 1 year from the date of final acceptance. |  | *Provide a statement of conformance in this field.* | Compliance Matrix Review |
| 45 |  | DVE manufacturer will furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification. |  | *Provide a statement of conformance in this field.* | Compliance Matrix Review |

**Document History for:**

**Digital Video Encoder (DVE) Compliance Matrix**

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| --- | --- | --- | --- | --- | --- | --- |
| Rev | Description | Authored and Checked | Reviewed | Approved | Approval Date | Rev More Stringent? |
| 1.0 | Conversion of matrix from Excel to Word, addition of evaluation method column, and changes to match current FHWA approved specification. | R. Meyer | D. Vollmer | J. Morgan | 8/30/2012 | N/A |
| 2.0 | Changed document control panel to include column for “Rev more stringent?” and added Rev # to header of matrix corresponding to latest approved document. Modified disclaimer to indicate compliance matrix is governing document and referencing PCH section 7.2 in place of A601-3. | A. Burleson | J. Morgan | J. Morgan | 02/19/2013 | No |
| 3.0 | Editing warranty statements to match the specification. | D. Vollmer | J. Morgan | J. Morgan | 03/05/2013 | No |
| 4.0 | Remove warranty language | D. Bremer | J. Morgan | J. Morgan | 05/09/2013 | No |
| 5.0 | Edited to match FA 7-30-13. | R. Meyer | J. Morgan | J. Morgan | 08/15/2013 | No |
| 6.0 | Replaced FDOT logo with latest approved one and added CM ID # to header. Revised document approver title. | D. Bremer  K. Moser | J. Morgan | J. Morgan | 10/30/2014 | No |
| 7.0 | Edited to match FA 1-6-15. | R. Meyer | J. Morgan | J. Morgan | 09/24/2015 | No |
| 8.0 | Updated to FA date 8-5-19 | W. Geitz | M. DeWitt  C. Raimer | D. Vollmer | 09/19/2019 | No |
| 9.0 | Converted to spec 996 and FA date 1-30-2020 | W. Geitz | M. DeWitt | D. Vollmer | 06/08/2020 | No |
| 10.0 | Updated FA date of spec 996 to 2-3-21. Added warranty information from 684. | W. Geitz | M. DeWitt | D. Vollmer | 05/26/2022 | No |
| 11.0 | Added test cases and steps. Updated to reflect latest FA approved spec 10-24-22. | D. Bremer | V. Johnson  W. Geitz | D. Vollmer | 09/18/2023 | No |
| 12.0 | Updated to latest FA dates of 12-4-23 and 12-1-23 for specs 684 and 996, respectively. | W. Geitz | D. Pedraza | D. Vollmer | 01/19/2024 | No |