

7850000 INTELLIGENT TRANSPORTATION SYSTEMS – INFRASTRUCTURE  
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

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Comment: (6-29-10)

1. 785-2.3.1, in the last sentence, "Lighting" should be "Lightning" in the title of NFPA 780.

Response:  
Corrected typo in draft document.

2. 785-4.2.9.6.3, suggest using "shall" rather than "must" to conform with general practice in the Specifications.

Response:  
The use of “must” vs. “shall” within the draft is consistent with the style desired and prescribed by the Specifications office.

3. 785-5.3.10: Please replace "grass" with "performance turf" to match the wording in 570.

Response:  
“Grass” has been replaced with “performance turf”.

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Comments: (7-1-10)

This spec. does not define how many ground rods are to be installed. It leaves contractors NO WAY To ESTIMATE this item. Very subject to a CLAIM.

Response:  
The draft has been modified to limit the maximum number of required ground rods.

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Comments: (7-1-10)

Section 785-5.3.6 Fencing – Section only references the use of sliding gates for the equipment shelter gate. The smallest gate referenced by Index 803 is a 12’ sliding gate. Using this minimum size gate would increase the overall width of the fencing to accommodate the gate. We normally use a five foot swing type gate. The use of swing gates should be allowed.

Response: The current draft references Index 802 for fencing and further specifies that sliding gates be constructed in accordance with Index 803. Index 802, sheet 2 of 3, note 11 specifies that all gates, other than sliding or special gates called for in plans, be chain link swing gates (single/double/etc.) approved by the Engineer. We believe the language in the current draft allows the use of swing gates as desired.

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Comments: (6-26-10) (Internal Review)

Please see attached D6 ITS review comments. Overall, the revisions are thought out and will make for clearer and open Standards. However, ITS D6 does have some concerns about the removal of certain previous requirements. ITS D6 would like these requirements to remain, or if necessary, reworded, but not deleted to avoid different interpretations.

1. 785-1 - Add APL requirement for all devices.
2. 785-2.1 – Disagree with the proposed change “Furnish and Install” is more direct and explicit than “Provide”. Also, not sure why TBSS is being changed to SPD.
3. 785-2.1 – Spell out “MSTCSD” and other abbreviations throughout the specification.
4. 785-2.2 – Disagree with removing this statement entirely from the specifications “Install a SPD both ahead of and behind (i.e., on the supply side and load side of) the ITS device electronics”. However, this requirement can be moved under the 785-2.3 Installation Requirements.
5. 785-2.3.1 – Description provided is in the Design Standards already. Hence, what is the purpose of repeating it? Also, make sure that description provided is consistent with Design Standards. Leave this section unchanged. Current requirement is good and does not need deletion.
6. 785-2.3.1 – Why is the requirement being reduced from multiple ground rods to four 20 feet rods? For locations where the 5 ohm requirement is not met even with multiple ground rods and with the removal of grounding augmentation, please detail what direction should the Engineer follow for approving these sites? Leave this section unchanged, especially leave grounding augmentation specifications as is. Current requirement is good and does not need deletion.
7. 785-2.3.2 – “All ground rods and connections must remain accessible for inspection, testing, and maintenance.” Does this mean the Contractor needs to install multiple pull boxes? How will the effect quantity overruns for regular design bid projects? This statement needs further clarification as we may not want to end up with “radial” installed pull boxes at each ground rod connection.
8. 785-2.3.3 Provide a test procedure for the “fall-of-Potential” method mentioned in this section, or do not change; that is, cite IEEE Standard as is done with current Standard Specifications.
9. (blank)

10. 785-2.4.2 – SPD at Power Entry Point: “The results of testing this device maximum let-through voltage...shall be submitted for approval and for equal consideration...” Is the Engineer supposed to review and approve these test results? Need to mention APL approval requirement for these devices.
11. 785-4.2.9.6.2 – Automatic Transfer Switch: Suggest addition of “if shown on plans”, an automatic transfer switch may be used...
12. 785-5.3.4 – ITS Shelter: Why delete this requirement from this section “Connect them to the existing grounding system with no less than the minimum wire size specified in 785-2, or the manufacturers’ recommended wire size, whichever is larger, typically a AWG #2 solid bare copper wire”. Current requirement is good and does not need deletion.
13. 785-5.3.4.1 - Interior Grounding – The revised spec calls for “green insulation” and not the actual size. Also, why are all references to AWG #2 deleted in this section? Current requirement is good and does not need deletion.

**Response:**

1. The APL requirement is stated for devices that are required to be listed on the APL. Some material governed by this specification, such as the ITS Equipment Shelter, are not required to be listed on the APL. A couple of APL requirement references were somewhat buried in subarticle content. Those that were, such as the requirement that lowering devices be on the APL, were moved to the front of the subarticle to help visibility.
2. The change from “Furnish” to “Provide” in certain statements within the document was intended to identify those items that are typically provided as part of another device or assembly that is actually furnished and/or installed as part of another item. This was the rationale behind the modification made to change “furnish” to “provide” in certain statements. TVSS is being changed to SPD since the term SPD has become a more common, current terminology and abbreviation for Surge Protective Devices.
3. MSTCSD is already contained in the list of abbreviations in section 1-2 of the Standard Specifications for Road and Bridge Constructions. If an abbreviation is not contained in 1-2, it is typically spelled out upon first use in a given section. There may be examples within existing Specifications where this is not the case since the style guide is silent on the matter.
4. Statement removed since the CO team feel that other requirements, including project plans, device installation instructions, etc. address the placement of suppressors adequately.
5. The CO Roadway Design Office is working on the creation of a Design Standard to cover a variety of grounding/bonding scenarios. At the moment, the only Standard Index drawings that include depictions of the grounding system described in 785-2.3.1 are associated with certain devices (such as for CCTV and DMS). However, these requirements are intended to apply to other ITS devices as well – hence they are expected to remain here in text at least until a general “grounding index” has been developed and can be referenced throughout the specifications.
6. The ambiguity of a maximum number of rods was creating bidding and estimation issues, hence the number has been limited. The use of fill is viewed as an exception, and will likely be less frequent since this spec no longer requires a hard requirement to achieve a 5

- ohm ground resistance. If deemed necessary on a specific project, these requirements can be re-introduced with either a TSP or MSP request with the appropriate justification.
7. There is desire within the Department to maintain a reasonably accessible test point for inspection and testing of the grounding system. The draft has been modified to clarify that, as a minimum (the designer has latitude to indicate more in the plans), a ground rod be placed and remain exposed for testing in the electrical pullbox nearest the equipment cabinet.
  8. Providing detailed instructions and procedures for performing this test are outside the scope of the specification. However, they are available from manufacturers of earth electrode testing equipment (in the user manual) as well as others.
  9. No comment
  10. There is no need for a detailed submittal review/approval/verification of spec compliance if the device is listed on the APL. A current APL certification number adequately demonstrates the device meets FDOT requirements. The requirement that SPDs be on the APL is stated in 785-2.2.
  11. Document modified as requested to provide design latitude.
  12. The requirement in 785-2 still applies. The reminder in 785-5.3.4 was viewed to be redundant.
  13. Agree. The references to solid #2 have been replaced in the draft.

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**Comments: (6-25-10)**

I am curious as to how we decided to change ‘Furnish’ to ‘Provide’ throughout the document. Will this be a blanket change in all of our ‘Furnish’ specifications in FDOT standard specs or is this one special for some reason? I hesitate to change the word (legally), as the pay item description and subsequent pay item section is still labeled ‘Furnish’ and ‘Install’. Will there be ambiguity from the contractor because he does not have to ‘Furnish’ but rather ‘Provide’? Could this be misinterpreted as ‘Provide for’?

There is a lot of abbreviating throughout the document, and instead of “proper grammar” of spelling out numbers under ten, we are exchanging those numeric words for actual numbers. The numbers thing is not a huge deal, but it does represent a non-blanket change for the FDOT standard specifications. Some other abbreviating that stands out to me: “100 cubic feet per minute” is now “100 cubic feet per min.”. However, abbreviating ‘minute’ to ‘min’ is not consistent throughout the document.

**Section 785-2.3.1:**

“Submit site resistance measurement to the Engineer for review, consideration, and further direction”. My comment – Then what? We took out augmentation altogether as an alternative to

not meeting grounding resistance, so I'm not sure what the Engineer with 'consider'. The decision from one Engineer to another varies greatly and the costs could be all over the place for their solution. I could see this as being a potential problem for the Engineer during post design services, unless there are alternative solutions spelled out.

I see we've removed the augmentation due to the maintenance nightmare it creates (i.e. forms a solid, one strike and it's basically a sheet of glass, etc). Has anyone done any research for other possibilities if we cannot reach 5 ohms? The alternatives the Engineer has available are not really spelled out.

Section 785-2.3.2 and 785-5.3.4.2:

"All ground rods and connections must remain accessible for inspection, maintenance....". My comment – This should be elaborated on that they must not remain 'above ground' do to mowing, exposure, etc., but rather "accessible" through a covered pull box.

