



Florida Department of Transportation

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GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JARED W. PERDUE, P.E.
SECRETARY

September 19, 2022

Khoa Nguyen
Director, Office of Technical Services
Federal Highway Administration
3500 Financial Plaza, Suite 400
Tallahassee, Florida 32312

Re: State Specifications Office
Section: **996**
Proposed Specification: **9960202 Intelligent Transportation System Device Materials.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Matt DeWitt from the Traffic Engineering and Operations Office to move all material requirements from Division II to Division III and clarified lens to be manual focus, auto focus, and automatic iris. This change is associated with the proposed changes to Section 685.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to daniel.strickland@dot.state.fl.us.

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.
State Construction Engineer

INTELLIGENT TRANSPORTATION SYSTEM DEVICE MATERIALS.
(REV 7-21-22)

SUBARTICLE 996-2.2.1 is deleted and the following substituted:

996-2.2 CCTV Camera:

996-2.2.1 Camera: CCTV cameras shall be compliant with the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Section 889, Prohibition on Certain Telecommunications or Video Surveillance Services or Equipment. CCTV cameras shall be compatible with the current version of the Department's SunGuide® software system. Camera types include dome pan-tilt-zoom (PTZ), external positioner-PTZ, and fixed. Video types include analog and internet protocol (IP).

—————Analog camera produces National Television System Committee (NTSC) composite video output of 1V peak-to-peak (Vp-p) at 75 ohms with a minimum resolution of 470 horizontal and 350 vertical TV lines.

Analog and IP cameras shall provide the following features and capabilities:

1. Day (color)/night (monochrome) switchover ~~and iris control, with user-selectable manual and automatic control capabilities.~~
2. Manual and automatic focus.
3. Automatic iris.
24. Ability to produce clear, detailed, and usable video images of the areas, objects, and other subjects visible from a roadside CCTV field site. Video produced by the camera is true, accurate, distortion free, and free from transfer smear, oversaturation, and any other image defect that negatively impacts image quality under all lighting and weather conditions in both color and monochrome modes.
35. User-selectable automatic gain control (AGC) that is peak-average adjustable to 28 dB.
- 4,6. A minimum signal-to-noise ratio of 50 dB.
57. Automatic color balance that references the white areas of the scene through the lens.
68. An automatic electronic shutter that is user selectable from 1/60 to 1/10,000 of a second.
79. PTZ cameras shall include a minimum 10x digital zoom.
810. PTZ cameras shall include programmable azimuth and compass display with ability to display pan and tilt position with a 1 degree resolution.

CCTV cameras shall provide titling and masking features including, but not limited to, programmable camera title, programmable preset titles for each preset position, and programmable privacy zones. Programmable titles shall allow a minimum of 18 characters per line.

996-2.2.2 Lens: Standard definition PTZ cameras shall include a minimum 22x motorized optical zoom lens with automatic iris. High definition CCTV cameras shall include a minimum 18x motorized optical zoom lens with automatic iris. ~~The lens shall provide automatic and manual focus and iris control.~~ Fixed cameras shall have a 3-9 mm varifocal lens with automatic iris. The lens shall have a maximum aperture of at least f/1.6 and the depth of field shall provide a clear image of roadside areas under all lighting conditions.

SUBARTICLE 996-2.2.8 is deleted and the following substituted:

996-2.2.8 Environmental Requirements: CCTV cameras shall 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.

All CCTV cameras, mounting hardware, and any other camera-related material that is exposed to the environment shall be designed for 150 mph wind speeds and meet the requirements of the Department’s Structures Manual.

SUBARTICLE 996-2.2.9 is deleted and the following substituted:

996-2.2.9 Additional Requirements for IP Cameras:

996-2.2.9.1 Video Encoding: The camera shall utilize the Moving Picture Experts Group’s MPEG4 part 10 (H.264) video compression technology in accordance with the ISO and IEC requirements detailed in the ISO/IEC 14496-10:2009 Standard.

Cameras shall establish unicast and multicast sessions using the Real-Time Streaming Protocol (RTSP) and provide for a 99.999% error-free operation. The encoded video shall transmit using programmable bit rates and the camera supports, at a minimum, a fixed bit rate mode.

