

SECTION 16C

INTRUSION DETECTION EQUIPMENT

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 Federal Specifications (Fed. Spec.):

J-C-30A & Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
W-A-00450B	Alarm System, Interior, Security, Components for
W-C-586C	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
W-B-134C	Battery, Storage, (Lead-Acid, Industrial Floating Service)
W-B-137C	Battery, Storage, (Nickel Alkaline, Industrial, Floating Service)
W-R-36C	Raceways and Fittings, Metallic, Underfloor
W-S-610C & Am-1	Splice Conductor
QQ-S-571E & Am-2	Solder, Tin Alloy: Tin-Lead Alloy; and Lead Alloy

Military Specification (Mil. Spec.):

MIL-F-14256D & Am-2	Flux, Soldering, Liquid (Rosin Base)
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1.3 American National Standards Institute Inc. (ANSI) Standard:

C39.1-1981	Electrical Analog Indicating Instruments
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American Society for Testing and Materials (ASTM) Publication:

A 386-78	Zinc Coating (Hot-Dip) on Assembled Steel Products
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American Water Works Association (AWWA) Standard:

C203-78	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines--Enamel and Tape--Hot-Applied
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National Fire Protection Association (NFPA) Standard:

No. 70-1981	National Electrical Code
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1.7 Underwriters Laboratories Inc. (UL) Standards:

UL 6	Rigid Metal Conduit (Oct 23, 1981, 9th Ed.)
UL 611	Central-Station Burglar-Alarm Units and Systems (Aug 18, 1978, 11th Ed.; Rev Aug 9, 1982)
UL 636	Holdup Alarm Units and Systems (Jul 11, 1980, 8th Ed.; Rev thru Jul 27, 1982)
UL 639	Intrusion-Detection Units (Sep 29, 1980, 4th Ed.; Rev Jul 13, 1982; Errata Nov 24, 1981)
UL 681	Installation and Classification of Merchantile and Bank Burglar-Alarm Systems (Oct 17, 1977, 9th Ed.; Rev thru Apr 20, 1979)
UL 796	Printed-Wiring Boards (May 29, 1980, 5th Ed.)

2. GENERAL REQUIREMENTS:

2.1 Design Criteria: All materials and equipment installed in the system shall be of standard design or model, and the products of manufacturers regularly engaged in the production of such equipment for at least 5 years. In addition, they shall be the manufacturer's latest standard designs current at time of delivery, except for such modifications from manufacturer's standards as may be required to conform to specification requirements. Where two or more units of the same class of equipment are required, such units shall be the standard products of a single manufacturer, but all component parts of the system need not be the products of the same manufacturer. The system and its components shall conform to the applicable rules and requirements of NFPA No. 70, UL 611, UL 636, UL 639, and UL 681. System components shall be designed to facilitate modular subassembly and part replacement. Designs shall incorporate solid-state components on printed circuit boards to the maximum extent feasible. Components shall be so arranged and assembled that they are readily accessible to maintenance personnel without compromising the defeat resistance of the system. Controls and adjustments inside enclosures requiring manipulation by personnel shall be readily visible and accessible with minimum disassembly of the equipment. Controls and terminals not required for operation of the system shall not be accessible to operators. Like units shall be physically and functionally interchangeable as complete items, without modification thereof or of other articles with which the items are used. Individual items shall not be handpicked for fit or performance. Reliance shall not be placed on any unspecified dimension, rating, or characteristic. Intrusion detection devices, components, and signal transmission equipment employing electromagnetic radiation shall be so designed and constructed as to provide maximum practicable invulnerability to electronic countermeasures. All systems shall be designed to minimize nuisance and false alarms and maximize the probability of detection.

2.1.1 False Alarm: The annunciation of an alarm for any reason other than the detection of a target specified to be detected or an environmental alarm. The Contractor shall provide a system which does not exceed the False Alarm Rate (FAR) specified while meeting all other performance requirements.

2.1.2 Environmental Alarm: The annunciation of an alarm during environmental conditions which exceed, in severity, the limits specified. The Contractor is not responsible for controlling environmental alarms.

2.1.3 Nuisance Alarm: The annunciation of an alarm resulting from the detection of a target specified to be detected but which does not represent an attempt to intrude into the protected area. The Contractor is not responsible for controlling nuisance alarms.

2.1.4 Intrusion Alarm: The annunciation of an alarm resulting from the detection of a target specified to be detected. The Contractor is responsible for assuring the specified Probability of Detection (PD).

2.2 Site Conditions:

2.2.1 Protected Areas: All systems installed in environmentally protected areas shall meet all performance requirements specified for the following conditions:

- a. Ambient temperatures of 32 to 120 degrees F.
- b. Relative humidities of 5 to 100 percent.

