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UNIFIED FACILITIES GUIDE SPECIFICATIONS

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DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

SECTION 28 16 01.00 10

SMALL INTRUSION DETECTION SYSTEM

11/08

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI INCITS 154 (1988; R 2004) Office Machines and Supplies - Alphanumeric Machines - Keyboard Arrangement

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142 (2007) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book

IEEE C2 (2012; Errata 2012; INT 1 2012; INT 2 2012) National Electrical Safety Code

IEEE C62.41.1 (2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 (2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL TELECOMMUNICATION UNION (ITU)

ITU V.34 (1998) Data Communication Over the Telephone Network: A Modem Operating at Data Signaling Rates of up to 33,600 Bit/S for Use on the General Switched Telephone Network and on Leased Point-To-Point 2-Wire Telephone-Type Circuits

ITU V.42 (2002; Corrigendum 1 2003) Data Communications Over the Telephone Network: Error-Correcting Procedures for

DCEs using Asynchronous-to-Synchronous Conversion

ITU V.42 bis

(1990) Data Communication over the Telephone Network: Data Compression Procedures for Data Circuit Terminating Equipment (DCE) Using Error Correction Procedures

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250

(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA ICS 1

(2000; R 2005; R 2008) Standard for Industrial Control and Systems: General Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70

(2011; Errata 2 2012) National Electrical Code

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST FIPS 140-2

(2001) Security Requirements for Cryptographic Modules

NIST FIPS 197

(2001) Advance Encryption Standard

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-232

(1997f; R 2002) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15

Radio Frequency Devices

47 CFR 68

Connection of Terminal Equipment to the Telephone Network

UNDERWRITERS LABORATORIES (UL)

UL 1037

(1999; Reprint Dec 2009) Safety Antitheft Alarms and Devices

UL 1076

(1995; Reprint Sep 2010) Proprietary Burglar Alarm Units and Systems

UL 294

(1999; R 2001; R 2004; R 2005; R 2009) Access Control System Units

UL 639

(2007; Reprint May 2012) Standard for Intrusion Detection Units

UL 681

(1999; Reprint Jan 2001) Installation and

Classification of Burglar and Holdup Alarm Systems

UL 796

(2010; Reprint Jan 2012) Standard for Printed-Wiring Boards

1.2 DEFINITIONS

1.2.1 Intrusion Alarm

An alarm resulting from the detection of a specified target and which results in an attempt to intrude into the protected area or when entry into an entry controlled area is attempted without successfully using entry control procedures.

1.2.2 Nuisance Alarm

An alarm resulting from the detection of an alarm stimuli, but which does not represent an attempt to intrude into the protected area.

1.2.3 Environmental Alarm

An alarm during environmental conditions which exceed those specified.

1.2.4 False Alarm

An alarm when there is no alarm stimulus.

1.2.5 Duress Alarm

An alarm condition which results from a set of pre-established conditions such as entering a special code into a keypad or by activating a switch. This alarm category shall take precedence over other alarm categories.

1.2.6 Standard Intruder

Individual that weighs 45 kg 100 pounds or less and is 1.5 m 5 feet tall or less, dressed in a long-sleeved shirt, slacks and shoes, unless environmental conditions at the site require protective clothing. Standard intruder movement is defined as any movement such as walking, running, crawling, rolling, or jumping through a protected zone in the most advantageous manner for the intruder.

1.3 SYSTEM DESCRIPTION

1.3.1 General

Configure the Intrusion Detection System (IDS) as described and shown, including Government Furnished Equipment (GFE). Computing devices, as defined in 47 CFR 15, shall be certified to comply with the requirements for Class A computing devices and labeled as set forth in 47 CFR 15. Submit the following:

- a. System block diagram.
- b. Console installation, block diagrams, and wiring diagrams.
- c. Processor installation, typical block, and wiring diagrams.
- d. Details of connections to power sources, including power supplies and grounding.
- e. Details of surge protection device installation.

- f. Sensor detection patterns.
- g. The qualifications of the Manufacturer, Contractor, and Installer to perform the work specified herein.

1.3.2 Overall System Reliability Requirement

The system, including all components and appurtenances, shall be configured and installed to yield a mean time between failure (MTBF) of at least 10,000 hours continuous operation.

1.3.3 Probability of Detection

Each zone shall have a continuous probability of detection greater than 90 percent and shall be demonstrated with a confidence level of 95 percent. This probability of detecting a standard intruder equates to 49 successful detections out of 50 tests or 98 successful detections out of 100 tests.

1.3.4 Electrical Requirements

NOTE: The designer will select the correct line frequency, and show on the drawings the characteristics of each voltage source.

Electrically powered IDS equipment shall operate on 120 or 240 volt [60] [50] Hz AC sources as shown. Equipment shall be able to tolerate variations in the voltage source of plus or minus 10 percent, and variations in the line frequency of plus or minus 2 percent with no degradation of performance.

1.3.5 Power Line Surge Protection

Protect equipment connected to alternating current circuits from power line surges. Equipment protection shall withstand surge test waveforms described in IEEE C62.41.1 and IEEE C62.41.2. Fuses shall not be used for surge protection.

1.3.6 Sensor Wiring and Communication Circuit Surge Protection

Protect inputs against surges induced on sensor wiring. Outputs shall be protected against surges induced on control and sensor wiring installed outdoors and as shown. All communications equipment shall be protected against surges induced on any communications circuit. All cables and conductors, except fiber optics, which serve as communications circuits from the console to field equipment, and between field equipment, shall have surge protection circuits installed at each end. Protection shall be furnished at equipment, and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within 900 mm 3 feet of the building cable entrance. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

- a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

1.3.7 System Reaction

All alarms shall be annunciated on the displays within 1 second of their occurring at a local processor.

1.3.8 System Capacity

The system shall monitor and control the number of inputs and outputs shown and shall include an expansion capability of a minimum of 25 percent.

1.4 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Intrusion Detection System[; G][; G, [____]]
Key Control Plan[; G][; G, [____]]
Spare Parts
Manufacturer's Instructions[; G][; G, [____]]
Testing[; G][; G, [____]]

Experience

SD-06 Test Reports

Performance Verification Test

SD-07 Certificates

Materials and Equipment

1.5 QUALITY ASSURANCE

Submit written proof that the following **experience** requirements are being met.