~~996-2.2.9.2 Encoded Video Interoperability: The camera’s encoded video shall be able to be displayed using video display control systems listed on the APL.~~

996-2.2.9.3 Encoded Video Requirements: The camera’s encoded video shall support resolutions that include; but are not limited to, those defined in Table 996-1. The camera shall deliver color and monochrome video at 30 frames per second (fps), regardless of resolution.

Format	Vertical Resolutions
H.264	240, 480

Note: The resolutions attained depend on the data transmission rate.

996-2.2.9.4 Network Interface: The camera’s Local Area Network (LAN) connection shall support the requirements detailed in the IEEE 802.3 Standard for 10/100 Ethernet connections. The camera shall have a minimum of one 10/100 Base-TX connection Ethernet port.

Unshielded twisted pair/shielded twisted pair network cables shall be compliant with the TIA-568 Standard. The network communication shall conform to TCP, UDP, Version 4 of the IP, RTSP, and Version 2 of the Internet Group Multicast Protocol (IGMP), at a minimum. If the camera supports NTCIP, then the camera shall be able to be controlled via TCP/IP or UDP/IP.

996-2.2.9.5 Configuration Management: The camera shall support local and remote configuration and management via serial login, telnet login, or a web-based

interface. Configuration and management functions shall include access to all user-programmable features including, but not limited to, network configuration, video settings, device monitoring, and security functions.

SUBARTICLE 996-3.2.8 is deleted and the following substituted:

996-3.2.8 Environmental Requirements: MFES shall operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2 [2021](#), Sections 2.2.7, 2.2.8., and 2.2.9.

SUBARTICLE 996-3.3.7 is deleted and the following substituted:

996-3.3.7 Environmental Requirements: The device server performs 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.

SUBARTICLE 996-3.4.15 is deleted and the following substituted:

996-3.4.15 Environmental Requirements: DVEs and DVDs installed in roadside cabinets shall 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. Hardware DVD installed in a climate-controlled environment, such as a TMC computer room, has an operating temperature range of 32 to 104°F.

SUBARTICLE 996-3.5.5 is deleted and the following substituted:

996-3.5.5 Environmental Requirements: Ensure media converters 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.

SUBARTICLE 996-4.2.6 is deleted and the following substituted:

996-4.2.6 Environmental Specifications: The SPDs shall operate properly during and after being subjected to the temperature and humidity test described in NEMA TS 2 [2021](#), Section 2.2.7, and the vibration and shock tests described in NEMA TS 2 [2021](#), Sections 2.2.8 and 2.2.9.

SUBARTICLE 996-5.2 is deleted and the following substituted:

996-5.2 Marking: The following information shall be permanently cast or engraved into the top surface of all pull and splice box covers. If used, identification plates shall be UV stable,

mechanically fastened, ~~and~~ bonded with adhesive material suitable for outdoor applications, and capable of installation in the field.

1. Mark application as follows:

FDOT TRAFFIC SIGNAL for signalized intersections

FDOT FIBER OPTIC CABLE for fiber optic cable

FDOT LIGHTING for highway lighting

FDOT TRAFFIC MONITORING for traffic monitoring

FDOT ELECTRICAL for other electrical applications

2. Manufacturer's name or logo

3. FDOT APL approval number

4. TIER rating

The date of manufacture (month/day/year, or date code) shall be permanently located on the top or bottom of the cover. The interior of the box body shall have a permanent marking that includes the manufacturer part/model number and date of manufacture near the top of box in a location that is visible after installation when the cover is removed.

SUBARTICLE 996-5.5 is deleted and the following substituted:

996-5.5 Testing Requirements: Pull and splice boxes shall meet or exceed the American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77 2017 Specification for Underground Enclosure Integrity for TIER 15 loading requirements with the following additional clarifications and requirements:

1. Apply all environmental tests to the box and its cover.

2. All flexural testing shall be conducted in accordance with an appropriate ASTM standard and clearly stated in the report.

