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USACE / NAVFAC / AFCEA UFGS-13703N (February 2004)  
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Preparing Activity: NAVFAC Superseding  
UFGS-13703N (September 1999)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

Latest change indicated by CHG tags.

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##### SECTION 13703N

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02/04

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## SECTION 13703N

### COMMERCIAL INTRUSION DETECTION SYSTEMS (IDS) 02/04

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NOTE: This guide specification covers the requirements for intrusion detection systems (IDS).

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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NOTE: This guide specification covers intrusion detection systems (IDS) consisting of commercial equipment which is limited to a full range of interior point protection devices duress sensors, volumetric (space) protection sensors, simple exterior sensors limited to devices that can be hung on or attached to perimeter barriers, closed-circuit television (CCTV) for remote alarm assessment purposes, alarm signal data communications media, alarm reporting and monitoring systems, and basic card entry control systems. The CCTV system covered in this specification is not intended for exterior perimeter surveillance usage. System requirements must conform to NAVFAC DM-13.02. Consult the Engineering Field Division (EFD), Naval Facilities Engineering Command on questions concerning system design.

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NOTE: The following information shall be shown on the project drawings:

1. Floor plans: Location of security devices, control units, alarm display equipment, and electrical power cabinets;
2. Site plan: Exterior devices and routing of conductors and conduit into building;
3. Single line type system riser diagram. Connection of equipment should be indicated for typical system chosen for cost estimating purposes;
4. Single line type electrical riser diagram; and
5. Mounting: Details for each device required for complete installation, including junction boxes for recessed BMS where required. Include device height and installation of wiring.

The device symbol presents an easy to use and efficient means of identifying the essential features of the security engineering design effort. The symbol provides a method by which the phenomenology of the device, necessary identifying details related to the phenomenology of the device, and the means by which the device is positioned or mounted can be readily indicated on the engineering plans. The symbol also provides a means of identifying the device in order to develop accurate bills of material and system diagrams. The tables presented are suggested usage and can be modified as necessary to suit the particular design effort.

The "Completed Device Legend" is presented to illustrate actual devices and the legend detail needed on submitted plans.

#### DESIGN SYMBOLOGY

Note:

1. Device type: A single letter code used to indicate the phenomenology of the device. Refer to the device type list.
2. Device detail: A single letter code used to differentiate between similar type devices. Refer to the device detail list.
3. Mounting detail: A single letter code used to indicate the mounting means or positioning of the device. Refer to the mounting detail list.
4. Identifier: Can be any alphanumeric sequence which allows identification of individual device. Room number with alpha character is particularly

effective for interior plans which have specific room numbers previously assigned.

5. Locator: Small 3 mm 3/32 inch dot which indicates the physical location of the device on the plans. Locator dot can be used with an arrow to indicate the location of directional devices, such as a CCTV camera, or with dashed lines to indicate fence mounted or buried line type devices. The symbol should be clarified in the legend and the plans.

6. Symbol: A 15 mm 1/2 inch or greater diameter circle with a horizontal line through the center. Can be changed to a square or hexagon of similar size, if necessary, for clarity on the drawings. The size is dictated by the height of letters used for the device nomenclature.

#### First Letter - Sensor Type (Phenomenology)

A	Acoustic
B	Balanced Magnetic Switch
C	Card Reader
D	Door Strike
E	Electrical Strain Sensitive
F	Fence Sensor
G	Glass Break
H	Reserved
J	Door Bolt
K	Capacitance
L	Photoelectric
M	Microwave
N	Radiation
P	Passive Infrared
R	Area Lighting
S	Switch (Contact)
T	Intercom
U	Ultrasonic
V	Video
W	Seismic (Vibration and Switchmat)
X	Ported Coaxial Cable
Y	Reserved
Z	Reserved

#### Second Letter - Sensor Detail

A	Ultracon
B	Intensified Silicon Intensified Target
C	Curtain
D	Vidicon
E	Angled left (____) (radians) (degrees) ((____) (radians) (degrees) from surface)
F	Reserved
G	Angled right (____) (radians) (degrees) ((____) (radians) (degrees) from surface)
H	Reserved
J	Reserved
K	Keypad

#### Second Letter - Sensor Detail

L	Long Range
M	Masked Coverage (Add Note to Legend & Spec for detail)
N	Reserved
P	Processor
R	Recessed
S	Surface
T	Transmitter
U	Receiver
V	Volume
W	Reserved
X	Reserved
Y	Reserved
Z	Reserved

#### Third Letter - Mounting Detail

A	Above Ceiling (above suspended ceiling)
B	Buried (Underground) (in pour or slab)
C	Ceiling Mounted
D	Duct Mounted
E	System Output to Control External Equipment
F	Flush Mounted
G	System Input From External Equipment
H	Header Mounted (above door opening)
J	Jamb Mounted (beside door opening)
K	Reserved
L	Reserved
M	Reserved
N	Reserved
P	Pole Mounted (i.e., exterior CCTV)
R	Recess Mounted
S	Surface Mounted
T	Table and Desk Mounted
U	Under Floor (below raised floor)
V	Reserved
W	Wall Mounted
X	Suspended
Y	Reserved
Z	Reserved

#### Completed Device Legend

ADT	X-Ray Unit Display Monitor, Desk Mounted
ADE	X-Ray Video Source
BRH	Balanced Magnetic Switch, Recess Mounted at Door Header
BSF	Balanced Magnetic Switch, Surface Mounted in Floor
BSH	Balanced Magnetic Switch, Surface Mounted at Door Header
BSP	Balanced Magnetic Switch, Surface Mounted on Post
BSJ	Balanced Magnetic Switch, Surface Mounted in Jamb of Door
CKP	Card Reader With Keypad, Post Mounted
CKW	Card Reader With Keypad, Wall Mounted

# Completed Device Legend

CM	Control Monitoring Unit
CS	Control Station Used With Ultrasonic Sensors
CPU	Central Processing Unit
CXP	Card Reader Without Keypad, Post Mounted
CXW	Card Reader Without Keypad, Wall Mounted
DRJ	Electric Door Strike, Recessed, Jamb Mounted
GYE	Ventilation System Butterfly Valve Output to Open Circuit in Equipment Supplied by Others
GYG	Ventilation System Butterfly Valve Input From Open Position Sensing Device
GZE	Ventilation System Butterfly Valve Output to Close Circuit in Equipment Supplied by Others
GZG	Ventilation System Butterfly Valve Input From Close Position Sensing Device
HYG	Ventilation System Blast Valve Input from Open Position Sensing Device
HZE	Ventilation System Blast Valve Output to Close Circuit
JSH	Door Bolt Locking Device, Surface Mounted at Door Header
LTW	Active Infrared Transmitter, Wall Mounted
LUW	Active Infrared Receiver, Wall Mounted
MUS	Metal Detector, Surface Mounted
NUS	Radiation Detector, Surface Mounted
PCC	Passive Infrared, Curtain, Ceiling Mounted
PCW	Passive Infrared Sensor, Curtain Detection, Wall Mounted
PMW	Passive Infrared Sensor, Masked; Detection to Left, Wall Mounted
PNW	Passive Infrared Sensor, Masked; Detection to Right, Wall Mounted
PVW	Passive Infrared Sensor, Volume Detection, Wall Mounted
RYE	Area Lighting Output to Energize Circuit in Equipment Supplied by Others
SRF	Switch Contact, Recessed, Floor Mounted
SRH	Switch Contact, Recessed, Header Mounted
SWG	Uninterruptible Power Supply Status Input From Sensing Device
SYE	Output Contact to Energize Door Open Circuit in Equipment Supplied by Others
SZE	Output Contact to Energize Door Close Circuit in Equipment Supplied by Others
TJT	Audio Communication Transceiver, Table Top
TJW	Audio Communication Transceiver, Wall Mounted
UEW	Ultrasonic Sensor, Detection Angled Left 1.31 rad 75 Degrees (0.262 rad15 Degrees From Surface), Wall Mounted
UGW	Ultrasonic Sensor, Detection Angled Right 1.31 rad 75 Degrees (0.262 rad15 Degrees Surface), Wall Mounted
UVC	Ultrasonic Sensor, Volume Detection, Ceiling Mounted
UVW	Ultrasonic Sensor, Volume Detection, Wall Mounted
VAC	Video, Ultracon Camera, Ceiling Mounted
VAP	Video Ultracon Camera, Pedestal Mounted



#### Completed Device Legend

VAW	Video, Ultracon Camera, Wall Mounted
VBP	Video, Isit Camera, Pole Mounted
VDX	Video, Display Monitor, Console Mounted
VOC	Video, Vidicon Camera, Ceiling Mount
WYG	Potable Water Isolation Valve Input From Open Position Sensing Device
WZW	Potable Water Isolation Valve Output to Close Circuit in Equipment Supplied by Others
XPB	Ported Coax, Data Processor, Mounted in Buried Vault Enclosure
XWW	Ported Coax, Data Control Interface Unit, Wall Mounted
YTT	Keypad Unit, Stand-Alone, Desk Mounted
ZTT	Personal Identity Verifier, Stand-Alone, Desk Mounted

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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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 C39.1	(1981; R 1992) Requirements for Electrical Analog Indicating Instruments
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#### ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
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ASTM B 32	(2003) Solder Metal
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#### ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA ANSI/EIA/TIA-232-F	(2002) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
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#### NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(2000) Industrial Controls and Systems: Controllers, Contactors, and Overload
------------	--

Relays Rated Not More than 2000 Volts AC  
or 750 Volts DC

NEMA ICS 6 (1993; R 2001) Industrial Control and  
Systems: Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS (SMPTE)

SMPTE 170M (1999) Television - Composite Analog Video  
Signal - NTSC for Studio Applications

U.S. DEFENSE INTELLIGENCE AGENCY (DIA)

DIA DCID 1/21 (1994) Security Guidance and Procedures;  
Physical Security Standards for Sensitive  
Compartmented Information Facilities

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

47 CFR 15 Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 1037 (1999; Rev thru Sep 1999) Antitheft Alarms  
and Devices

UL 1076 (1995; Rev thru Feb 1999) Proprietary  
Burglar Alarm Units and Systems

UL 1610 (1998; Rev Aug 2001) Central-Station  
Burglar-Alarm Units

UL 294 (1999; Rev thru Oct 2001) Access Control  
System Units

UL 636 (1996; Rev thru Mar 2001) Holdup Alarm  
Units and Systems

UL 639 (1997; Rev thru Sep 2002) Intrusion  
Detection Units

UL 681 (1999; Rev thru Jan 2001) Installation and  
Classification of Burglar and Holdup Alarm  
Systems

UL 796 (1999; Rev thru Dec 2003) Printed-Wiring  
Boards

## 1.2 RELATED REQUIREMENTS

Section 16050N BASIC ELECTRICAL MATERIALS AND METHODS, applies to this  
section with the additions and modifications specified herein.

