



**PDHonline Course E165W (4 PDH)**

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**Overview of Electrical  
Engineering for School Design  
(Live Webinar)**

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## Overview of Electrical Engineering for School Design

### Commentary on New York City School Construction Administration Construction Specification 16783, Cameras for Surveillance

Recently, the New York City School Construction Administration (NYC SCA) has made available to the public copies of their standard construction specifications. Previously, these were available only to design contractors and construction contractors on specific contracts. They were not available to the public, even in response to requests under the Freedom of Information Act.

A sample NYC SCA specification, **16783, Cameras for Surveillance**, is available through **PDH Center** as a download .pdf file for this course. It is a good specification and worthy of study simply as an example. It is considerably more valuable in showing differences between conventional specifications and NYC SCA standards. Many of these differences are called out in the following commentary.

Additionally, the NYC SCA 16783 is a work-in-progress. The version included is dated 8/30/06. There are oversights and errors, which are also pointed out in the commentary.

Each commentary section is preceded by the referenced section from 16783.

**1.01 DESCRIPTION OF WORK** - Note that Digital Video Recorders (DVRs), camera controls, monitor controls and monitors are NOT included in 16783.

NYC SCA has chosen, wisely, in my opinion, to hire a Systems Integrator, under a separate contract, for the heavy-duty electronics of the system. Interestingly, there appears to be no standard specification for the System Integration task. This may make good sense, in that technology is advancing so rapidly that a solid spec could limit the job to obsolete equipment.

A problem, which always occurs, is coordination between the Electrical Contractor, the video installer (AI), his sub, and the System Integrator (SI), with no contractual relationship. These firms must work together well to provide and good system and have everyone make money. A construction hold-up for finger-pointing hurts everyone. It is clear that three field construction organizations must cooperate to produce a quality installation and meet this specification. Typically, the Construction Manager proactively avoids conflicts among the organizations.

CCTP is a proprietary technology from Anixter. It will be discussed in later commentary. Note, however, the adoption of proprietary technology - this is contrary to some State laws regarding procurement for public projects. Proprietary means that the name can only be used for products of a single manufacturer (unless it has been licensed to others). Usually the manufacturer will sell to a limited number of installers in a specific geographical area. The State viewpoint, shared by most Purchasing professionals, is that better prices are obtained through competitive bidding of similar technologies. The downside is that the low-bidder can (and will) sue if disqualified for his choice of "or equal".

**1.02 SUBMITTALS** - The problem is that these cost the Contractor money - substantial money. A neat sketch of the wiring and schematic diagrams is usually NOT available, much less, drafted documents. Depending on the size of the installation, these drawings may cost \$1,000 to \$10,000 to prepare.

In my experience on large public projects with similar specification requirements, the Contractor simply ignores the requirement. If the Construction Manager chooses to pursue the requirement, HE must invest hours for repeated phone calls. Even when this is done, the result has been only partial sketches that

had to be re-drawn to be useful. Point-to-point diagrams, which call-out each cable with a unique number, and each terminal number, are even more rare (but required in a later section).

Why is this? Because the installer doesn't need the diagrams. The technicians are very skilled at hooking up the signal leads to the signal terminals and the power leads to the power terminals. Put a mark on the wall where the camera goes and show them where the power supply and patch panel go and they can do the job themselves. The diagrams are only interesting to someone trying to confirm that the purchased items were installed (trouble maker) and later maintenance or upgrade persons.

Photographs are unbelievably expensive. Numbers like \$50/photo are normal. Yes, a foreman with a throw-away camera can walk around for no incremental charge, but most specification front-ends specify 8x10 prints and may require a professional photographer. Consider that the professional photographer is not familiar with the job and may not be familiar with construction safety personal protective equipment (PPE) and rules. Now, the foreman is pulled away from supervision, at a guaranteed inconvenient time, to provide a guided tour and oversight.

Note the requirement for photographs of the cameras field of view. A later section of the spec indicates how to get these, but it is exceedingly burdensome and does not contribute to the job.

Test results will be discussed in a later commentary. NYC SCA calls out high-end Fluke LAN testers with NIST calibration. The Contractor says, "The system is demonstrated to work. Why do the tests?"

AUTOCAD or Visio diagrams. This comes back to the earlier comment about neat sketches vs. drafting. If we are going to require AutoCad or Visio, we should indicate an EARLY version, such as 2000. More current versions have features which keep the files from loading on pc's with only the older version. These features make no contribution to readability or content. If you have the newer software version, it will open old content files with no trouble.

**1.04 REFERENCES** - The nasty secret is that almost nobody has copies of any of these references. Therefore, calling them out well serves no purpose. But, we play the game, so ...

Which version of the National Electric Code? 1999, 2002, 2005? 2005 has much more strict low-voltage communications cable installation requirements.

I don't have copies or familiarity with the UL or TIA documents, but I do know that UL 864, for fire alarm systems was substantially updated in 2003 and the changes took effect October, 2006. It is a good guess that the other standards have distinctions between the different years of issue. We should, at least, say, "latest".