1.5.1 Hardware Manufacturer

All system components shall be produced by manufacturers who have been regularly engaged in the production of intrusion detection system components of the types to be installed for at least 3 years.

1.5.2 Software Manufacturer

All system and application software shall be produced by manufacturers who have been regularly engaged in the production of intrusion detection system and application software of similar type and complexity as the specified system for at least 2 years.

1.5.3 System Installer

The system shall be installed by a Contractor who has been regularly engaged in the installation of intrusion detection systems of similar type and complexity as the specified system for at least 2 years.

1.5.4 Line Supervision

1.5.4.1 Signal and Data Transmission System (DTS) Line Supervision

**NOTE: Specify 5 percent line supervision for Level
A security assets as defined in UFC 4-020-04FA.**

All signal or DTS lines between sensors and the alarm annunciation console shall be supervised by the system. The system shall supervise the signal lines by monitoring changes in the direct current that flows through the signal lines and a terminating resistor. The system shall initiate an alarm in response to a current change of [5] [10] percent or greater. The system shall also initiate an alarm in response to opening, closing, shorting, or grounding of the signal and DTS lines.

1.5.4.2 Data Encryption

**NOTE: Data encryption should be used only when
required by governing regulations or when it has
been determined that it is undesirable to allow
unauthorized persons access to system
intercommunication.**

The intrusion detection system shall incorporate data encryption equipment on data transmission media links as shown. The algorithm used for encryption shall be the Data Encryption Standard (DES) algorithm described in **NIST FIPS 140-2** and **NIST FIPS 197**.

1.5.5 Data Transmission System (DTS)

NOTE: The designer will include in the project specification the UFGS specified below.

Provide data transmission systems as specified in Section **27 15 19.00 10** WIRE LINE DATA TRANSMISSION SYSTEM and as shown.

1.6 ENVIRONMENTAL REQUIREMENTS

1.6.1 Interior, Controlled Environment

All system components, except the console, installed in interior locations having controlled environments shall be rated for continuous operation under ambient environmental conditions of **2 to 50 degrees C 36 to 122 degrees F** dry bulb and 20 to 90 percent relative humidity, noncondensing.

1.6.2 Interior, Uncontrolled Environment

All system components installed in interior locations having uncontrolled environments shall be rated for continuous operation under ambient environmental conditions of **minus 18 to plus 50 degrees C 0 to 122 degrees F** dry bulb and 10 to 95 percent relative humidity, noncondensing.

1.6.3 Exterior Environment

System components that are installed in locations exposed to weather shall be rated for continuous operation under ambient environmental conditions of **minus 34 degrees to 50 degrees C minus 30 to 122 degrees F** dry bulb and 10 to 95 percent relative humidity, condensing. In addition, the system components shall be rated for continuous operation when exposed to performance conditions as specified in **UL 294** and **UL 639** for outdoor use equipment. In addition, components shall be rated for continuous operation when exposed to rain as specified in **NEMA 250**, winds up to **137 km/h 85 mph** and snow cover up to **610 mm 2 feet** thick, measured vertically.

1.6.4 Hazardous Environment

System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of **NFPA 70** and as shown.

1.6.5 Central Station

All central station equipment shall, unless designated otherwise, be rated for continuous operation under ambient environmental conditions of **16 to 29 degrees C 60 to 85 degrees F** and a relative humidity of 20 to 80 percent.

1.7 EXTRA MATERIALS

Submit spare parts data for each different item of equipment and material specified, after approval of detail drawings and not later than [2] [_____] months prior to the date of beneficial occupancy. The data shall include a complete list of parts, tools and supplies, with current unit prices and source of supply, and a list of the parts recommended for stocking.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

NOTE: Some sensors have special or optional features that may be required for this project. Refer to Technical Manual 5-853-4 for guidance on applicability. Add descriptions of special or optional features to this specification if they are required.

Where materials or equipment are specified to conform, be constructed or tested to meet specific requirements, submit certification that the items provided conform to such requirements. Certification by a nationally recognized testing laboratory that a representative sample has been tested to meet the requirements, or a published catalog specification statement to the effect that the item meets the referenced standard, will be acceptable as evidence that the item conforms. Compliance with these requirements does not relieve the Contractor from compliance with other requirements of the specifications

2.1.1 General

Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's model and serial number in a conspicuous place. Provide laminated plastic nameplates for local processors. Each nameplate shall identify the local processor and its location within the system. Laminated plastic shall be 3 mm 1/8 inch thick, white with black center core. Nameplates shall be a minimum of 25 by 75 mm 1 by 3 inches, with minimum 6 mm 1/4 inch high engraved block lettering. Attach nameplates to the inside of the enclosure housing the local processor. Other major components 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. Nameplates will not be required for devices smaller than 25 by 75 mm 1 by 3 inches.

2.1.2 Enclosures

NOTE: Show on the drawings which specific type of enclosure is needed. Show metallic enclosures for very high security areas or when a higher degree of tamper protection is desirable.

System enclosures shall be as shown.

2.1.2.1 Interior Sensor

Sensors to be used in an interior environment shall be housed in an enclosure that provides protection against dust, falling dirt, and dripping noncorrosive liquids.

2.1.2.2 Interior Electronics

System electronics to be used in an interior environment shall be housed in enclosures which meet the requirements of NEMA 250 Type 12.

2.1.2.3 Exterior Electronics

System electronics to be used in an exterior environment shall be housed in enclosures which meet the requirements of NEMA 250 Type 4X.

2.1.2.4 Corrosion Resistant

System electronics to be used in a corrosive environment as defined in NEMA 250 shall be housed in an enclosure which meet the requirements of NEMA 250 Type 4X.

2.1.2.5 Hazardous Environment Equipment

System electronics to be used in a hazardous environment shall be housed in an enclosure which meets the requirements of paragraph Hazardous Environment.

2.1.3 Fungus Treatment

NOTE: Fungus treatment should only be used on equipment to be installed in climates that are known to cause problems with fungus growth. Examples are extremely tropical climates or humid, poorly ventilated areas. If these conditions do not exist, delete the fungus treatment requirement.

System components located in fungus growth inductive environments 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.