### 1.3 DEFINITIONS

- a. Active mode: That in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected.
- b. Fail-safe: The capability to monitor system functions and report an alarm when a failure is detected in a critical system function.
- c. Installer: Either the Contractor or a subcontractor with whom the Contractor has a firm contractual agreement.
- d. Intruder: An animate object at least 1220 mm 48 inches in height, 34 kg 75 pounds in weight and 0.113 cubic meter 4 cubic feet in volume, moving through the protected zones or portals at a velocity of 30 to 3000 mm 0.1 to 10 feet per second.
- e. Sensor zone: A geographic position for which an intrusion must be identified and displayed and may be the combination of multiple detection devices.
- f. Element: As used in this section means a constituent part of a complex signal such as an ac or dc voltage or current, ac phase, or frequency duration.

### 1.4 SYSTEM DESCRIPTION

[Provide new] [and] [modify existing] intrusion detection system (IDS), including associated equipment and appurtenances. System design shall include supervising installation of rigid or flexible conduit for IDS as required during site preparation, running of system wires and cables, and system component installation, component testing, and system checkout. Each system shall be complete and ready for operation. [Existing system was manufactured by [\_\_\_\_], and new equipment shall be compatible with and operate accurately and reliably with the existing system.] Include materials not normally furnished by the manufacturer with the IDS equipment as specified in [Section 16302N UNDERGROUND TRANSMISSION AND DISTRIBUTION] [and] [Section 16301N OVERHEAD TRANSMISSION AND DISTRIBUTION] [and] Section 16402 INTERIOR DISTRIBUTION SYSTEM.

#### 1.4.1 Design Requirements

##### 1.4.1.1 Backup Battery Capacity Calculations

Submit calculations showing that backup battery capacity exceeds sensor operation, communications supervision, and alarm annunciation power requirements.

##### 1.4.1.2 Probability of System Success Calculations

Submit calculations showing probability of system success (Ps) meets the requirements for the IDS Ps in accordance with paragraph entitled "Combinational Processing."

### 1.5 SUBMITTALS

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**NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an**

item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" 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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

[ [The [\_\_\_\_\_] will review and] [\_\_\_\_\_] Division, Naval Facilities Engineering Command will approve submittals requiring special review in this section.]

#### SD-02 Shop Drawings

IDS components; G

Overall system schematic; G

#### SD-03 Product Data

Interior point sensors; G

Interior volumetric sensors; G

Exterior fence sensors; G

Duress alarms; G

Access control subsystem; G

Card reader; G

Keypad; G

Communications cable; G

Microwave sensors; G

Radio frequency link communications systems; G

Communications interface devices; G

CCTV camera; G

CCTV lenses; G

Auxiliary CCTV camera equipment; G

Video switchers; G

Video monitors; G

Video tape recorder; G

Local annunciator unit; G

Control units; G

Printer; G

Uninterruptible power supply (UPS); G

Batteries; G

Central alarm reporting display unit; G

[Color graphic] CRT displays; G

Fixed map display; G

Four quadrant multiplexer; G

#### SD-05 Design Data

Backup battery capacity calculations; G

Probability of system success calculations; G

#### SD-06 Test Reports

IDS operational test; G

IDS final test; G

#### SD-07 Certificates

IDS operational test plan; G

Installer's qualifications; G

Instructor's qualifications; G

#### SD-10 Operation and Maintenance Data

IDS components, Data Package 5; G

IDS software, Data Package 1; G

Submit in accordance with Section 01781 OPERATION AND MAINTENANCE DATA and Section 16050N BASIC ELECTRICAL MATERIALS AND METHODS.

### 1.6 QUALITY ASSURANCE

#### 1.6.1 Drawings

##### 1.6.1.1 IDS Components

Submit drawings that clearly and completely indicate the function of each IDS component. Indicate termination points of devices, and interconnections required for system operation. Indicate interconnection between modules and devices. In addition, submit a layout drawing showing spacing of components, location, mounting and positioning details.

##### 1.6.1.2 Overall System Schematic

Indicate the relationship of integrated components on one diagram and show power source, system controls, impedance matches; plus number, size, identification, and maximum lengths of interconnecting wires. Drawings shall be not less than [420 by 297] [\_\_\_\_\_] mm [11 by 17] [\_\_\_\_\_] inches.

#### 1.6.2 Evidence of Experience and Qualifications

##### 1.6.2.1 Installer's Qualifications

Prior to installation, submit data of the installer's experience and qualifications. Show that the installer who will perform the work has a minimum of [2] [\_\_\_\_\_] years experience successfully installing IDS of the same type and design as specified herein. Include the names, locations, and points of contact of at least two installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than [12] [\_\_\_\_\_] months.

##### 1.6.2.2 Instructor's Qualifications

Prior to installation, submit data of the instructor's experience and qualifications. Show that the instructor, who will train operating and maintenance personnel, has received a minimum of 24 hours of IDS training from a technical organization such as the National Burglar and Fire Alarm Association, and 2 years experience in the installation of IDS of the type specified.

### 1.6.3 Regulatory Requirements

Provide only UL listed IDS equipment except for exterior IDS sensors, access control, and closed-circuit television (CCTV) components.

### 1.6.4 IDS Operational Test Plan

Submit at least 30 days prior to commencement of formal operational testing. Include detailed procedures for operational testing of each IDS component and subsystem, and for performance of an integrated system test.

### 1.6.5 User's Software Data

Submit for approval not later than 30 days prior to formal operational testing or instruction to Government personnel on IDS software, whichever is earlier. IDS software shall be documented in the user's manual.

## PART 2 PRODUCTS

### 2.1 IDS SUBSYSTEMS

Provide a complete integrated IDS consisting of the following major subsystems:

- a. Detection
  - [b. Basic automated access control]
- c. Communications
  - [d. Closed-circuit television (CCTV)]
- e. Alarm reporting and display
- f. Power

### 2.2 INTEGRATED SYSTEM FUNCTIONAL REQUIREMENTS

Ensure that IDS is fully integrated with physical security and other elements of the overall facility security system. Provide specific subsystem consisting of the following:

- a. Detection subsystem: Sensors to detect intrusion attempts [and provide means to indicate a duress condition].
- [b. Basic automated access control subsystem: Electronic devices to monitor and control personnel movement through normal access routes in and out of the facility and between protected areas within the facility.]
- c. Communications subsystem: Elements required to ensure that pertinent data is transferred from point of origin to point where appropriate actions can be taken. [Provide redundant communications links from control units to central processor unit.]
- [d. CCTV subsystem: Electronic devices required to provide visual assessment of IDS alarms [at two separate locations].]
- e. Alarm reporting and display subsystem: Electronic devices to

control, process, integrate, and annunciate IDS data [at [two]  
[\_\_\_\_\_] separate locations].

- f. Power subsystem: Components required to ensure continuous operation of the entire IDS.

#### 2.2.1 Growth Capability

Provide capability for modular IDS expansion with minimal equipment modification. Products provided shall not limit growth capability to products of a single manufacturer.

#### [2.2.2 Intrinsically Safe

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**NOTE: Do not locate alarm reporting and display equipment within a hazardous area. If point sensors and volumetric sensors are required in hazardous areas, clearly identify their location on the plans. Delete this paragraph if no hazardous areas exist in this project.**

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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 NFPA 70. Classification of area and corresponding equipment ratings and installation procedures shall be as defined and specified in Chapter 5 of NFPA 70.

#### ]2.3 INTEGRATED SYSTEM PERFORMANCE REQUIREMENTS

The installed and operating IDS shall be integrated into the overall facility to detect intrusion and shall perform as an entity, as specified below.

#### 2.3.1 Detection Coverage

Provide and adjust sensors so that coverage is [overlapping and] maximized without mutual interference. [IDS coverage shall include [the facility perimeter] [and] critical spaces within the facility.]

#### 2.3.2 Detection Resolution (Sensitivity)

Sensitivity shall be capable of the following:

- a. Locating intrusions [within [100] [\_\_\_\_\_] meter zones along a line or perimeter] [to one side of the [facility] [building]];
- b. Locating intrusions at individually protected assets or at an individual portal;
- c. Locating intrusions within volume or areas to within the coverage on a single volumetric sensor; and
- d. Locating failures or tampering at individual sensors.



### 2.3.3 Detection Alarm and Reporting Capacity

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NOTE: Select system capacity parameters based on the specific facility design requirements. System capacity should be expressed as a binary number. Include a 25 percent expansion factor to accommodate changes in design caused by reconfiguration of equipment within interior spaces or renovation.  
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The IDS shall have the capacity to collect, communicate, and display up to [12] [32] [256] [\_\_\_\_\_] sensor zone alarms [and to enable control of [one] [two] [\_\_\_\_\_] response devices in each of the sensor zones]. If the sensor zone is a combination of multiple alarm sources, the system shall maintain the capability to identify individual sensors in an alarm state. A single alarm shall be annunciated within one second average, 2 seconds maximum, after sensor transducer or other detection device activation [except that alarms transmitted by radio frequency signaling shall communicate in approximately 2 seconds].

### 2.3.4 Probability of System Success

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NOTE: For U.S. Navy facilities, minimum Ps is 0.9. Delete this paragraph for simple, non-high security systems. Use this paragraph when specific DoD and USN directives require a high level of performance, which is usually expressed as "probability of detection." See NAVFAC DM-13.02 for discussion of "probability of detection."  
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Success shall be predicated on the proposed system architecture. Overall system probability of success shall be [0.90] [0.95] [0.99] [\_\_\_\_\_] minimum.

#### 2.3.4.1 Combinational Processing

The required system probability of success at the 90 [\_\_\_\_\_] percent confidence level is based on the standard Chi-square distribution and is calculated from the formula  $Ps = Pd \times Pc \times Pa \times Pp$  where:

Ps = Probability of system success.

Pd = Probability of detection for an individual sensor or sensor combination when more than one sensor is used.

Pc = Probability of correctly transmitting sensor data. The performance measure will account for remote processing and transmission error.

Pa = Probability of correctly annunciating alarm data and of providing the correct response at the operator interface, including accounting for errors introduced by central processing and display functions, but not including operator performance.

Pp = Probability of providing operating power of suitable quality.

#### 2.3.4.2 Other System Success Considerations

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**NOTE: Select the most restrictive choice(s) based upon the degree of IDS annunciation granularity required.**  
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- a. False alarm: An alarm which does not result from a valid intrusion by personnel, vehicles, other moving objects, or nuisances, but rather as a result of an internally generated sensor or other system component noise. The false alarm rate shall not exceed one per [30] [\_\_\_\_\_] days for each sensor zone.
- b. Nuisance alarm: May result from sources external to the system which provide sensor stimuli similar to those of personnel, vehicles, or moving objects, such as wildlife and natural phenomena. Nuisance alarm rate is a function of sensor adjustment and shall not exceed a rate of one alarm per [7] [\_\_\_\_\_] days for each sensor zone for the initial 90 days after acceptance by the Government. Nuisance alarm rate shall not exceed a rate of one alarm per [30] [\_\_\_\_\_] days for each sensor zone thereafter.
- c. Reliability and Availability: Reliability for IDS shall be based upon reliabilities of equipment used. Reliability requirements shall be as contained in equipment specifications, and when equipment is combined in particular configuration, shall provide a system-level mean-time-between-failure (MTBF) that is consistent with both the system-level availability requirement stated below and specific requirements for each defined functional area. Inherent availability required (Ai) is based on an assumption of no planned system downtime for preventive maintenance and shall be calculated as:

$$A_i = \frac{MTBF}{MTBF + MTTR}$$

Where MTBF is the mean-time-between-failure of the system as defined by:

$$\frac{1}{MTBF} = \frac{1}{\sum_j (MTBF)_j}$$

Where (MTBF)<sub>j</sub> is the achieved mean-time-between-failure of each individual piece of equipment used in the given system configuration as demonstrated in the individual equipment reliability qualification test. MTBF for this system shall be not less than [5000] [\_\_\_\_\_] hours. System shall be capable of pinpointing failures within [20] [\_\_\_\_\_] minutes.