Exposure of the equipment at the high temperature extreme shall not exceed 4 continuous hours; exposure at the low extreme shall not exceed 72 hours continuously. Systems components installed in unheated security protected areas shall meet performance requirements for temperatures as low as 0 degrees F.

2.2.2 Exposed-to-Weather Locations: System components that are mounted in locations exposed to weather shall be housed in corrosion-resistant enclosures. System performance shall not degrade because of improper housing design. Systems shall meet all performance requirements when exposed to the following conditions, except as noted in paragraph DETECTION DEVICES.

- a. Wind-driven dust, dirt, sand, and snow for 6 hours.
- b. Rain at a maximum rate of 4 inches per hour.
- c. Ice loads up to 2 inches, measured radially to exposed surfaces.
- d. Wind up to 85 mph.
- e. Sleet with wind up to 55 mph.
- f. Snow cover up to 2 feet measured vertically.
- g. All possible humidities.

h. Ambient temperatures from minus 30 to 150 degrees F.

Exposure at the high temperature extreme shall not exceed 4 hours. Low temperature extreme shall not exist longer than 72 hours continuously.

2.2.3 Hazardous Locations: All system components located in areas where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of the NFPA No. 70. All classification of area and the corresponding equipment ratings and installation procedures shall be as defined and specified in Chapter 5 of the NFPA No. 70.

2.3 Nameplates: Each major component of the system shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a corrosion-resistant plate secured to the item of equipment.

2.4 Verification of Dimensions: The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

3. SUBMITTALS:

3.1 Shop Drawings: Shop drawings shall be submitted in accordance with SUBMITTALS and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature; performance charts and curves; catalog cuts; and installation instructions. As a minimum, shop drawings shall include:

- a. Details of Security Control Center, including details of enclosures, layout arrangement of annunciator module and power supply panel.
- b. Details of power supply enclosure.
- c. Details of mounting brackets for detectors and initiators.
- d. Details of all sensor devices.
- e. Layout of system equipment in the protected area.

Additional shop drawings shall be supplied if needed to clarify technical conformance to these specifications and drawings.

3.2 Spare Parts Data: After approval of the shop drawings, and not later than 3 months prior to the date of beneficial occupancy, a list of spare parts data for each item of specified materials and equipment shall be submitted. The data shall include a complete list of parts and supplies with current unit prices and source of supply. All spare parts shall be on-site prior to commencement of acceptance testing. Depleted spare parts shall be replaced prior to beneficial occupancy.

3.3 Operating and Maintenance Instructions:

3.3.1 Operating Instructions: Step-by-step procedures required for system startup and operation shall be furnished at least 30 days prior to scheduled start of acceptance tests. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features.

3.3.2 Maintenance Instructions: A listing of routine maintenance procedures, possible breakdowns, and repairs shall be furnished at least 30 days prior to scheduled start of acceptance tests. The instructions shall include simplified diagrams for the system as installed.

3.3.3 Training Course: The Contractor shall conduct a training course for operating staff as designated by the Contracting Officer. The training period shall consist of one training day (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the Operating and Maintenance Instructions.

3.3.4 Display of Instructions: Framed instructions under glass or laminated plastic, showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal operation, and procedures for system startup and shutdown shall be prepared in typed form, framed as specified above, and posted beside the system diagrams. Proposed diagrams and instructions shall be submitted prior to posting. The framed instructions shall be posted prior to acceptance testing of the systems.

3.4 Performance Test Reports: Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing all field tests performed to adjust each detector system, and all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position or readings of calibrating controls.

4. GENERAL COMPONENT REQUIREMENTS:

4.1 Component Enclosures: Panels, annunciator housings, power supply enclosures, wiring gutters, and other component housings, collectively referred to as enclosures, shall be so formed and assembled as to be sturdy and rigid. Thicknesses of metal in cast and sheet metal enclosures of all types shall be not less than those in Tables I and II, UL 611. Sheet steel used in fabrication of enclosures shall be not less than 16-gage. Panels may be 18-gage. Doors and covers shall be flanged. Enclosures shall not have prepunched knockouts. Where doors are mounted on hinges with exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent ready removal. Doors having a latch edge length of less than 24 inches shall be provided with a single lock. Where the latch edge of a hinged door is 24 inches or more in length, the door shall be provided with a three-point latching device with lock; or alternatively with two locks, one located near each end. Any ventilator openings in enclosures and cabinets shall conform to the requirements of UL 611. Unless otherwise indicated, sheet metal enclosures shall be designed

for wall mounting with top holes slotted. Mounting holes shall be in positions which remain accessible when all major operating components are in place and the door is open, but shall be inaccessible when the door is closed. Covers of pull and junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws. Zinc labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of the intrusion detection system.