That is my two cents so far, but I'd like to add your comments and submit them to FDOT as a whole. I'd like you all to review this spec. since it is likely very near and dear to our hearts when the owner comes back to the designer complaining of multiple failures at a location, due to surge and grounding, etc. It only takes an hour or two, so please do what you can.

**Response:**

The change from "Furnish" to "Provide" in certain statements within the document was intended to identify those items that are typically provided as part of another device or assembly that is actually furnished and/or installed as part of another item. This was the rationale behind the modification made to change "furnish" to "provide" in certain statements.

The draft has been reviewed again for consistency with the Specifications Style Guide. Changes to abbreviations, spelled numbers, etc. have been made where necessary.

The ambiguity of leaving the engineer responsible for providing guidance to the contractor in the event that 5 ohms cannot be achieved has been removed.

Location of ground system test access point has been clarified in a manner that agrees with your comment (placed in the nearest electrical pull box unless otherwise shown in plans).

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**Comments: (6-29-10)**

I have reviewed the above industry review specification. My only comments are to confirm that the following terms are defined somewhere in the section:

MSTCSD

AWG  
NFPA 780  
NPT  
APL

**Response:**

A number of these abbreviations are defined in section 1-2 of the Standard Specifications for Road and Bridge Construction. If they do not appear there, then it is standard practice to spell them out upon their first appearance within an individual spec section. We added National Pipe Thread (NPT) to the draft.

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**Comments: (7-13-10)**

Our company has provided camera lowering systems throughout the state of Florida and the world. In fact, the first lowering device for CCTV was deployed by FDOT back in 1997 and provided by our company. To date, we remain the ONLY Camera Lowering Device Provider Listed on FDOT's APL. APL #78561601215013

We have a number of comments and concerns with the proposed specification change. In general, it seems that while some items are being given more stringent technical requirements it seems the most important technical aspects of a lowering device are being cast out. At the least, the logic behind many of the changes is confusing. Pursuant to your June 24, 2010 MEMORANDUM advising of proposed specification changes, **please find attached our official and specific set of comments in WORD document format.**

I urge you and others to give these commented items serious review. I remain available for discussion via phone or even in person for those involved with this review. I will even be available to bring applicable component parts for your in persons examination and review. A final approval of the specification change pertaining to lowering device as originally proposed would mark a significant step backwards from the quality, performance and field support of the product currently supplied to FDOT. I certainly hope your receive a vast amount of additional comments from consultants, engineers and contractors statewide. Lastly, I would like to request the names of any other persons within FDOT responsible for final determination on these proposed specification changes. Please forward these (if there are any) to my attention.

***Comments are provided in BLUE below to distinguish between current spec language and FDOT proposed new language in RED.***

***Comments provided by: Martin A. Maners, III / Vice President & General Counsel for MG Squared. Of note, MG Squared provided the first camera lowering device in the world in Jacksonville, FL in 1997. MG Squared together with ITS Products were the first camera lowering device on the FDOT APL (over a year ago) and as of June 2010, remain the only***

**camera lowering device on the APL. I remain open for further discussion on any of these points below and can be reached at 205-823-6688 or [martin@mgsquared.com](mailto:martin@mgsquared.com)**

**785-3.2.2 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. ~~Locate the stainless steel lowering cable inside conduit to avoid cable twisting and to ensure that only the lowering cable is in motion inside the pole when the lowering device is operated. Ensure that all other cables remain stable and secure during lowering and raising operations.~~ ***The lowering device system support arm must be capable of withstanding service tension and shear up to 1 kip (kilopound) minimum.***

*It should be noted that the Pole Fitter and the Disconnect unit Fitter are to be considered part of the “system support arm” for purposes of this requirement. Another lowering device provider experienced “cracks” or “failures” on the Pole Fitter which is where the support arm inserts. Without the inclusion of these fitters, while an arm (in between these fitters) may meet the strength requirements... the fitter may not... and continued failures of what previously happened is permissible.*

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. ***All finished castings must have a smooth finish free from cracks, blow-holes, shrinks, and other flaws.***

***The lowering device must be provided with 100 feet of composite power and signal cable prewired to the lowering device at the factory unless otherwise shown in the plans.***

Use only lowering device equipment and components that meet the requirements of these minimum specifications, and are listed on the Department’s Approved Product List (APL). ***The lowering device must be permanently marked with the APL certification number, manufacturer name, model number, and date of manufacture.***

**785-3.2.2.1 Equipment Connection Box:** Provide an equipment connection box for connecting the CCTV camera or other ITS device to the lowering device.

***The equipment connection box must include a 1.5” NPT pipe connection point for attaching a camera.*** Ensure that the equipment connection box has an ingress protection rating of no less than IP55.

*It is interesting that the specification fails to give any minimum requirements as to the weight of this box. It has been proven that without this box weighing at least 40-50lbs, due to the light weight of the cameras... the cameras would be easily subjected to wind either slamming them against the side of the pole during the raising and lowering operation or even wrapping the camera around the pole. We have successfully demonstrated in many installations in Florida and on the Sunshine Skyway Bridge in particular that a camera junction box (or Equipment Connection Box as you call it) weighing close to 50lbs ensures the camera not be overly*

swayed/pushed in winds gusting up to 40mph. This specification already lacks significant detail for this component... failing to have a minimum weight requirement could result in camera damage or worse.

**785-3.2.2.2 Disconnect Unit:** Ensure that the disconnect unit has a minimum load capacity of 200 pounds with a 4:1 safety factor. This is an outdated latch strength rating. Current equipment and the system currently on the APL carries a strength rating of 600lb with 4:1 safety factor. Specifying anything less here than what is available in the industry simply compromises the ultimate safety of the system. 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 load is transferred~~ removed from the lowering cable *to the mechanical latches when the system is in the latched position.* 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.

**785-3.2.2.2.1 Disconnect Unit Housing:** Ensure that the disconnect unit housing is provided with a gasket to seal the interior from dust and moisture. Ensure that the disconnect unit housing has an ingress protection rating of no less than IP55.

**785-3.2.2.2.2 Connector Block:** ~~Provide a connector block as shown in the plans and directed by the Engineer.~~ Provide modular, self-aligning and self-adjusting female and male socket contact halves in the connector block. Equip the lowering device with enough contacts to permit operation of all required functions of the camera, up to a maximum of 20 contacts. ~~There is no need to identify a maximum number of contacts at 20. For at least 10 years now in the State of Florida (and elsewhere), lowering devices have been provided with 14 contacts... which has been more than adequate to meet the needs of today's dome cameras. Most cameras are utilizing between 8-10 contacts (and sometimes less). Requiring a 20 pin max connector is not representative of what is utilized. Of further note, the Lowering Device currently on the APL is based upon a 14 pin configuration.~~ Provide at least two 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 V<sub>AC</sub>, 9-24 V<sub>AC</sub>, and 9-48 V<sub>DC</sub> 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. Submit documentation ~~to the Engineer~~ showing pin assignment for his approval. ~~NOTE... documentation regarding the actual pin assignment will always be the responsibility of the camera installer/integrator. Lowering devices come with numbered or colored pins/wires and it has always been the discretion of the installer/integrator as to which number/color will be assigned a particular function.~~

~~Ensure that the connector block conforms to one of the two options described below:~~  
**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 male contacts used for grounding mate first and break last. 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.~~

~~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 0.09102 inch in diameter *and firmly affixed to the connector block*. Provide two male contacts that are longer than the other contacts to mate first and break last. 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.~~

The proposed spec has made two critical depreciations in quality of connector with the above language or lack thereof. Specifically, it is odd that the minimum pin diameter has been reduced from 0.102 to a 0.09 diameter. The lowering device currently on the APL utilizes a pin diameter of at least 0.125 diameter. Reducing the diameter of the pin will always equate to a less durable pin, less surface contact area and less capacity of handling/surviving transient surges. The specification should follow at least what is currently on the APL.

Secondly, the proposed language has eliminated both the requirement of a durable material actually designed for outdoor use as the connector block body... as well as the requirement that the male contacts create a moisture tight seal when mated. The connector is the Heart of the lowering device. Failure here will cripple the ITS deployment. Time and circumstance have proven that the best material with extreme heat and cold resistance is synthetic rubber. The pins must be more than “FIRMLY AFFIXED TO THE CONNECTOR BODY”... they should be Molded into the body. A connector body fabricated from rubber will allow this. When the pins are molded into the body, there is no risk for the pins to “push out or become dislodge” in their respective sockets after countless insertions. Also, by requiring the connector body to be a molded rubber also allows the requirement of “O-rings” or “shoulders” at the base of each male which enable the male to actually seal when engaging the female.

I find it odd that the proposed specification goes to great length at requiring the Equipment connection box and the disconnect unit housing to have an ingress protection rating, but fails to give any requirement for the actual Electrical contact block that is responsible for providing continuous signal through the life of the system regardless of the weather. One must understand that despite requiring the Disconnect Unit Housing (The Bell Housing that encloses the contacts) to be IP55... there will still be a large and regular amount of condensation occurring within the Disconnect Unit Housing. That considered, the two halves of the contact block MUST provide a means for sealing each individual pin. The language struck-through in this section pertaining to this should be reinstated. The lowering device on the APL currently utilizes a synthetic rubber contact block where the pins and wire leads are permanently molded into the block and the male

pins have “o-rings” at the base of each creating a moisture tight seal when mated. The FDOT specification should require nothing less.

