7850000 – ITS INFRASTRUCTURE – FIELD CABINETS, EQUIPMENT SHELTERS COMMENTS/RESPONSES FROM INDUSTRY REVIEW

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Tim Grimm

Comments:

ITS Equipment Shelter (Article 785-6.4) - TF-Comment - It may be possible to get more than 1 (one) year of warranty for the FOC [??] from the manufacturer. Should ask for at least two (2) years of warranty.

ITS Section Response: Comment noted. Shelter warranties typically are for one year, although our specification makes that a minimum. We have based our requirement on what is commonly offered in the industry, as indicated by the research we did. If a manufacturer offers a longer warranty, then that is what will apply.

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Stephanie Kolb
stephanie.kolb@transcore.com
813-249-9057 Ext. 101, FAX 813-249-9084

Comments:

*Section 785-4 ITS Field Cabinet: should specify use of a 334 cabinet instead of 332; 334 is the empty version of the 332 (which is fully outfitted for traffic signal use).

ITS Section Response: Comment accepted and incorporated into the document. Type 334 has replaced the Type 332 reference in the table in 785-4.2.1.

*Section 785-5 ITS Equipment Shelter: should specify the size within the TSP.

ITS Section Response: Comment noted. Document not changed. Chapter 785 begins with the stipulation that all infrastructure items herein are to be furnished and installed as detailed in the plans. That is a standard reference in all ITS specifications.

*Section 785-5.2.8 HVAC Sys: Consider requiring two redundant AC units with lead-lag control.

ITS Section Response: Comment noted. Document not changed. While this is a good idea for large shelters with lots of equipment, we prefer to let the project designer determine whether this amount of cooling is warranted and if so, to note it in the plans.

*Section 785-5.2.10 Equipment Racks: add requirements such as rack height, load requirements, inclusion of vertical & horizontal cable management, inclusion of vertical power strips, etc. Require securing the rack to the floor in a location shown in the plans or as specified by the Engineer.

ITS Section Response: Comment accepted and incorporated into the document.

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Melissa Hollis
Estimates, Engineering Support
850-414-4182, SC 994-4182
Melissa.Hollis@dot.state.fl.us

Comments:
We may want to get clarification in the spec about the 110 and 550 work, so that they are designed/paid consistently. (If we pay separately on one job, and then try to include it on another, we'll open the Department for a claim.)

The 785 spec looks great. If I am reading the content correctly, the site preparation (110) and exterior fence (550) are incidental to the spec. If this is correct, I'll add them in the BOE note.

ITS Section Response: Yes, that is correct. The text will be edited to make clear that site prep and fencing are part of the shelter installation, not paid for separately.

As a matter of consistency with other sections, please do not list any of the "ABC" variables with the pay items at the end of the Section.

In the case of 785, when you add the 785-1-11, -12, etc., only the "A" variable of 1(Furnish and Install) is included. The general **785-1- ITS Pole** covers the entire structure for 785-1-AB where A=operation, B=Type.

ITS Section Response: Comment accepted and incorporated into the document.

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Martin A. Maners, III
Vice President & General Counsel – MG Squared, Inc.
205-823-6688 ext.25
Fax: 205-823-6615

Comments:

785-2 *3* Pole and Lowering Device.
785-23.1 Description: Furnish and install a steel or concrete pole, with or without a lowering device, as shown in the plans. Consider the lowering device and pole as two interdependent components of a single unit, and provide them together to ensure compatibility of the pole and lowering device.
785-23.2 Materials:
785-23.2.1 Pole: Use a pole as shown in the plans that meets the requirements of either Section 641 for prestressed concrete poles or Section 649 for steel poles.

Section 641 does not apply to the type of concrete pole typically provided with camera lowering devices. Section 641 pertains to strained concrete poles… otherwise known a cast poles. The

concrete poles used with a camera lowering device are “Spun concrete” poles. This is needed so that an adequate raceway exists for the lowering cable and its conduit as well as the power signal cable. I am not sure where or if there is a state spec for centrifugally spun concrete poles. If there is… then the spec should point to same. If not, then one should be drafted. The top two spun concrete pole companies that should be consulted for any type of spun concrete spec are Stresscrete and Accord.