4.2 Tamper Provisions: Enclosures, cabinets, housings, boxes, raceways, and fittings of every description having hinged doors or removable covers and which contain circuits of the intrusion detection system and its power supplies, shall be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved as little as 1/4 inch from its normally closed position. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall be greater than 1 second. Enclosure and tamper switch shall function in such a manner as to not allow direct line of sight to any internal components or the tampering of the switch or circuiting. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware so concealed that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door or cover protected; and shall be wired so that they break the circuit when the door or cover is disturbed. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pull-set, automatic-reset type. Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches if they contain no splices or connections, but shall be protected as described for component enclosures in paragraph GENERAL COMPONENT REQUIREMENTS. Lines between control units and the Security Panel shall be supervised for all intrusion detection systems. Interconnecting lines and tamper switches shall remain under constant supervision during both SECURE and ACCESS modes. Systems whose sensors are passive (transmit signals only for alarm conditions) shall utilize line supervision between sensors and control units.

4.3 Lock and Key-Lock Switches: All locks and key-lock-operated switches required to be installed on components of the system shall be UL listed, round-key type with three dual, one mushroom, and three plain pin tumblers, or have a pick resistance equal to a lock having a combination of five cylinder pin and five-point three-position side bar in the same lock. Keys shall be stamped U.S. GOVT. DO NOT DUP. All key-lock-operated switches shall be keyed differently and shall be two-position, with the key retractable from either position. Two keys shall be furnished for each switch. Maintenance locks shall be of the one-way key-pull type so arranged that the key can be withdrawn only when the lock is in the locked position. All locks on components for maintenance access shall be keyed alike and only two keys shall be furnished for all of these locks. During performance of the work, every precaution to protect the security of keys

shall be exercised. These precautions shall include procedures for accounting for all keys at the end of each work day, storing keys in a secure container during nonworking hours, and rigid controls to prohibit employees from removing keys from the job site. Upon completion of the work, all keys, properly and permanently tagged with metal tags, shall be delivered and accompanied by a manufacturer's certificate which records the number of each key made.

4.4 Electronic Components: All electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL 796. Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. All power-dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity.

4.5 Relays: Light duty relays and similar switching devices shall be solid-state type or hermetically sealed electromechanical.

4.6 Meters: Any electrical indicating instruments incorporated into components of the system shall conform to applicable provisions of ANSI C39.1.

4.7 Annunciator Lamps/LED's: Visual annunciators used on annunciator modules and elsewhere throughout the system shall be either electric lamps or light emitting diodes (LED's). Annunciators shall be so connected in the circuit that a failure of the annunciator, socket, or protective and LED's shall be compatible with standby power supplies. LED's shall be brightly lit and visible from a distance of 30 feet in an area illuminated at 75 foot-candles. LED's shall not be used in outdoor applications or in the presence of sunlight. Electric lamps shall be long-life types having an average life expectancy of not less than 50,000 hours and be clear, white, or frosted with color caps of brilliant color. Signals shall be clearly visible from a distance of 30 feet in an area illuminated at 75 foot-candles. To the extent practicable, all lamps shall be standardized for multiple applications in order to reduce the number of types, sizes, and sockets in the system. Lamps of varying types, voltage, and wattage shall have bases and sockets that will preclude incorrect replacement.

4.8 Control Designations: Controls shall be provided to assure ease of operation of all specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function. Controls, switches, visual signals and indicating devices, input and output connectors, terminals, and test points shall be clearly marked or labeled on the hardware to permit quick identification, intended use, and location. Terminal markings and labels shall be of a permanent and legible type and located so that they are visible when the associated system wiring is in place. Identification markings shall be associated with each adjustment device or item requiring periodic maintenance. Safety warnings or cautions shall be marked in conspicuous red letters. Control and indicator identifications that are exposed outside enclosures shall be permanent, machine-engraved letters, painted to contrast with the background color.

4.9 Wire and Cable: Wire and cable shall be installed as specified in paragraph INSTALLATION.

4.10 Test Mode: The intrusion detection system shall include a provision which permits testing from the security control panel. The test mode shall be initiated by a spring-actuated momentary-closing switch. The test mode must actually disrupt the medium used to detect intruder presence; simple electrical signal simulations between sensors and control units shall not be acceptable. Any signals or processes generated by depressing test pushbuttons to stimulate sensors for remote testing shall be automatically cancelled upon the receipt of an alarm signal. This shall allow the zone to be immediately resettable.