MTTR is the weighted average mean-time-to-repair of the system as defined by:

$$MTTR = \frac{\sum_j (MTTR)_j}{\sum_j (MTBF)_j}$$

Where (MTTR)<sub>j</sub> is the achieved mean-time-to-repair of each individual piece

of equipment used in the specified system configuration. MTTR for this system shall not exceed [30] [\_\_\_\_\_] minutes of on-site time for any one element.

#### 2.3.5 Alarms

Alarms shall include but not be limited to the following:

- a. Intrusion detection
- b. Tamper switches
- c. Fail-safe capability
- d. Line fault (for hardwire systems only) detection
- e. Power loss detection

##### 2.3.5.1 Intrusion Detection

Include full range of interior point protection sensors, volumetric (space) protection sensors, exterior fence sensors, and duress alarms. Duress alarms shall be [annunciated to be clearly distinguishable from other intrusion detection alarms] [silent at the reporting location and clearly distinguishable from other intrusion detection alarms] at the central reporting processor.

##### 2.3.5.2 Tamper Switches

Enclosures, cabinets, housings, boxes, raceways, and fittings with hinged doors or removable covers which contain circuits of the intrusion detection system and associated power supplies shall be provided with cover having corrosion-resistant tamper switches. Arrange tamper switches to initiate an alarm signal when the door or cover is moved as little as 6 mm 1/4 inch from the normally closed position. Mechanically mount tamper switches to maximize defeat time when enclosure covers are opened or removed. Minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall be one second. Enclosure and tamper switch shall prevent direct line of sight to internal components and prevent switch or circuit tampering. Conceal mounting hardware so switch cannot be observed from enclosure exterior. Covers of junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches if covers contain no splices or connections. Tamper alarms shall be annunciated to be clearly distinguishable from intrusion detection alarms. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service power supplies shall be the push/pull-set, automatic-reset type. Tamper switches shall be:

- a. Inaccessible until switch is activated;
- b. Under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating;
- c. Spring-loaded and held in the closed position by the door, or cover protected;
- d. Wired to break the circuit when the door or cover is disturbed;  
and

- e. Wired so that each sensor and device is annunciated [individually] [by zone] at the central reporting processor.

#### 2.3.5.3 Fail-Safe Capability

Provide fail-safe capability in critical elements of the IDS. This shall include, but not be limited to, capability to monitor communication link integrity and to provide self-test. When diminished functional capabilities are detected, system shall provide annunciation of the fault. Fail-safe alarms shall be annunciated to be clearly distinguishable from other types of alarms.

#### 2.3.5.4 Line Fault Detection

As a minimum, fault isolation at the systems level shall have the same geographic resolution as provided for intrusion detection. Communication links of the IDS shall have an active mode for line fault detection. System shall be either a static, or dynamic system. In a static system, the "no-alarm" condition shall always be represented by the same signal, which shall be different than the signal originally transmitted. The dynamic system shall represent "no-alarm" with a signal which continually changes with time.

#### 2.3.5.5 Power Loss Detection

Provide capability to detect when a critical component of the system experiences temporary or permanent loss of power and to declare an alarm. Alarm shall be annunciated to clearly identify the component experiencing power loss.

#### 2.3.6 Self-Test

Provide self-test capability for sensors, [response devices,] display lights, and other elements which are not inherently self-tested by virtue of continuous operation. Initiation of a test command shall be by [both automatic and] manual means. Provide manual sensor test initiation capability by [both the IDS control unit and at] command elements of the alarm reporting and display subsystem. Sensor test command signal shall initiate an intrusion simulation which shall cause the sensor to test as much of itself, including the transducer, as is reasonable and shall result in the generation of an alarm condition. [Automatic sensor test command signals shall be issued by a central unit when a landline is provided from the sensor or by the sensor RF transmitter when radio transmission is provided from the sensor. A test initiation signal shall be issued at specified time intervals.]

#### 2.3.7 Electrical Power

Obtain by the normal commercial or base electrical distribution system. Power shall be continuously monitored and, if interrupted, automatic switching from primary to emergency backup sources shall be accomplished without interruption or degradation of critical system function. Intrusion alarms shall not be generated as a result of power switching; however, an indication of power switching and on-line source shall be provided at the alarm monitor. Upon restoration of prime power, system shall automatically switch back to the primary source. Failure of an on-line battery shall be detected and reported as a fault condition.

#### 2.3.7.1 Primary Power

Furnish [120] [\_\_\_\_\_] volt ac service, transformed through a two-winding isolation transformer and rectified to low-voltage dc for system operation. Obtain primary power [from the line side of incoming facility power] [at the location indicated]. Provide a separate, lockable, fused safety switch [adjacent to the power distribution panel] [at the location indicated].

#### 2.3.7.2 Backup Power

Provide backup power to the primary power by [dedicated on-site diesel engine generator set (not a part of the IDS)] [backup battery in each element or subsystem as may be appropriate to provide a minimum of [4] [\_\_\_\_\_] hours of power] [uninterruptible power supply (UPS)].

- a. UPS: Backup power required for uninterrupted operation of the IDS [until a diesel engine generator set can assume the full load] shall be provided by an uninterruptible power supply (UPS). The UPS shall consist of a rectifier, battery and support racks, a static inverter, static switch transfer, and a manual bypass switch. The UPS shall have a continuous output to supply the maximum load requirements of the IDS. Size battery to sustain the UPS at full rated load [for 4 hours] [for 15 minutes] [until diesel engine generator set can assume the load] [\_\_\_\_\_] .
- b. Batteries: Provide [further] backup by dedicated batteries in remotely located system elements such as individual sensors or control units. When radio frequency (RF) operation is required, batteries shall be an integral part of dispersed system elements. Batteries shall be capable of operation in any position and shall be protected against venting caustic chemicals or fumes within an equipment cabinet. Batteries shall be capable of continuous operation for up to [4] [\_\_\_\_\_] hours without recharge or replacement.

### 2.4 SYSTEM PERFORMANCE REQUIREMENTS

Design system components to operate as described herein within the context of the overall system performance previously described. Perceived inconsistencies between the following component performance specifications and overall system level performance descriptions shall be decided in favor of the former.

#### 2.4.1 Modularity

Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. Design system components to facilitate modular subassembly and part replacement.

#### 2.4.2 Reliability

Provide only new components in current manufacturing production, manufactured to meet requirements specified herein, and free from characteristics and defects which affect appearance, or serviceability or render equipment unsuitable for the intended purpose. MTBF for component shall not be less than [5000] [\_\_\_\_\_] hours. [Provide only IDS components which meet requirements of DIA DCID 1/21.]

#### 2.4.3 Maintainability

Components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be arranged and assembled to be readily accessible to maintenance personnel without compromising defeat resistance of IDS.

#### 2.4.4 Availability

Provide components designed for continuous operation. Provide solid-state electronic components, 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. 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 hermetically sealed electromechanical. Electrical indicating instruments incorporated into system components shall conform to applicable provisions of ANSI C39.1.

#### 2.4.5 Environmental Conditions

##### 2.4.5.1 Interior Conditions

Equipment installed in environmentally protected interior areas shall meet performance requirements specified for the following ambient conditions:

- a. Temperature: 0 to 50 degrees C 32 to 120 degrees F.  
Components installed in unheated security protected areas shall meet performance requirements for temperatures as low as minus 17 degrees C zero degrees F;
- b. Pressure: Sea level to 4,573 meters 15,000 feet above sea level;
- c. Relative humidity: 5 to 95 percent;
- d. Fungus: Components shall be constructed of nonfungus nutrient materials or shall be treated to inhibit fungus growth; and
- e. Acoustical noise: Components shall be suitable for use in high noise areas above 100 dB, such as boiler rooms, power plants, and foundries without adversely affecting their performance.

##### 2.4.5.2 Exterior Conditions

Components mounted in locations exposed to weather shall be housed in corrosion-resistant enclosures with appropriate environmental protection. Component performance shall not degrade because of improper housing design. Components in enclosures shall meet performance requirements when exposed to the following ambient conditions:

- a. Temperature: Minus 32 to 60 degrees C Minus 25 to 140 degrees F;
- b. Pressure: Sea level to 4,573 meters 15,000 feet above sea level;
- c. Solar radiation: Six hours of solar radiation at dry bulb temperature of 60 degrees C 120 degrees F including 4 hours of solar radiation at 0.00112 watts per square millimeter 104 watts per square foot;

- d. Sand and dust: Wind driven for up to [9.6] [\_\_\_\_\_] km per hour [6] [\_\_\_\_\_] miles per hour;
- e. Rain: 50 mm 2 inches per hour and 125 mm 5 inches per hour cyclic with wind plus one period of 300 mm 12 inches per hour;
- f. Humidity: 5 to 95 percent;
- g. Fungus: Warm, humid atmosphere conducive to the growth of heterotrophic plants;
- h. Salt fog: Salt atmosphere with 5 percent salinity;
- i. Snow: Snow loading of 234 kg per square meter 48 pounds per square foot (psf) per hour; blowing snow of 22.5 kg per square meter 4.6 psf per hour;
- j. Ice accretion: Up to 12.7 mm 1/2 inch of radial ice;
- k. Wind: Up to 80 km/h 50 mph with gusts to 106 km/h 66 mph, except that fence sensors shall detect intrusions up to 56 km/h 35 mph; and
- l. Acoustical noise: Components shall be suitable for use in high noise areas above 110 dB, such as flight lines, runup pads, and generator sites without adversely affecting their performance.

#### 2.4.5.3 Lightning and Power Surges

Intrusion detection, video circuitry, and communication circuits that lead to the central alarm reporting and display unit shall be protected at both ends against excessive voltages. This requirement shall apply for circuits that are routed both in underground conduits and overhead runs. As a minimum, install primary detection devices, such as three electrode gas-type surge arresters, and secondary protectors to reduce dangerous voltages to levels that will cause no damage. Fuses shall not be permitted as protection devices. Provide fail-safe gas tube type surge arresters on exposed IDS data circuits. Breakdown voltage for the unit shall be 300 to 500 volts dc. Unit shall have equal performance for bipolar operation with automatic reset feature and a minimum life of 1000 surges with 10 times 1000 microsecond waveform at 1000 amperes. Provide low capacitance transient suppression type video lightning surge arresters on exposed video cables. Breakdown voltage for the unit shall be 7 to 9 volts at 10 milliamperes. Maximum clamping voltage shall be 15 volts at 130 amperes for one time 50-microsecond waveform. Minimum life shall be 1000 surges with one time, 50-microsecond waveform at 130 amperes. There shall be no degradation in video quality. Units shall be UL listed. Transient protection shall protect against spikes up to 1000 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 25 ohms to ground.