ISO/IEC 11801 - European standard for LAN cable. I think that means a sticker on the reel, but hard to enforce beyond a check-off against the submittal cut-sheet. There is something peculiar about requiring only a single brand and part number of cable, then specifying a European standard for similar cables. If the standard is revised before the manufacturer is able to update his manufacturing line, then the only acceptable cable does not meet the required standard.

**1.07 AUTHORIZED INSTALLER (AI)** - This is the firm I called the Video Installer, to use a descriptive term. "The AI shall be responsible for all documentation...and testing..." This quote is hidden near the end of the second paragraph. If the Electrical Contractor missed that in preparing his quote, he can be thankful for the \$10,000 – 100,000 in work that was passed down to his sub. Hopefully the AI noticed it. (It is also fairly standard in construction for the AI or SI to do the documentation and testing.)

"Three years parts and labor" warranty. One year from date of constructive acceptance is standard for construction jobs and one year from date of delivery is a standard manufacturer's warranty. This section commits the AI to supplement the pass-through warranties with his own.

WARNING: As this conflicts with industry standards, it is important to coordinate with the Bid Package front-end which usually restates the industry-standard one-year period.

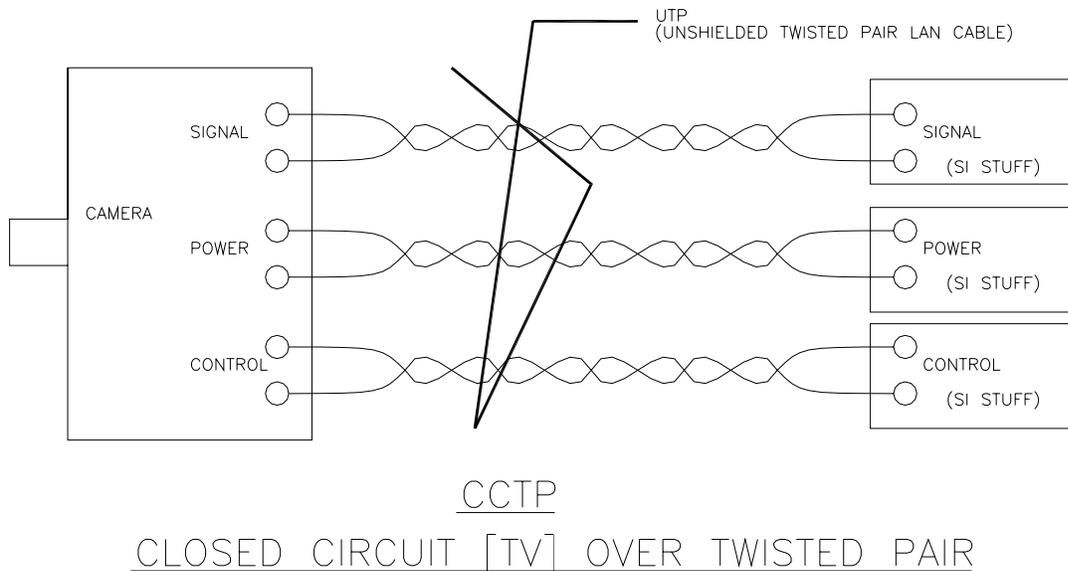
EXAMPLE: Until recently, Pelco was shipping Digital Video Recorders (DVRs) with hard disks that failed 13-months after installation. A three-year warranty is good for NYC SCA, but bad for the AI on a Pelco dvr.

“Authorized installer for CCTPs:” Note that there is NOT an “or equal” line. Suspicious members of the public might ask on what basis these firms got into the elite group to collect checks from NYC CSA?

Again, CCTP is a proprietary technology from Anixter.

**1.08 COORDINATION WITH SYSTEM INTEGRATOR (SI)** - Note that the Surveillance Camera contract EXCLUDES wiring switches, video encoders, server and viewing stations. But, the Electrical Contractor shares responsibility for satisfactory system operation.

**1.09 SYSTEM DESCRIPTION** - This is the only explanation of CCTP (Closed Circuit [tv] over Twisted Pair). Below is my inference of what they are saying:



Using twisted-pair for analog tv signals is not a new idea. For many years, third-party suppliers have offered a potted balun transformer (balanced-unbalanced) with a video connector on one end and terminals or a modular telephone jack on the other. Two firms that specialize in this are Nitek.net and nvt.com, including single units and rack-mount multiple units. Most cctv supply houses offer branded or commodity baluns. And, Pelco offers a few cameras with a built-in proprietary balun configuration for twisted pair.

“Color to black and white....” Recently, I have been told by salespersons that a good fixed lens for color is not a good fixed lens for black and white. The reasoning is as follows:

Black and white is really infra-red. It is the natural response of CCD sensors. Infra-red is off the color spectrum - longer wavelengths. So, a lens that does and good job of focusing a color image on the

CCD will focus the infra-red behind the CCD, leaving only a fuzzy image on the CCD. Unless, of course, you buy his special, color / infra-red corrected lens.