5. BALANCED MAGNETIC SWITCHES: Switch mechanism shall be of the balanced magnetic type that opens and crosses, or opens and grounds the circuit when actuated. To prevent welding of the contacts, each reed-type switch shall be provided with an overcurrent protective device, rated to limit current to 80 percent of the switch capacity. Switches shall be rated for a minimum lifetime of one million operations. Switches and magnets shall be housed in enclosures made of nonferrous metal. Switches and magnets to be used in outdoor applications shall be housed in weatherproof enclosures. The switch mechanism shall be internally adjustable so that the operating gap between faces of the switch housing and the magnet container may be adjusted from 1/4 inch to 1 inch to accommodate installation variances. Switch boxes shall be the hub type or shall have threaded bodies. Covers of cast-aluminum switch boxes shall be secured by stainless steel screws. Covers of magnet housing shall not be readily removable.

5.1 Switch Mounting: Unless otherwise indicated, magnetic switch components shall be mounted on the inner side of doors with metal brackets and hardware recommended by the switch manufacturer. Brackets shall be neatly designed and finished to match switch and magnet housings. Switches shall be carefully connected in accordance with manufacturer's instructions to avoid degrading defeat-resistance. The operating portion of the switch shall be mounted on the door frame with the associated magnet mounted on the door. Double leaf doors shall be protected by two switches, one on each door.

5.2 Tamper Protection: The switch housing shall be protected from unauthorized access by a cover operated, corrosion-resistant tamper device. This device shall initiate an alarm when the cover is opened as much as 1/8 inch from closed position, and be inaccessible until actuated. The tamper switch shall be monitored regardless of whether the circuit is in the ACCESS or SECURE mode.

5.3 Test Features: The last magnetic switch in a circuit in a zone shall have a feature enabling the switch mechanism to be remotely tested from the Security Control Panel. This feature must actually test the switch mechanism. Simply opening or shorting of the switch circuit is not acceptable.

5.4 System Sensitivity: Testing of the balanced magnetic switch sensitivity shall be performed by slowly opening the latching edge of the door to 1 inch from closed position. The alarm shall be initiated no later than when the door reaches the 1-inch position. The test shall be repeated, using a permanent magnet to attempt to capture the magnetic switch and prevent an alarm. The alarm shall again be initiated no later than the 1-inch position. Each zone shall have a continuous Probability of Detection (PD) greater than 90 percent and shall be demonstrated with a confidence level of 95 percent. A False Alarm Rate (FAR) of less than 1 false alarm per zone per 30 days shall be provided at this PD.

6. ALARM REPORTING SYSTEMS:

6.1 General: Alarm reporting systems shall link the remote detector units with the security control panel. Alarm reporting systems shall utilize electrical conductor lines. Links that rely on electromagnetic transmission shall not be acceptable. Alarm electrical lines shall not rely on any current path except for electrical wires. Neutral conductors of electrical distribution systems shall not be used as signal transmitters. All conductors outside of enclosures protected by tamper switches shall be installed in rigid galvanized steel conduit conforming to UL 6. The supervision circuit shall not initiate nuisance alarms in response to normal line noise, transients, crosstalk, or in response to normal parametric changes in the line over a temperature range of minus 30 degrees to 125 degrees F. Ambient current chosen for line supervision shall be sufficient to detect tampering and shall be within the normal operating range of the electrical components. The degree of line supervision shall be selected based upon cost considerations and the security requirements. Line supervision and tamper alarms shall be reported regardless of mode of operation.

6.2 Direct-Wire, Direct Current Supervision: Direct-wire direct current alarm reporting circuits shall be used for systems whose low security requirements do not justify the cost of more secure supervision techniques. An alarm condition shall be indicated by the opening of contacts. The supervision circuit shall comply with all requirements for Class B supervisory circuits in Fed. Spec. W-A-00450. The circuit shall be supervised by monitoring changes in the direct current that flows through the detection circuit and a terminating resistor. For supervision of current levels of 0.5 to 30 mA, the supervision circuit shall initiate an alarm in response to a current change of 5 percent or greater. The supervision circuitry shall also initiate an alarm in response to opening, closing, shorting, or grounding of the conductors. Visual and audio alarms shall begin within 1 second of the alarm condition.

7. SECURITY CONTROL PANEL: The security control panel shall be the principal panel for all controls and annunciation. Each detector which forms part of the security system shall be integrally tied to the security control panel. Visual and audible signals, annunciator modules, CPU's, and any necessary controls for each detection circuit shall be installed in the security control console or within the protected area of the detection circuit. Sensitivity control of individual detector circuits shall not be accessible from the security control panel. Communication circuits shall be routed through the security control panel. The security control panel

shall also house switches, relays, timers, meters, or other ancillary controls required for operation of the system. Line supervision circuitry shall be in the security control panel.