3. Perform repetitions of Cycle 1 in Table X2.1 of ASTM G154 for a minimum duration of 1000 hours for the simulated sunlight exposure test.

4. Use deflection-measuring devices positioned to measure vertical and lateral deflection (wherever maximum deflection occurs) for the vertical sidewall load test.

5. Conduct the lateral sidewall pressure, vertical sidewall load and cover vertical load tests without any removable or permanent wall to wall supporting beams located in the interior or top of the box opening.

When testing pull and splice boxes of various sizes (width x length x depth), the cover impact test, internal equipment protection test, coefficient of friction test, and all environmental tests, can be completed using a single representative box/cover (instead of samples from all box/cover sizes) as long as the test report indicates the following:

1. Materials of construction, compositions, and manufacturing processes are identical for all box and cover sizes submitted for listing on the APL.

2. Size (width x length x depth) of the representative box/cover.

SECTION 996 is expanded by the following new Article:

996-7 Traffic Control System Auxiliaries.

996-7.1 General: Traffic Control System Auxiliaries shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

996-7.2 Uninterruptible Power Supply (UPS): The UPS shall be either a line interactive or online/double-conversion UPS. UPS assemblies shall be designed for installation in a roadside NEMA 3R enclosure to provide battery backup functionality for traffic control systems, including traffic signal and intelligent transportation system (ITS) devices. UPS assemblies shall include batteries provided by the UPS manufacturer or in accordance with manufacturer's requirements.

Loss of utility power, transfer from utility power to battery power, and transfer back to utility power shall not interfere with normal operation of connected equipment. In the event of UPS failure or battery depletion, connected equipment shall be energized automatically upon restoration of utility power.

The UPS shall operate in hot standby mode with power transfer being accomplished in 40 milliseconds or less.

Removal and replacement of the UPS shall not disrupt the operation of the equipment being protected.

All harnesses necessary to connect and operate the system shall be included. All connectors shall be keyed to prevent improper connection.

996-7.2.1 Configuration and Management: The UPS shall support local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions shall be password protected.

Alarm function monitoring shall include the following: loss of utility power, inverter failure, low battery, and temperature out of range. The UPS shall include an event log that indicates the date and time of the following events: AC high, AC low, AC frequency error, AC fail/blackout, and over temperature. The UPS event log shall be able to store a minimum of 60 events.

The UPS shall include a front panel display and controls that allows programming of configurable parameters, features, and functions without the need for another input device. The UPS shall have visual indications for Power-On, Mode of Operation (utility power or inverter), Battery Status, Alarm Status, Load Levels, and AC Output Voltage.

996-7.2.2 Communication Interfaces: The UPS shall include an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

996-7.2.3 Batteries: Batteries must be provided by the UPS manufacturer or in accordance with manufacturer's recommendations. Batteries shall be sealed and require no maintenance, cause no corrosion, and be capable of maintaining 80% of original capacity and performance for a minimum of five years.

The UPS shall be supplied with a wiring harness for battery connections. The battery wiring harness shall allow 6 feet of separation between the UPS and its battery bank. Battery terminals shall include a protective covering to prevent accidental spark or shorting.

The UPS shall include battery management functions that includes active or equalized balancing; monitoring of temperature, voltage, and amperage of charge and discharge; and temperature compensated automatic charging to maximize the life of the batteries.

996-7.2.4 Electrical: UPS assemblies used to provide backup power in an ITS cabinet shall provide a minimum of 350 watts (at 120 V_{AC}) of continuous backup power for a minimum of two hours.

UPS assemblies used to provide backup power in a traffic signal controller cabinet shall provide a minimum 400 watts (at 120 V_{AC}) of continuous power for a minimum of 6.5 hours.

Frequency shall be regulated to 60 Hz, plus or minus 0.5 Hz, while the UPS is supplying power. The UPS shall operate on 85 to 140 V_{AC} without requiring assistance from the batteries.

The UPS shall be listed to the requirements of UL 1778. Upstream back feed voltage from the UPS shall be less than 1 V_{AC}.

Double-conversion UPS shall be capable of simultaneously producing fully regenerated and regulated, conditioned, True Sine Wave power and hot standby AC output, and have a minimum operating efficiency of 90%.