ITS Section Response: Comment noted. Document text was changed to make reference to a forthcoming FDOT Structures Office specification being developed for centrifugally spun concrete poles.

Use a pole that is equipped with a handhole of sufficient size to provide access to the pole interior and for temporarily securing and operating the lowering tool.

The words “sufficient size” are too vague. What is sufficient for one person might not be sufficient for another. Simply give a minimum guideline. You could either talk to your district engineers and ask them based upon what they currently have… what would be the minimum size needed to provide safe and efficient operation of the winch, or you could state what the majority of the country requires as a minimum ---- a minimum of 6 inches wide by 27 inches tall handhole.

ITS Section Response: Comment noted. Document not changed. It is our view that “sufficient size” is clearly requiring the hand hole to be big enough for accessing the pole interior and operating the lowering tool. Vendors should refer to either the standard FDOT drawings that call out hand hole dimensions in the notes, or to the project plans. Our specification requires the lowering device and pole to function as a unit. We leave this to the designer to produce a satisfactory integration of the two.

Ensure that the pole-top tenon is rotatable.

There should be some minimum guidelines on the tenon size and thickness to promote both efficiency on the install and strength over the life of the system. Across the U.S., the majority of DOTs (and on previous jobs in Florida) have utilized/required a steel tenon that is a minimum of 6 inches Outside Diameter and 0.25 inches thick. The tenon is usually a minimum of 12 inches tall.

ITS Section Response: Comment noted. Document not changed. At this time FDOT is preparing standard ITS device drawings that include sheets depicting the lowering device and its details. This tenon size requirement may also be made a part of the instructions in the FDOT Plans Preparation Manual.

785-23.2.2 Lowering Device: Use a lowering device as shown in the plans.
Ensure that the lowering device provides the electrical connections between the control cabinet and the equipment installed on the lowering device without reducing the function or effectiveness of the equipment installed on the lowering device or degrading the overall system in any way. Ensure that the only cable in motion when operating the lowering device is the

stainless steel lowering cable contained within the pole. Ensure that all other cables remain stable and secure during lowering and raising operations.

The ONLY way you can ensure only the stainless steel cable will be in motion when operating the device and the ONLY way you can ensure other cables remain stable and secure during operation is to require the lowering cable to be located INSIDE conduit. This method will also ensure that there is never any cable twist either during and installation or during operation. Typically, the installing contractor is required to provided 1.25 inch PVC conduit in the pole for the lowering cable and the lowering device provider is to provide a conduit mount adapter to interface the contractor provided conduit with the internal back side of the lowering device. If this is not required in the spec… the contractors will not do it.

It also becomes essential to have the lowering cable in conduit when other devices are added to the pole in the future. Otherwise, it will be very likely that the new device's power/signal cable will get tangled with the existing lowering cable.

ITS Section Response: Comment accepted and incorporated into the document.

Ensure that the lowering device includes a disconnect unit for electrically connecting the equipment installed on the lowering device's equipment connection box to the power, data, and video cables (as applicable); a divided support arm, a pole adapter for the assembly's attachment to the rotatable pole-top tenon, and a pole-top junction box, as shown in the plans.

Ensure that all of the lowering device's external components are made of corrosion-resistant materials that are powder-coated, galvanized, or otherwise protected from the environment by industry-accepted coatings that withstand exposure to a corrosive environment.

785-23.2.2.1 Equipment Connection Box: Provide an equipment connection box for connecting the CCTV camera or other ITS device to the lowering device. Ensure that the equipment connection box is watertight and able to seal the interior from moisture and dust.

This equipment connection box is more commonly known as the camera junction box. The requirement that this box be "watertight" is too vague. There are multiple levels of watertightness. There are NEMA ratings and IP ratings. You could even state your own requirement…but it needs to be detailed if you desire to enforce same.

Of note, inside this box, either hard terminations are being made from the lowering device leads to the camera leads OR a connector is installed by the contractor that serves as the interface. Either way, you cannot afford to have moisture that would develop from simple condensation sit in the box. That considered, most states require screened and vented holes on the bottom of the box otherwise known as a condensation exit system. With this in mind, you may not want a "watertight" standard so great as to require the elimination of these needed exit holes.