2.1.4 Tamper Provisions

2.1.4.1 Tamper Switches

Enclosures, cabinets, housings, boxes, and fittings of every description having hinged doors or removable covers and which contain circuits or connections 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. The enclosure and the tamper switch shall function together in such a manner as to not allow direct line of sight to any internal components before the

switch activates. Make tamper switches inaccessible until the switch is activated; have mounting hardware so concealed that the location of the switch cannot be observed from the exterior of the enclosure; be connected to circuits which are 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; and shall be wired so that they break the circuit when the door or cover is disturbed.

- a. Nonsensor Enclosures: Tamper switches on nonsensor enclosures, which must be opened to make routine maintenance adjustments to the system and to service the power supplies, shall be push/pull-set, automatic reset type.
- b. Sensor Enclosures: Tamper switches on sensor enclosures, which must be opened to make routine maintenance adjustments to the sensor, shall be single pole single throw type.

2.1.4.2 Enclosure Covers

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 by tack welding or brazing the covers in place or by tamper resistant security fasteners. Labels shall be affixed to such boxes indicating they contain no connections.

2.1.5 Locks and Key-Lock Switches

NOTE: Either round key or conventional key type locks are acceptable for use in the System. Selection should be based on hardware availability at the time of design and the requirements for matching locks currently in use at the site. If the locks do not have to be matched to locks in use, and the designer has no preference, all brackets may be removed.

2.1.5.1 Locks

Install locks on system enclosures for maintenance purposes. Locks shall be UL listed, [round-key type, with three dual, one mushroom, and three plain pin tumblers] [or] [conventional key type lock having a combination of five cylinder pin and five-point three position side bar]. Keys shall be stamped "U.S. GOVT. DO NOT DUP". The locks shall be so arranged that the key can only be withdrawn when in the locked position. All maintenance locks shall be keyed alike and only two keys shall be furnished for all of these locks. These keys shall be controlled in accordance with the [key control plan](#). Submit a Key control plan including the following:

- a. Procedures that will be used to log and positively control all keys during installation.
- b. A listing of all keys and where they are used.
- c. A listing of all persons allowed entry to the keys.

2.1.5.2 Key-Lock-Operated Switches

All key-lock-operated switches required to be installed on system components shall be UL listed, [round-key type, with three dual, one mushroom, and three plain pin tumblers] [or] [conventional key type lock having a combination of five cylinder pin and five-point three position side bar]. Keys shall be stamped "U.S. GOVT. DO NOT DUP".

Key-lock-operated switches shall be two position, with the key removable in either position. All key-lock-operated switches shall be keyed differently and only two keys shall be furnished for each key-lock-operated-switch. These keys shall be controlled in accordance with the key control plan.

2.1.5.3 Construction Locks

If the Contractor requires locks during installation and construction, a set of temporary locks shall be used. The final set of locks installed and delivered to the Government shall not include any of the temporary locks.

2.1.6 Application of System Component

System components shall be designed for continuous operation. Electronic components shall be solid state type, mounted on printed circuit boards conforming to [UL 796](#). Printed circuit board connectors shall be plug-in, quick-disconnect type. Power dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current carrying capacity. Light duty relays and similar switching devices shall be solid state type or sealed electro-mechanical.

2.1.6.1 Maintainability

Components shall be designed to be maintained using commercially available tools and equipment. Components shall be arranged and assembled so they are accessible to maintenance personnel. There shall be no degradation in tamper protection, structural integrity, EMI/RFI attenuation, or line supervision after maintenance when it is performed in accordance with manufacturer's instructions. The system shall be configured and installed to yield a mean time to repair (MTTR) of not more than 8 hours. Repair time is the clock time from the time maintenance personnel are given entrance to the system and begin work, until the system is fully functional.

2.1.6.2 Interchangeability

Construct the system with off-the-shelf components which are physically, electrically and functionally interchangeable with equivalent components as complete items. Replacement of equivalent components shall not require modification of either the new component or of other components with which the replacement items are used. Custom designed or one-of-a-kind items shall not be used. Interchangeable components or modules shall not require trial and error matching in order to meet integrated system requirements, system accuracy, or restore complete system functionality.

2.1.6.3 Electromagnetic and Radio Frequency Interference (EMI/RFI)

System components generating EMI/RFI shall be designed and constructed in accordance with [47 CFR 15](#).

2.1.6.4 Product Safety

System components shall conform to applicable rules and requirements of **NFPA 70**. System components shall be equipped with instruction plates, including warnings and cautions, describing physical safety, and special or important procedures to be followed in operating and servicing system equipment.

2.1.7 Controls and Designations

Provide controls and designations as specified in **NEMA ICS 1**.

2.1.8 Special Test Equipment

Provide all special test equipment, special hardware, software, tools, and programming or initialization equipment needed to start or maintain any part of the system and its components. Special test equipment is defined as any test equipment not normally used in an electronics maintenance facility.

2.1.9 Alarm Output

The alarm output of each sensor shall be a single pole double throw (SPDT) contact rated for a minimum of 0.25 A at 24 volts DC.

2.1.10 Alarm Indicator Lights

Indicator lights used throughout the system shall be light emitting diodes (LED) or long life incandescent lamps. The indicator lights used shall be visible from a distance of **9 m 30 feet** in an area illuminated to **800 lux 75 foot candles**. The indicator lights shall conform to the following color coding:

- a. FLASHING RED to alert an operator that a zone has gone into an unacknowledged alarm or that primary power has failed.
- b. RED to alert an operator that a zone is in alarm and that the alarm has been acknowledged.
- c. YELLOW to advise an operator that a zone is in access.
- d. GREEN to indicate that a zone is secure or that power is on.

2.1.11 Access/Secure Devices

NOTE: The designer should refer to the design manual for proper application of this type of hardware.

Access/secure devices shall be used to place a protected zone in ACCESS. The device shall disable all sensor alarm outputs, with the exception of tamper alarm outputs within the protected zone, and sensors in zones above false ceilings or other inaccessible locations as shown.

2.1.11.1 Switches

The switch shall consist of a double pull key-operated switch housed in a

NEMA 12 equivalent enclosure.

2.1.11.2 Key Pads

Secure/Access keypads shall use a unique combination of alphanumeric and other symbols as an identifier. Keypads shall contain an integral alphanumeric/special symbols keyboard with symbols arranged in ascending ASCII code ordinal sequence. The keypad shall have a contact output.