7.1 Layout, Enclosures, and Arrangement: The security control panel shall be housed in a sectional cabinet. The cabinet shall be constructed of not less than 18 gage sheet steel. The cabinet shall have no prepunched knockouts. The security control enclosures shall be the open front type, with openings for annunciator hardware, power supply monitors, and any necessary control switches or hardware. All controls necessary for operation of the security system shall be accessible from the front of the panel. All components that need not be accessible from the panel front, with the exception of the standby power supply, shall be mounted inside the enclosure. The enclosure shall be designed to prohibit access of operating personnel to the interior without creating an alarm. Detection sensitivity controls and maintenance adjustments of current operated devices shall be inaccessible to the operator. All meters, relays, contact switches, and other delicate electromechanical parts shall be designed with suitable protection against dust, moisture, and physical damage. The enclosures shall be shielded to prevent EMI interference.

7.2 Tamper Switch: The security control panel enclosure shall be protected by tamper switches. An alarm mounted within the security control panel shall be actuated if unauthorized entry to the enclosure is attempted. This alarm shall be audible for at least 50 feet, and shall not cease ringing until manually reset. Electrical lines between security control panel tamper switches and the alarm shall be electrically supervised.

7.3 Voltage Surge Protection: Intrusion detection circuitry that leads to the security control panel shall be protected at both ends against excessive voltages. This requirement shall apply for circuits that are routed in overhead runs. Fuses shall not be permitted as protection devices. Suitable devices are zener diodes, optical isolators, and varistors. Transient protection shall protect against spikes up to 1,000 volts peak voltage with a one microsecond rise time and 100 microsecond decay time, without causing false alarms. The protective device shall be automatic and self-restoring, and shall be on duty at all times. Circuits shall be designed or selected assuming a maximum of 10 ohms to ground.

7.4 Individual Annunciator Modules: Each intrusion detector circuit in a direct-wired system shall be accompanied by an individual annunciator module to be mounted in the front of the security control panel to form an annunciator panelboard. Modules shall be plug-in modular units built from solid-state components and shall be mounted on printed circuit boards in compliance with UL 796. Each module shall provide three distinct and independent visual signals in duplicate: SECURE, ACCESS, and ALARM. Modules that utilize light emitting diodes (LED's) shall be required to duplicate only the ALARM signal. The module shall also provide an audible alarm with silencing switch, an ACCESS-SECURE toggle switch, and TEST and RESET pushbutton switches. Each visual signal and switch shall be clearly marked to indicate its function by machine engraving and color contrast with the background. Switches shall operate independently. Modules

monitoring zones which do not permit authorized entry shall not be equipped with an ACCESS/SECURE switch or an ACCESS visual signal. Plugs may be inserted in lieu of these devices.

7.4.1 Modes: The mode in which each zone is operating shall be indicated by an illuminated visual signal. ALARM conditions shall be indicated by a RED light, ACCESS mode by a YELLOW light, and a SECURE condition by a GREEN light. Indicators shall be brightly lit and visible from a distance of 30 feet. An ALARM condition shall initially be indicated by a flashing RED light and an audio alarm; activation of the switch that silences the accompanying audio alarm shall switch the flashing RED to a steady RED glow. Switches, buttons, keys, and plugs that correspond to a visual indicator shall be installed in or adjacent to the indicator, and clearly marked to indicate its function.

7.4.2 Audio Alarms: Audio signal devices shall be solid-state tone generators audible to a distance of 30 feet. An audio device provided for common use by several annunciator modules shall be capable of being independently activated from any of the modules it serves. Silencing switches may be installed to mute the alarm after its activation. Silencing the audio alarm triggered by one annunciation module shall not mute the alarm's response to subsequent alarms from other modules. The audio signal shall sound if the SILENCE switch is put in the SILENCE position and an ALARM condition does not exist. Silencing switches shall be designed to prohibit disabling of alarm annunciation by holding or taping down the RESET contact. If individual audio signaling devices are provided with each annunciator module, the silencing switch shall be a toggle switch. Silencing switches shall be positive-reset; when the annunciator module is reset, the audio signal shall sound until the silencing switch is returned to its non-SILENCE position. Audio signals used for different panel functions shall be readily distinguishable from each other. Different signals may utilize variations in tone, pulsed tones of varying durations, warbles, and any other readily distinguishable audio technique that is not unpleasant to operators.

7.4.3 The ACCESS/SECURE Mode: The ACCESS/SECURE switch shall be a toggle selector switch. The switch shall operate in conjunction with the authorized entry control unit ACCESS/SECURE switch at the protected area. If the switch at the protected area and the switch on the security control panel are both in the ACCESS mode, alarms from the protected area shall be disabled. If the switches are both in the SECURE mode, alarms shall not be disabled. If the two switches differ in settings, the ALARM mode shall be triggered. Setting either of the switches to the ACCESS mode shall not interrupt the supervision of tamper switches and electrical lines between detectors and the security control panel.