Probably the best clarification of watertightness would be a stated volume of water, being applied at the top and sides of the box, at a certain pressure and for a stated time period. There is something similar already provided in Variable Message Signs.

Lastly, the spec should be clear in stating that the connection box is not to be the means of keeping moisture out of an attached camera. The sealing requirement of the cameras attached should be no different than if they were not placed on a lowering device. The device and company best positioned to seal a camera is the camera housing and the manufacturer of the camera…. Not the lowering device.

ITS Section Response: Comment noted. Document changed. As we have done with the ITS field cabinet requirements verbiage later in this chapter, we have specified an appropriate rating to denote weather resistance of the unit.

785-23.2.2.2 Disconnect Unit: Ensure that the disconnect unit has a minimum load capacity of 200 pounds with a 4:1 safety factor. Ensure that the fixed and movable components of the disconnect unit have a locking mechanism between them. Provide a minimum of two mechanical latches for the movable assembly and, when latched, ensure that all weight is removed from the lowering cable. Ensure that the fixed unit has a heavy-duty cast tracking guide and a means to allow latching in the same position each time.
Ensure that the disconnect unit is capable of securely holding the lowering device and the equipment installed on the lowering device. Use interface and locking components that are stainless steel or aluminum.

785-23.2.2.2.1 Disconnect Unit Housing: Ensure that the disconnect unit housing is watertight with a gasket provided to seal the interior from dust and moisture.

Again, the statement of watertight is vague at best and interpreted many ways. Keep in mind the reason or intent of wanting the disconnect unit housing (often referred to as the "bell housing") free from dust and moisture is due to the fact that the electrical disconnect unit connector block is housed inside. Protecting from entrance of moisture externally is easy. But again, consideration must be given to the reality that moisture is going to be created on the interior of this sealed housing via condensation. If moisture is permitted to ingress into the male-female contact point… you could have failure of the heart of the system.

There are some companies who provide a connector block that already provides a seal from moisture itself via "o" rings at the base of EACH male pin.

ITS Section Response: Comment noted. Document changed. As we have done with the ITS field cabinet requirements verbiage later in this chapter, we have specified an appropriate rating to denote weather resistance of the unit.

785-23.2.2.2.2 Connector Block: Provide a connector block as shown in the plans and directed by the Engineer. Provide modular, self-aligning and selfadjusting female and male socket contact halves in the connector block. Provide a minimum of 9 and a maximum of 20 contacts with at least 2 spare contacts. Provide contact connections between the fixed and movable lowering device components that are capable of passing EIA-232, EIA-422, EIA-485, and Ethernet data signals and 1 volt peak to peak (Vp-p) video signals, as well as 120 VAC, 9-24 VAC, and 9-48 *VDC*VDC power. Ensure that lowering device

connections are capable of carrying the signals, voltages, and current required by the device(s) connected to them under full load conditions.

Writing a spec that states provide a minimum of 9 and a maximum of 20 contacts will likely ALWAYS get you the Minimum on a low bid contract. Either delete the language for the maximum…. Or simply state that the lowering device shall be equipped with enough contacts to permit operation of all required functions of the camera. The camera must be able to perform all necessary functions on 20 contacts or less.

ITS Section Response: Comment noted. Document changed to say, "Equip the lowering device with enough contacts to permit operation of all required functions of the camera, up to a maximum of 20 contacts."

Ensure that the connector block conforms to one of the two options described below:

One should add just before these two options that it is the responsibility of the District engineer to note in the specs and drawings whether Option 1 or Option 2 shall be required. If nothing is stated… on a low bid award you will always get Option 1… as Option 1 is the least expensive.

ITS Section Response: Comment noted. This could be added in the FDOT Plans Preparation Manual notations we are preparing.

Option 1 – Light-Duty Connector: Provide plastic female and male halves of the connector block that houses the connector pins. Provide corrosion-resistant stainless steel hardware. Ensure that all contacts and connectors are self-aligning and self-adjusting mechanical systems. Provide a spring-assisted contact assembly to maintain constant pressure on the contacts when the device is in the latched position. Because there are no individual gaskets on the top and bottom connectors, ensure that a gold or silver lining is provided in the interior to prevent degradation of the connectors due to moisture.