2.2 INTERIOR SENSORS

NOTE: Show sensor patterns and installation details on drawings. Add requirement for additional site specific conditions such as furniture/equipment layout within protected areas, hazard location area, type of hazard, class, and group. Remote test capability should be used only when required by governing regulations or when sensors are installed in hard to reach areas. Within the U.S., the FCC regulates the operating frequencies of all microwave sensors. Other countries have their own frequencies. The designer must determine what frequency is allowed at the project site.

2.2.1 Balanced Magnetic Switch (BMS)

The BMS shall detect 6 mm 1/4 inch of separating relative movement between the magnet and the switch housing. Upon detecting such movement, it shall transmit an alarm signal to the alarm annunciation system.

2.2.1.1 BMS Subassemblies

The BMS shall consist of a switch assembly and an actuating magnetic assembly. The switch mechanism shall be of the balanced magnetic type. Each 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. The housings of surface mounted switches and magnets shall be made of nonferrous metal and shall be weatherproof. The housings of recess mounted switches and magnets shall be made of nonferrous metal or plastic.

2.2.1.2 Remote Test

Provide a remote test capability. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall activate the sensor's switch mechanism causing an alarm signal to be transmitted to the alarm annunciation system. The remote test shall simulate the movement of the actuating magnet relative to the switch subassembly.

2.2.2 Glass Break Sensor, Piezoelectric

The glass break sensor shall detect high frequency vibrations generated by the breaking of glass while ignoring all other mechanical vibrations. An alarm signal shall be transmitted upon detecting such frequencies to the alarm annunciation system.

2.2.2.1 Sensor Element

The sensor element shall consist of piezoelectric crystals. The sensor element housing shall be designed to be mounted directly to the glass surface being protected. Only the adhesive recommended by the manufacturer of the sensor shall be used to mount detectors to glass. The detection pattern of a sensor element shall be circular with at least a 1.5 m 5 foot radius on a continuous pane of glass. A factory installed hookup cable of not less than 1.8 m 6 feet shall be included with each sensor. The sensor element shall not exceed 2600 square mm 4 square inches. The sensor element shall be equipped with a light emitting diode (LED) activation indicator. The activation indicator shall light when the sensor responds to the high frequencies associated with breaking glass. The LED shall be held on until it is turned off manually at the sensor signal processor or by command from the alarm annunciation system.

2.2.2.2 Sensor Signal Processor

The sensor signal processor shall process the signals from the sensor elements and provide the alarm signal to the alarm annunciation system. The sensitivity of the sensor shall be adjustable by controls within the sensor signal processor. The controls shall not be accessible when the sensor signal processor housing is in place. The sensor signal processor may be integral with the sensor or may be a separate assembly.

2.2.2.3 Glass Break Simulator

Provide a device that can induce frequencies into the protected pane of glass that will simulate breaking glass to the sensor element without causing damage to the pane of glass.

2.2.3 Glass Break Sensor, Acoustic

The glass break sensor shall detect high frequency vibrations generated by the breaking of glass while ignoring all other mechanical vibrations. An alarm signal shall be transmitted upon detecting such frequencies to the alarm annunciation system.

2.2.3.1 Acoustic Sensor Element

The sensor element shall be a microprocessor based digital device. The sensor shall detect breakage of plate, laminate, tempered, and wired glass while rejecting common causes of false alarms. The detection pattern of the sensor element shall be a range of 6 m 20 feet minimum. The sensor element shall be equipped with a light emitting diode (LED) activation indicator. The activation indicator shall light when the sensor responds to the high frequencies associated with breaking glass. The LED shall be held on until it is turned off manually at the sensor signal processor or by command from the alarm annunciation system. The sensor signal processor shall process the signals from the sensor element and provide the alarm signal to the alarm annunciation system.

2.2.3.2 Acoustic Sensor Signal Processor

The sensor signal processor shall process the signals from the sensor elements and provide the alarm signal to the alarm annunciation system. The sensitivity of the sensor shall be adjustable by controls within the sensor signal processor. The controls shall not be accessible when the sensor signal processor housing is in place. The sensor signal processor

may be integral with the sensor or may be a separate assembly.

2.2.3.3 Acoustic Glass Break Simulator

A device that can induce frequencies which simulate breaking glass to the sensor shall be available for the specific sensor selected. The simulator shall not cause damage to the pane of glass.

2.2.4 Duress Alarm Switches

NOTE: The designer will decide what type of duress alarm should be used for this project.

Duress alarm switches shall provide the means for an individual to covertly notify the alarm annunciation system that a duress situation exists.

2.2.4.1 Footrail

Footrail duress alarms shall be designed to be foot activated and floor mounted. No visible or audible alarm or noise shall emanate from the switch when activated. The switch shall lock in the activated position until manually reset with a key. The switch housing shall shroud the activating lever to prevent accidental activation. Switches shall be rated for a minimum lifetime of 50,000 operations.

2.2.4.2 Pushbutton

Latching pushbutton duress alarms shall be designed to be activated by depressing a pushbutton located on the duress switch housing. No visible or audible alarm or noise shall emanate from the switch. The switch shall lock in the activated position until manually reset with a key. The switch housing shall shroud the activating button to prevent accidental activation. Switches shall be rated for a minimum lifetime of 50,000 operations.

2.2.4.3 Wireless

Wireless duress alarms shall consist of portable alarm transmitters and permanently installed receivers. The transmitter shall be activated by depressing a pushbutton located on the housing. An alarm signal shall be transmitted to one or more receivers located within a protected zone. The receivers shall, in-turn, transmit an alarm signal to the alarm annunciation system. No visible or audible alarm or noise shall emanate from the transmitter or receiver when activated. The receiver shall lock in a transmitting mode until manually reset. The transmitter housing shall shroud the activating button to prevent accidental activation. The transmitter shall be designed to be unobtrusive and still be activated in a covert manner. Switches shall be rated for a minimum lifetime of 50,000 operations. The transmitters shall have a range of 30 m 100 feet.

2.2.5 Security Screen

Security screens shall detect an standard intruder when the sensor wire is disconnected, cut, or broken. An alarm signal shall be transmitted to the alarm annunciation system. The sensor shall be constructed from 26 gauge insulated hard-drawn copper wire installed in a grid pattern on a wooden frame or as shown. The sensor grid wires connection to the alarm

annunciation system shall be housed within a junction box as shown. A tamper switch shall be provided to detect attempts to remove the screen and to detect attempts to tamper with connections and end of line resistor.