7.4.4 Test Modes: Test switches shall enable the operator to test the proper operation of each detector circuit, including the detection device. Test circuits that merely verify proper operation of the annunciator module are not acceptable. Where several similar detection devices are used for protection of a zone, the detector chosen for test shall be the one most distant from the center and/or the one least likely to be tested routinely in daily operations. Depression of a TEST pushbutton switch shall indicate proper operation of the corresponding zone by triggering the visual and

audio ALARM indicators on the annunciator module. Any signals or processes generated by depressing test pushbuttons to stimulate sensors for remote testing shall be automatically cancelled upon receipt of an alarm signal. This shall allow the zone to be immediately resettable.

7.4.5 RESET Switches: The RESET switch shall be a momentary contact, pushbutton switch to restore the annunciator module from the ALARM mode to its previous SECURE or ACCESS mode. The module shall not be resettable until the cause of the alarm is corrected. Disabling of an ALARM signal by holding or taping down a RESET switch shall not be possible.

7.4.6 Blank Panel Spaces: Spaces in the panel not required for annunciator modules shall be filled with module sized blank plates, finished to match the remainder of the panel. Power supply, standby batteries, wiring, connectors, and related components shall be sized to accommodate future operation of the console with all blank plates replaced by annunciator modules.

7.5 Mode Annunciation: SECURE, ACCESS, and ALARM modes shall be annunciated using the following guidelines.

7.5.1 SECURE Mode: When the protected zone is being monitored under full protection and no alarm condition exists, a GREEN Visual signal shall be displayed on the module. No audio alarm shall sound.

7.5.2 ACCESS Mode: When the authorized entry control unit at the protected zone is switched to ACCESS, a flashing RED light and the audio alarm shall be activated. When the ACCESS/SECURE switch at the panel is placed in ACCESS position and the RESET button depressed, the audio alarm shall mute and a steady YELLOW signal shall be displayed. This shall indicate that detection circuits are disabled for authorized entry. Tamper switches, electrical line supervision, and detector circuits that need not be disabled for authorized entry shall remain fully protected. Restoration of the circuit from ACCESS mode to SECURE mode shall initiate a RED alarm signal which cannot be reset until the switches on the Authorized Entry Control Unit and annunciator module are in the same position. If an alarm condition is detected during authorized entry, involving tamper switches, electrical line, operating detectors, the YELLOW light shall be extinguished and a flashing RED light and audio alarm shall be activated at the annunciator module. When the cause for the alarm is removed and the circuit is reset, it shall return to the ACCESS mode and the YELLOW light shall be reilluminated.

7.5.3 ALARM Mode: An alarm indication from a detector circuit, a tamper switch opening, or attempted defeat of the electrical lines shall trigger an ALARM mode at the panel. A flashing RED light and an audio signal shall begin. Distinct and separate causes of alarms shall not be separately annunciated. Silencing the audio signal shall cause the RED light to burn steadily until the circuit is reset. The ALARM mode shall remain locked in operation until the circuit is manually reset by the panel operator. Silencing the audio signal shall cause the red light to burn steadily. The ALARM mode shall remain locked in operation until the circuit is manually reset or the annunciator receives another alarm signal which shall cause the RED light to flash and shall sound the audio alarm.

7.6 Power Supply Monitor: A panel to monitor the security control panel power supply shall be provided on the panel front as specified in paragraph POWER SUPPLIES. Normal primary mode operation on alternating current power shall be so indicated by a steady GREEN light labeled NORMAL. Labeling shall be machine-engraved and shall contrast in color with the background. When utility power to the power supply fails, or when voltage variations exceed allowable limits and power automatically switches to battery power, the GREEN light shall be extinguished and a WHITE signal labeled BATTERY illuminated. An audio signal whose sound is readily distinguishable from other audio annunciators shall sound. The sound shall be audible from 30 feet. Two-position silencing switches shall be provided to silence the alarm. Upon restoration of normal power, the WHITE signal shall be extinguished and the GREEN light reilluminated. If the silencing switch was in the SILENCE position, the audio alarm shall sound until the switch is returned to normal position. Visual annunciators for different power supplies shall be labeled to identify the power supply with which they are associated.

8. AUTHORIZED ENTRY CONTROL UNITS: Each intrusion detection circuit designed to allow authorized entry shall be provided with an authorized entry control unit. The unit shall be located within the protected zone or where shown. Controls shall be housed in metal enclosures. The unit shall be operated by keylock and shall be permanently marked to show ACCESS and SECURE positions. The key shall be able to be withdrawn from either position. Authorized-entry control units shall be designed to disable detectors when the unit is in the ACCESS mode, and shall switch in a resistive load to permit the annunciator module to balance its normal terminating resistive load. Resistive loads shall not change resistance beyond operating limits over the range of temperature excursions. In the ACCESS mode, all tamper switches, duress switches, and electrical line supervision shall be monitored. Any detection or protection devices that need not be disabled for authorized entry shall remain operable. Authorized entry control units, as well as line termination units installed in circuits where authorized-entry control units are not specified, shall contain circuitry to permit remote testing of the line and circuits. Momentarily depressing the TEST button on the annunciator module shall transmit a signal over the circuit to the termination unit test circuit. A delayed action shall return a signal to the panel after the TEST button has been released. During the waiting period, the circuit shall be capable of sending an actual alarm signal.