**785-3.2.3 Lowering Tool:** Provide a *portable* 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~~ *a torque limiter that will prevent over-tensioning of the lowering cable*. It should be noted that the portable lowering tool shall come with a manual hand crank. The additional language is unclear as to whether the torque limiter is to be a piece of equipment utilized with the electric drill (as in the past) or if such is to be incorporated into the manual hand crank. It appears language further below expects the provider to include this torque limiter as part of the manual winch handle. Please clarify. 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. The specification fails to address how the pole is affixed to the respective poles. The most reliable and safe manner has been to require the lowering tool to actually fasten to the pole/handhole itself. This is typically accomplished by a simple ½ inch bolt passing through the winch frame and into the pole itself. For safety sake... this should be added. Ensure that the lowering tool is equipped with a *winch with a minimum drum size width of 3.75”* (The winch used across the country and that is currently the design submitted and approved on the APL utilizes a drum size width of 2.0”. This allows up to 125ft of winch cable to be spooled. It is unclear why FDOT desires to increase the size which will change the standard model to a more expensive winch. Please reconsider.) *and a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling. Ensure the lowering cable winds evenly and does not bind on the lowering tool winch drum during operation. Ensure the winch includes a manual winch handle that incorporates a non-shear pin type (and self re-setting... if it is not self resetting then getting the winch re-operable after a over torque event may cause unnecessary delay at best or difficulty at worst) torque limiter that can be used repeatedly and will prevent damage to the lowering system.*

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.

*All roller fairlead frames shall be corrosion resistant stainless steel or aluminum* It is unclear why this comment appears here within the “Lowering Tool” section. Roller fairleads are applicable to the standard External Mount system as is currently on the APL. NOTE... if the new requirement listed further below under the External Mount Device pertaining to a 3” conduit vs. a 2” conduit... then roller fairleads will NO LONGER BE USED.

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. Please state clearly if the minimum of “one lowering tool” is to include the electric drill and clutch mechanism. The manual hand crank alone often suffices for poles less than 70ft. One can

manually crank down a camera from 50ft in less than 90 seconds. A drill/clutch assembly allows such to happen in about 38 seconds.

**785-3.2.4 Lowering Cable:** Provide a lowering cable with a minimum diameter of 0.125 inch. *The cable must be constructed of stainless steel type 316 aircraft cable type (7strands x 19 gauge) with a minimum breaking strength of 1,760 THE number 4 should be removed pounds, and with 7 strands of 19-gauge wire each. Ensure the lowering cable assembly (as installed with thimble and crimps on one end and a cable clamp inside the latch on the lowering device end), has a minimum breaking strength of 1760 lbs. Ensure all lowering cable accessories, such as connecting links have a minimum workload rating that meets or exceeds that of the lowering cable.* Ensure that the prefabricated components for the lift unit support system preclude the lifting cable from contacting the power or video cables. *The ONLY way one can ever ensure that the lowering cable will never contact or twist with other cables in the pole is to require the lowering cable to be contained within conduit. Even if an installer should successfully keep the lowering cable separate from the power/signal cables during the initial install... we have seen instances where DOT went back a year or more later and had a RTMS unit or antenna installed on the same pole. In doing so, the installer (different than the one on the initial project) unknowingly drops the cable for the new equipment down the pole and tangles such with the lowering cable. In section 785-3.3.1 General further below... the specification does make mention of the requirement of 1.25 inch PVC conduit to house the lowering cable. Basically, that requirement would be more appropriate here in the section actually on lowering cable.*

**785-3.2.5 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.

**785-3.2.6 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/*junction* box that is able to accept the respective (i.e., general/light or heavy-duty) *This language about light or heavy duty connectors should be removed here and to simply reflect or acknowledge that all of the previous sections on lowering devices still apply here unless specifically noted otherwise* lowering device. Ensure that the system includes a winch assembly permanently housed in a corrosion-resistant lower lockable *pole-mounted cabinet* box with gaskets, as shown in the plans. *Ensure the upper mounting/junction box includes a maintenance access door with captive attachment hardware.* Provide all necessary mounting hardware for the upper and lower box, conduits, standoffs, and conduit mounts required for a complete and functional system. *This has always been the responsibility of the installation contractor or integrator.*

*Ensure the cabinet minimum dimensions are 12" x 18" x 10" and that the cabinet and door do not interfere with the operation of the winch. The cabinet must provide adequate clear area for operation of the winch manually and with an electric drill.*

*The cabinet must be constructed of 5052 sheet aluminum with a minimum thickness of 1/8". All inside and outside edges of the cabinet must be free of burrs. The outside surface of the cabinet must have a smooth, uniform natural aluminum finish. All welds must be neatly formed, free of cracks, blow holes, and other irregularities. Cabinet hinges must be vandal resistant and made of 14 gauge diameter stainless steel or 1/8" diameter aluminum and include stainless steel hinge pins. Cabinet door must not sag. Door opening must be double flanged. Door must include*

*neoprene closed-cell gaskets permanently secured on the interior door surfaces that contact the door opening. The cabinet must be NEMA 4 rated.*

*Door must include a pin tumbler lock. Provide locks keyed for use with a #2 key unless otherwise directed. Provide 2 keys with each cabinet. The cabinet door handle must include a lock hasp that will accommodate a padlock with a 7/16" diameter shackle.*

*Ensure external conduit used to connect the winch cabinet to the upper mounting/junction box is galvanized schedule 40 with NPT threads. The conduit must have a minimum ID of 3" at the lower winch cabinet entrance and allow the lowering cable to wind evenly on the winch drum without binding. The Device currently on the APL utilizes 2" conduit mount for both the upper and lower boxes. Increasing to a minimum 3 inch INSIDE Dia. Will increase the costs unjustifiably. Reconsider. All conduit couplings and connections between the pole-mounted cabinet and upper mounting/junction box must be watertight*

### **785-3.3 Installation Requirements:**

**785-3.3.1 General:** 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 Structures Manual, Volume 9. Supply internal conduit in the pole for the power and video cabling if required by the Engineer.

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.

Provide 1.25-inch-diameter PVC conduit in the pole for the lowering cable. Verify that a conduit mount adapter is furnished for the interface between the conduit and the internal back side of the lowering device. This requirement of 1.25 inch PVC conduit ONLY applies to the lowering device being mounted on a properly customized concrete or steel pole. This does not apply to the External System specified immediately prior.

**785-3.3.1 2 Concrete Poles:** Install foundation and pole in accordance with 641-4.2, except footing dimensions shall be in accordance with Design Standard 18113.

**785-3.3.2 3 Steel Poles:** Install foundation and pole in accordance with 649-5 and 649-6.

**785-3.3.4 Lowering Device:** *Ensure that the lowering device can be safely operated and is installed in a manner that does not place the operator directly under the device when it is being raised or lowered. Ensure that on-site instruction regarding the safe operation of the lowering system is provided by the lowering device manufacturer. Contractors responsible for the installation of a lowering device must be certified by the lowering device manufacturer. This certification must show evidence that the installer has been trained in the proper and safe installation and inspection of the manufacturer's lowering device system.*

*Ensure that any personnel responsible for operation or maintenance of the lowering device are trained and certified by lowering device manufacturer or a contractor certified by the lowering device manufacturer.*

*Removal of the above language seriously compromises the safety and operation of the entire system. This kind of language has and continues to exist in the specification for Highmast Light towers... and justifiably so. It is unclear why FDOT would desire to remove a key safety driven specification. By requiring the installation contractor on a job by job basis to receive authorized factory oversight of the first 2-3 lowering systems installed on a job it greatly increases the potential for a safe and proper installation. Further, it affords them as well as local maintenance personnel to receive hands-on operation training. Considering the millions of*

*dollars spent on ITS camera deployments, the relatively small cost adder for such a requirement is well worth the time and effort.*

*Ensure the lowering device support arm self-aligns the disconnect unit and attached device with the pole centerline and remains centered after installation without moving or twisting. Ensure the connection between the lowering device and tenon is weather resistant to prevent the entrance of water. For externally-mounted lowering systems, use conduit straps to secure lowering cable conduit to the pole. Do not use stainless steel bands to secure conduit to the pole. Place the stainless steel lowering cable inside conduit. It is unclear whether this preceeding sentence is addressing the external mount or internal mount system. It should clarify as the Internal Mount system. Ensure that only the lowering cable is in motion inside the pole when the lowering device is operated. Ensure that all other cables remain stable and secure during lowering and raising operations. Label all wire leads with their function, label spares as spares. Again, wire function labeling is the responsibility of the installer/integrator.*

*Ensure that crimps and other cable connection hardware associated with the lowering cable cannot come in direct contact with the winch tool or guides when operating the system. The only way this can be ensured is by proper adherence to the written or in person directions provided by the lowering device manufacturer. Ensure the correct length of lowering cable is installed and that the installed length prevents cable slack and prevents cable from jumping off the winch spool. The only way this can be ensured is by proper adherence to the written or in person directions provided by the lowering device manufacturer. Ensure the lowering cable strands do not twist or unwind when the lowering device is operated.*

~~*Ensure that power and communication cables attached to the lowering device are secured and do not move when the lowering system is being operated. Label all wire leads with their function, label spares as spares.*~~

*Provide manufacturer recommended field installation instructions, inspection instructions (including, recommended schedules and procedures), and operating instructions.*

Response:

Your comments are appreciated and were considered during the finalization of the draft document. The specification currently reflects the minimum functional requirements that are desired by FDOT. This draft includes additional requirements not found in past, implemented versions. These changes were implemented as a direct result of operational feedback, including the addition of safety features and other requirements that are intended to address past field installation/operational issues with MG2 and CLS devices.