996-7.2.5 Traffic Signal UPS Cabinet: Cabinets used to house traffic signal UPS assemblies shall be designed to be mounted to the side of a traffic cabinet or base mounted. Cabinets shall meet the requirements of Section 676 and include shelves and rack rails to house all UPS system components including the UPS, batteries, harnesses, switches, surge protective device, power terminal block and a generator hookup with transfer switch. The UPS cabinet shall allow a maintenance technician to safely insert power for traffic signal operation while the UPS or associated equipment is serviced or replaced.

A surge protective device shall be installed where the supply circuit enters the cabinet in accordance with Section 620-2.

The cabinet shall include a 20 A, 120 volt, 60 Hz GFCI receptacle. The receptacle shall be wired to utility power and not regulated by the UPS module. The cabinet shall include a main breaker and a breaker for the technician GFCI outlet.

996-7.2.5.1 Transfer Switch and Generator Access Panel: The cabinet shall include an automatic transfer switch and generator access panel in accordance with Section 676. The generator access door shall not protrude more than 1 inch when closed.

996-7.2.6 Mechanical: All parts shall be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements shall be Type 304 or 316 passivated stainless steel.

996-7.2.7 Environmental: UPS assemblies, including batteries, shall provide continuous power with specified wattage and operate properly 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.

996-7.3 Remote Power Management Unit (RPMU): The RPMU shall be designed for installation in a roadside Traffic Cabinet to provide remote control of electrical receptacles.

996-7.3.1 Configuration and Management: Provide a RPMU that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions shall be password protected.

The RPMU shall include an event scheduler that can store a minimum of 60 events.

The RPMU shall include LED indicators for relay inputs and outlet status.

Upon loss of communications the RPMU shall maintain each receptacle and relay in its currently stored state of operation.

Upon restoration of electrical power after an outage the RPMU shall automatically restore each receptacle and relay to its previously stored state of operation and all configurable parameters shall be retained.

The unit shall support SNMP v2c, including trap notifications of receptacle state changes.

996-7.3.2 Communication Interfaces: The RPMU shall have an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

996-7.3.3 Electrical: The RPMU shall have a minimum of 6 NEMA 5-15R receptacles, nominal 120 V_{AC}. The RPMU shall have a minimum current capacity of 12 amperes (amps).

996-7.3.4 Mechanical: All parts shall be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements shall be Type 304 or 316 passivated stainless steel.

996-7.3.5 Environmental: The RPMU shall operate properly 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.

INTELLIGENT TRANSPORTATION SYSTEM DEVICE MATERIALS.
(REV 7-21-22)

SUBARTICLE 996-2.2.1 is deleted and the following substituted:

996-2.2 CCTV Camera:

996-2.2.1 Camera: CCTV cameras shall be compliant with the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Section 889, Prohibition on Certain Telecommunications or Video Surveillance Services or Equipment. CCTV cameras shall be compatible with the current version of the Department's SunGuide® software system. Camera types include dome pan-tilt-zoom (PTZ), external positioner-PTZ, and fixed. Video types include analog and internet protocol (IP). Analog camera produces National Television System Committee (NTSC) composite video output of 1V peak-to-peak (Vp-p) at 75 ohms with a minimum resolution of 470 horizontal and 350 vertical TV lines.

Analog and IP cameras shall provide the following features and capabilities:

1. Day (color)/night (monochrome) switchover.
2. Manual and automatic focus.
3. Automatic iris.
4. Ability to produce clear, detailed, and usable video images of the areas, objects, and other subjects visible from a roadside CCTV field site. Video produced by the camera is true, accurate, distortion free, and free from transfer smear, oversaturation, and any other image defect that negatively impacts image quality under all lighting and weather conditions in both color and monochrome modes.
5. User-selectable automatic gain control (AGC) that is peak-average adjustable to 28 dB.
6. A minimum signal-to-noise ratio of 50 dB.
7. Automatic color balance that references the white areas of the scene through the lens.
8. An automatic electronic shutter that is user selectable from 1/60 to 1/10,000 of a second.
9. PTZ cameras shall include a minimum 10x digital zoom.
10. PTZ cameras shall include programmable azimuth and compass display with ability to display pan and tilt position with a 1 degree resolution.