2.2.6 Vibration Sensor

NOTE: The area protected by a single sensor can be increased by installing a steel strap grid as discussed in the design manual.

The vibration sensor shall detect the high frequency vibrations generated by the use of such tools as oxyacetylene torches; oxygen lances; high speed drills and saws; and explosives, to penetrate a structure while ignoring all other mechanical vibrations. An alarm signal shall be transmitted to the alarm annunciation system. The sensor shall consist of a sensor signal processor and piezoelectric crystal sensor elements that are designed to be rigidly mounted to the structure being protected. The sensor signal processor may be integral with the sensor element or may be a separate assembly. The sensor signal processor shall process the signals from the sensor elements and provide the alarm signal to the alarm annunciation system. The sensitivity of the sensor shall be adjustable by controls within the sensor signal processor. The controls shall not be accessible when the sensor signal processor housing is in place. The detection pattern of a sensor element shall be circular with at least a 1.8 m 6 foot radius on the protected structure.

2.2.7 Microwave Motion Sensor

The transmitted microwave motion sensor shall detect changes in a microwave signal. Upon detecting a specific change, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall detect a standard intruder moving within the sensor's detection pattern at a speed of 0.09 to 2.3 m 0.3 to 7.5 feet per second. The sensor shall comply with 47 CFR 15 Subpart F. The sensor's coverage pattern shall be as shown. The sensitivity of the sensor shall be adjustable by controls within the sensor. The controls shall not be accessible when the sensor housing is in place. The sensor shall be adjustable to obtain the coverage shown.

2.2.7.1 Test Indicator, Microwave Signal

The microwave motion sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor such that it can only be seen when the housing is open/removed.

2.2.7.2 Remote Test, Microwave Signal

Provide a remote test capability. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite the sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system. The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

2.2.8 Passive Infrared Motion Sensor

The passive infrared motion sensor shall detect changes in the ambient level of infrared emissions caused by the movement of a standard intruder within the sensor's field of view. Upon detecting such changes, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall detect a change in temperature of no more than 1.1 degrees C 2 degrees F, and shall detect a standard intruder traveling within the sensor's detection pattern at a speed of 0.091 to 2.29 m 0.3 to 7.5 feet per second across two adjacent segments of the field of view. Emissions monitored by the sensor shall be in the 8 to 14 micron range. The sensor shall be adjustable to obtain the coverage pattern shown. The sensor shall be equipped with a temperature compensation circuit.

2.2.8.1 Test Indicator, Infrared Emissions

The passive infrared motion sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor such that it can only be seen when the housing is open/removed.

2.2.8.2 Remote Test, Infrared Emissions

Provide a remote test capability. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite the sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system. The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

2.2.9 Microwave-Passive Infrared Dual Detection Motion Sensor

The dual detection motion sensor shall be a single unit combining a detector which detects changes in the transmitted microwave signal and a detector which detects changes in the ambient level of infrared emissions caused by the movement of a standard intruder within the detection pattern. The detection pattern shall be capable of covering a 6 by 9 m 20 by 30 feet room. Upon detection of changes by either detector, a window of more than 3 seconds but less than 8 seconds shall be opened. If the other detector detects a change during this window, the sensor shall transmit an alarm signal to the alarm annunciation system. The passive infrared detector shall detect a change in temperature of no more than 1.1 degrees C 2 degrees F, and shall detect a standard intruder traveling within the detection pattern at a speed of 0.09 to 2.3 m 0.3 to 7.5 feet per second across two adjacent segments of the field of view. Emissions monitored by the sensor shall be in the range of 8 to 14 microns. The microwave detector shall detect a standard intruder moving within the detection pattern at a speed of 0.09 to 2.3 m 0.3 to 7.5 feet per second. The microwave detector shall comply with 47 CFR 15 Subpart F. The controls shall not be accessible when the sensor housing is in place. The sensor shall be configured to produce an alarm when both detectors sense a target.

2.2.9.1 Test Indicator

The sensor shall be equipped with an LED walk test indicator for both the passive infrared detector and the microwave detector. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicators or the test indicators shall be located within the sensor such that it can only be seen when the housing is open/removed.

2.2.9.2 Remote Test

Provide a remote test capability. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite each sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system. The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

2.2.10 Photo-Electric Sensor

The photo-electric sensor shall detect an interruption of the light beam that links the transmitter and receiver caused by a standard intruder walking at a speed of less than 2.3 m 7.5 feet per second through the beam. Upon detecting such an interruption, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall use a pulsed infrared light source. Multiple sensors shall be able to operate within the same zone without interfering with each other. The coverage pattern shall be as shown.

2.2.10.1 Test Indicator, Photo-Electric System

The sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor so that it can only be seen when the housing is open/removed.

2.2.10.2 Remote Test, PhotoElectric System

Provide a remote test capability. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite each sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system. The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

2.3 CENTRAL STATION HARDWARE

The central station computer shall be a standard unmodified digital computer of modular design. The CPU word size shall be 64 bits or larger. The operating speed of the processor shall be at least 150 MHZ.

2.3.1 Memory

The computer shall contain at least 40 megabytes of usable installed memory.

2.3.2 Power Supply

The power supply shall have a minimum capacity of 250 Watts.

2.3.3 Serial Port

- a. One TIA-232 serial port shall be provided for general use.
- b. Adjustable data transmission rates from 9600 to 57.6 kbps shall be selectable under program control.

2.3.4 Parallel Port

An enhanced parallel port shall be provided.

2.3.5 Color Monitor

The monitor shall be no less than 430 mm 17 inches, with a minimum resolution of 1280 by 1024 pixels, noninterlaced, and a maximum dot pitch of 0.28 mm 0.0112 inches. The video card shall support at least 256 colors at a resolution of 1280 by 1024 pixels at a minimum rate of 70 Hz.

2.3.6 Keyboard

A 101 keyboard having a minimum 64 character standard ASCII character set based on ANSI INCITS 154 shall be furnished.

2.3.7 Enhancement Hardware

Enhancement hardware such as special function keyboards, special function keys, touch screen devices, or mouse shall be provided for frequently used operator commands such as: Help, Alarm Acknowledge, Place Zone In Access, Place Zone In Secure, System Test, Print Reports, Change Operator, Security Lighting Controls, and Display Graphics.