With respect to some of your individual comments/concerns, the following responses are offered:

The reference to the lowering device arm in the existing document is interpreted to include the fitter subcomponents.

The maximum total weight and EPA of the lowering device, connection box, camera, etc. is stated on Index. 18111 and 18113 as 5.6 sq ft total and 240 lbs. These values were established based upon the box having the significant weight you describe. The products that have been received and evaluated to date at the TERL and deployed on Florida transportation projects have been provided with a significant and sufficient amount of weight to suit the needs of the device

application, though we will consider adding additional detail concerning the minimum weight of the box if it becomes an issue or necessity in the future.

The staff involved in the development and review of the lowering device specification included a number of individuals from various offices within the FDOT Central Office and FDOT Districts (during previous internal reviews, etc.). Internal Central Office staff that contributed to the review and development of functional requirements during this effort principally included Jeffrey Morgan, Gene Glotzbach, Trey Tillander, Fred Heery, Sivam Ramalingam, and Ron Meyer. Manufacturer input was solicited and considered as the draft was produced, including coordination and outreach to Jeffrey Watson and Jim Labatt, acting on behalf of MG2 and CLS, respectively.

The load capacity of the disconnect unit has been increased in the draft since the 600lb value is now common amongst these devices.

The minimum pin diameter has, in general, been increased, as the former “light-duty” option in this specification has been removed. The pin diameter specified is considered to be an adequate minimum based upon past experiences with various devices throughout Florida. To date, water penetration has not been an issue, but there is verbiage in the latest draft to ensure this requirement is addressed in product designs.

The specification calls for the manual hand crank and torque limiter to be provided with either internal or external systems. Language has been added in an attempt to prevent the functionality of the torque limiter to be bypassed when using a drill and to require the tool to have some mechanism for securely supporting itself and the load.

The Department desires the increased winch drum size on both portable and permanently mounted winches. To avoid confusion, the statement regarding roller fairleads has been moved to section 785-3.2.2 as a general requirement that should be required of any such components (if they are used), regardless of placement or use in the product.

The required number of portable lowering tools and/or drills is left to the discretion of the designer. Specific quantities can be shown in the plans based upon project need. The specification simply requires a minimum of one manual tool, in the event that the plans are silent on a specific quantity or type to be provided.

The requirement that the lowering cable be placed in conduit is adequately addressed and covered both by the specification (785-3.3.4) and depicted in FDOT Standard Index 18110.

The Department has justifiable reason to require the increased conduit size. The specification currently prohibits the use of PVC conduit on external systems.

The Specifications Office feels that certification/training/proper operation requirements are adequately addressed in Index 18110 at this time and is not within the scope of this document.

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Comments: (7-21-10)

I would remove reference to the IEEE C62 series specifications. These are wonderful guidelines for design, but are largely applicable to a controlled test environment and not really construction friendly. I did notice that the spec references a Section 620 which states: • “Use solid No. 6 AWG copper insulated (green) conductor for electrical or lightning protection ground from the system ground bus or barrier plate(s) to the grounding electrodes and from grounding electrode to grounding electrode.” While the modified spec states: • “Bond multiple grounding rod electrode assemblies to each other with #No. 2 AWG solid bare tinned copper wire that is exothermically welded at all connection points.” I think the Section 620 should be updated and changed to reflect using a #2 AWG wire from electrode to electrode. The Bill Cook modifications delete the distance the main ground electrode is placed from the ITS device or structure. This distance is referenced in Index #18102 which states min 12” and max 36” from structure. I added a reference (within 3’) shown in green. Bill had also deleted reference to the wire size for the ITS Equipment Shelter “halo” ground wire. Per ANSI J-STD-607-A, Commercial Building Grounding (Earthing) And Bonding Requirements For Telecommunications the minimum bonding conductor size shall be a #6 AWG. I made this change also shown in green. Otherwise, Bill has done a very good job with his spec changes.

Response:

The reference to the IEEE C62 specs and a number of other requirements have been removed in favor of relying upon other standards, such as UL1449, rev. 3 to govern some of the testing and functionality expected of SPDs. Comment re: 620 is noted and will be considered for future updates to that section. The CO Roadway Design Office is working on the creation of requirements to cover a variety of grounding/bonding scenarios. We anticipate that some harmonization/consolidation of content in 620, 785, and others will be a part of that activity and will suggest that they consider changes in wire size requirements as appropriate.

\*\*\*\*\*

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Comments: (7-21-10)

785-3.2.2.2 Connector Block: Our standard connector has 14 pins, 20 pins can be provided if necessary on a particular project. By taking out all sealing requirements the connector may be subject to weathering and corrosion. Sealing around each pin assures the best protection and longest life of the contact block 785-3.2.3 Lowering Tool: I would add that the torque limiter be a non-friction self re-setting type to assure that you will get the type of torque limiter that was provided to TERL as a sample. 785-3.3.4 Lowering Device: I strongly recommend that the on-

site installation and operation instruction be re-instated in the spec.

**Response:**

See responses provided to similar comments made by Martin Maners of MG2.

\*\*\*\*\*

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**Comments: (7-22-10)**

As stated in the accompanying email, the District Seven ITS Project Manager Vaughn Cooper, P.E., chaired a meeting with industry professional to review and comment on the proposed changes and existing content of FDOT Supplemental Specification 785. Below is a compilation of the comments that were arrived at with consensus by all present.

1. Section 785-2.2: Due to some discrepancies with Section 620, please add the following: "...Section 620. If this section differs from Section 620, this section shall govern."
2. Section 785-2.2, Second Paragraph: Change "connection" to "circuit."
3. Section 785-2.3.1: A number of changes are suggested. The modified section is shown below. Also, please see the modified specification with "track changes." The reasoning is as follows:
  - a. Salinity of soil can dramatically affect the maintenance of ground rods. Thus, utilizing stainless steel ground rods in these environments should be considered to reduce future maintenance expenses.
  - b. South Florida has allot of coral that makes it very difficult to drive a ground rod to depth. Therefore, angling or placing horizontal is an option.
  - c. A minimum of two ground rods should be used for redundancy.

**785-2.3.1 General:** Ensure that the grounding rod electrode assemblies used in the grounding system consist of a minimum of 2 copper-clad ground rod electrodes unless the plans identify a high concentration of salinity in the soil, in which case stainless steel ground rods shall be used as shown in the plans. Each ground rod electrode assembly must have a minimum length of 20 feet. Individual ground rod electrode assembly sections must have a minimum length of 8 feet. Ensure that ground rods are a minimum 5/8" inch in diameter. Bond multiple grounding rod electrode assemblies to each other with No. 2 AWG solid bare tinned copper wire that is exothermically welded at all connection points. If the depth of ground rods cannot be achieved, angled or horizontal installation, ranging from 20 feet to 40 feet, may be permitted at the discretion of the Engineer at no additional cost. Bond the grounding system to a main ground bar within the site equipment cabinet.

A two ground rod electrode array bonded to the equipment cabinet constitutes a minimal grounding system with a main and secondary ground rod array. If this array does not achieve a resistance to ground of 5 ohms or less, install additional 20-foot grounding rod electrode assemblies and connect them to the main grounding rod electrode array. If the array still does not achieve a resistance to ground of 5 ohms ( $\Omega$ ) or less, install additional 20 foot grounding rods , spaced 40 feet apart, until 5 ohms is achieved. References for this section include, but are not limited to: UL467 (Latest Edition), Grounding and Bonding Equipment (Latest Edition); UL497A, Standard for Secondary Protectors for Communications Circuits (Latest Edition), and the NEC (Latest Edition). Ensure that lightning protection systems conform to the requirements of NFPA 780, Standard for the Installation of Lightning Protection Systems (Latest Edition).

4. Section 785-2.3.2: A number of changes are suggested. The modified section is shown below. Also, please see the modified specification with “track changes.” The reasoning is as follows:
  - a. One of the biggest issues during construction and maintenance is not properly creating a neutral-ground bond. By having the contractor identify it, two things happen. The first is that the contractor needs to acknowledge it. The second is that the CEI now knows to look for it.
  - b. Accessing the ground rod needs to be defined so that it can be measured. Therefore, clarifying accessibility would be advisable.
  - c. Mechanical connections oftentimes include split bolts, which are problematic for maintenance. Requiring a compression mechanical connection eliminates this issue.