#### 2.4.6 Electromagnetic Interference (EMI)

IDS components employing electromagnetic radiation shall be designed and constructed to provide maximum practical invulnerability to electronic countermeasures.

#### 2.4.7 Electromagnetic Radiation (EMR)

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**NOTE: National Post Telephone and Telegraph is normally the approving authority for EMR components overseas.**  
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Provide only IDS components which are [Federal Communications Commission (FCC)] [\_\_\_\_\_] licensed and approved. Provide system components which are electromagnetically compatible.

#### 2.4.8 Interchangeability

Like components shall be physically and functionally interchangeable as complete items, without modification of either the original items or of other components with which the items are used.

#### 2.4.9 Safety

IDS components shall conform to application rules and requirements of NFPA 70 and applicable UL publications.

#### 2.4.10 Human Engineering

Displays, other than wall-mount displays, shall be housed in standard [desk-type consoles] [480 mm/19 inch racks]. Central alarm reporting and display unit shall be designed for operation by one individual. Aural considerations shall include location of annunciators, tone pitch, quality, and intensity. Number of different audible signals shall not exceed four. Component design shall provide for ease of accessibility for maintenance.

##### 2.4.10.1 Visual Annunciators

Annunciators shall be either electric lamps, liquid crystal displays (LCDs), or light emitting diodes (LEDs). Annunciators shall be so connected in the circuit that a failure of the annunciator, socket, or protective circuitry shall not result in an improper or indeterminate signal. Lamps, LCDs, and LEDs shall be compatible with standby power supplies. LCDs shall be back-lit. LEDs shall be brightly lit and visible from a distance of 9 meters 30 feet in an area illuminated at 805 lux 75 footcandles. Use LEDs 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 9 meters 30 feet in an area illuminated at 805 lux 75 footcandles. To the extent practicable, lamps shall be standardized for multiple applications 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 preclude incorrect replacement.

##### 2.4.10.2 Controls

Provide to ensure ease of operation of 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 to be visible when associated system wiring is in place. Identification markings shall be associated with each adjustment device or item requiring periodic maintenance. Safety warning 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 background color. Controls not required for system operation shall be inaccessible to the system operator.

#### 2.4.11 Computer Software

Software shall be comprised of computer programs and computer data bases as required. Software shall be categorized as mission software and support software.

##### 2.4.11.1 Mission Software

Mission software shall consist of software implemented to provide complete operation of the IDS.

##### 2.4.11.2 Support Software

Support software shall consist of software implemented to support system operation, such as system setup and off-line maintenance routines.

##### 2.4.11.3 Software Performance Requirements

Provide software in modules to meet application requirements of this section. Software shall include the operating system (OS), be complete off-the-shelf, modifiable for specific IDS application specified herein, and be a product of and supported by the IDS central processor manufacturer. OS executive shall accomplish in real time the scheduling and sequencing of programs for execution. Each program shall be assigned a priority level. Provide priority levels in sufficient number to provide total functional operation as specified. Software shall be menu-driven. Menu, reconfiguration, and other actions which could in any way compromise the security and integrity of the IDS shall be password controlled. A minimum of [eight] [\_\_\_\_\_] password levels shall be provided. Software provided shall be documented in a user's manual which shall be approved by the Government prior to system implementation.

#### 2.4.12 Test Points

Test points, controls, and other adjustments inside enclosures shall be readily visible and accessible with minimum disassembly of equipment. Test points and other maintenance controls shall not be readily accessible to operator personnel.

#### 2.4.13 Component Enclosures

Consoles, annunciator housings, power supply enclosures, sensor control and terminal cabinets, control units, wiring gutters, and other component housings, collectively referred to as enclosures, shall be formed and assembled to be sturdy and rigid.

##### 2.4.13.1 Metal Thickness

Thicknesses of metal in cast and sheet metal enclosures of all types shall

be not less than those listed in Tables 8.1, 8.2, and 8.3 of UL 1610 for alarm components, and NEMA ICS 2 and NEMA ICS 6 for other enclosures. Sheet steel used in fabrication of enclosures shall be not less than 16 gage, except consoles may be 18 gage.

#### 2.4.13.2 Doors and Covers

Doors and covers shall be flanged. 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. Provide doors having a latch edge length of less than 600 mm 24 inches with a single lock. Where latch edge of a hinged door is 600 mm 24 inches or more in length, provide the door with a three-point latching device with lock; or alternatively with two locks, one located near each end. Covers of junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws.

#### 2.4.13.3 Ventilation

Ventilation openings in enclosures and cabinets shall conform to requirements of UL 1610.

#### 2.4.13.4 Mounting

Unless otherwise indicated, sheet metal enclosures shall be designed for wall mounting with top hole slotted. Mounting holes shall be in positions which remain accessible when major operating components are in place and door is open, but shall be inaccessible when door is closed.

#### 2.4.13.5 Labels

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.

#### 2.4.13.6 Enclosure Locks

Locks and key-lock-operated switches required to be installed on component enclosures shall be UL listed, round-key type with three dual, one mushroom, and three plain pin tumblers, or shall 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." Key-lock-operated switches shall be keyed differently and shall be two-position, with the key retractable from either position. Furnish two keys for each switch. Maintenance locks shall be of the one-way key-pull type arranged so that the key can be withdrawn only when the lock is in the locked position. Locks on components for maintenance access shall be keyed alike; only two keys shall be furnished for such locks. Deliver keys, tagged with metal tags, accompanied by a manufacturer's certificate which records the number of each key made.

#### 2.4.14 Detection Sensors

Sensors shall detect penetration of the facility perimeter and protected zones by unauthorized personnel or intruders with a probability of detection (pd) of 0.9 with a 95 percent confidence level and, as applicable, shall conform to UL 639. Unless otherwise specified, required sensor power is plus 12 volts dc.

#### 2.4.14.1 Interior Point Sensors

- a. Door and window protection: Accomplish by one or more of the following:

(1) Door and window open detection

(a) Balanced magnetic switches (BMS): Switches shall be [surface mounted] [and] [recessed] [as indicated] and shall have a minimum of two encapsulated reed switches. Switches shall activate when a disturbance in the balanced magnetic field occurs. Provide each BMS with an overcurrent protective device, rated to limit current to 80 percent of the switch capacity. BMS shall be rated for a minimum lifetime of one million operations. House the BMS components in nonferrous enclosure materials.

(b) Surface mount BMS: House components used in outdoor applications in weatherproof enclosures. Switch mechanism shall be internally adjustable so the operating gap between faces of the switch housing and the magnet housing may be adjusted from 6 to [13] [50] mm 1/4 to [1/2] [2] inch[es] to accommodate installation variances. Surface mount BMS housing for the switch element shall have the capability to receive threaded conduit. Housing cover for surface mounted BMS, if made of cast aluminum, shall be secured by stainless steel screws. Magnet housing cover shall not be readily removable. Protect BMS housing from unauthorized access by a cover operated, corrosion-resistant tamper device. Device shall initiate an alarm when cover is opened as little as 3 mm 1/8 inch and shall be inaccessible until actuated. As an alternative, BMS shall consist of [three] [four] preadjusted reed switches and three preadjusted magnets. Field adjustments in the fixed space between magnet and switch housing shall not be possible. Attempts to adjust or disturb the magnetic field shall cause a tamper alarm. [Conductors running from the door to alarm circuits shall be jumpered within a flexible armored cord constructed from corrosion-resistant metal. Each end of the armored cord shall terminate in a junction box or other enclosure. Armored cord ends shall be mechanically secured to the junction boxes by clamps or bushings. Conductors within the armored cord shall be provided with lug terminals at each end. Jumpered conductors and the armored cord shall experience no mechanical strain as the door is removed from fully open to closed. Switch circuit shall initiate an alarm if a short circuit is applied to the door cord.]

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**NOTE: Regarding the text below, show a junction box above each door so that slack in conductors serving switches cannot be accessed when switch mounting screws are removed. If building construction does not permit junction box location above doors, specify switches to be epoxy glued in place after preliminary testing.**

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(c) Recessed BMS: The recessed BMS shall consist of [two] [three] preadjusted reed switches and [two] [three] preadjusted magnets. Field adjustments in the fixed space between magnet and switch housing shall not be possible. Attempts to adjust or

disturb the magnetic field shall cause a tamper alarm. [Ball bearing door trips shall be mounted within vault door headers such that when the locking mechanism is secured, the door bolt engages an actuator, mechanically closing the switch. Door bolt locking mechanism shall be completely engaged before the ball bearing door trip is activated. Provide circuit jumpers from the door.]

(2) Glass breakage detection

(a) Breakwire sensors: Sensors shall consist of fine wire embedded in or affixed to interior of glazing. Breakage of protected glazing shall result in wire breakage. Wire shall be hard-drawn copper and not exceed 26 AWG diameter. If affixed to glazing, protect sensor wire by a clear coating which shall not inhibit sensor functioning. Sensor shall be terminated in insulated connectors which are [concealed] [tamper protected].

(b) Glass breakage sensors: Sensors shall detect window breakage by responding to sonic or vibration frequencies that accompany breaking glass. Sensors shall selectively filter input to minimize false alarms. Sensors shall be contained in a fire-resistant ABS plastic housing and shall be mounted in contact with the window. Glass breakage sensors shall initiate alarm when glass they protect is cracked or broken. Sensing shall be accomplished through the use of a mechanical filtered piezoelectric element. Sensor shall have a sensitivity adjustment controlling output voltage from the piezoelectric element which triggers a solid-state latching device. Provide sensor with an LED for adjusting sensitivity. Supply sensor with a two-sided polyurethane tape with acrylic adhesive. Provide sensor with an exterior label to protect tape from direct sunlight. Sensor shall not initiate alarm in response to seismic vibrations or other ambient stimuli. [Test glass breakage sensors by using test units supplied by the manufacturer which simulate glass breakage.]

