Security Systems Made Secure with Proper Commissioning

In its simplest sense, commissioning verifies that systems operate in a manner consistent with construction or procurement documents. This includes identifying and labeling devices, cabling and equipment; cleaning; preparing O&M documentation; testing and adjusting; and training personnel. Labeling components Labeling of cables is an oftentimes neglected but vital part of security system co...

By David R. Duda, P.E., CPP, Associate Partner, and John E. Tokaji, PSP, Associate, Newcomb & Boyd, Atlanta
09/01/2004

In its simplest sense, commissioning verifies that systems operate in a manner consistent with construction or procurement documents. This includes identifying and labeling devices, cabling and equipment; cleaning; preparing O&M documentation; testing and adjusting; and training personnel.

Labeling components

Labeling of cables is an oftentimes neglected but vital part of security system commissioning. But for as-built or record drawings to have any value in future repair, troubleshooting or expansion of security systems, components and cables—regardless of length—must be labeled with identification numbers or letters corresponding to labels on the drawings.

Cables should be marked with preprinted, wrap-around number or letter cable markers at both ends. For enclosures and other major components, labels are generally engraved plastic laminate or metal plates. These labels are placed on rack- or wall-mounted equipment, switches, controls and receptacles, and located so as to facilitate service and replacement. Electrical circuits feeding security equipment also have to be clearly identified at the electrical panel boards. This will pay dividends when the system needs servicing, upgrades or expansion.

Cleaning and polishing

Another major concern in checking security systems is the removal of dust, dirt, rust, stains and temporary covers. Foreign matter should be blown, vacuumed or cleaned from equipment, enclosures and all identification plates. Painted enclosures used in outdoor applications should undergo inspection to ensure that the finish was not damaged during installation. Equipment, conduit and room surfaces should also be cleaned of dust and dirt and maintained in a clean condition starting from the date of substantial completion or the architect's final certificate until final completion of work.

Documenting the process

Documentation must be produced to support all phases of the commissioning process. Typical documentation includes the following:

Preliminary testing and calibration plan . This plan should include each device in the system—card readers, door position switches, perimeter detection points, intercoms and video cameras. It should be based on the manufacturer's standard written start-up and checkout procedures and include the manufacturer's standard field checkout sheets. In addition to testing each device, the commissioning agent should test grounding, copper cabling and fiber-optic cabling.

Acceptance testing plan . If not provided in the construction documents, the commissioning agent should prepare point-by-point acceptance testing procedures. The plan defines the performance limits for the tests and is used by the owner's representative during the final acceptance test as part of the testing documentation. This plan also needs to include checklists and procedures, with specific boxes or lines for recording and documenting the checking and inspections of each procedure, and a summary statement with a signature block at the end of the plan.

Testing documentation includes full details of any owner-contracted tests, as well as any factory testing reports. The commissioning agent annotates the test plan forms and checklists to list deficiencies, and fully documents the test results of each preliminary and acceptance test as they are performed. The owner's representative, likewise, documents any observed tests and creates a punch list of deficiencies to be corrected and retested.

Testing the systems

Test equipment should be of an accuracy required to test system performance with the tolerances specified. Accuracy of other sensors should generally be at least twice that of the device being tested. Equipment should be calibrated according to both the manufacturer's recommended intervals and when dropped or damaged. Calibration tags should be affixed or certificates kept on record. Testing occurs in the following stages:

Pre-installation testing . Some sub-systems have components that are pre-tested prior to assembly or installation. These include operable vehicle barriers, gates and major sub-systems. Even common components such as video cameras will benefit from a quick functional test prior to installation. Pre-installation tests allow components damaged in shipment to be replaced and systems that require calibration or adjustment to be more efficiently serviced in the shop.

Preliminary testing and calibration . Each system and subsystem should be thoroughly tested and all adjustments and calibrations completed prior to beginning the acceptance testing. This includes the testing of each individual device or component for the proper operation and interactive system responses. For example, each access control point should be tested for valid and invalid card reads, door prop alarms and door forced alarms; each alarm point should be tested for intrusion detection, video camera call-up and recording and graphical user interface (GUI) system response; each intercom should be tested for proper operation, video camera call-up and recording and GUI response; and each video camera should be tested for resolution, light sensitivity, focus, and where applicable, pan-tilt and zoom control. This is then followed by the burn-in period.