**785-2.3.2 Grounding Specifications:** Provide a grounding system as shown in the plans. Ensure that grounding rod electrodes are listed according to UL requirements as detailed in the standard UL 467. Identify the neutral-ground bond and ensure that it meets the requirements of the NEC (Latest Edition). Make all connections to the grounding electrode using exothermic welds. The two ground rods in the primary array must remain accessible for inspection, testing, and maintenance as shown in the plans. Accessible is defined as 6-8” of ground rod exposed in a pull box such that a “fall of potential” or “clamp-on” meter can access the ground rod for testing. Subsequent ground rods, in addition to the two primary rods, installed to improve the array resistance, may be below grade and not accessible for inspection after completion of the ITS site. These will be interconnected to the primary array with #2 AWG solid tin plated copper wire and exothermically welded at all connection points. Connect all grounding electrodes related to the ITS device and any grounded electrical system within a 100-foot radius (but not beyond the edge of the roadway pavement or onto private property unless permanent access has been obtained) of the structural base of the ITS device, to a single point main grounding bar inside the equipment cabinet or mounted to the base of the ITS structure and as shown in plans. Place multiple grounding rod electrode assemblies in a “T” configuration. In the event that the “T” configuration cannot be placed in the right-of-way, change the configuration of the radials to make the grounding array fit in the space available, and/or increase the length of the ground rods to a maximum of 40 feet. Install the main grounding rod electrode in the electrical pull box at the structural base of the ITS device.

Bond all metal components of the ITS device subsystem, such as the cabinets and steel poles, to the grounding system with a grounding cable that uses a compression mechanical connection on the equipment side and an exothermically welded connection at the down cable.

5. Section 785-2.3.2: Suggest utilizing a 24x13 or 12x12 pull box without a concrete apron to provide access to the second ground rod. A detail in the Standards may be advisable.
6. Section 785-2.3.3: A number of changes are suggested. The modified section is shown below. Also, please see the modified specification with “track changes.” The reasoning is as follows:
  - a. The Fall-of-Potential Method is not widely understood. Therefore, clarification is advisable.

**785-2.3.3 Ground Resistance Testing and Certification:** Measure the ground resistance with an instrument designed specifically to measure and document earth/ground resistance, soil resistance, and current flow. Conduct the test by using the Fall-of-Potential method. Provide the Engineer with written test results for each testing location. It is acceptable to use the 62% procedure which states that the “P” probe measurement will be located at the 62% distance between the earth rod and the “C” test probe. That includes the 52%, 62% & 72% readings showing that the resistance results do not deviate by more than +/- 10 feet between the 52% – 62% reading and the 62 – 72% reading. It is essential to test that the 62% point is outside of the “sphere of influence” of the grounding array. Using these three reading will clearly identify that the 62% is truly the resistance of the array. If the difference between the 52% & 62% points is greater than 10 feet then the “C probe must be move further from the array under test and a new 62% point established. This must be continued until the 52% – 62% and 62% – 72% readings are within the acceptable 10 foot value. Include in the test results the instrument model and date of calibration for the device used in the testing, the local environmental conditions at the time of testing. Certify and sign the test results submitted.

7. Section 785-2.3.3: Has a required level of certification been considered. This is a general comment not only for 785, but also for the entire 780 series.
8. Section 785-2.4.1: There is no introduction of the low-voltage SPD’s. Suggest adding the following at the end of the paragraph: “Provide a specialized SPD at both ends of all low-voltage connections between the device and its operating subsystems, except when the device and the subsystems are mounted such that they are on the same structure and the cable does not proceed below ground. In which case only one SPD will be required prior to the operating subsystem unless otherwise shown in the plans.”
9. Section 785-2.4.2: A number of changes are suggested. The modified section is shown below. Also, please see the modified specification with “track changes.” The reasoning is as follows:
  - a. This section was modified based on research of existing SPD’s in the industry.

**785-2.4.2 SPD at Power Entry Point (Primary SPD):** Install a SPD at the closest termination/disconnection point where the 120-volt (V) supply circuit enters the ITS device cabinet. Locate the SPD on the load side of the main disconnect and ahead of

any and all ITS electronic devices. Configure the SPD to operate at 120 V single phase (i.e., line, neutral and ground) or 120/240 V single phase (line 1, line 2, neutral and ground) as required to match the supply circuit configuration. Verify that the SPD has been labeled to indicate that the unit is UL listed and meets the requirements of UL 1449, (Latest Edition).

Ensure that the SPD for the ITS device's power source has an operating voltage of 120 V single phase and a maximum continuous operating voltage of no more than 150 V single phase. The SPD shall be rated at a minimum of 50 kiloamps (kA) per mode, and a minimal nominal current (In) of 10 kA based on the UL1449 (Latest Edition) tests. Each individual MOV shall be a minimum of 20 KA. The results of testing this device for let-through voltage will be indicated on the UL label on the device and can be verified by accessing the UL web site ([www.ul.com](http://www.ul.com)) and verifying the UL test results..

Ensure that the SPD has 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 normally open (NO)/normally closed (NC) Form C contacts for remote alarm monitoring. The enclosure for a SPD shall have a NEMA 4 rating.

10. Section 785-2.4.3: A number of changes are suggested. The modified section is shown below. Also, please see the modified specification with "track changes." The reasoning is as follows:
  - a. This section was modified based on research of existing SPD's in the industry.

**785-2.4.3 SPD at Point of Use (Secondary SPD):** Install a SPD at the point the ITS devices receive 120 V power. The device will be a "series" connected SPD device. Ensure that the units are rated at 15 or 20 amps load and a minimum In of 3kA of surge current capacity. Verify that the SPD has been labeled to indicate that the unit is UL recognized or UL Listed (Latest Edition).

Ensure that the SPD at point of use has an operating voltage of 120 V single phase and a maximum continuous operating voltage of no more than 150 V single phase. Ensure that the SPD is rated at a minimum of 3 kiloamps (kA) In per mode as defined by UL 1449 (Latest Edition).

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. Hardwired type units shall also include one set of dry contacts to transmit this status information to other monitoring systems. Ensure that these units have internal fuse protection and provide common mode (L+N-G) protection.

11. Section 785-2.4.4: A number of changes are suggested. The modified section is shown below. Also, please see the modified specification with "track changes." The reasoning is as follows:
  - a. The wording supply and load side has presenting difficulties in construction with regards to the contractual requirements, since supply and load side is relative to what you consider your demarcation point.

**785-2.4.4 SPD for Low-Voltage Power, Control, Data and Signal Systems:** Install a specialized SPD at both ends of all low-voltage connections between the device and its

operating subsystems, except when the device and the subsystems are mounting such that they are on the same structure and the cable does not proceed below ground. In which case only one SPD will be required prior to the operating subsystem unless otherwise shown in the plans. These connections shall include, but are not limited to, Category 5 data cables, coaxial video cables, twisted pair video cables, and low-voltage control cables that comply with Electronic Industries Alliance (EIA) requirements as detailed in the EIA-232/422/485 standards. Ensure that these devices are of hybrid multi-staged design that optimizes performance with maximum let-through voltage as shown in the accompanying table.

TABLE NOT SHOWN.

Install a SPD that has an operating voltage matching the characteristics of the circuit.

12. Section 785-3.2.1: Define what “sufficient size” of the hand hole is it relates to minimum dimensions. There have been maintenance concerns in the past when the hand hole has been too small.
13. Section 785-3.2.2, fourth paragraph: Add the following at the end of the paragraph: “... plans or unless additional cable is required due to the height or configuration of the mounting structure.”
14. Section 785-3.2.3, first paragraph: add “at a minimum” after “electric drill.”
15. Section 785-4.2.9.3: Change the bus bar to accommodate a 2 AWG copper wire, since this is the size of wire being used for the grounding array.

Response:

1. The document has been modified to indicate that the system must meet the minimum requirements of both. If the minimum requirements are higher in 785 (such as No. 2 AWG vs. No. 6 for wire size of ground rod connections), then that should govern. We anticipate that the planned future harmonization/consolidation of bonding/grounding content currently contained in 620, 785, and other sections will also address revisions necessary for clarification and/or eliminating potential conflicts.
2. The draft document has been revised as suggested.
3. The draft document was silent on the use of horizontal radials. It wasn't specifically prohibited, but we have added language to clarify that such a design would be acceptable in the event that vertical rods are impractical or ineffective given project-specific conditions. The requirement for a single rod is a minimum requirement. If more than one is required due to unique conditions or project needs, this can be addressed during design and reflected in the final project documents. The same holds true for location and placement of boxes, etc. associated with the rods. The designer has some degree of latitude to exceed the minimum requirements based upon project needs when justifiable.
4. Additional instruction to construction and inspection personnel re: neutral-ground bond and compliance with applicable electrical/building codes, etc. is viewed to be outside the scope of this document at present. However, your comments are noted for future consideration. Accessibility of grounding system has been clarified in the latest draft (main ground rod in nearest electrical pullbox). Agree that mechanical connections using split bolts can be problematic. Use of split bolts for grounding system connections has been prohibited in 785-2.3.2.
5. See Response to #3 above.