Although there are two options for the connector body….
Option 2 requires a minimum diameter for the pins. Why doesn't Option 1? You could end up with some very thin pins without a minimum.

Option 2 requires two male contacts that are longer than the rest to insure optimum grounding performance. Why Doesn't Option 1? Is optimum grounding not important in option 1?

ITS Section Response: Comment noted. Document changed to require ground contacts that mate first and break last under both options. The pin diameter requirements were the subject of past comments and remain as is.

Option 2 – Heavy-Duty Connector: Ensure that the female socket contacts and the male contact halves of the connector block are made of molded synthetic rubber or molded chlorosulfonated polyethylene, or approved equal. Provide connector pins made of brass- or gold-plated nickel, or gold-plated copper. Ensure that the current-carrying male and female contacts are a minimum of 0.102 inch in diameter. Provide two male contacts that are longer than the other contacts to mate

first and break last, providing optimum grounding performance.

Provide cored holes in the rubber to create moisture-tight seals when mated with the male connector. Permanently mold the wire leads from both the male and female contacts in a body of chlorosulfonated polyethylene, or an approved equal. Provide current-carrying wires and signal wires of American Wire Gauge (AWG) #18/1 jacketed wire. Ensure that the contacts are self-wiping with a shoulder at the base of each male contact so that it is recessed in the female block, thereby giving each contact a rain-tight seal when mated..

785-23.2.3 Lowering Tool: Provide a metal-frame lowering tool with winch assembly and a cable with a combined weight less than 35 pounds; a quick release cable connector, and an adjustable safety clutch. Ensure that the lowering tool can be powered using a half-inch chuck, variable-speed reversible industrial-duty electric drill to match the manufacturer-recommended revolutions per minute, or supply a drill motor for the lowering tool as shown in the plans. Ensure that the lowering tool supports itself and the load. Ensure that the lowering tool is equipped with a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling.
Use a lowering tool equipped with gearing that reduces the manual effort
required to operate the lifting handle to raise and lower a capacity load. Provide the lowering tool with an adapter for operating the lowering device with the portable half-inch chuck drill using a clutch mechanism. Ensure that the lowering tool is manufactured of durable, corrosion resistant materials that are powder-coated, galvanized, or otherwise protected from the environment by industry-accepted coatings that withstand exposure to a corrosive environment.

Provide a minimum of one lowering tool plus any additional tools as required in the plans. Upon a project's final acceptance, deliver the lowering tool to the Department.

785-23.2.4 Lowering Cable: Provide a lowering cable with a minimum diameter
of 0.125 inch. Construct it of stainless steel aircraft cable with a minimum breaking strength of 1,740 pounds, and with 7 strands of 19-gauge wire each. Ensure that the prefabricated components for the lift unit support system preclude the lifting cable from contacting the power or video cables.
785-23.2.5 Wiring: Ensure that all wiring meets NEC requirements and follows
the equipment manufacturers' recommendations for each device connected on the pole, at the lowering device, and in the field cabinet.

785-23.2.6 External-mount Lowering System Enclosure for Mounting to Existing Structures: Furnish and install an external-mount lowering system enclosure for mounting to existing structures, as shown in the plans. Ensure that the system includes external conduit, cabling, and upper mounting box that is able to accept the respective (i.e., general/light or heavy-duty) lowering device. Ensure that the system includes a winch assembly permanently housed in a corrosion- resistant lower lockable box with gaskets, as shown in the plans. Provide all necessary mounting hardware for the upper and lower box, conduits, standoffs, and conduit mounts required for a complete and functional system.

The last sentence should be clear in stating that the mounting hardware for the upper and

lowering box, conduits and standoffs are provided by the installation contractor.

ITS Section Response: Comment noted. Document not changed. The requirements in FDOT specifications are always directed at the Contractor – the entity with whom the Department has a contractual relationship on a project. The requirement that all hardware, parts and supplies be provided is stated here and also in Section 780, the general contract requirements for ITS installations.

785-23.3 Installation Requirements: Ensure that the divided support arm and receiver brackets self-align the contact unit with the pole centerline during installation, and that the contact unit cannot twist when subjected to the design wind speeds defined in the FDOT Plans Preparation Manual, Vol. I, Chapter 29, Table 29.1. Supply internal conduit in the pole for the power and video cabling if required by the Engineer.