Burn-in period . Before scheduling the acceptance performance test, the commissioning agent should operate the systems during a burn-in period. The acceptance test should be conducted after a period of not less than 14 consecutive normal working days of trouble-free operation. During this period, each system should operate 24 hours a day. Any discrepancies and problems should be remedied and noncompliance items corrected before beginning the acceptance testing.

Acceptance testing . Acceptance testing begins upon completion of a system. Like preliminary testing, it includes the testing of individual devices or components for proper operation and interactive system responses. Again, each access control point, intrusion alarm point, video camera and intercom will be tested and the system observed to see that the integration (camera call-up and recording and GUI system response) occurs as required in the construction documents. Components such as video cameras should be examined in daylight conditions and after dark. Acceptance testing should be completed and test documentation approved by the owner's representative before the project will be considered substantially complete.

Retesting of equipment and systems . The commissioning agent has to correct deficiencies—differences between specified and observed performance—when identified and interpreted by the owner's representative, and retest the equipment as required to demonstrate proper operation and performance. In most cases, the integrator is tasked with providing the labor and materials required for retesting due to any failed acceptance test. Therefore, verification of proper operation and performance should be completed during preliminary testing to avoid retesting. In some cases, the commissioning agent may bear the costs for the owner's representative to further supervise the retesting of the systems.

Operations outlined so far are essential to produce a critical end-result: the operation & maintenance documents.

Operating, maintaining systems

The O&M manuals should include detailed installation, operating, troubleshooting and maintenance procedures. Contractors

often submit manufacturers' user manuals for documentation. But it's important that they also prepare brief site-specific instructions for routine and emergency operations. The O&M manuals should also contain full warranty information, including the owner's responsibilities for keeping the warranty in force. Warranty cards or correspondence that need to be returned to the manufacturer should be completed and mailed. The manufacturers of each piece of equipment should be listed, especially in the case of custom manufactured parts.

Moreover, any certifications provided by the manufacturer indicating compliance with specific regulatory requirements or standards should be included in O&M manuals. (See "Instructing Operators and Relying on Warranties.")

Also included in these manuals are *record drawings* that indicate as-built conditions of the systems, incorporating changes made during construction. Ideally, they are an evolution of shop drawings and are consolidated from a marked up set showing as-built conditions that are maintained at the site and kept current throughout the project. Record drawings generally contain the manufacturer and model number of each piece of equipment, equipment location and orientation, raceway and cable tray locations and sizes, and revised shop drawings indicating field and as-installed conditions. The record drawings must also include the indentification of each equipment and cable termination that corresponds with the cable labeling and equipment nameplates. Equipment loading schedules, clearly identifying terminations and spare capacity, are also a crucial part of having accurate record drawings that aid in the maintenance and future expansion of the systems.

Toward the end of any project, both owners and contractors all too often overlook the importance of the commissioning documentation, which is crucial for successful maintenance.

Commissioning is one of the most neglected aspects of security system work. A project that is properly commissioned will provide designer, installer and owner with a security system—and business relationship—that works.

Instructing Operators and Relying on Warranties

Two separate formal instruction sessions should be considered for training operating staff. The first, conducted at the time of acceptance testing, gives the initial training needed to operate and maintain systems. The second, conducted about two months later, answers questions that develop once the staff begins.

The sessions should include general familiarization and operating procedures for each specialty system; routine maintenance procedures; and user-level programming of systems. Factory-trained technicians should give instructions on complicated systems and equipment.

Each class session should have a wealth of training materials that include an overview of the program, a description of how the program will be conducted, when and where meetings are to be held, names and company affiliations of lecturers, a summary of the content and outline for each lecture, and recommended reference material and outside reading. Because there will always be staff turnover, the training sessions should be recorded and archived. It can be required as part of the construction documents or procurement documents and be included in the project cost.

Warranty period

Commissioning agents should be aware that equipment warranty periods are an opportunity to correct deficiencies and make necessary adjustments to systems or equipment. Additionally, O&M manuals, as well as as-built drawing systems, should be updated to reflect any equipment modifications made during the warranty period.

Likewise, systems such as perimeter intrusion detection systems that might perform differently under various weather conditions should be tested to the extent practical under all conditions. A warranty walk-through conducted in the last quarter of the warranty period can be very timely due to the fact that there is still time to correct deficiencies and make any necessary adjustments to the systems or equipment.