

## RESPONSE 2 Comments from Industry Review – 7850000

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### Bill Cook

\* 785-1.3.5 Air Terminals: Ensure that air terminal lightning protection devices consist of either a hemispherical array type of dissipating air terminal or a single lightning rod constructed of a material compatible with the structure. There are enough scientific studies and papers that clearly state that dissipation arrays do not work. One of the most recent studies performed at the University of Florida in Gainesville, was funded, in part by the Federal government via the "National Science Foundation" I have attached a copy for your reference. Leaving these devices in the specification implies and supports their functionality by the state.

**ITS SECTION RESPONSE:** Comment noted. While research casts doubt on the effectiveness of dissipation arrays, there is still an interest by some agencies in utilizing these devices in certain settings. The specification requires that any lightning protection systems conform to NFPA 780, but no longer specifically mentions alternative technologies, such as dissipation arrays. Selection of specific device types may be covered in the plans on a project-by-project basis and is left to the design team for each project.

\* 785-1.4.2 TVSS Device at Power Entry Point: Install a TVSS that complies with the requirements as detailed in Section 2.2.7 of the NEMA LS 1 standard. The NEMA document LS1 is a standard of how to write a surge protector specification sheet. It is not a product or performance standard.

**ITS SECTION RESPONSE:** Comment noted. The reference to NEMA LS 1 is valid. The notation in the text has been corrected to state NEMA LS 1-1992 (R2000). Section 2.2.7 of this seven-page standard defines the protection modes pertaining to low-voltage surge protection devices.

\* 785-1.4.2 TVSS Device at Power Entry Point: Ensure that the suppression device is a hybrid, multi-staged device with a visual indication system that monitors the weakest link in each mode and shows normal operation or failure status and also provides one set of dry contacts to export this status information to other monitoring. This statement is erroneous for a primary AC surge protector connected in parallel with the load. A multi stage device is associated with a series connected surge protector, therefore delete multi-stage.

**ITS SECTION RESPONSE:** Comment not accepted. We do not agree with the justification to delete the multi-stage wording. The industry has gone to the multi-stage design to improve the performance of their products. To meet the performance parameters in this specification, the industry standard is to use the multi-stage approach. Though we could take out the wording and closely monitor the performance, the preference is to have two "check points" for compliance. If a manufacturer invents a new product that meets the performance and is not multi-staged design, the Design Engineer could make the decision to waive the multi-stage requirement.

\* 785-1.4.3 TVSS Device at Point of Use: The maximum allowable let-through voltages for the A1 waveform is 45 V line to neutral mode, 60 V line to ground mode, and 35 V neutral to ground mode. The let-thru-voltage cannot be lower than the service voltage. The sentence should continue to say - "above the nominal line voltage."

**ITS SECTION RESPONSE:** Comment noted. Document changed. While we do not agree with the suggested wording addition or the justification, this comment does point out that some clarification of intent should be added to improve interpretation of the requirements. The text was revised to state, "The maximum allowable excursion of the let-through voltage from the service voltage sine wave when testing with the A1 waveform is..."

\* 785-1.4.3 TVSS Device at Point of Use: Ensure that the suppression device is a hybrid, multi-staged device with a visual indication system that monitors the weakest link in each mode and shows normal operation or failure status and also provides one set of dry contacts to export this status information to other monitoring systems. Receptacle devices do not have sets of dry contacts to export the status information. This should be deleted.

**ITS SECTION RESPONSE:** Comment noted. Document changed. Receptacle devices can have dry contacts, but we agree that it would be an expensive option. The line in the text has been edited to read "and hardwired type units shall also include one set of dry contacts to export this status information to...."

\* 785-1.4.4 TVSS Device for Low-Voltage Power, Control, Data and Signal Systems: Table 4.1 - values of Low-Voltage Circuits. The last item CAT 5 refers Cat 5 Up to 12 V - Up to 500 mA - Up to 100 Mbps - 3,000 Watts per mode(10x1000  $\mu$ s) - <30 Vpk (10 x 1000  $\mu$ s). The surge capacity should not be stated as "Watts" this should be in the same manner as all the other devices - " 1kA per wire (8 x 20 u/s) therefore the Let-Thru-Voltage should also reflect the 8 x 20 u/s test pulse instead of the 10 x 1000 u/s as shown.