(c) Screening: Construct security screens from a maximum of 26 AWG insulated hard-drawn copper. Connect screens to an alarm circuitry by means of flexible armored cords. Security screen circuitry shall provide end-of-line resistors in series or equivalent methods ensuring alarm activation if short-circuiting of the screen is attempted. [If screen corners are not installed as a breakwire sensor (wire traps), provide tamper switches. Provide tamper switches in the frames as required with not less than one switch on each side if dimensions are 610 mm 2 feet square or less, and two switches if dimensions exceed 610 mm 2 feet square. Tamper switches shall be corrosion-resistant, spring-operated, and shall initiate an alarm with a movement of 50 mm 2 inches or less before access to the switch is possible. Electrical characteristics of the switch shall match the alarm system requirements.]

b. Object Protection

(1) Capacitance proximity sensor: Sensor shall consist of two solid-state synchronous oscillators, a reference oscillator, and a detecting oscillator. Detecting oscillator shall be electrically connected to the sensing wire (antenna) circuitry, such that capacitance of antenna circuitry determines frequency and phase of oscillation. If an intruder approaches protected objects,

oscillator shall detune with respect to the reference oscillator, initiating an alarm. System shall provide means of indicating an alarm condition at protected objects during installation and calibration. Provide indicator with a disabling device within a tamperproof enclosure. The number of objects protected by a single capacitance detector shall not exceed the unit's maximum capacitance at the desired sensitivity. Protected objects shall be insulated from ground by insulating pads which shall have a dielectric constant such as glass or thermoplastic materials. [If screen grids or radiators are employed as antennas, they shall be insulated from ground. Wires used for grid shall be larger than No. 14 AWG, 30 percent copper-clad steel covered with a minimum of 0.794 mm 1/32-inch vinyl coating. Space grid elements at 150 mm 6 inches maximum, and construct in a symmetrical manner.] Provide sensor with sensitivity controls inaccessible to operating personnel. Sensor shall be insensitive to human body movements in excess of 915 mm 36 inches from the antenna circuit. Sensor sensitivity to alarm-producing stimuli shall be readily adjustable from contact to 915 mm 36 inches with a heavily gloved hand. Sensor shall not initiate nuisance alarms in response to normal ambient conditions. [Provide sensors with tamper switches. Constantly supervise interconnecting lines and tamper switches even when system is set for authorized access.] Sensor shall not reset upon restoration of SECURE mode if antennas were altered during authorized entry to disable detection capability.

c. Floor, wall, and ceiling protection

(1) Vibration sensors: Sensors shall sense and selectively amplify signals generated by forced penetration of a protective structure. Sensors shall initiate alarms upon detecting drilling, cutting, or blasting through walls, or other methods of forced entry through a structure. Mount vibration sensors directly contacting the surface to be protected. Sensors shall be designed to give peak response to structurally conveyed vibrations associated with forcible attack on the protected surface. Provide at least one sensor on each monolithic slab or wall section, even though spacing closer than that required for midrange sensitivity may result. House sensors in protective mountings and fasten to surface with concealed mounting screws or an epoxy. [Provide sensors with tamper switches.] Removal of a sensor from the surface shall initiate an alarm. An adjustable alarm discriminator shall function to prevent incidental vibrations which may occur from triggering the alarm circuit. Adjust discriminator on the job to precise needs of application. Connect sensors to an electronic control unit by means of wiring or fiber optics cable run in [rigid steel conduit] [electrical metallic tubing (EMT)]. Sensor sensitivity shall be individually adjustable unless sensor is designed to accommodate vibration ranges of specific surface type on which it will be mounted. Sensitivity adjustments shall not be accessible without removing the sensor cover. Sensor shall not be responsive to airborne sound.

(2) Gridwire sensors: Provide strands of hard-drawn copper wire stapled to a wall, door, or ceiling and attached to a terminal strip enclosure. Enclosure shall be tamper switch-protected both on the cover and with a pry-off tamper switch on rear of enclosure. When correctly arranged, installed, and connected into

an electrically supervised detector circuit, cutting, breaking, or grounding of gridwire shall initiate an alarm. Install gridwire in a pattern of 100 mm 4 inches on center over a wall, door, or ceiling area generally not exceeding 1200 by 2400 mm 4 by 8 feet in dimensions, for each terminal strip. Cover grid pattern by a cosmetic material such as paneling. Hard-drawn gridwire used in fabricating security sensors shall not exceed 17.8 N 4 pounds tensile strength and shall be capable of carrying a current of 60 milliamperes at 60 volts with a temperature rise of not more than one degree C 2 degrees F. Wire shall not be larger than 26 AWG.

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**NOTE:** Utility inlet openings are protected in a variety of methods, the correct one being dependent on two variables: the nature of the intrusion threat (i.e., physical penetration, electrical, electro-optical, etc.) and the characteristics of the utility inlet opening (i.e., discharge water from a nuclear plant, office air duct, electric conduit, etc.). Subsequent to such analysis, almost any of the intrusion detection sensors described herein could provide the necessary protection. Normally a breakwire trap sensor is used for this application.

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(3) Protection of utility inlet openings: Provide protection by a sensor of the [breakwire] [wire trap] type consisting of up to 26 AWG hard-drawn copper wire with a tensile strength of 17.8 N 4 pounds maximum interlaced throughout the opening such that no opening between wires shall be larger than 100 mm 4 inches on center. Terminate sensor so that attempts to cut the wire or otherwise enlarge openings between wires shall cause an alarm. Sensor termination shall be [concealed] [tamper protected].

#### 2.4.14.2 Interior Volumetric Sensors

- a. Passive infrared sensors: Sensors shall detect intruder presence by monitoring the level of infrared energy emitted by objects within a protected zone. Sensor shall initiate an alarm upon observing increased or fluctuating infrared energy caused by the presence and motion of an intruder whose temperature is as little as 1 1/2 degrees C 3 degrees F different from the background temperature. Sensor shall be passive in nature; no transmitted energy shall be required for detection. Sensor shall be sensitive to infrared energy emitted at wavelengths corresponding to human body and other objects at ambient temperatures. Sensor detection pattern shall be 3.14 rad 180 degrees for volumetric units, unless otherwise indicated [, and shall be housed in a tamper-alarmed enclosure]. Sensor shall provide some means of indicating an alarm condition during installation and calibration. A means of disabling the indication shall be provided within the sensor enclosure. Sensor shall alarm when an intruder moves within the area of protection more than 1500 mm 5 feet at a velocity of 30 mm 0.1 foot per second, and one step per second, assuming 150 mm 6 inchesper step. Detection sensitivity shall be irrespective of direction of motion. Sensor shall also alarm at velocities faster than 30 mm 0.1 foot per second, up to 3000 mm 10 feetper second. Sensor maximum detection range shall be [a minimum of 10.6 meters

35 feet] [as indicated]. Sensor shall not alarm in response to general area thermal variations.

- b. Dual technology sensors: Provide sensor combining passive infrared and microwave sensors designed and manufactured specifically to be mounted in a single enclosure.

(1) Passive infrared (PIR) sensor section: Sensor shall detect intruder presence by monitoring the level of infrared energy emitted by objects within a protected zone. Sensor shall initiate an alarm upon observing increased or fluctuating infrared energy caused by the presence and motion of an intruder whose temperature is as little as 1.5 degrees C 3 degrees F different from the background temperature. Sensor shall be passive in nature; no transmitting energy shall be required for detection. Sensor shall be sensitive to infrared energy emitted at wavelengths corresponding to human body or other objects at ambient temperatures. Sensor detection pattern shall be 3.14 rad 180 degrees for volumetric units, unless otherwise indicated.

(2) Microwave sensor section: Sensor shall detect intruder presence by transmitting electromagnetic energy into a protected zone, receiving the direct and reflected energy, and monitoring the frequency shift between transmitted and received signals. If more than one device is used in an area, devices shall operate on different frequencies. Provide for selective filtering by sensor to minimize nuisance alarms due to moving metal objects such as fan blades and venetian blinds, interference from radar, or other sources of electronic interference. Transceivers shall consist of a combined transmit/receive antenna and an adjustable-gain preamplifier in a single housing. Provide transceivers with sensitivity adjustments. Transceiver controls shall permit adjustment of transmission range and alarm signal threshold. Sensitivity controls shall be inaccessible to operating personnel. Sensitivity requirements shall be met with sensitivity controls set approximately at midrange.

(3) Additional dual technology sensor requirements: Enclosure containing the two sensor sections shall be tamper alarmed. Both the microwave and PIR sections shall activate simultaneously to generate an alarm. Only an intrusion characterized by volumetric motion and radiant body heat shall be detected. Sensor shall provide a means of indicating an alarm condition during installation and calibration. A means of disabling the indication shall be provided within the sensor enclosure. Sensor shall alarm when an intruder moves within the area of protection more than 1500 mm 5 feet at a velocity of 30 mm 0.1 foot per second, and one step per second, assuming 150 mm 6 inches per step. Detection sensitivity shall be irrespective of direction of motion. Sensor shall also alarm at velocities faster than 30 mm 0.1 foot per second, up to 3000 mm 10 feet per second. Sensor shall not alarm in response to general area thermal variations. Mount sensors [near ceiling on vibration-free surfaces] [as indicated]. Electronic circuitry shall be solid state and mounted on printed circuit boards. Sensor elements shall contain circuitry for transmitter drive, signal processing, tamper circuitry, and power supplies. Circuitry shall provide an alarm relay with Form C contacts capable of carrying 2 amperes at 100 volts dc minimum.

- c. Ultrasonic sensors: Sensors shall detect intruder presence by transmitting ultrasonic energy into a protected zone, receiving the direct and reflected energy, and monitoring frequency shift between transmitted and received signals. Ultrasonic energy shall be above 24 kHz and below 30 kHz (nominally 26 kHz). Sensor shall provide for selective filtering to minimize nuisance alarms due to external sources of ultrasonic energy. Sensor shall automatically adapt to changing levels of air turbulence and shall consist of a control unit and as many transceivers as required to protect a zone within limitations of the control unit. Ultrasonic system shall provide a means of indicating an alarm condition at the protected zone during installation and calibration. This indication shall be provided with a disabling device within sensor enclosure. Transceivers shall consist of an adjustable-gain preamplifier, an ultrasonic-to-electrical transducer, and an electrical-to-ultrasonic transducer in a single enclosure. Transducers shall be adjustable in position to allow adequate adjustment and directivity. Each transceiver shall be capable of protecting a rectangular volume approximately 6 by 9.2 meters 20 by 30 feet in a zone with an 2440 to 3660 mm 8 to 12 foot ceiling. Maximum peak power output of transmitter shall not exceed 105 dB sound pressure level (SPL) at 900 mm 3 feet or greater range. Transceiver zones shall overlap slightly; particular care shall be taken to ensure adequate sensitivity in area abundant in acoustic-absorbing materials such as carpets and drapes. When the protected zone is broken up by furniture or large objects, it shall not be possible to traverse the zone undetected by moving the blind zones created by the objects. Provide each sensor with sensitivity adjustments. Controls shall be inaccessible to operating personnel. Sensitivity requirements shall be met with sensitivity controls set approximately at midrange. System shall alarm if an intruder moves within the area of protection more than 1500 mm 5 feet at a velocity of 150 mm 0.5 foot per second to 4570 mm 15 feet per second. Sensitivity shall be irrespective of direction of motion. System shall also alarm at velocities higher than 150 mm 0.5 foot per second, up to 2440 mm 8 feet per second. Sensor elements shall be [installed to be self-protecting] [and] [housed in a tamper-alarmed enclosure].
- d. Microwave sensors: Sensors shall detect intruder presence by transmitting electromagnetic energy into a protected zone, receiving direct and reflected energy, and monitoring frequency shift between transmitted and received signals. When more than one device is used in an area, devices shall operate on different frequencies. Provide for selective filtering by the sensor to minimize nuisance alarms due to moving metal objects such as fan blades, and venetian blinds, interference from radar, or other sources of electronic interference. Provide a means of indicating an alarm condition on the sensor at the protected zone during installation and calibration. Provide an indicator disabling device within sensor enclosure. Transceivers shall consist of a transmitting antenna and a receiving antenna, or a combined transmit/receive antenna, and an adjustable-gain preamplifier in a single housing. Provide transceivers with sensitivity adjustments. Transceiver controls shall permit adjustment of transmission range and alarm signal threshold. Sensitivity controls shall be inaccessible to operating personnel. Sensitivity requirements shall be met with sensitivity controls



set approximately at midrange. System shall alarm when an intruder moves within the area of protection more than 1500 mm 5 feet at a velocity of 30 mm 0.1 foot per second and one step per second, assuming 150 mm 6 inches per step. Sensitivity shall be irrespective of direction of motion. Sensor shall be [installed to be self-protecting] [housed in a tamper-alarmed enclosure]. The number of transceivers chosen shall be adequate to completely cover the protected zone. In the event that dead spots cannot be overcome by adding sensors, the use of a different type sensor shall be employed. Power output from each transceiver shall be minimum level required for stable operation and adequate sensitivity. Maximum power density radiated from transmitters shall not exceed 0.2 mW per square centimeter at 30 meters 100 feet. Frequency of emissions and allowable power densities for each shall be governed by FCC 47 CFR 15. Mount transmitters near ceiling on vibration-free surfaces. Electronic circuitry shall be solid state, mounted on printed circuit boards. Sensor elements shall contain circuitry for transmitter drive, signal processing [, tamper circuitry,] and power supplies. Circuitry shall provide an alarm relay with contacts capable of carrying 2 amperes at 120 volts ac minimum.