This would be an additional place where you would require the installation contractor to provide and install 1.25 inch PVC conduit for the lowering cable within each pole.

ITS Section Response: Comment accepted and incorporated into the document.

Ensure all pulleys installed for the lowering device and portable lowering tool have sealed, self-lubricated bearings, oil-tight bronze bearings, or sintered bronze bushings. Ensure that the poles and their foundations conform to the requirements of the PPM and Indexes 17723 and 17725 of the Design Standards, and with the AASHTO LTS-4 standard with current addenda. Use Vol. 1, Chapter 29, Table 29.1, Design Wind Speeds, of the PPM to compute the wind loads. Provide shop drawings that specify the overturning moment or ground line moment detail for the pole structure and all necessary design features.

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Robert Lopes
Robert.Lopes@dot.state.fl.us

Comments:

1. Hub Equipment rack - recommend requiring inclusion of cable management and vertical power strips. Add equipment load requirement and rack height requirement.
2.

ITS Section Response: Comment accepted and incorporated into the document.

2. Hub HVAC - recommend requiring two redundant AC units with lead-lag Controllers.

ITS Section Response: Comment noted. Document not changed. While this is a good idea for large shelters with lots of equipment, we prefer to let the project designer determine whether this amount of cooling is warranted and if so, to note it in the plans.

3. Hub size - spec does not mention the required size; if it's intended that the size will be

specified in the plans, then need to make such reference in the spec. Otherwise, need to specify the size in the Specification.

ITS Section Response: Comment noted. Document not changed. Chapter 785 begins with the stipulation that all infrastructure items herein are to be furnished and installed as detailed in the plans. That is a standard instruction in all ITS specifications. It is up to the project designer to pick a size and note it in the plans.

4. Cabinets - need to require use of a 334 cabinet instead of a 332.

ITS Section Response: Comment accepted and incorporated into the document. Type 334 has replaced the Type 332 reference in the table in 785-4.2.1.

5. The 332 cabinet is intended for use in traffic signal applications.
On pages 18/19, they are still calling for a Type 332 cabinet where it should be a Type 334 cabinet. The Type 332 cabinet is intended for traffic signal installations; the Type 334 is the cabinet shell only and is intended for use on ITS projects in place of the 332.

ITS Section Response: Comment accepted and incorporated into the document. Type 334 has replaced the Type 332 reference in the table in 785-4.2.1.

6. It should be the responsibility of the vendor or manufacturer to pay for shipping in both directions. The specification currently does not address this issue. It would be great if we could include such a requirement in our state specs, but I don't know if the industry would be willing to accept it.

ITS Section Response: Comment noted. Document not changed. This is not appropriate subject matter for a material specification. If you have a shipping preference, it should be included in the contract RFP you advertise and in your contract documents for the job.

7. Specs do not mention requirements for shielding cabinets.

ITS Section Response: Actually, thermal shielding is covered in 785-4.2.7. Sunshields, if required for a project, are to be shown on the plans and must be offset a minimum of one inch from the exterior cabinet walls.

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John Roth, ITS and Public Safety Sales Engineer
Atlantic Scientific Corporation
4300 Fortune Place, Suite A
W. Melbourne, Florida 32904
Office 800 544 4737 Cell 321 626 4234

Comments:

We are pleased to have the opportunity to comment on the subject specifications. Our comments are listed in the same order as the subjects are addressed in the specifications. If you

have any questions on our comments please do not hesitate to call on us.

785-2.4.2 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 transmit this status information to other monitoring systems*".

Parallel connected TVSS in the primary position are not multi-stage hybrids unless it is a device that employs both SAD and MOV device technology. If this is referring to the typical multi-stage hybrids used in series connected devices then it is wrong. However, if this is an SAD and MOV technology requirement, as stated in the section covering the primary TVSS for a shelter, then it should specify this clearly.

ITS Section Response: Comment noted. Document changed. New information was added to the section that reflects the needs of the shelters. The text was revised to clarify the requirements.

785-2.4.4 TVSS Devices for Low-Voltage Power, Control, Data and Signal Systems.

Table 4.1 Continuous Current Values.