**ITS SECTION RESPONSE:** Comment noted. Document changed. The word "watts" was removed and replaced with "amps" to match the other entries in the column. The reference to the pulse information, however, is correct as written and was not changed.

Thank you for the opportunity to contribute to the specification, however, if you require any additional explanation or input, please do not hesitate to contact me.

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Surge Protection for Professionals

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## Bob Dion

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Suggest separating this section into 2, one for grounding, lightning protection and transient surge suppression (similar to section 620) and the other for ITS Poles. 785-1 applies to all ITS equipment, 785-2 deals specifically with poles and lowering devices.

**ITS SECTION RESPONSE:** Comment noted. Document not changed. The intent of this specification is to capture all common infrastructure items under Section 785, which ultimately will include grounding, TVSS, field cabinets, equipment shelters, poles having lowering devices, and other items. The format has been requested by the FDOT Specifications Office.

785-1.2: the requirements of section 620 are for driving a specific linear foot of grounding rod. 785-1 is for a resistance to ground measurement. What portion of 620 is applicable? See 780-4 in specification 7800000, previously sent out for review. The reference in that article to 620 is more than a “guide”, it calls for ‘meeting the requirements of Section 620 and in Section 785-1’ (this should be article 785-1).

**ITS SECTION RESPONSE:** Comment noted. Document changed. Subsection 785-1.2 has been edited to clarify the text. Section 620 contains requirements for various signal installations; the pertinent sections are 620-3.1 through 620-3.6. The new Section 785-1 expands 620-3 to encompass ITS devices that are installed in similar settings, but often operate on very small voltages and for which resistance to ground must be lower.

Suggest moving the warranty language from all ITS sections, as in 785-3, to Section 780, it has appeared in all other ITS sections and applies to all ITS work. Include language in it similar to 611-5.1 or 580-5.

**ITS SECTION RESPONSE:** Comment not accepted. Warranty language in all ITS specifications is being rewritten to clarify the requirements and make certain they conform to the rules of the FDOT Construction Office. The various products all have varying warranty terms, so one paragraph in Section 780 for all is not feasible.

Change the article number, and Subarticle numbers of 784-4 to 785-4.

**ITS SECTION RESPONSE:** Comment noted. Correction made.

784-4.1 mentions ‘Poles, with or without the lowering devices’. The item in 785-5 is for ITS Pole and Lowering Device. Is the cost of the lowering device significant? Should there be items for ‘785-x ITS Pole’ and another for ‘785-x ITS Lowering Device’?

**ITS SECTION RESPONSE:** Comment noted. These subsections have been edited to clarify the text. The pay items also have been corrected. Poles have their own pay item number. A newly installed lowering device [not a retrofit] must be provided with a pole for integration purposes, so there are “pole with lowering device” pay items, too. The material cost of a lowering device as described in this specification is roughly \$4,000.

785-2.2 refers to section 641 and 649. Can items for ITS poles use items from these sections for the poles and not create new items for the poles, only requiring a new pay item for ‘ITS Lowering Device’?

**ITS SECTION RESPONSE:** No. The Estimates Office is attempting to track the state funding spent on ITS deployments, so they requested separate pay item numbers for all ITS-related devices and materials, including poles, field cabinets, fiber optic cable and vehicle detectors.

Delete the second paragraph of 784-4.2, 4.3 and 4.4 if a separate item for lowering device is needed. Does the reference in these to ‘retrofit’ refer to an externally mounted lowering device as mentioned in 785-2.2.6? If so, the cost would not be incidental to the installation of a pole since a pole exists.

**ITS SECTION RESPONSE:** The lowering device retrofit has its own pay item number. The paragraphs that mention this were not changed, though other subsections were edited to clarify the text. As for new installations, the intent is for the pole and its lowering device to be provided as a unit so that they function properly together. Retrofits are externally mounted, as mentioned in 785-2.2.6.