CCTV cameras shall provide titling and masking features including, but not limited to, programmable camera title, programmable preset titles for each preset position, and programmable privacy zones. Programmable titles shall allow a minimum of 18 characters per line.

996-2.2.2 Lens: Standard definition PTZ cameras shall include a minimum 22x motorized optical zoom lens with automatic iris. High definition CCTV cameras shall include a minimum 18x motorized optical zoom lens with automatic iris. Fixed cameras shall have a 3-9 mm varifocal lens with automatic iris. The lens shall have a maximum aperture of at least f/1.6 and the depth of field shall provide a clear image of roadside areas under all lighting conditions.

SUBARTICLE 996-2.2.8 is deleted and the following substituted:

996-2.2.8 Environmental Requirements: CCTV cameras shall 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.

All CCTV cameras, mounting hardware, and any other camera-related material that is exposed to the environment shall be designed for 150 mph wind speeds and meet the requirements of the Department's Structures Manual.

SUBARTICLE 996-2.2.9 is deleted and the following substituted:

996-2.2.9 Additional Requirements for IP Cameras:

996-2.2.9.1 Video Encoding: The camera shall utilize the Moving Picture Experts Group's MPEG4 part 10 (H.264) video compression technology in accordance with the ISO and IEC requirements detailed in the ISO/IEC 14496-10:2009 Standard.

Cameras shall establish unicast and multicast sessions using the Real-Time Streaming Protocol (RTSP) and provide for a 99.999% error-free operation. The encoded video shall transmit using programmable bit rates and the camera supports, at a minimum, a fixed bit rate mode.

996-2.2.9.2 Encoded Video Requirements: The camera's encoded video shall support resolutions that include; but are not limited to, those defined in Table 996-1. The camera shall deliver color and monochrome video at 30 frames per second (fps), regardless of resolution.

Table 996-1 Minimum Resolution Requirements	
Format	Vertical Resolutions
H.264	240, 480

Note: The resolutions attained depend on the data transmission rate.

996-2.2.9.3 Network Interface: The camera's Local Area Network (LAN) connection shall support the requirements detailed in the IEEE 802.3 Standard for 10/100 Ethernet connections. The camera shall have a minimum of one 10/100 Base-TX connection Ethernet port.

Unshielded twisted pair/shielded twisted pair network cables shall be compliant with the TIA-568 Standard. The network communication shall conform to TCP, UDP, Version 4 of the IP, RTSP, and Version 2 of the Internet Group Multicast Protocol (IGMP), at a minimum. If the camera supports NTCIP, then the camera shall be able to be controlled via TCP/IP or UDP/IP.

996-2.2.9.4 Configuration Management: The camera shall support local and remote configuration and management via serial login, telnet login, or a web-based interface. Configuration and management functions shall include access to all user-programmable features including, but not limited to, network configuration, video settings, device monitoring, and security functions.

SUBARTICLE 996-3.2.8 is deleted and the following substituted:

996-3.2.8 Environmental Requirements: MFES shall operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2 2021, Sections 2.2.7, 2.2.8., and 2.2.9.

SUBARTICLE 996-3.3.7 is deleted and the following substituted:

996-3.3.7 Environmental Requirements: The device server performs 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.

SUBARTICLE 996-3.4.15 is deleted and the following substituted:

996-3.4.15 Environmental Requirements: DVEs and DVDs installed in roadside cabinets shall 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. Hardware DVD installed in a climate-controlled environment, such as a TMC computer room, has an operating temperature range of 32 to 104°F.

SUBARTICLE 996-3.5.5 is deleted and the following substituted:

996-3.5.5 Environmental Requirements: Ensure media converters 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.

SUBARTICLE 996-4.2.6 is deleted and the following substituted:

996-4.2.6 Environmental Specifications: The SPDs shall operate properly during and after being subjected to the temperature and humidity test described in NEMA TS 2 2021, Section 2.2.7, and the vibration and shock tests described in NEMA TS 2 2021, Sections 2.2.8 and 2.2.9.