- e. Audio sensors: Sensors shall consist of microphones which detect audio information and transmit signals to an audio amplifier in a central control unit. Multiple units may be connected to a central control unit. Audio sensors shall be designed to be especially sensitive to generic audio intrusion signature of [breaking glass] [splintering wood] [fracturing of cement block] [normal voice conversation]. Sensors shall have sensitivity adjustments which shall be inaccessible to operating personnel. Sensitivity adjustment shall permit operating ranges up to a maximum of [465] [\_\_\_\_\_] square meters [5000] [\_\_\_\_\_] square feet. Sensors shall have a detection sensitivity of [unidirectional design] [omnidirectional design]. [Audio assessment capability shall be provided.] Sensors shall be capable of installation in a concealed configuration and shall be inherently self-protecting.
- f. Photoelectric sensors: Sensors shall detect intruder presence by establishing a series of infrared or ultraviolet beams and detecting beam disruptions. Beam transmitters shall be designed to emit [no perceptible] light. Beam may be reflected by one or more mirrors before being received and amplified. Disruption of the beam by an opaque body shall initiate an alarm. Transmitted beam shall be uniquely modulated to prohibit an intruder from shining another light source into the receiver to escape detection. Provide a means of local alarm indication on the sensor for use at the protected zone during installation and calibration. Provide with an indicator disabling device within the sensor enclosure. Sensor shall consist of modulating transmitter, focusing lenses, mirrors, demodulating receiver, power supply, and interconnecting lines. House elements in tamper-alarmed enclosure. Receiver unit shall provide an alarm relay with contacts capable of carrying 2 amperes at 120 volts ac minimum. Protective beam shall be focused in a straight line. Installed beam distance from transmitter to receiver shall not exceed 80 percent of the manufacturer's maximum recommended rating. Mirrors may be used to extend the beam or to establish a network of beams. Each mirror used shall derate the maximum system range by no more than 50 percent. Mirrors and photoelectric sources used in

outdoor applications shall have self-heating capability to eliminate condensation and shall be housed in weatherproof enclosures. System shall utilize automatic gain control or be provided with sensitivity adjustments to allow for various beam lengths. Controls shall be inaccessible to operating personnel. With controls set at approximately midrange, system shall initiate an alarm when the beam is interrupted. Test system by walking through the beam. Systems that use multiple beams to establish a fence shall be tested by attempting to crawl under and jump through and over beams. Systems shall provide cutoffs of at least [90] [\_\_\_\_\_] percent to handle a high percentage of light cutoff prior to initiating an alarm.

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**NOTE: At the text below, the number of pixels digitized depends on the application. The designer should consider cost effectiveness as a factor since digitizing a large number of pixels could increase cost by a magnitude of 500 percent with little additional actual detection capability for a specific application.**

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- g. CCTV motion detection sensors: Sensors shall accept video signals from CCTV cameras as described in SMPTE 170M. Sensors shall automatically monitor and process information from each camera in succession in such a manner that it detects motion within the camera's field of view and provides automatic visual, remote alarms, and motion-artifacts as a result of detected motion. When synchronizing is required, it shall be composite sync in accordance with SMPTE 170M. Sensor processor shall detect motion by digitizing [\_\_\_\_\_] pixels within each video scene and comparing the gray scale of the pixels to a previously stored reference. An alarm shall be initiated when the comparison varies by 6 percent or more. Rate of scanning shall be [not less than one sample per second] [adjustable]. Processor camera capacity shall be modularly expandable and shall be a minimum of [\_\_\_\_\_] . Composite sync connectors shall be compatible with other equipment in the CCTV system. Video output shall automatically produce a display which will show the individual alarming camera and the [point] [area] where intrusion has occurred. The view of each camera shall be manually selectable. [Point masking shall be provided to allow exclusion of areas in constant movement.] Alarm areas on each channel shall be individually controllable. Required sensor power shall be 105 to 130 volts ac.

#### 2.4.14.3 Exterior Fence Sensors

- a. Electromechanical fence sensors: Sensors shall detect human presence by sensing mechanical vibrations or motion associated with an intruder scaling, cutting through a standard security chain link fence, or attempting to lift the fence fabric. Sensor shall fully protect fence installation. Dead zones shall not exist where an intruder can scale the fence or cut through the fence without detection. Length of fence protected shall be divided into [100 meter] [\_\_\_\_\_] zones. Sensors shall consist of individually electromechanical sensing units mounted every 3045 mm 10 feet on the fence [fabric] [posts] and shall be wired in series to a sensor zone control unit and associated power supply. Sensor

zone control unit shall alarm when a sufficient number of sensing unit activations are sensed within a specified time period. Alarm threshold shall be field adjustable by zone and shall [in combination with adjustments to individual sensing units] permit compensation for winds up to [40] [56] [\_\_\_\_\_] km/h [25] [35] [\_\_\_\_\_] mph without increased nuisance alarms while maintaining specified sensor performance. With sensitivity controls set at approximately midrange, sensor shall alarm when an intruder attempts to scale the fence or to climb undetected in areas of reduced sensitivity, such as around poles and rigid supports. Sensor shall alarm for attempted fence liftings or scalings, including scalings assisted by climbing aids leaned against the fence. Sensors shall allow gradual changes in fence position, due to expansion, settling, and aging, without increased numbers of nuisance alarms. Sensors shall be either tamper alarmed or self-protecting. Exterior components shall be housed in rugged, corrosion-resistant enclosures, protected from environmental degradation. Provide sensor zone control unit housings with tamper alarms. Fence cable support hardware shall be weather-resistant. Interfacing between sensor zones and alarm annunciators shall be carried in underground cables.

- b. Strain-sensitive cable sensors: Sensors shall detect movement on a standard security chain link fence associated with an intruder scaling, cutting through, or attempting to lift the fence fabric. Entire sensor system, including sensor zone electronics, shall be capable of mounting directly on the fence and exposed to the same environmental conditions as the fence. Length of fence protected shall have no dead zones where an intruder can penetrate the fence, and through sensor electronics, shall be divided into [100 meter] [\_\_\_\_\_] zones. Sensing unit of sensor shall consist of transducer cable capable of achieving specified performance either by attachment directly to the fence fabric by plastic cable every 300 to 455 mm 12 to 18 inches or by installation inside EMT conduit mounted on the fence. Sensing unit shall have equal adjustable sensitivity throughout the entire length. To permit installation in extreme EMI environments with no loss of detection capability, only conventional waterproof coaxial cable connectors shall be used for connections of the sensing unit. Entire sensor system shall be capable of detecting tampering within each portion of the system by sensor zone. Sensor zone electronic circuitry shall provide capability for alarm threshold sensitivity adjustment to permit compensation by zone for winds up to [40] [56] [\_\_\_\_\_] km/h [25] [35] [\_\_\_\_\_] mph while maintaining the same level of detection performance as under ambient conditions. Sensor zone control unit shall provide an analog audio output for interface to an external audio amplifier to permit remote audio assessment regardless of sensor alarm status. Sensor zone control unit alarm output interface shall be a separately supervised relay contact normally open or normally closed, with [an adjustable intrusion alarm pulse width of 0.5 second adjustable and a] continuous (until corrected) tamper alarm.
- c. Electrostatic field sensors: Sensors shall initiate an alarm when an intruder attempts to approach or scale a fence or physical barrier. Electrostatic field sensors shall detect human presence by generating an electric field around one or more horizontal wires and sensing the induced signal in parallel sensing wires. Sensor shall monitor the induced signal for changes that result

from the presence of a conductive body, or a body with a high dielectric constant such as the human body, which distorts coupling between transmitting and sensor wires. Sensor components shall consist of one or more signal generator field wires and mounting hardware, sensing wires, an amplifier/signal processor, power supplies, and necessary circuitry hardware. Mounting and support hardware shall be provided by the equipment manufacturer. Wires shall be spring tension-mounted and provided with end-of-line terminators to detect cutting, shorting, or breaking of the wires. Sensor configuration shall be selected such that an intruder cannot crawl under the bottom wire, through the wires, or over the top wire without being detected and shall be divided into sensor zones. Sensors shall be capable of following irregular contours and barrier bends without degrading sensitivity below the specified detection level. In no case shall a single sensor zone exceed 100 meters or be long enough to significantly degrade sensitivity. Adjacent zones shall provide continuous coverage to avoid a dead zone. Adjacent zones shall be designed to prevent crosstalk interference. Signal processing circuitry shall provide filtering to distinguish nuisance alarms. Sensor configuration shall incorporate balanced, opposed field construction to eliminate far field noise. Exterior components shall be housed in rugged corrosion-resistant enclosures, protected from environmental degradation. Provide housing with tamper switches. Interfacing between exterior units shall be carried in underground cables. Exterior support hardware shall be stainless or galvanized to avoid tension degradation in the physical support system. Sense and field wires shall be stainless steel. Wire spacing for various configurations shall follow manufacturer's specifications. Spacing of wires shall be maintained constant throughout each zone and shall be uniform with respect to the ground. Signal processing equipment shall be separately mounted such that no desensitized zones are created within the zone of detection. Sensor sensitivity shall be adjustable. Adjustment controls shall be inaccessible to operating personnel. With system sensitivity controls set at approximately midrange, system shall alarm when an intruder is within 915 mm 3 feet of a wire. Sensitivity shall be irrespective of direction of motion, or velocity in the range of 30 mm to 3000 mm 0.1 foot to 10 feet per second. Sensor shall detect intruder attempts to cross potential dead zones, such as between adjacent zones or in the vicinity of posts with the minimum specified performance or better. Sensor shall provide some means of indicating an alarm at the protected perimeter to facilitate installation and calibration. Provide an indicator disabling device within a tamperproof enclosure. Power required shall be 120 volts ac.