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**Bijan Behzadi, P.E., PTOE**

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Overall Comment: The TSPs call for testing by TERL at many places. Is this a practical requirement for the number of projects that will be deployed simultaneously in Florida? Does TERL have the required staff to be responsive to the needs of these projects? If so, the TSPs need to specify when the units are to be submitted for testing and what timeframe TERL will need to complete its testing.

**ITS SECTION RESPONSE:** Comment noted. Product evaluation, procedures, and staffing are all policy and program management issues being decided by TERL and are not covered in a device specification. The testing you refer to is intended to verify a product’s compliance with the spec and, if accepted, placement on the Department’s Approved Product List for ITS devices. Section 780 – Intelligent Transportation Systems General Requirements – covers this. Testing is done by product, not by project.

Section 785-1.2, second sentence: The term “ahead of and behind” is not clear.

**ITS SECTION RESPONSE:** Comment accepted. Document changed to refer to the supply side and load side of the device, as well as data, video and other conductive connections.

Section 785-1.3.2, second paragraph: The word “points” is too vague. Suggest using “rods” or “electrodes.”

**ITS SECTION RESPONSE:** Comment accepted. Wording changed to “electrodes”.

Section 785-1.3.2, fourth paragraph: Considering the limitations of right-of-way along arterial streets (state routes), how can the minimum 40 feet spacing be met for any additional grounding electrodes given the Y configuration?

**ITS SECTION RESPONSE:** Comment noted. The grounding array mentioned is applicable to freeway installations where space is abundant. In urban settings along arterials, it is up to the designer to configure the array so that it meets the grounding objectives, yet fits in the allotted space. Further, the requirement for radial placement of multiple ground rods is only in the event that they are necessary to achieve the 5-ohm resistance required in the specification. If 5 ohms can be achieved to the Engineer’s satisfaction with a single driven rod, then that is all that would be required.

Section 785-1.3.2, fifth paragraph: The term “Bond all metal components of the ITS device subsystem” is too vague. Suggest defining the applicable elements – at least as some examples of applicable elements.

**ITS SECTION RESPONSE:** Comment accepted. Examples of such components were added to clarify the text.

Section 785-1.3.5: It is not clear what structures/devices will require air terminals. Thought this is a design decision that must be incorporated in the specifications and plans, not all FDOT districts are treating this design requirement consistently and uniformly. Suggest standardization of minimum requirements for qualified structures and devices.

**ITS SECTION RESPONSE:** Comment noted. Document changed. The implied application is installation on a pole, DMS, or other tall structure for which lightning is a threat. The text has been edited to require conformance with NFPA 780, Standard for the Installation of Lightning Protection Systems. The designer must also consider the ITS equipment manufacturer’s recommendations on lightning protection measures.

Section 785-1.4: This section heading is orphan relative to its support text. Please place this section heading in page 4.

**ITS SECTION RESPONSE:** Comment noted. Document not changed. This heading was formatted by the Specifications Office, in accordance with the structure of the Spec Book. It is correct.

Section 785-1.4.2: Please consider replacing the term “ahead of” with “before.”

**ITS SECTION RESPONSE:** Comment noted. Document not changed. “Ahead of” is preferred in describing physical location.

Section 785-1.4.2: Do you mean “NEMA TS 1” or “NEMA LS 1.”

**ITS SECTION RESPONSE:** The reference to NEMA LS 1 is correct. It is the standard for low-voltage surge protection devices. The notation has been corrected to state NEMA LS 1-1992 (R2000).

Section 785-1.4.2: Please consider replacing the word “export” with “transmit.”

**ITS SECTION RESPONSE:** Comment accepted. Document changed to state “transmit”.

Section 785-2.2.2.2: Please consider adding the term “power over Ethernet” as another power option.

**ITS SECTION RESPONSE:** Comment accepted. Document changed to require that connector and contacts be capable of carrying DC voltage inputs of up to 48 V<sub>DC</sub>, which would cover power over Ethernet.

Section 785-2.2.3: Please specify the applicable length of cable for the specified 35 pounds weight limit.

**ITS SECTION RESPONSE:** Comment noted. Document not changed. The weight for stainless steel aircraft-quality cable of that diameter and strength is 28 pounds per 1,000-foot spool. The weight limit, however, applies to all three items: lowering tool, winch assembly and cable.