2.3.8 Disk Storage

A hard disk with controller having a maximum average access time of 10 milliseconds shall be provided. The hard disk shall provided a minimum of 2.0 gigabytes of formatted storage.

2.3.9 Floppy Disk Drive

A minimum of 1 high density floppy disk drive and controller in 90 mm 3-1/2 inch diameter size shall be provided.

2.3.10 Magnetic Tape System

A 4 mm 0.16 inch cartridge magnetic tape system shall be provided. The system capacity shall be 0.8 gigabytes minimum per tape. Each tape shall be computer grade, in a rigid cartridge with spring-loaded cover and write-protect capability.

2.3.11 Modem

Modem shall operate at 28.000 bps, full duplex on circuits using asynchronous communications. The modem shall have error detection, auto answer/autodial, and call progress detection. The modem shall meet the requirements of ITU V.34, ITU V.42 for error correction and ITU V.42 bis for data compression standards, and shall be suitable for operating on unconditioned voice grade telephone lines in conformance with 47 CFR 68.

2.3.12 Audible Alarm

The manufacturer's standard audible alarm shall be provided.

2.3.13 CD-ROM Drive

A CD-ROM drive having a nominal storage capacity of 650 megabytes shall be provided. The CD-ROM drive shall have the following minimum characteristics:

- a. Data Transfer Rate: 1.2 Mbps.
- b. Average Access Time: 150 milliseconds.
- c. Cache memory: 256 Kbytes.
- d. Data throughput: 1 Mbyte/second, minimum.

2.3.14 Dot Matrix Alarm Printer

A dot matrix alarm printer shall be provided and interconnected to the central station equipment. The dot matrix alarm printers shall have a minimum 96 character standard ASCII character set based on ANSI INCITS 154 and with graphics capability. The printer shall be able to print in both red and black without ribbon change. The printers shall have adjustable sprockets for paper width up to 279 mm 11 inches, print at least 80 columns per line and have a minimum speed of 200 characters per second. Character spacing shall be selectable at 10, 12, or 17 characters per inch. The printers shall utilize sprocket-fed fan fold paper. The units shall have programmable control of top-of-form. The printer shall be provided with 25,000 sheets of printer paper and 12 ribbons.

2.3.15 Report Printer

A report printer shall be provided and interconnected to the central station equipment. The printer shall be a laser printer with printer resolution of a minimum of 600 dots per inch. The printer shall have a minimum of 2 megabytes of RAM. Printing speed shall be a minimum of 8 pages per minute with a 100 sheet paper cassette and with automatic feed. Two thousand sheets of paper and 5 toner cartridges shall be furnished after successful completion of the endurance test.

2.3.16 Uninterruptible Power Supply (UPS)

A self contained UPS, suitable for installation and operation at the central station, shall be provided sized to provide a minimum of 6 hours of operation of the central station equipment. Equipment connected to the UPS shall not be affected in any manner by a power outage of a duration less than the rated capacity of the UPS. UPS shall be complete with all necessary power supplies, transformers, batteries, and accessories and shall include visual indication of normal power operation, UPS operation, abnormal operation and visual and audible indication of low battery power. The UPS shall be as specified in Section 26 32 33.00 10 UNINTERRUPTIBLE

POWER SUPPLY (UPS) SYSTEM ABOVE 15 kVA CAPACITY.

2.4 SOFTWARE

The software shall support all specified functions. The central station shall be online at all times and shall perform all required functions as specified. Software shall be resident at the central station and/or the local processor as required to perform all specified functions.

2.4.1 System Software

The operating system shall perform the following functions:

- a. Support multiuser operator with multiple tasks for each user.
- b. Support operation and management of all peripheral devices.
- c. Provide file management functions for disk I/O, including creation and deletion of files, copying of files, a directory of all files including size and location of each sequential and random ordered records.
- d. Provide printer spooling.

2.4.2 Applications Software

2.4.2.1 Operator Commands

The operator's commands shall provide the means for entry of monitoring and control commands, and for retrieval of system information. Processing of operator commands shall commence within 1 second of entry, with some form of acknowledgment provided at that time. The operator's commands shall perform tasks including:

- a. Request help with the system operation.
- b. Acknowledge alarms.
- c. Place zone in access.
- d. Place zone in secure.
- e. Test the system.
- f. Change operator.

2.4.2.2 Command Input

Operator's commands shall be full English language words and acronyms selected to allow operators to use the system without extensive training or data processing backgrounds. The system shall prompt the operator in English word, phrase, or acronym. Commands shall be available in an abbreviated mode, in addition to the full English language (words and acronyms) commands, allowing an experienced operator to disregard portions, or all, of the prompt-response requirements.

2.4.2.3 Command Input Errors

The system shall supervise operator inputs to ensure they are correct for proper execution. Operator input assistance shall be provided whenever a command cannot be executed because of operator input errors. The system shall explain to the operator, in English words and phrases, why the command cannot be executed. The error responses requiring an operator to look up a code in a manual or other document are not acceptable. Conditions for which operator error assist messages shall be generated

include:

- a. The command used is incorrect or incomplete.
- b. The operator is restricted from using that command.
- c. The command addresses a point which is disabled or out of service.
- d. The command addresses a point which does not exist.
- e. The command would violate constraints.

2.4.2.4 Enhancements

The system shall implement the following enhancements by use of special function keys, touch screen, or mouse, in addition to all other command inputs specified:

- a. Help: Used to produce a display for all commands available to the operator. The help command, followed by a specific command shall produce a short explanation of the purpose, use, and system reaction to that command.
- b. Acknowledge Alarms: Used to acknowledge that the alarm message has been observed by the operator.
- c. Place Zone in Access: Used to remotely disable all intrusion alarm circuits emanating from a specific zone. The system shall be structured so that tamper circuits cannot be disabled by the console operator.
- d. Place Zone in Secure: Used to remotely activate all intrusion alarm circuits emanating from a specific zone.
- e. System Test: Allows the operator to initiate a system wide operational test.
- f. Zone Test: Allows the operator to initiate an operational test for a specific zone.
- g. Print Reports: Allows the operator to initiate printing of reports.
- h. Change Operator: Used for changing operators.
- i. Security Lighting Controls: Allows the operator to remotely turn on/off security lights.
- j. Display Graphics: Used to display any graphic displays implemented in the system.