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10. POWER SOURCE:

10.1 Primary Power Source: All electrical and electronic equipment in the security control panel shall be powered from a direct wire, 120 volts a.c., 60 Hz, single-phase, primary power source.

10.2 Back-Up Power Supply: Primary input shall be 120 volts a.c. with batteries and charger and shall comply with the requirements of Fed. Spec. W-B-134 or W-B-137. Batteries shall be sealed lead-acid or nickel cadmium type and capable of operating the system for 24 hours in supervisory mode. Charger shall be rated to recharge fully discharged batteries in 8 hours, shall operate in an automatic mode, and shall maintain batteries fully charged.

11. INSTALLATION: Installation shall be as specified and as required by NFPA No. 70.

11.1 Soldering: Solder shall conform to Fed. Spec. QQ-S-571. For soldering electrical connections, composition Sn60, Type AR or S, shall be used for general purposes; and composition Sn62 or Sn63, Type AR or S, for special purposes. When Type S solder is used for soldering electrical connections, the flux shall conform to Mil. Spec. MIL-F-14256. No acid or acid salts shall be used in preparation of soldering, particularly where they can come into contact with electrical insulation material. Limited exception is permitted for preliminary tinning of electrical connections and for preparation of mechanical joints not used to complete electrical circuits, provided no contact with insulation material is possible. When acid or acid salts are used, they shall be completely neutralized and removed immediately after use. There shall be no sharp points or rough surfaces resulting from insufficient heating. The solder shall feather out to a thin edge, indicating proper flowing and wetting actions, and shall not be crystallized, overheated, or underheated. The minimum necessary amount of flux and solder shall be used for electrical connections. Any means employed to remove an unavoidable excess of flux shall not incur the risk of loose particles of flux, brush bristles, or other foreign material remaining in the equipment; flux being spread over a larger area; or damage to the equipment. Insulation material that has been subjected to heating during the soldering operation shall be undamaged and parts fastened thereto shall not have become loosened. Factory machine soldering may be used in the production of circuit boards where this is the manufacturer's standard procedure.

11.2 Galvanizing: All ferrous metal shall be hot-dip galvanized in accordance with ASTM A 386, or otherwise protected against corrosion by methods equal or superior to hot-dip galvanizing. Screws, bolts, nuts, and other fastenings and supports shall be of a corrosion-resistant type.

11.3 Fungus Treatment: System components shall be completely treated for fungus resistance. Treating materials containing a mercury bearing fungicide shall not be used. Treating materials shall not increase the flammability of the material or surface being treated. Treating materials shall cause no skin irritation or other injury to personnel handling it during fabrication, transportation, operation, or maintenance of the equipment, or during use of the finished items when used for the purpose intended.

11.4 Interior Wiring Methods: All conductors outside the security control panel, cabinets, boxes, and similar enclosures shall be installed in rigid galvanized steel conduit conforming to UL 6. Conduit outlet boxes, pull boxes, junction boxes, conduit fittings, and similar enclosures shall be cast metal or malleable iron conforming to Fed. Spec. W-C-586, with threaded hubs or bodies. Electric metallic tubing (EMT), armored cable, nonmetallic sheathed cable, or flexible conduit will not be permitted except where specifically noted herein. Wires carrying signal circuits shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes or similar fittings with other building wiring. Metal raceways and fittings shall conform to the requirements of Fed. Spec. W-R-36 except that raceways shall not have prepunched knockouts. Flexible cords and cord connectors shall not be used to supply power to any components of the intrusion detection system, except where specifically noted herein.

11.4.1 Conduit: Conduit shall be installed in accordance with NFPA No. 70. Minimum size of conduit shall be 1/2 inch. Connections shall be tight tapered threaded. No threadless fittings or couplings shall be used. Conduits shall be supported and secured at intervals of not more than 8 feet. Exposed conduits shall have runs installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Changes in direction of runs shall be made with symmetrical bends or cast metal fittings. Where conduits connect to sheet steel enclosures, they shall be fastened with two locknuts where insulating bushings are used. Bushings shall be installed on ends of all conduits and shall be of the insulating type. Crushed or deformed conduits shall not be installed. Trapped conduits in damp and wet locations shall be avoided where possible. If trapped conduits are unavoidable, the ends shall be plugged with an approved room-temperature-vulcanizing (RTV) sealing compound after wires are pulled therein. Care shall be taken to prevent the lodgment of plaster, dirt, or debris in conduits, boxes, fittings, and equipment during the course of construction. Clogged conduits shall be entirely freed of obstructions or shall be replaced. Conduits crossing expansion joints in concrete slabs shall be provided with suitable expansion fittings, or other suitable means, to compensate for building expansion and contraction. Where wires or cables are carried on the exterior of building walls, they shall be in rigid steel conduit adequately supported. Conduits, installed underground or under