SUBARTICLE 996-5.2 is deleted and the following substituted:

996-5.2 Marking: The following information shall be permanently cast or engraved into the top surface of all pull and splice box covers. If used, identification plates shall be UV stable, mechanically fastened, bonded with adhesive material suitable for outdoor applications, and capable of installation in the field

1. Mark application as follows:

FDOT TRAFFIC SIGNAL for signalized intersections
FDOT FIBER OPTIC CABLE for fiber optic cable
FDOT LIGHTING for highway lighting
FDOT TRAFFIC MONITORING for traffic monitoring
FDOT ELECTRICAL for other electrical applications

2. Manufacturer's name or logo
3. FDOT APL approval number
4. TIER rating

The date of manufacture (month/day/year, or date code) shall be permanently located on the top or bottom of the cover. The interior of the box body shall have a permanent marking that includes the manufacturer part/model number and date of manufacture near the top of box in a location that is visible after installation when the cover is removed.

SUBARTICLE 996-5.5 is deleted and the following substituted:

996-5.5 Testing Requirements: Pull and splice boxes shall meet or exceed the American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77 2017 Specification for Underground Enclosure Integrity for TIER 15 loading requirements with the following additional clarifications and requirements:

1. Apply all environmental tests to the box and its cover.
2. All flexural testing shall be conducted in accordance with an appropriate ASTM standard and clearly stated in the report.
3. Perform repetitions of Cycle 1 in Table X2.1 of ASTM G154 for a minimum duration of 1000 hours for the simulated sunlight exposure test.
4. Use deflection-measuring devices positioned to measure vertical and lateral deflection (wherever maximum deflection occurs) for the vertical sidewall load test.
5. Conduct the lateral sidewall pressure, vertical sidewall load and cover vertical load tests without any removable or permanent wall to wall supporting beams located in the interior or top of the box opening.

When testing pull and splice boxes of various sizes (width x length x depth), the cover impact test, internal equipment protection test, coefficient of friction test, and all environmental tests, can be completed using a single representative box/cover (instead of samples from all box/cover sizes) as long as the test report indicates the following:

1. Materials of construction, compositions, and manufacturing processes are identical for all box and cover sizes submitted for listing on the APL.
2. Size (width x length x depth) of the representative box/cover.

SECTION 996 is expanded by the following new Article:

996-7 Traffic Control System Auxiliaries.

996-7.1 General: Traffic Control System Auxiliaries shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

996-7.2 Uninterruptible Power Supply (UPS): The UPS shall be either a line interactive or online/double-conversion UPS. UPS assemblies shall be designed for installation

in a roadside NEMA 3R enclosure to provide battery backup functionality for traffic control systems, including traffic signal and intelligent transportation system (ITS) devices. UPS assemblies shall include batteries provided by the UPS manufacturer or in accordance with manufacturer's requirements.

Loss of utility power, transfer from utility power to battery power, and transfer back to utility power shall not interfere with normal operation of connected equipment. In the event of UPS failure or battery depletion, connected equipment shall be energized automatically upon restoration of utility power.

The UPS shall operate in hot standby mode with power transfer being accomplished in 40 milliseconds or less.

Removal and replacement of the UPS shall not disrupt the operation of the equipment being protected.

All harnesses necessary to connect and operate the system shall be included. All connectors shall be keyed to prevent improper connection.

996-7.2.1 Configuration and Management: The UPS shall support local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions shall be password protected.

Alarm function monitoring shall include the following: loss of utility power, inverter failure, low battery, and temperature out of range. The UPS shall include an event log that indicates the date and time of the following events: AC high, AC low, AC frequency error, AC fail/blackout, and over temperature. The UPS event log shall be able to store a minimum of 60 events.

The UPS shall include a front panel display and controls that allows programming of configurable parameters, features, and functions without the need for another input device. The UPS shall have visual indications for Power-On, Mode of Operation (utility power or inverter), Battery Status, Alarm Status, Load Levels, and AC Output Voltage.