2.4.3 Site Specific Database Software

2.4.3.1 Database Definition Process

Software shall be provided to define and modify each point in the database using operator commands. The definition shall include all physical parameters and constraints associated with each sensor, commandable output, zone, etc. Each database item shall be callable for display or printing, including EEPROM, ROM and RAM resident data. Define and enter the database into the central station based upon input from the Government.

2.4.3.2 System Access Control

The system shall provide a means to define system operator capability and functions through multiple, password operated protected operator levels. At least 3 operator levels shall be provided. System operators and managers with appropriate password clearances shall be able to change operator levels for all operators. Three successive attempts by an operator to execute functions beyond their defined level during a 24-hour period shall initiate a software tamper alarm. A minimum of 32 passwords shall be usable with the intrusion detection system software. The system shall display the operator's name or initials in the console's first field. The system shall print the operator's name or initials, action, date, and time on the system printer at log-on and log-off. The password shall not be displayed or printed. Each password shall be definable and assignable for the following:

- a. Commands usable.
- b. Access to system software.
- c. Access to application software.
- d. Individual zones which are to be accessed.
- e. Access to database.

2.4.3.3 Alarm Monitoring Software

This program shall monitor all sensors, local processors and DTS circuits and notify the operator of an alarm condition. All alarms shall be printed in red on the alarm printer and displayed on the console's text and graphics map monitors. Higher priority alarms shall be displayed first and within alarm priorities. The oldest unacknowledged alarm shall be displayed first. Operator acknowledgment of one alarm shall not be considered as acknowledgment of any other alarm nor shall it inhibit reporting of subsequent alarms. Alarm data to be displayed shall include type of alarm, and location of alarm, and secondary alarm messages. Alarm data to be printed shall include: type of alarm, location of alarm, date and time (to nearest second) of occurrence, and operator response. A unique message field with a width of 60 characters shall be provided for each alarm. Assignment of messages to a zone or sensor shall be an operator editable function. Secondary messages shall be assignable by the operator for printing to provide further information and shall be editable by the operator. The system shall provide for 25 secondary messages with a field of 4 lines of 60 characters each. The most recent 1000 alarms shall be stored and shall be recallable by the operator using the report generator.

2.4.3.4 Monitor Display Software

Monitor display software shall provided for text and graphics map displays that include zone status integrated into the display. Different colors shall be used for the various components and real time data. Colors shall be uniform on all displays. The following color coding shall be followed.

- a. FLASHING RED to alert an operator that a zone has gone into an alarm or that primary power has failed.
- b. RED to alert an operator that a zone is in alarm and that the alarm has been acknowledged.
- c. YELLOW to advise an operator that a zone is in access.

- d. GREEN to indicate that a zone is secure or that power is on.

2.4.3.5 System Test Software

This software shall enable the operator to initiate a test of the system. This test can be of the entire system or a particular portion of the system at the operator's option. The results of each test shall be stored for future display or print out in report form.

2.4.3.6 Report Generator

Software shall be provided with commands to generate reports for displaying, printing, and storing on disk and tape. Reports shall be stored by type, date, and time and shall be printed on the report printer. Reports shall be spooled, allowing the printing of one report to be complete before the printing of another report commences. The dynamic operation of the system shall not be interrupted to generate a report. The report generation mode, either periodic automatic or on request, shall be operator selectable. The report shall contain: the time and date when the report was printed; and the name of the operator generating the report. The exact format of each report type shall be operator configurable.

- a. Periodic Automatic Report Modes: The system shall allow for specifying, modifying, or inhibiting the report to be generated, the time the initial report is to be generated, the time interval between reports, end of period, and the output peripheral.
- b. Request Report Mode: The system shall allow the operator to request at any time an immediate printout of any report.
- c. Alarm Report: The alarm report shall include all alarms recorded by the system over an operator selectable time. The report shall include such information as: the type of alarm (intrusion, tamper, etc.); the type of sensor; the location; the time; and the action taken.
- d. System Test Report: This report documents the operation status of all system components following a system test.
- e. Access/Secure Report: The report documents all zones placed in access, the time placed in access, and the time placed in secure mode.

2.5 FIELD PROCESSING HARDWARE

2.5.1 Alarm Annunciation Local Processor

The alarm annunciation local processor shall respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station and change outputs based on commands received from the central station. The local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs.

- a. Inputs. Local processor inputs shall monitor dry contacts for change of state that reflect alarm conditions. The local processor shall have at least 8 alarm inputs which allow wiring as normally open or normally closed contacts for alarm conditions; and shall also provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements.

The local processor shall report for any condition that remains off normal at an input for longer than 500 milliseconds. Each alarm condition shall be transmitted to the central computer during the next interrogation cycle.

- b. Outputs. Local processor outputs shall reflect the state of commands issued by the central station. The outputs shall be a form C contact and shall include normally open and normally closed contacts. The local processor shall have at least 4 command outputs.

2.5.2 Processor Power Supply

Local processor and sensors shall be powered from an uninterruptible power source. The uninterruptible power source shall provide 6 hours of battery back-up power in the event of primary power failure and shall automatically fully recharge the batteries within 12 hours after primary power is restored. There will be no equipment malfunctions or perturbations or loss of data during the switch from primary to battery power and vice versa. Batteries shall be sealed, non-outgassing type. The power supply shall be equipped with an indicator for ac input power and an indicator for dc output power. Loss of primary power shall be reported to the central station as an alarm.

2.5.3 Auxiliary Equipment Power

A GFI service outlet shall be furnished inside the local processor's enclosure.

2.6 FIELD PROCESSING SOFTWARE

All field processing software described in this specification shall be furnished as part of the complete system.

2.6.1 Operating System

Each local processor shall contain an operating system that controls and schedules that local processor's activities in real time. The local processor shall maintain a point database in its memory that includes all parameters, constraints, and the latest value or status of all points connected to that local processor. The execution of local processor application programs shall utilize the data in memory resident files. The operating system shall include a real time clock function that maintains the seconds, minutes, hours, date and month, including day of the week. Each local processor real time clock shall be automatically synchronized with the central station clock at least once per day to plus or minus 10 seconds. The time synchronization shall be accomplished without operator intervention and without requiring system shutdown.