6. Providing detailed instructions and procedures for performing this test are outside the scope of the specification. However, they are available from manufacturers of earth electrode testing equipment (in the user manual) as well as others.
7. Prerequisites and/or certifications will be considered for future spec revisions or other contractual requirements.
8. The suggested text is viewed as a design detail that could be covered in plans using existing language.
9. The various requirements in the section and table 785-1 have been revisited based on UL1449 and other FDOT-specific requirements in order to align the operating voltages, surge capacities, let-through voltages, etc. to various devices from a number of qualified manufacturers that have been commonly and successfully deployed for these purposes.
10. See response #9.
11. See response #9.
12. The hand hole is detailed in the standard index sheets (18111 and 18113). The description of the hand hole is no longer needed in 785-3.2.1 and has been removed.
13. The requirement is for a minimum of 100ft of cable. Additional cable is not prohibited.
14. The need/desire for this change is unclear. The draft remains as-is, but the comment will be considered for future investigation.
15. No.6 reference changed to No.2 as suggested.

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Chester H. Chandler III, P.E.  
 District ITS Program Manager  
 Department of Transportation -- District VII  
 813.615.8610

Comments: (7-23-10)  
 (Document attached)

Response:

The Central Office team responsible for reviewing and responding to comments has considered the document submitted and implemented a number of the recommended/requested modifications. Those not incorporated into the current document will be considered for future revisions.

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 Advanced Protection Technologies  
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Comments: (7-22-10)  
 (Document attached)

Response:

The Central Office team responsible for reviewing and responding to these comments has considered the document submitted during the course of the review process. A number of changes have been made to the draft specification based upon input and feedback from a number of internal and external stakeholders and subject matter experts. We appreciate the information that you provided and considered it while finalizing the document.

\*\*\*\*\*

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Comments: (7-22-10)

*Comments from Blackhawk Enterprises and Camera Lowering Systems (NorthStar Lighting) are provided in Green.*

*Comments are provided in **BLUE** below to distinguish between current spec language and FDOT proposed new language in **RED**.*

*Comments provided by: Martin A. Maners, III / Vice President & General Counsel for MG Squared. Of note, MG Squared provided the first camera lowering device in the world in Jacksonville, FL in 1997 (this first lowering device was actually manufactured by Camera Lowering Systems and distributed by MG2, not manufactured by MG2). MG Squared together with ITS Products were the first camera lowering device on the FDOT APL (over a year ago) and as of June 2010, remain the only camera lowering device on the APL. (The CLS product has been submitted to TERL and is awaiting APL listing at this time). I remain open for further discussion on any of these points below and can be reached at 205-823-6688 or [martin@mgsquared.com](mailto:martin@mgsquared.com)*

**785-3.2.2 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. Locate the stainless steel lowering cable inside conduit to avoid cable twisting and to ensure that only the lowering cable is in motion inside the pole when the lowering device is operated. Ensure that all other cables remain stable and secure during lowering and raising operations. *The lowering device system support arm must be capable of withstanding service tension and shear up to 1 kip (kilopound) minimum.*

*It should be noted that the Pole Fitter and the Disconnect unit Fitter are to be considered part of the "system support arm" for purposes of this requirement. Another lowering device provider experienced "cracks" or "failures" on the Pole Fitter which is where the support arm inserts. Without the inclusion of these fitters, while an arm (in between these fitters) may meet the strength requirements... the fitter may not... and continued failures of what previously happened is permissible. This is total heresay and conjecture. The CLS lowering device has been successfully tested to the FDOT TERL strength requirements by independent laboratories. Mr. Maners refers to former failures and continued failures of competitors equipment. Once again, this is heresay. You can ask FDOT personnel in District Offices and at TERL, and they will attest that there have been failures of the MG2 system in the State of Florida. We do not*

*engage in smear campaigns against our competition, and we let our product value, quality and service sell our product for us.*

*We do agree that the castings between the arm be included as part of the support arm. A recent test by an independent testing laboratory proves that Camera Lowering Systems meets or exceeds the FDOT TERL strength requirements.*

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. *All finished castings must have a smooth finish free from cracks, blow-holes, shrinks, and other flaws. The lowering device must be provided with 100 feet of composite power and signal cable prewired to the lowering device at the factory unless otherwise shown in the plans.*

Use only lowering device equipment and components that meet the requirements of these minimum specifications, and are listed on the Department's Approved Product List (APL). *The lowering device must be permanently marked with the APL certification number, manufacturer name, model number, and date of manufacture.*

**785-3.2.2.1 Equipment Connection Box:** Provide an equipment connection box for connecting the CCTV camera or other ITS device to the lowering device. *The equipment connection box must include a 1.5" NPT pipe connection point for attaching a camera.* Ensure that the equipment connection box has an ingress protection rating of no less than IP55. It is interesting that the specification fails to give any minimum requirements as to the weight of this box. It has been proven that without this box weighing at least 40-50lbs, due to the light weight of the cameras... the cameras would be easily subjected to wind either slamming them against the side of the pole during the raising and lowering operation or even wrapping the camera around the pole. We have successfully demonstrated in many installations in Florida and on the Sunshine Skyway Bridge in particular that a camera junction box (or Equipment Connection Box as you call it) weighing close to 50lbs ensures the camera not be overly swayed/pushed in winds gusting up to 40mph. This specification already lacks significant detail for this component... failing to have a minimum weight requirement could result in camera damage or worse.

*We agree that in most cases counterweight(s) should be provided with the junction box for the purposes stated above. Depending on the weight of the junction box itself, the height of the pole, other circumstances like on a bridge, etc., the amount of weight can vary. We do not believe that an absolute weight needs to be defined, but maybe a statement to the effect "the weight of the junction box (camera connection box) should weigh at least 40lbs. The weight should be sufficient to prevent the camera from swaying or hitting the pole during the raising/lowering process".*

**785-3.2.2.2 Disconnect Unit:** Ensure that the disconnect unit has a minimum load capacity of 200 pounds with a 4:1 safety factor.

This is an outdated latch strength rating. Current equipment and the system currently on the APL carries a strength rating of 600lb with 4:1 safety factor. Specifying anything less here than what is available in the industry simply compromises the ultimate safety of the system.

**We do not have issue with this proposed change to the specification. It is known that both commercially available lowering devices used a 200lb with 4:1 safety factor for many years**

**and has had no problems. The 600lb. with 4:1 safety factor basically became a game of specmanship, (totally irrelevant to the performance of the system in this application). Both products currently exceed this newer spec.**

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, eEnsure that all weight *load* is *transferred* removed from the lowering cable *to the mechanical latches when the system is in the latched position*. 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.

**785-3.2.2.2.1 Disconnect Unit Housing:** Ensure that the disconnect unit housing is provided with a gasket to seal the interior from dust and moisture. Ensure that the disconnect unit housing has an ingress protection rating of no less than IP55.

**785-3.2.2.2.2 Connector Block:** Provide a connector block as shown in the plans and directed by the Engineer. Provide modular, self-aligning and self-adjusting female and male socket contact halves in the connector block. Equip the lowering device with enough contacts to permit operation of all required functions of the camera, up to a maximum of 20 contacts.

There is no need to identify a maximum number of contacts at 20. For at least 10 years now in the State of Florida (and elsewhere), lowering devices have been provided with 14 contacts... which has been more than adequate to meet the needs of today's dome cameras. Most cameras are utilizing between 8-10 contacts (and sometimes less). Requiring a 20 pin max connector is not representative of what is utilized. Of further note, the Lowering Device currently on the APL is based upon a 14 pin configuration. **In our typical application we have video (2 wires), data (5 wires) and power (2 wires) for a total of 9 required pins. There may be instances where multiple cameras are installed on the same lowering device, which is why a higher number has always been specified.** Provide at least two 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 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. Submit documentation to the Engineer showing pin assignment for his approval.

NOTE... documentation regarding the actual pin assignment will always be the responsibility of the camera installer/integrator. Lowering devices come with numbered or colored pins/wires and it has always been the discretion of the installer/integrator as to which number/color will be assigned a particular function.

**To date, we agree with the comments above that color assignment is the responsibility of the installing Contractor. The State may want to consider standardizing on a cable construction and color coding, and therein specify the assignments of each conductor. Several other states have implemented this methodology for consistency of wiring on all lowering devices from any manufacturer. South Carolina DOT was the first to adopt such a methodology.**

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

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 male contacts used for grounding mate first and break last. 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.

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 0.09102 inch in diameter *and firmly affixed to the connector block*. Provide two male contacts that are longer than the other contacts to mate first and break last. 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.

The proposed spec has made two critical depreciations in quality of connector with the above language or lack thereof. Specifically, it is odd that the minimum pin diameter has been reduced from 0.102 to a 0.09 diameter. The lowering device currently on the APL utilizes a pin diameter of at least 0.125 diameter. Reducing the diameter of the pin will always equate to a less durable pin, less surface contact area and less capacity of handling/surviving transient surges. The specification should follow at least what is currently on the APL.