- d. Taut-wire sensors: Sensors shall consist of a perimeter intrusion detection sensor incorporated into a barbed wire security fence. Intrusion detection shall be achieved by cutting of any single wire or the deflecting, as by climbing, of any wire by more than [\_\_\_\_]. Sensor zone shall include one or more [61] [\_\_\_\_] meters [200] [\_\_\_\_] foot maximum sections of [2100] [\_\_\_\_] mm [7] [\_\_\_\_] foot high parallel fence with each sector consisting of [13] [\_\_\_\_] horizontal barbed wires attached to the taut-wire fence posts, and three strands as outriggers, plus an "antiladder" trip wire supported by rods extending from the outriggers for a total vertical height of approximately [2440] [\_\_\_\_] mm [8] [\_\_\_\_] feet. Displacement switches for each horizontal wire

shall be mounted within a prewired channel fastened to the fabric fence post at the midpoint of each section. Outrigger barbed wire and tripwire may share the same switch. Each taut-wire fence post shall mount to the normal security fence (chain link) fabric posts or other barrier via standoffs to position the taut-wire approximately 150 mm 6 inches from the fence fabric or other barrier. Mount freestanding taut-wire fence posts in concrete to support the taut-wire fence system. Each barbed wire strand shall be pretensioned and clamped to the lever arm of the displacement switch, such that the lever is in the neutral (off) position; therefore, the forces applied by the barbed wires are balanced equal in opposite directions. Tripwire shall be pretensioned in a like manner. Tripwire shall be linked to the top switch in the sensor switch channel by a special subassembly that includes a rod which shall serve as a lever to transfer movement of the tripwire to the end of the actuating lever arm of the sensor switch. Abnormal displacement of a switch lever resulting from cutting or deflecting its attached wire, as by climbing on or through fence strands, shall initiate an alarm condition. Damping mechanism in the sensor shall reduce alarm threshold due to slowly changing phenomena such as ground shifting, daily and seasonal temperature variations, and winds up to 56 km/h 35 mph. Sensor switch shall provide electrical contact closure as the means for initiating an alarm condition, whenever the wire clamped to the vertical center bolt is pulled laterally in any direction by an amount not over 19 mm 0.75 inch. Housing for switch assembly shall be covered by a neoprene cap to retain the center bolt (lever arm), which functions as a lever to translate movement of the attached horizontal wire into contact closure. When the neoprene cap is firmly seated on the cup-shaped polycarbonate housing, it shall function as the fulcrum for the lever (bolt). Upper exposed end of the lever shall be threaded to accommodate clamping to the horizontal wire. The lower end of the lever, which is fashioned to serve as the movable electrical contact, shall be held suspended in a small cup-shaped contact that floats in a plastic putty material. The plastic putty shall retain a degree of elasticity under varying temperature conditions and provide the sensor switch with a self-adjusting property. This provides the switch with a built-in compensating mechanism that ignores small, very slow changes in lever alignment (which may result from environmental changes such as extreme temperature variations and ground creepage due to weather conditions) and to react to fast changes only, as caused by manual deflection or cutting of the wires. Provide metal slider strips having slots through which the barbed wires pass. Wires shall be prevented from leaving the slots by rivets. Purpose of the slider strip shall be to translate forces normal to the barbed wire to a horizontal displacement of the sensor. Install one slider strip pair, upper and lower, on every fence post except where sensor posts or anchor strips are installed. Separation between slider elements along the fence shall be [3000] [\_\_\_\_\_] mm [10] [\_\_\_\_\_] feet. Attach barbed wires of sensor to existing specially installed fence posts, called anchor posts, located equidistant on both sides of sensor posts and at ends of sensor zone run. Anchor strip shall be a strip of steel plate on which are installed fastening plates. Weld strip or otherwise attach the strip to anchor post and ends of tensed barbed wires wrapped around the fastening plates. Attempts to climb on fastening plates or on the attached barbed wires shall cause plates to break off, creating an alarm and

making it impossible to defeat the system by climbing at the anchor post. Barbed wire used in the system shall be suitable for installation under a preload tension of approximately 392 N 88 pounds and be flexible enough for convenient manipulation during tensioning. Double-strand 15 1/2-gage barbed wire shall be the minimum acceptable. Sensor zone control unit shall monitor up to [10] [\_\_\_\_\_] zones. Provide relay outputs to interface alarm outputs with the overall IDS. Input power requirements shall be 120/208 volts ac.

- e. Gate units: Provide in accordance with specific fence sensor manufacturer's recommendations to ensure continuous fence sensor zone protection for the entire protected perimeter. Provide gate unit for each fence portal. When gate units are not provided by the fence sensor manufacturer, provide separately zoned BMS gate sensors. Sensors shall perform as specified in paragraph entitled "Balanced Magnetic Switches (BMS)." In addition, for a double gate, since both BMS elements must be mounted on the gate, electrical connection shall be jumpered within a flexible armored cord constructed from corrosion-resistant metal. Each end of the armored cord shall terminate in a junction box or other enclosure. Secure armored cord ends mechanically to the junction boxes by clamps or bushings. Provide conductors within the armored cord with lug terminals at each end. Jumpered conductors and the armored cord shall experience no mechanical strain as gate is moved from fully open to closed.
- f. Barrier protection: Provide for exterior facility barriers other than fences by the employment of [electrostatic field sensors] [taut-wire sensors] [mounted on the barrier] [in a stand-alone configuration]. Divide the facility barrier perimeter sensor length electronically into [100-meter] [four] [\_\_\_\_\_] zones. Install sensors [on the exterior side of the barrier] [and] [as recommended by the manufacturer]. Sensors shall be as specified in the paragraph entitled ["Electrostatic Field Sensors"] ["Taut-Wire Sensors"].

#### 2.4.14.4 Duress Alarms

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- a. Hardwire duress alarms: Provide at points within the protected area as indicated. Alarms shall be capable of being secretly activated by the foot or hand of an average adult in both standing and seated positions. Alarms shall not be visible or audible from the sensor. Alarm signal shall lock-in upon activation until manually reset with a key or similar device and shall be readily identifiable by the IDS. Sensors shall be easy to operate and designed to minimize the possibility of accidental activation. Hardwire duress alarms shall be rated for a minimum lifetime of 50,000 operations. Securely mount sensors in rugged, corrosion-resistant housing.
- b. Radio frequency duress alarms: Duress alarms shall consist of a compact and lightweight transmitter enclosed in a case that can be easily worn at the waist on a belt. Each transmitter shall have a unique identification code. The transmitter shall be capable of transmitting 2 watts of RF power. Each transmitter shall transmit up to [500] [\_\_\_\_\_] times on the power provided by internal

batteries. A small, flexible PVC-encased antenna shall be mounted 10 mm 1/2 inch away from the transmitter to ensure reliable propagation of the alarm signal and rotation of 6.28 rad 360 degrees without damage to the sensor. Provide a case to prevent corrosion in hostile environments. Transmitter shall be available in both the very high frequency (VHF) and ultrahigh frequency (UHF) radio bands. The transmitter shall be FM modulated to ensure reception and decoding of the alarm signal. Signal transmitted shall readily interface with the IDS communications subsystem as specified in paragraph entitled "Radio Frequency Link." Activation of the sensor shall be by hand-operated switch protected from accidental activation, yet easily activated by hand when worn at the waist on a belt. [Sensor activation shall be automatic when mounted on a belt and the wearer is in a horizontal position for longer than [one] [5] [15] [\_\_\_\_\_] minutes, adjustable. Adjustment of time interval activation shall not be accessible to operations personnel.]

#### 2.4.15 Basic Automated Access Control

Provide basic automated access control subsystem based upon a modular distributed microprocessor architecture complete with access control cards and ready for operation. [Subsystem shall interface with and provide alarm and other status to the overall IDS.] [Subsystem shall provide monitoring and control for the IDS.] Subsystem shall meet the Grade [AA] [\_\_\_\_\_] communications requirements of UL 1076 and UL 294 and shall have the capability of controlling up to [32] [\_\_\_\_\_] card reader and keypad access control devices. Subsystem shall grant or deny access or exit based upon keypad identification data, card identification data, or a combination of both, input through the card reader and keypad access control devices compared to data stored within the system, as well as time of day and day of week. Decision to grant or deny access or exit shall be based upon authorization for such data to be input at a specific location for the current time period. [Access decisions for high security areas shall be based upon combination of card and keypad data.] When conditions are met, a signal shall be sent to the input device location to activate the appropriate electronic strike or release. Under normal operations, subsystem shall provide both a hard copy and a magnetic data record of valid transactions upon occurrence. Record shall include identification of the individual, location, and time of day. When access is denied, an alarm shall be initiated and subsystem shall provide a record of time, location, and reason for denial. Subsystem shall incorporate a provision for entering a special code to indicate duress from keypad data entry devices. Code shall cause duress alarm initiation while granting access, when other authorization criteria are met. Subsystem shall provide an interface to the IDS to enable identification of alarm type, location, and annunciation of access control subsystem alarms by the IDS. Subsystem communications shall be by dual independent multiplexed data communications channels. Subsystem power requirements shall be as specified in paragraph entitled "Electrical Power." Access control data bases shall be protected by UPS and backup batteries as specified in paragraph entitled "Backup Power."

##### 2.4.15.1 Error and Throughput Rates

Rates shall be portal to portal performance averages obtained when processing individuals one at a time. When serial verification techniques or multiple attempts are required to satisfy error performance requirements, features shall not reduce capability to meet throughput requirements. A Type I error denies access to an authorized enrolled

individual. A Type II error grants access to an unauthorized individual. Subsystem Type I and Type II error rates shall be both less than [0.1] [\_\_\_\_\_] percent. At the error rates, subsystem access throughput rate shall be minimum of [12] [\_\_\_\_\_] individuals per minute through one card reader and keypad access control device.

#### 2.4.15.2 Access Control Subsystem Central Processing

Provide serial management and control of subsystem. Provide a microprocessor control device designed to monitor and control units and up to [32] [\_\_\_\_\_] card reader and keypad access control devices. Central processor shall interrogate and receive responses from each control unit within 100 milliseconds. Failure to respond to an interrogation shall cause an alarm. Provide a printer with a minimum print rate of 30 characters per second to produce hard copy of subsystem events. Provide the central processor with an EIA ANSI/EIA/TIA-232-F interface port to communicate with the printer. Provide an operator interface to control system operating functions. Provide the central processor with a facility-tailorable data base for a minimum of [1000] [\_\_\_\_\_] card holders with by-name alphanumeric printout, and for automated [subsystem] [IDS] monitoring, management, and control functions. Provide enrollment equipment to process access control cards and enroll personnel into and disenroll personnel from the subsystem data base. Enrollment equipment shall not be accessible to IDS operations personnel. Provide a minimum of [150 percent of the number of card holders specified above] [\_\_\_\_\_] access control cards with the enrollment equipment. Provide system configuration controls and electronic diagnostic aids for subsystem setup and troubleshooting with the central processor. Components shall not be accessible to operations personnel. Central processor components shall be tamper alarmed.

#### 2.4.15.3 Access Control Subsystem Control Unit

Unit shall be microprocessor controlled with onboard data communication capability for full duplex communication to and from the subsystem central processor over either four wire continuous dc lines or voice grade telephone lines. Response to a central processor interrogation shall be within 100 milliseconds. In the event of a communication loss, control unit shall automatically convert to local control of the associated card reader and keypad access control devices and shall automatically revert to central control upon restoration of communications. Control unit shall be capable of control of up to four card reader and keypad access control devices, of controlling access based upon a minimum of [16] [\_\_\_\_\_] time zones, of monitoring associated portal status and associated IDS sensors, and of interfacing with the IDS for the purpose of communicating sensor alarms. Control unit shall provide associated electronic strike power and control and an electronic strike energize time adjustable from one to 30 seconds. The control unit shall contain critical circuitry for operation of the associated card reader and keypad access control devices and shall be located within the IDS-protected perimeter. Enclose control units in a tamper-alarmed enclosure. Control unit shall report as an alarm, by location, forced portal openings, portals held open over a predetermined period of time, reader tamper, illegal card use, tamper, power failure, and access or exit request denials. Control unit shall support paired card reader and keypad access control devices on a single portal for anti-passback functions. Provide electronic diagnostic aids within the control unit to aid in subsystem setup, maintenance, and troubleshooting.