The 30 ampere continuous current requirement for the 12V, 24V, and 48V circuits are rarely found at those voltages for ITS devices. If the TVSS device is in series, the danger of the TVSS device being able to pass 30 amperes without failing could mean a failure of the ITS device itself. If the TVSS devices is connected in parallel then the low let through voltages would not be achieved because the benefit of multi-stage hybrid technology would not be realized.

We recommend that the continuous current be limited to 10 amperes for series TVSS devices.

ITS Section Response: Comment noted. Document not changed. This is a general specification written to cover as many situations as possible. The term “up to 30 amp” denotes that there may be a 48V, 30 amp circuit on the system. The rating of the device should be adjusted to meet the needs. A 10 amp circuit would cover the majority of the circuits.

785-4.2.2 Doors

“…and has no fewer than three stainless steel hinges”

One continuous length stainless steel hinge per door offers a more robust design with less chance of failure, hinge pin tampering or vandalism.

ITS Section Response: Comment noted. Document changed to permit the alternate design of a single, full-length “piano” hinge.

785-4.2.4 Rails

"…Provide rails that are either 0.1345-inch thick plated steel or .105-inch thick stainless steel. …Do not use unistruts or other rail types"

Aluminum 19" rails mounted front and rear on Unistruts offer complete adjustment for all custom depth rack equipment and can be adjusted much easier than cage racks. Most ITS devices are shelf or 19" rail mounted. DIN rails are used for most all other devices.

Using aluminum rails avoids galvanic corrosion found with dissimilar metals and yet gives comparable strength characteristics as steel or stainless steel.

ITS Section Response: Comment noted. Document not changed. The FDOT preference is the rail requirement as written, based on the Department's experience with traffic controller cabinets.

785-4.2.7 Sunshield:

If the ITS field cabinet is provided with sunshields…..as provide in the plans.

This paragraph appears to state that sunshields are optional? We would add a choice between sunshields or internal thermal insulation on all side and door surfaces with a rating of R5 or better.

ITS Section Response: Comment noted. Document not changed. Sunshields are the preferred option. Thermal insulation inside may trap heat that is generated by devices inside the cabinet.

785-4.2.8 Ventilation

"…Ensure that the thermostat activates the fans within three degrees of the set temperature."

It would reason the three degrees tolerance would have the fans turning on and off in very short cycles and in turn reducing the MTBF on the fans. We recommend a 10 degree threshold.

ITS Section Response: Comment noted. Document not changed. The FDOT preference is the fan activation requirement as written, based on the Department's experience with traffic controller cabinets.

785-4.2.9.6 Generator and Auxiliary Power Connection

This paragraph indicates *"..an internal transfer switch"* and a generator panel with *"…a manual transfer switch…"*

Does the generator panel manual transfer switch replace the internal transfer switch?. We feel both are not needed at the same time.

ITS Section Response: Comment noted. Document was changed to clarify that a manual transfer switch is required.

785-5.2.13.1 Primary AC-Powered Transient Voltage Surge Suppression Device:

3. A maximum surge current (8x20 μs) for a MOV module that is ≥50 kA

The primary TVSS for the cabinets has an MOV section rated for 150kA but the shelter indicates only 50kA surge current capacity. This appears to be a typographical error and the surge current capacity should at least be that of the cabinets or 150 kA. Also, this surge current statement should read "minimum" rather than maximum.

ITS Section Response: Comment noted. Document changed. The text you note in 785-5.2.13.1 was removed and replaced with a reference to the surge suppression requirements earlier in 785-2.4. Other text was added to clarify the equipment shelter requirements.

5. A maximum continuous operating voltage of 150V

This sentence should read "minimum".

ITS Section Response: Comment noted. Document changed. The text you note in 785-5.2.13.1 was removed and replaced with a reference to the surge suppression requirements earlier in 785-2.4. Other text was added to clarify the equipment shelter requirements. For the record, "maximum" is the correct term.

785-5.2.1.3.2 Secondary AC Powered Transient Voltage Surge Suppression Device.

Both surge current sentences should read minimum.

ITS Section Response: Comment noted. Document changed. The text you note in 785-5.2.13.2 was replaced with a reference to the surge suppression requirements in 785-2.4. Other text was added to clarify the equipment shelter requirements.
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