**We strongly disagree with our competitor's statements above. The statements are made with nothing to support or substantiate the statement. A .09" diameter pin is an extremely durable pin and has never bent or degraded in any way. The .09" diameter pin has a U. L. current rating of 20 Amps and will handle any surges coming from the cabinet. The original State of Florida specifications were written around the legacy MG2 specification/product, and then opened up for competition which is good for the state of Florida. "Less durability and less capacity of handling transient surges" is a false statement to get a product sole sourced. There is no hard data or proof that the .09 dia. pins are less durable. Further, these systems are carrying 1V p-p video signals and 5V RS-422 signals, with typically 24VAC power. Regular camera cables, and data cables, typically use 22ga or 24ga. wires. Anything larger is not necessary.**

Secondly, the proposed language has eliminated both the requirement of a durable material actually designed for outdoor use as the connector block body... as well as the requirement that the male contacts create a moisture tight seal when mated. The connector is the Heart of the lowering device. Failure here will cripple the ITS deployment. Time and circumstance have proven that the best material with extreme heat and cold resistance is synthetic rubber. The pins must be more than "FIRMLY AFFIXED TO THE CONNECTOR BODY"... they should be Molded into the body. A connector body fabricated from rubber will allow this. When the pins are molded into the body, there is no risk for the pins to "push out or become dislodge" in their respective sockets after countless insertions. Also, by requiring the connector body to be a molded rubber also allows the requirement of "O-rings" or "shoulders" at the base of each male which enable the male to actually seal when engaging the female.

**This paragraph is once again an effort to promote a sole source specification in the state of Florida. The CLS connector system uses an outdoor, high temp, extreme heat/cold resistant material in its construction. The difference is the pins are not molded into the connector body, but rather spring-loaded, locked, and entirely potted and sealed. When mated, the connector system is moisture resistant. There have never been any reports of pins becoming “pushed out” or “dislodged” in over 12 years of manufacturing these systems. The comments by our competitor are merely heresay.**

I find it odd that the proposed specification goes to great length at requiring the Equipment connection box and the disconnect unit housing to have an ingress protection rating, but fails to give any requirement for the actual Electrical contact block that is responsible for providing continuous signal through the life of the system regardless of the weather. One must understand that despite requiring the Disconnect Unit Housing (The Bell Housing that encloses the contacts) to be IP55... there will still be a large and regular amount of condensation occurring within the Disconnect Unit Housing. That considered, the two halves of the contact block MUST provide a means for sealing each individual pin. The language struck-through in this section pertaining to this should be reinstated. The lowering device on the APL currently utilizes a synthetic rubber contact block where the pins and wire leads are permanently molded into the block and the male pins have “o-rings” at the base of each creating a moisture tight seal when mated. The FDOT specification should require nothing less.

**We strongly disagree with these comments for the reasons stated above. The CLS lowering device has been used throughout Florida, the U.S., and throughout the world with no problems reported with regard to the hypothetical potentials put forth by our competitor.**

**785-3.2.3 Lowering Tool:** Provide a *portable* 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 *a torque limiter that will prevent over-tensioning of the lowering cable.*

It should be noted that the portable lowering tool shall come with a manual hand crank. The additional language is unclear as to whether the torque limiter is to be a piece of equipment utilized with the electric drill (as in the past) or if such is to be incorporated into the manual hand crank. It appears language further below expects the provider to include this torque limiter as part of the manual winch handle. Please clarify.

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.

The specification fails to address how the pole is affixed to the respective poles. The most reliable and safe manner has been to require the lowering tool to actually fasten to the pole/handhole itself. This is typically accomplished by a simple ½ inch bolt passing through the winch frame and into the pole itself. For safety sake... this should be added.

**We agree that the standard procedure for mounting the winch to the handhole in the pole is with a ½” bolt passing through into a threaded flange at the bottom of the handhole.**

Ensure that the lowering tool is equipped with a *winch with a minimum drum size width of 3.75”* (The winch used across the country and that is currently the design submitted and approved on the APL utilizes a drum size width of 2.0”. This allows up to 125ft of winch cable to be spooled. It is unclear why FDOT desires to increase the size which will change the standard model to a more expensive winch. Please reconsider.)

**We believe this larger drum is with regard to external mounted lowering devices and with permanently mounted winches in a cabinet at the bottom of the pole. Although a winch**

**with a 2” drum width is supposed to hold 125ft of cable, the cable will only fit on the drum if it is wound perfectly on the drum. It will realistically handle approximately 80% of the cable, or 100ft. Winches in need of cable in excess of 100 ft should use a wider drum.**

*and a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling. Ensure the lowering cable winds evenly and does not bind on the lowering tool winch drum during operation. Ensure the winch includes a manual winch handle that incorporates a non-shear pin type*

*(and self resetting... if it is not self resetting then getting the winch re-operable after a over torque event may cause unnecessary delay at best or difficulty at worst)*

*torque limiter that can be used repeatedly and will prevent damage to the lowering system.*

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. *All roller fairlead frames shall be corrosion resistant stainless steel or aluminum*

It is unclear why this comment appears here within the “Lowering Tool” section. Roller fairleads are applicable to the standard External Mount system as is currently on the APL. NOTE... if the new requirement listed further below under the External Mount Device pertaining to a 3” conduit vs. a 2” conduit... then roller fairleads will NO LONGER BE USED.

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.

Please state clearly if the minimum of “one lowering tool” is to include the electric drill and clutch mechanism. The manual hand crank alone often suffices for poles less than 70ft. One can manually crank down a camera from 50ft in less than 90 seconds. A drill/clutch assembly allows such to happen in about 38 seconds.

**This is a generic spec. Individual project specifications typically dictate the qty of lowering tools required on a project. We don’t believe these specifications should address any quantity. If someone was adding 1 lowering device onto an existing system where the DOT already had 10 lowering tools, they would not need another lowering tool.**

**785-3.2.4 Lowering Cable:** Provide a lowering cable with a minimum diameter of 0.125 inch. *The cable must be Construct it of stainless steel type 316 aircraft cable type (7strands x 19 gauge) with a minimum breaking strength of 1,7640 THE number 4 should be removed pounds, and with 7 strands of 19-gauge wire each. Ensure the lowering cable assembly (as installed with thimble and crimps on one end and a cable clamp inside the latch on the lowering device end), has a minimum breaking strength of 1760 lbs. Ensure all lowering cable accessories, such as connecting links have a minimum workload rating that meets or exceeds that of the lowering cable.* Ensure that the prefabricated components for the lift unit support system preclude the lifting cable from contacting the power or video cables.

The ONLY way one can ever ensure that the lowering cable will never contact or twist with other cables in the pole is to require the lowering cable to be contained within conduit. Even if an installer should successfully keep the lowering cable separate from the power/signal cables during the initial install... we have seen instances where DOT went back a year or more later and had a RTMS unit or antenna installed on the same pole. In doing so, the installer (different than the one on the initial project) unknowingly drops the cable for the new equipment down the pole

and tangles such with the lowering cable. In section **785-3.3.1 General further below... the specification does make mention of the requirement of 1.25 inch PVC conduit to house the lowering cable. Basically, that requirement would be more appropriate here in the section actually on lowering cable. We agree that a conduit should be provided inside each pole for the reasons listed. This is actually required and depicted in Florida Standard 18110.**

**785-3.2.5 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.

**785-3.2.6 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/*junction* box that is able to accept the respective (i.e., general/light or heavy-duty)

This language about light or heavy duty connectors should be removed here and to simply reflect or acknowledge that all of the previous sections on lowering devices still apply here unless specifically noted otherwise

**(the entire "heavy-duty", "light-duty" was an interim step to allow competition when the original specification was written sole source. The new goal was to have a single powering device that meets FDOT's requirements and allows competition without sacrificing safety or performance).**

lowering device. Ensure that the system includes a winch assembly permanently housed in a corrosion-resistant lower lockable *pole-mounted cabinet* box with gaskets, as shown in the plans. *Ensure the upper mounting/junction box includes a maintenance access door with captive attachment hardware.* Provide all necessary mounting hardware for the upper and lower box, conduits, standoffs, and conduit mounts required for a complete and functional system.

This has always been the responsibility of the installation contractor or integrator.

#### **Agreed**

*Ensure the cabinet minimum dimensions are 12" x 18" x 10" and that the cabinet and door do not interfere with the operation of the winch. The cabinet must provide adequate clear area for operation of the winch manually and with an electric drill. The cabinet must be constructed of 5052 sheet aluminum with a minimum thickness of 1/8". All inside and outside edges of the cabinet must be free of burrs. The outside surface of the cabinet must have a smooth, uniform natural aluminum finish. All welds must be neatly formed, free of cracks, blow holes, and other irregularities. Cabinet hinges must be vandal resistant and made of 14 gauge diameter stainless steel or 1/8" diameter aluminum and include stainless steel hinge pins. Cabinet door must not sag. Door opening must be double flanged. Door must include neoprene closed-cell gaskets permanently secured on the interior door surfaces that contact the door opening. The cabinet must be NEMA 4 rated.*

*Door must include a pin tumbler lock. Provide locks keyed for use with a #2 key unless otherwise directed. Provide 2 keys with each cabinet. The cabinet door handle must include a lock hasp that will accommodate a padlock with a 7/16" diameter shackle. Ensure external conduit used to connect the winch cabinet to the upper mounting/junction box is galvanized schedule 40 with NPT threads. The conduit must have a minimum ID of 3" at the lower winch cabinet entrance and allow the lowering cable to wind evenly on the winch drum without binding.*

*The Device currently on the APL utilizes 2" conduit mount for both the upper and lower boxes. Increasing to a minimum 3 inch INSIDE Dia. Will increase the costs unjustifiably. Reconsider.*

*All conduit couplings and connections between the pole-mounted cabinet and upper mounting/junction box must be watertight.*

### **785-3.3 Installation Requirements:**

**785-3.3.1 General:** 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 Structures Manual, Volume 9. Supply internal conduit in the pole for the power and video cabling if required by the Engineer. 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. Provide 1.25-inch-diameter PVC conduit in the pole for the lowering cable. Verify that a conduit mount adapter is furnished for the interface between the conduit and the internal back side of the lowering device.