996-7.2.2 Communication Interfaces: The UPS shall include an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

996-7.2.3 Batteries: Batteries must be provided by the UPS manufacturer or in accordance with manufacturer's recommendations. Batteries shall be sealed and require no maintenance, cause no corrosion, and be capable of maintaining 80% of original capacity and performance for a minimum of five years.

The UPS shall be supplied with a wiring harness for battery connections. The battery wiring harness shall allow 6 feet of separation between the UPS and its battery bank. Battery terminals shall include a protective covering to prevent accidental spark or shorting.

The UPS shall include battery management functions that includes active or equalized balancing; monitoring of temperature, voltage, and amperage of charge and discharge; and temperature compensated automatic charging to maximize the life of the batteries.

996-7.2.4 Electrical: UPS assemblies used to provide backup power in an ITS cabinet shall provide a minimum of 350 watts (at 120 V_{AC}) of continuous backup power for a minimum of two hours.

UPS assemblies used to provide backup power in a traffic signal controller cabinet shall provide a minimum 400 watts (at 120 V_{AC}) of continuous power for a minimum of 6.5 hours.

Frequency shall be regulated to 60 Hz, plus or minus 0.5 Hz, while the UPS is supplying power. The UPS shall operate on 85 to 140 V_{AC} without requiring assistance from the batteries.

The UPS shall be listed to the requirements of UL 1778. Upstream back feed voltage from the UPS shall be less than 1 V_{AC}.

Double-conversion UPS shall be capable of simultaneously producing fully regenerated and regulated, conditioned, True Sine Wave power and hot standby AC output, and have a minimum operating efficiency of 90%.

996-7.2.5 Traffic Signal UPS Cabinet: Cabinets used to house traffic signal UPS assemblies shall be designed to be mounted to the side of a traffic cabinet or base mounted. Cabinets shall meet the requirements of Section 676 and include shelves and rack rails to house all UPS system components including the UPS, batteries, harnesses, switches, surge protective device, power terminal block and a generator hookup with transfer switch. The UPS cabinet shall allow a maintenance technician to safely insert power for traffic signal operation while the UPS or associated equipment is serviced or replaced.

A surge protective device shall be installed where the supply circuit enters the cabinet in accordance with Section 620-2.

The cabinet shall include a 20 A, 120 volt, 60 Hz GFCI receptacle. The receptacle shall be wired to utility power and not regulated by the UPS module. The cabinet shall include a main breaker and a breaker for the technician GFCI outlet.

996-7.2.5.1 Transfer Switch and Generator Access Panel: The cabinet shall include an automatic transfer switch and generator access panel in accordance with Section 676. The generator access door shall not protrude more than 1 inch when closed.

996-7.2.6 Mechanical: All parts shall be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements shall be Type 304 or 316 passivated stainless steel.

996-7.2.7 Environmental: UPS assemblies, including batteries, shall provide continuous power with specified wattage and operate properly 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.

996-7.3 Remote Power Management Unit (RPMU): The RPMU shall be designed for installation in a roadside Traffic Cabinet to provide remote control of electrical receptacles.

996-7.3.1 Configuration and Management: Provide a RPMU that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.

Configuration and management functions shall be password protected.

The RPMU shall include an event scheduler that can store a minimum of 60 events.

The RPMU shall include LED indicators for relay inputs and outlet status. Upon loss of communications the RPMU shall maintain each receptacle and relay in its currently stored state of operation.

Upon restoration of electrical power after an outage the RPMU shall automatically restore each receptacle and relay to its previously stored state of operation and all configurable parameters shall be retained.

The unit shall support SNMP v2c, including trap notifications of receptacle state changes.

996-7.3.2 Communication Interfaces: The RPMU shall have an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.

996-7.3.3 Electrical: The RPMU shall have a minimum of 6 NEMA 5-15R receptacles, nominal 120 V_{AC}. The RPMU shall have a minimum current capacity of 12 amperes (amps).

996-7.3.4 Mechanical: All parts shall be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements shall be Type 304 or 316 passivated stainless steel.

996-7.3.5 Environmental: The RPMU shall operate properly 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.