slabs-on-grade, shall be factory-coated with thermosetting epoxy or thermoplastic resin. Field-applied coatings shall conform to AWWA C 203. Wooden plugs inserted in concrete or masonry are not acceptable as a base for conduit fastenings, nor shall conduits or pipe straps be welded to steel structures. Conduits shall be secured by pipe straps or supported by wall brackets, strap hangers, or ceiling trapeze, fastened by wood screws on wood, toggle bolts on hollow masonry units, expansion bolts on concrete or brick, and machine screws on steel work. Nail-type nylon anchors or threaded studs, driven in by a powder charge and provided with lock washers and nuts, are acceptable in lieu of expansion bolts, or machine or wood screws. Powder driven studs or expansion anchors and bolts will not be permitted closer than 12 inches to prestressed steel in prestressed concrete work. Nails shall not be used as a means of fastening conduits.

11.4.2 Interior Conductors: Power conductors for supplying 120 volt a.c. power to the system shall be of solid or stranded copper not smaller than No. 12 AWG, with moisture-resistant rubber insulation Type RW or RH-RW, or moisture-resistant thermoplastic insulation Type THW conforming to Fed. Spec. J-C-30 as applicable. Low voltage conductors (50 volts and less) shall be of solid, soft drawn copper, with moisture-resistant rubber insulation Type RF-2, or thermoplastic insulation, Type F, having a nominal thickness of not less than 1/32 inch and conforming to NFPA No. 70. Wire connectors of insulating material, or solderless pressure connectors in conformance with Fed. Spec. W-S-610 shall be used for all connections and shall be properly taped. For single or dual conductor cables, the conductors shall be no smaller than No. 14 AWG. For cables having more than two conductors, the conductors shall be no smaller than 22 AWG. Conductors between an audio alarm and its source of power shall be no smaller than No. 16 AWG. Conductors shall be installed in accordance with NFPA No. 70 and UL 681, except that all conductors shall be installed in galvanized rigid steel conduit. Circuit conductors, between detectors and other alarm initiating devices and area control units, shall be identified either by color coded covering; plastic coated, self-sticking, printed markers; or permanently stamped metal foil markers. Identification shall be provided within each enclosure where a tap, splice, or termination is made. Identification shall match that shown on the shop drawing of the system wiring diagram. Hand lettering or marking will not be accepted. Enclosures that house taps, splices, or terminations shall not be externally marked to indicate enclosed security circuits. Neutral conductors, conduits, junction boxes, cabinets, cable messengers, and all noncurrent-carrying metallic parts of equipment shall be grounded in accordance with NFPA No. 70. Incoming cables carrying detection and communications circuits to the security control console shall be connected through distribution racks for fanning strips mounted inside the enclosure.

12. ACCEPTANCE TESTING: Upon completion of installation of the system, tests shall be conducted in the presence of the Contracting Officer by the Contractor to demonstrate system compliance to the specified requirements. The Contractor shall submit proposed test procedures to the Contracting Officer for approval at least 6 days prior to commencement of acceptance testing. The Contracting Officer may suspend or discontinue the tests at any time that performance does not meet specifications, or that testing does not represent maximum effort to avoid detection. Resumption of testing will cover the previously untested elements, and any previously

tested elements at the discretion of the Contracting Officer. The Contractor shall make written notations of the time, cause, and other conditions prevailing at the time each alarm signal is received. The Contractor shall furnish all test personnel. Test instruments and equipment of the accuracy necessary to perform the tests shall be furnished by the Contractor. A complete set of operation and maintenance manuals and system connections diagrams shall be submitted 30 days prior to the beginning of acceptance testing.

12.1 Equipment Tests: Acceptance testing of an intrusion detection System shall include line supervision tests, testing of all sensors, switches annunciators, consoles, power supplies, etc.

12.2 Power Supplies Tests: The voltage of the alternating current power supply to the system shall be varied to limits specified in paragraph POWER SUPPLIES, with a recording voltmeter connected into the supply circuit for voltage record. The system shall operate during voltage variations and upon automatic transfers from normal to emergency power, and shall return to normal power without alarm or faulty sensitivity. The Contracting Officer may designate a representative number of locally-powered detectors for similar tests to demonstrate that the stability of their power supplies conform to the requirements specified in paragraph POWER SUPPLIES.