This requirement of 1.25 inch PVC conduit ONLY applies to the lowering device being mounted on a properly customized concrete or steel pole. This does not apply to the External System specified immediately prior.

**785-3.3.1 2 Concrete Poles:** Install foundation and pole in accordance with 641-4.2, except footing dimensions shall be in accordance with Design Standard 18113.

**785-3.3.2 3 Steel Poles:** Install foundation and pole in accordance with 649-5 and 649-6.

**785-3.3.4 Lowering Device:** *Ensure that the lowering device can be safely operated and is installed in a manner that does not place the operator directly under the device when it is being raised or lowered. Ensure that on-site instruction regarding the safe operation of the lowering system is provided by the lowering device manufacturer. Contractors responsible for the installation of a lowering device must be certified by the lowering device manufacturer. This certification must show evidence that the installer has been trained in the proper and safe installation and inspection of the manufacturer's lowering device system. Ensure that any personnel responsible for operation or maintenance of the lowering device are trained and certified by lowering device manufacturer or a contractor certified by the lowering device manufacturer.*

*Removal of the above language seriously compromises the safety and operation of the entire system.*

*This kind of language has and continues to exist in the specification for Highmast Light towers... and justifiably so. It is unclear why FDOT would desire to remove a key safety driven specification. By requiring the installation contractor on a job by job basis to receive authorized factory oversight of the first 2-3 lowering systems installed on a job it greatly increases the potential for a safe and proper installation. Further, it affords them as well as local maintenance personnel to receive hands-on operation training. Considering the millions of dollars spent on ITS camera deployments, the relatively small cost adder for such a requirement is well worth the time and effort.*

*We agree that having on-site representation should be required for any contracting crew that has not been trained or installed a lowering device in the past. However, if a crew or personnel have been trained and have installed these devices in the past, we don't agree that the State should have to pay to have a factory representative on-site for every installation. Take the example that ABC Contracting just installed 40 lowering devices in District 4. If ABC Contracting bids another project to install 2 more devices in District 4 with the same personnel, why should they need to have the factory onsite?*

*Ensure the lowering device support arm self-aligns the disconnect unit and attached device with the pole centerline and remains centered after installation without moving or twisting. Ensure the connection between the lowering device and tenon is weather resistant to prevent the*

*entrance of water. For externally mounted lowering systems, use conduit straps to secure lowering cable conduit to the pole. Do not use stainless steel bands to secure conduit to the pole. Place the stainless steel lowering cable inside conduit.*

*It is unclear whether this preceding sentence is addressing the external mount or internal mount system. It should clarify as the Internal Mount system.*

*Ensure that only the lowering cable is in motion inside the pole when the lowering device is operated. Ensure that all other cables remain stable and secure during lowering and raising operations. Label all wire leads with their function, label spares as spares.*

*Again, wire function labeling is the responsibility of the installer/integrator.*

***The State should consider a standard cable construction and color code to be followed for all installs of any lowering device.***

*Ensure that crimps and other cable connection hardware associated with the lowering cable cannot come in direct contact with the winch tool or guides when operating the system.*

*The only way this can be ensured is by proper adherence to the written or in person directions provided by the lowering device manufacturer.*

*Ensure the correct length of lowering cable is installed and that the installed length prevents cable slack and prevents cable from jumping off the winch spool.*

*The only way this can be ensured is by proper adherence to the written or in person directions provided by the lowering device manufacturer.*

*Ensure the lowering cable strands do not twist or unwind when the lowering device is operated.*

*Ensure that power and communication cables attached to the lowering device are secured and do not move when the lowering system is being operated. Label all wire leads with their function, label spares as spares.*

*Provide manufacturer recommended field installation instructions, inspection instructions (including, recommended schedules and procedures), and operating instructions.*

Response:

Your comments are appreciated and were considered during the finalization of the draft document. The specification currently reflects the minimum functional requirements that are desired by FDOT. This draft includes additional requirements not found in past, implemented versions. These changes were implemented as a direct result of operational feedback, including the addition of safety features and other requirements that are intended to address past field installation/operational issues with MG2 and CLS devices.

See responses provided to comments received from Martin Maners of MG2 similar for additional information.

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Comments: (7-23-10)

785 Infrastructure, Table 4-1 - Values for Low-Voltage Circuits.

1. The power and control devices all have "up to 30A" as continuous current. A 12V device that can carry 30A would be incredibly expensive and have wires similar to your car battery. Don't think that fits an ITS application. They should be more realistic values. A 120V parallel device at 30A is reasonable.

2. The T-1 industry standard is 1.54MHz, not 100MHz. And it is 12Vdc

3. The Cat5 industry standard is 5Vdc and 100MHz. The 10/1000us waveform at 3kA is unrealistic. We know of no device on the market that can even approach that specification. 30Vpk at .5kA, 8 x 20us is realistic.

I have attached a spreadsheet, based on Table 4-1, that has industry standard specifications.

<<FDOT Infrastructure 785 Values for Low Voltage, Table 4-1.xls>>

Power to 12V	24575	Up to 30A	60Hz	5kA mode/line, 8x20us	<150Vpk, IEEE Cat B3/C1, 6kV/3kA <50Vpk, IEEE Cat A1 Ringwave 2kV
Power to 24V	24580	Up to 30A	60Hz	5kA mode/line, 8x20us	<175pk, IEEE Cat B3/C1,6kV/3kA <50Vpk, IEEE Cat A1Ringwave 2kV
Power to 48V	24585	Up to 30A	60Hz	5kA mode/line, 8 x 20us	<200Vpk, IEEE Cat B3/C1. 6kV/3kA <50Vpk, IEEE Cat A1, Ringwave 2kV
Power to 120V	24572	Unlimited in	60Hz	13kA, mode/line, 8x20us	<550Vpk, IEEE Cat B3/C1, 6kV/3kA
	22035	Parallel	60Hz	20kA, mode/line, 8x20us	<50Vpk, IEEE Cat A1, Ringwave 2kV
RS422	24528	Up to 500mA	Up to 100MHz	10kA,mode/line, 8x20us	<30Vpk, IEEE Cat B3/C1, 6kV/3kA
RS485	24587	Up to 500mA	Up to 100MHz	10kA, mode/line, 8x20us	<30Vpk, IEEE Cat B3/C1, 6kV/3kA
T-1	24558	Up to 500mA	1.54MHz,	10kA, mode/line, 8x20us	<20Vpk, IEEE B3/C1, 6kA/3kA
CAT5	24540	Up to 500mA	100MHz	1kA, mode/line, 8 x 20us	<30Vpk, .5kA, 8x20us

Response:

A number of changes have been made to the draft specification based upon input and feedback from a number of internal and external stakeholders and subject matter experts, including the various descriptive values and other criteria in the table. We appreciate the information that you provided and considered it while finalizing the document.

\*\*\*\*\*

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Comments (7-26-10)  
(Document attached)

Response:

A number of changes have been made to the draft specification based upon input and feedback from a number of internal and external stakeholders and subject matter experts, including some that align with recommendations in the document you submitted.

The latest draft should afford some additional design latitude with respect to placement of grounding systems within limited rights-of-way. In addition, the CO Roadway Design Office is working on the creation of a Design Standard to cover a variety of grounding/bonding scenarios. As you noted, the Standard Index drawings that include depictions of the grounding system described in 785-2.3.1 are associated with certain devices (such as for CCTV and DMS) and assumes adequate land area. Providing some alternate typical designs for situations where this may not be the case will likely be included in the effort to consolidate various FDOT grounding requirements.

The single point ground has always been intended, but a specific statement to that effect has been added, as have various reference updates re: UL1449, etc.

Another long-term goal is to move some of the material requirement for SPDs from the Standard Specifications for Road and Bridge Construction to the Minimum Specifications for Traffic Control Signals and Devices.

Agree that some of the references may not relate directly to installation. The general references have been moved to 785-2.1.

Providing detailed instructions and procedures for performing 3-point or 4-point tests are considered to be outside the scope of the specification. However, they are available from manufacturers of earth electrode testing equipment (in the user manual) as well as others. However, the Central Office staff involved with these specifications will consider and engage others with respect to the best method to ensure that adequate design consideration and work performance are addressed.

Document has been modified with respect to air terminal UL listing as suggested.

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