A zoom lens has a focus control, so you or it can compensate for the switch. Actually, I have never seen this problem in 100's of installations, but it is a good idea to sell premium lenses.

### **2.01 MANUFACTURERS** - CAUTION this section differs from 2.02 and 2.03.

This section states that Panasonic, Bosch, Sony and Pelco are acceptable vendors for cameras and enclosures. Note that "or equal" is missing.

**2.02 INDOOR AND OUTDOOR FIXED CAMERA** - Note voltage range for 12VDC, 83-333% (10-40VDC). This is a fairly standard industry spec, but it sure makes long power leads possible. 36VDC at the source will not damage the camera and will go a LONG way before it drops to 10V.

The enclosure is to be "vandal-resistant". This implies an acrylic dome rather than a Lexan dome. I would suggest that Lexan is better, but maybe the special Sony and Panasonic are not available with Lexan (polycarbonate). The manufacturers' published specification does not include this information.

Note, also, that only a specific Sony SSCCD73V or Panasonic WV-CW474AS camera is acceptable.

**2.03 INDOOR AND OUTDOOR PTZ DOME CAMERA** - 480 TV lines (TVL) with 4x digital zoom? That gives you an image with 120 lines resolution. I can't believe anyone smiles when they see that.

Dome assembly includes heater but nowhere indicates heater wattage. Hard to design for, unless the special Bosch and Panasonic cameras have very limited enclosure offerings.

Clear outer dome. I prefer a smoked outer dome to provide deterrence (the perpetrator does not know which direction the camera is focused). It provides a 1/2 stop light reduction, but this is usually acceptable.

Again, special Bosch or Panasonic cameras only.

**2.04 CCTP CABLING** - 308-ft run limit. This is peculiar for two reasons. First, it is contradicted in 2.08 (328-ft). And, second, CCTV runs at 6MHz bandwidth, nominal. The reason LAN cables are limited to 308/328-ft is because the 350MHz signal starts to lose high-frequency components. You can lose a lot of highs from 350 before you start degrading 6.

By the way 328, is 100-meters, cable limit. 308-ft excludes the 10-ft up-the-wall and 10-ft down-the-wall lost length. The distance is NOT as-the-crow-flies, but actual linear-ft.

ASIDE: I participated in a 100Mbps data test which showed that an 800-ft spool of Cat 5 cable delivered acceptable terminal operation. We had no test equipment, but noted no response delays or problems with large downloads. This implies that the 308/328 -ft limitation is magical thinking for data, and even more so for analog video.

400 MHZ, that's what the spec says. Maybe they plan to upgrade to a bank of IP-TV cameras at each location at a later date. Might need more mA than they can push thru 22AWG for a bank of cameras, though.

Surge Protectors. This is certainly a good idea, but any shunt device causes losses, especially high-frequency losses. It would be very interesting to see if they do time-domain reflectometry testing with the surge protectors in place.

AVerMedia AverTv CARDBUS MCE. This is something you can buy at Amazon for \$69. It is supposed to go with the Microsoft operating extension called "Media Center" to feed video and NTSC tv into your laptop. The Amazon version works with the standard XP operating system. This is how they get the screen captures required in the Submittals section.

**2.08 WIRING** - I have been specifying an uninterruptible power source (UPS) for security systems. It seems like a good idea to capture what is going on during a power outage. NYC SCA appears not to agree. This is very peculiar, since the NYC SCA Fire Alarm spec calls out schools as a gathering point during emergencies. It seems like a time you might want to watch and record the occupants.

A serious oversight in this specification is lack of details or reference on cable-hanging and use of raceway. Wide bandwidth LAN cable requires a certain amount of care in installation, usually handled by reference to spec 16120 (Wiring Systems) and 16130 (Raceways and Supports). Both are available in the NYC SCA set of specifications. Lacking this reference, it is desirable to include a brief EXECUTION section on spacing from power conductors, orthogonal crossing support intervals, use of J-Hooks and cable tray and use of rigid and flexible conduit indoors and out. A frequently overlooked item is wall penetrations, use of boxes and escutcheons.

**3.03 LABELING OF CABLES** - This is a good idea, but rarely implemented, because it costs a lot of money to the Contractor and provides no benefit to the Contractor. It will be the Construction Manager's responsibility to enforce the requirement.

Technically, they should call-out a specific brand and model of tag they want.

**3.04 TESTS** - I am not familiar with the Fluke or Agilent testers. Big bucks to rent. Steep learning curve to use and interpret the results.

Fluke / Microtest Omni Scanner II, \$5,000

Fluke DSP-4000, \$6,000

Agilent WireScope 350, \$3,000 + fiber adapter

The published specifications on these units refer to attenuation and comparison with specific test criteria from TIA requirements. The older time-domain reflectometers provided information on termination defects and pinches in the pull-route.