Section 785-3.1: Please consider adding “maintaining agency” as another entity to whom the warranty should be transferable.

**ITS SECTION RESPONSE:** Comment noted. Document not changed. The warranty section has been rewritten to conform to Department provisions as dictated by the Construction Office.

Section 784-4: This section and all associated subsections should be 785 instead of 784. The specs are not clear as to who will furnish the composite or other cabling between the device cabinet and device? Who will install the composite or other cabling between the device cabinet and device? Who will interconnect the composite or other cabling between the device cabinet and device to the lowering device connector that interfaces with the device? Typically, the Contractor provides the composite cable to the manufacturer of the lowering device and pole for termination with the lowering device connector and installation within the pole before the pole is erected by the Contractor. Language is needed here to ensure the device requirements for power, video, and PTZ control are considered in sizing the conductors for composite or other cabling between the device cabinet and device considering the length of the composite cable between the device and device cabinet.

**ITS SECTION RESPONSE:** Comment noted. The numbering of this subsection has been corrected. Cables required by the CCTV camera are furnished by the Contractor, as specified in Section 782. Regardless of whether the Contractor provides cables to a manufacturer, or the manufacturer provides cables to the Contractor, the Contractor is ultimately responsible for the overall work and materials associated with the project. Section 780-3 states that the Contractor is to furnish all equipment, materials and supplies needed to complete an installation, and must perform all operations and equipment integration necessary to ensure that the installation works as the plans require.

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**Mark Burcham**

1) For 785-1.3.5 Air Terminals section, suggest consideration to remove air terminals entirely since they can serve as a lightning rod due to Florida high concentration of lightning strikes. Reviewer realizes that topic is frequently debated conceptually. To the reviewer's knowledge, one definitive example exists. FDOT D5 has replaced several CCTV cameras due to lightning strikes. Once they removed the air terminal, the replacement of CCTV camera significantly decreased.

**ITS SECTION RESPONSE:** Comment noted. While there are differing viewpoints on the effectiveness and risk of using air terminals, there is general consensus that when they are deployed, they should conform to existing standards developed for lightning protection systems. It is left to the professional judgment of the design team for a given project to determine if they are required and or appropriate for a particular device site, location, etc. The goal of this document is to require that, when used and included in project plans, these systems conform to applicable standards and follow best practices.

2) For 785-2.2.5 Wiring section, recommend inclusion that wiring shall meet all applicable NEC codes in addition to equipment manufacturer's recommendations.

**ITS SECTION RESPONSE:** Comment was accepted and incorporated into the document.

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**John C. Hess**

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Comments:

Section 785-2.2.3 Lowering Tool: The last two sentences in the first paragraph state: Ensure that the lowering tool can be powered using a half-inch chuck, variable-speed reversible industrial-duty drill to match the manufacturer-recommended revolutions per minute, or supply a drill motor for the lowering tool as shown in the plans. Provide an electrically powered drill unit.

It appears the last sentence is either redundant, or unclear. To me the last sentence appears redundant and therefore unnecessary.

**ITS SECTION RESPONSE:** Comment was accepted and incorporated into the document. Text edited to correct the redundancy.

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**Chung Tran, FHWA**

785-2.2 -There were issues regarding the deflection of Prestressed concrete poles in D-4. Therefore, should this be changed the new standard, please verify with D-4 ITS office. Thanks

**ITS SECTION RESPONSE:** Comment noted. We are using existing references for poles. Generally, specific requirements for deflection as well as pole length, loading and other construction/fabrication details are provided as part of the plans, dictated by FDOT Design Standards. Also required is the submittal of shop drawings, calculations, etc., for the Engineer's approval prior to fabrication, delivery, or installation. In the future, FDOT may develop detailed shop drawings in order to further standardize specific pole designs [as they have in the past with light standards, mast arms and some other items].

785-2.3 - Define high wind condition, 20, 30 40 mph? which is it?

**ITS SECTION RESPONSE:** Comment noted. Document text changed to reference the design wind speed section in the FDOT Plans Preparation Manual, Vol. I, Chapter 29, Table 29.1.

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