2.6.1.1 Startup

The local processor shall have startup software that causes automatic commencement of operation without human intervention, including startup of all connected functions. A local processor restart program based on detection of power failure at the local processor shall be included in the local processor software. The startup software shall initiate operation of self-test diagnostic routines. Upon failure of the local processor, if the database and application software are no longer resident, the local processor shall not restart and systems shall remain in the failure mode indicated until the necessary repairs are made. If the database and

application programs are resident, the local processor shall immediately resume operation.

2.6.1.2 Operating Mode

Each local processor shall control and monitor inputs and outputs as specified, independent of communications with the central station. Alarms, status changes and other data shall be transmitted to the central station when communications circuits are operable. If communications are not available, each local processor shall function in a stand-alone mode and operational data, including the status and alarm data normally transmitted to the central station shall be stored for later transmission to the central station. Storage for the latest 1024 events shall be provided at each local processor. Each local processor shall accept software downloaded from the central station.

2.6.1.3 Failure Mode

Upon failure for any reason, each local processor shall perform an orderly shutdown and force all local processor outputs to a predetermined (failure mode) state, consistent with the failure modes shown and the associated control device.

2.6.2 Functions

Provide all software necessary to accomplish the following functions, as appropriate, fully implemented and operational, within each local processor.

- a. Monitoring of inputs.
- b. Control of outputs.
- c. Reporting of alarms automatically to central station.
- d. Reporting of sensor and output status to central station upon request.
- e. Maintenance of real time, updated by the central station at least once a day.
- f. Communication with the central station.
- g. Execution of local processor resident programs.
- h. Diagnostics.
- i. Download and upload data to and from the central station.

2.7 WIRE AND CABLE

2.7.1 General

Provide all wire and cable not indicated as Government furnished equipment. All wiring shall meet NFPA 70 standards.

2.7.2 Above Ground Sensor Wiring

Sensor wiring shall be 20 AWG minimum, twisted and shielded, 2, 3, 4, or 6 pairs to match hardware. Multiconductor wire shall have an outer jacket of PVC.

2.7.3 Class 2 Low Energy Conductors

The conductor sizes specified for digital functions shall take precedence over any requirements for Class 2 low energy signal-circuit conductors specified elsewhere.

PART 3 EXECUTION

3.1 INSTALLATION

NOTE: Designer will specify the correct Section titles and numbers for electrical work. The type of raceway used can be electric metallic or rigid galvanized steel. The requirements of the National Electrical Code are the governing authority.

Install the system in accordance with the standards for safety, NFPA 70, UL 681, UL 1037 and UL 1076, and the appropriate installation manual for each equipment type. Components within the system shall be configured with appropriate service points to pinpoint system trouble in less than 20 minutes. Minimum size of conduit shall be 13 mm 1/2 inch. DTS shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring. Flexible cords or cord connections shall not be used to supply power to any components of the system, except where specifically noted herein. All other electrical work shall be as specified in Sections 26 20 00 INTERIOR DISTRIBUTION SYSTEM and as shown. Grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation. Install all system components, including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, IEEE C2 and as shown, and shall furnish necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Submit printed copies of manufacturer's recommendations for installation of materials prior to installation. Where installation procedures, or any part thereof, are required to be in accordance with manufacturer's recommendations, installation of the item will not be allowed to proceed until the recommendations are received and approved.

3.1.1 Enclosure Penetrations

All enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and all penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer, and in such a manner that the cable is not damaged.

3.1.2 Cold Galvanizing

All field welds and/or brazing on factory galvanized components, such as boxes, enclosures, and conduits, shall be coated with a cold-galvanized paint containing at least 95 percent zinc by weight.

3.2 SYSTEM STARTUP

Do not apply power to the intrusion detection system until the following items have been completed:

- a. Intrusion detection system equipment items and DTS have been set up in accordance with manufacturer's instructions.
- b. A visual inspection of the intrusion detection system has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
- c. System wiring has been tested and verified as correctly connected as indicated.
- d. All system grounding and transient protection systems have been verified as properly installed and connected as indicated.
- e. Power supplies to be connected to the intrusion detection system have been verified as the correct voltage, phasing, and frequency as indicated.
- f. Satisfaction of the above requirements will not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work/equipment.

3.3 SITE TESTING

3.3.1 Testing

Submit a Test Plan defining all tests required to ensure that the system meets technical, operational and performance specifications, [60] [_____] days prior to proposed test date. The test plan must be approved before the start of any testing. The test plan shall identify the capabilities and functions to be tested, and include detailed instructions for the setup and execution of each test and procedures for evaluation and documentation of the results. Perform site testing and adjustment of the completed intrusion detection system. Provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing. The Government will witness all testing. Obtain written permission from the Government before proceeding with the next phase of testing.

- a. Original copies of all data produced during performance verification and endurance testing shall be turned over to the Government at the conclusion of each phase of testing prior to Government approval of the test. Submit written notification of planned testing to the Government, at least 14 days prior to the test, and in no case shall notice be given until after the Contractor has received written approval of the specific test procedures.
- b. Calibrate and test all equipment, verify data transmission system (DTS) operation, place the integrated system in service, and test the integrated system. Test installed ground rods as specified in IEEE 142.
- c. Deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the Government that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.

3.3.2 Performance Verification Test

Demonstrate that the completed system complies with the specified requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown. The performance verification test, as specified, shall not be started until receipt of written permission from the Government, based on the Contractor's written request. This shall include certification of successful completion of testing as specified in paragraph Contractor's Field Testing, and upon successful completion of training as specified. Upon successful completion of the performance verification test, deliver test reports and other documentation to the Government, as specified. Submit test reports, in booklet form with witness signatures verifying execution of tests. Reports shall show the field tests to verify compliance with the specified performance criteria. Test reports shall include records of the physical parameters verified during testing. Test reports shall be submitted within [7] [14] [_____] days after completion of testing. The Contractor will not be held responsible for failures in system performance resulting from the following:

- a. An outage of the main power in excess of the capability of any backup power source, provided that the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the system performed as specified.
- b. Failure of a Government furnished communications link, provided that the failure was not due to Contractor furnished equipment, installation, or software.
- c. Failure of existing Government owned equipment, provided that the failure was not due to Contractor furnished equipment, installation, or software.
- d. The occurrence of specified nuisance alarms.
- e. The occurrence of specified environmental alarms.

-- End of Section --