#### 2.4.15.4 Card Reader and Keypad Access Control Devices

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**NOTE: Specify only one type of access control card.  
Be sure card type and card readers are compatible  
with each other.**

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Devices shall be tamper alarmed, tamper and vandal resistant, and solid state, containing no electronics which could compromise the access control subsystem should the subsystem be attacked. Devices shall be surface, semiflush, pedestal, or weatherproof mountable as specified for each individual location. [Each device shall contain a visual display, mounted on the face, to indicate access or exit request processing, request approval, and request denial.] Card readers shall be the [proximity] [insertion] [swipe-through] type and shall be capable of reading [magnetic stripe] [high coercivity magnetic stripe] [Wiegand] [Hollerith] [proximity] [\_\_\_\_\_] type access control cards. Keypads shall contain an integral 12-digit tactile keyboard with digits [arranged in numerical order] [scrambled for each access or exit request]. Keypad shall be [a stand-alone device] [or] [integrated into the card reader].

#### 2.4.15.5 Access Control Cards

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**NOTE: Determine the format, logo, and wording for  
the cards from the using activity before final  
design. A unique facility code may only be  
available with the purchase of 5000 cards or more.**

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Cards shall be manufactured with capability of modification and lamination during enrollment process without reduction of readability for use as a picture and identification badge. Cards shall contain binary coded data arranged in a scrambled pattern as a unique identification code stored on or within the card and of the type readable by the subsystem card readers. Include within the card binary data a nonduplicated unique facility access control subsystem identification code common to access control cards provided. [Cards shall be designed for use as a photo identification card suitable for lamination.]

#### 2.4.16 Communications

Communications shall link together subsystems of the IDS. IDS communications links shall be via hardwire (cable) [or radio frequency]. Communications links shall be supervised. Common communications interface devices shall be provided throughout the IDS. Sensor to control unit interface shall be by dry relay contact normally open or normally closed, except as specified otherwise. Control unit to central alarm reporting and display processor interface shall be digital, asynchronous, or multiplexed data. Individual data bits shall be grouped into word format and transmitted as coded messages. Interface shall be implemented by modems which function as a communications controller, perform data acquisition and distribution, buffering message handling, error checking, and signal regeneration as required to maintain communications.

##### 2.4.16.1 Link Supervision

- a. Hardwire direct current line supervision: Provide only for sensor

to control unit links which are within IDS protected area. Circuit shall be supervised by monitoring changes in the current that flows through the detection circuit and a terminating resistor of at least 2.2 kohms. Supervision circuitry shall initiate an alarm in response to opening, closing, shorting, or grounding of conductors by employing Class C, standard line security. Class C circuit supervisor units shall provide an alarm response in the annunciator in not more than one second as a result of the following changes in normal transmission line current:

(1) Five percent or more in normal line signal when it consists of direct current from 0.5 through 30 milliamperes.

(2) Ten percent or more in normal line signal when it consists of direct current from 10 microamperes to 0.5 milliampere.

(3) Five percent or more of an element or elements of a complex signal upon which security integrity of the system is dependent. This tolerance will be applied for frequencies up to 100 Hz.

(4) Fifteen percent or more of an element or elements of a complex signal upon which the security integrity of the system is dependent. This tolerance will be applicable for all frequencies above 100 Hz.

- b. Hardwire alternating current supervision: Supervision shall not be capable of compromise by use of resistance, voltage, or current substitution techniques. The method shall be employed on circuits which employ a tone modulated frequency-shift keying (FSK), interrogate-and-reply communications method. Supervisory circuit shall be immune to transmission line noise, crosstalk, and transients. Detection circuit shall be terminated by a complex impedance. Supervision of the line shall be maintained by monitoring current amplitude and phase. Complex impedance shall be sized so that current leads or lags the driving voltage by 0.785 plus or minus 0.087 rad 45 plus or minus 5 degrees. For supervision currents of 0.5 to 30 milliamperes root mean square (rms), an alarm shall result when rms current changes by more than 5 percent, or phase changes by more than 0.087 rad 5 degrees. For lines with supervision currents of 0.01 to 0.5 milliampere, an alarm shall result when rms current changes by more than 10 percent, or phase changes by more than 0.139 rad 8 degrees. Identified line supervision alarm shall be communicated within one second of the alarm condition.
- c. Hardwire digital supervision: Modems at both ends of circuit shall exchange digital data to indicate secure or alarm condition at least every 2 seconds. For passive supervisory circuits, an alarm shall sound if data is missed for more than one second. Coding used for data shall not be decipherable by merely viewing data on an oscilloscope. For transponder schemes, supervisory circuit shall asynchronously transmit bursts of digital data. Data pattern shall be random in nature. Remote detectors shall receive data and encode a response based on a proprietary coding scheme. Each IDS shall have a unique encoding scheme; an industry-wide or vendor standard is not acceptable. Encoded response shall be transmitted back to supervisory circuit. Supervisory circuit shall compare the response to an anticipated

response. Failure of the detector to return a data burst, or return an incorrect response, shall initiate an alarm.

- d. RF link supervision: System shall consist of link supervision components which provide a line supervision alarm declaration at the annunciation end of the link in approximately 2 seconds after the system has verified a problem by repeating the same signal no less than nine times during a period of 30 seconds or less.

#### 2.4.16.2 Hardwire

- a. Hardwire shall utilize electrical conductor lines. Alarm electrical lines shall not rely on current path except for electrical wires; neutral conductors of electrical distribution systems shall not be used as signal transmitters. Conductors outside the protected area shall be [shielded cable] [buried] [[installed in rigid galvanized steel conduit.] [installed in electrical metallic tubing (EMT)] as specified in Section 16402 INTERIOR DISTRIBUTION SYSTEM]. Supervision circuitry 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 35 to 52 degrees C 30 to 125 degrees F. Ambient current levels chosen for line supervision shall be sufficient to detect tampering and shall be within the normal operating range of electrical components. Line supervision and tamper alarms shall be reported regardless of mode of operation. Provide hardwire links as specified in UL 1076 and Section 16402 INTERIOR DISTRIBUTION SYSTEM for interior applications with additions and modifications specified herein. Conductors shall be copper. Conductors for links which also carry ac voltage, shall be No. 12 AWG minimum; single conductors for low-voltage dc links shall be No. [14] [16] AWG minimum. Conductors shall be color coded. Conceal wiring in finished areas of new construction and wherever practical in existing construction if not otherwise precluded by the Government. Identify conductors within each enclosure where a tap, splice, or termination is made. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Connect sensors, control units, and communication devices so that removal will cause a tamper alarm to sound. Pigtail or "T" tap connections are not acceptable. Each conductor used for identical functions shall be distinctively color coded. Each circuit color code wire shall remain uniform throughout circuit.
- b. Communication link from sensor to control unit shall be by dedicated circuit. An alarm condition shall be indicated by the opening or closing of a relay contact. Analog signals shall be converted to digital values or a relay closure or opening within 76 meters 250 feet of the sensing point. Communications from control unit to central alarm reporting and display processor shall operate in a continuous interrogation and response mode, using time-multiplexed digital communications techniques at a data rate of [5.12] [10.24] [\_\_\_\_\_] kilobaud. Interrogation and response communications between the control unit and central processor shall be half-duplex, bidirectional on one dual twisted pair cable, one pair for interrogation, one for response, which may have one or more parallel branches. Individual control unit lines shall be 22 AWG or larger wire. Connect control wires in parallel to the hardwire link. Communications system shall

provide for connection of as many as [255] [\_\_\_\_\_] control units. When operating without line repeaters or other signal regenerating or amplifying devices, communication system shall maintain specified performance over a link length of 2287 meters 7500 feet.

When operating with signal-regenerating line repeaters, communications system shall maintain specified performance over a link length of 22 865 meters 75,000 feet. Control unit to central alarm reporting and display processor communications link shall also be capable of operating over a maximum of [two] [four] [\_\_\_\_\_] standard voice grade telephone leased or proprietary lines. Link shall be capable of operating half duplex over a Type 3002 data transmission pair and be capable of modular expansion. Telephone lines shall be provided by the Government. Coordinate and check out system operation. General characteristics and telephone line service shall be as follows:

- (1) Connections: Two- or four-wire
- (2) Impedance at 1000 Hz: 600 ohms
- (3) Transmitting level: 0 to 12 dBm
- (4) Transmitting level adjustment: 3 dB increments
- (5) Type: Data
- (6) Direction: Two-way alternate (half duplex)
- (7) Maximum speed: [1.2] [5.12] [10.24] [\_\_\_\_\_] kilobaud
- (8) Maximum loss at 1000 Hz: 33 dB.

- c. Video hardware links shall be as specified in paragraph entitled "Video Transmission."

#### 2.4.16.3 Radio Frequency Link

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NOTE: Radio frequency links may not be allowed on some Government facilities. Recommended usage for RF links is as backup to hardwire links or to a remote location lacking telephone lines. OPNAV Instruction 2400.20E requires that funds shall not be obligated for procurement of radio equipment until frequency allocation authority has been obtained. As soon as possible, but no later than schematic design, the designer shall contact the area radio frequency coordinator (usually the base radio officer) to determine the availability of radio frequencies and to ensure that the using activity submits a DD Form 1494, "Application for Frequency Allocation," for a Stage 1 ("Conceptual Development") allocation (see DD Form 1494 Preparation Guide). Stage 1 allocation authority (i.e., approval) must be obtained prior to advertisement of the contract.

The 138 to 150.8 MHz band is the preferred range since specific frequencies in this range are

reserved for DOD use. Frequencies in the 162 to 174 MHz and 450 to 470 MHz bands are shared with other users on a first-come, first-served basis. In order to avoid potential contract delays, the frequency assignment should be included in the specification when possible. For additional information, contact the base radio officer or the Naval Electromagnetic Spectrum Center at (202) 433-0689, OPNAVINST 2400.20E issued by OPNAV Code N60 (previously Code OP941), telephone (703) 695-7284.

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System shall be a full duplex supervised RF polling specifically designed for alarm data communications with components manufactured by one manufacturer. System shall operate in the VHF, 134 to 154 MHz band. System shall interface directly with IDS hardwire data link from control unit to central alarm reporting and display location and shall translate (reduce) the data rate for RF transmission, modulate and demodulate the data signal, and transmit and receive IDS data. Provide a factory-tested complete RF link which both automatically and upon operator command transmits a signal with a unique identification from the central alarm monitoring location to the control unit locations. Message receipt at control unit location shall be ignored by all units except the addressee. Unit with the correct address shall decode the interrogation signal and respond to the interrogation with the status of the reporting sensors. When the addressee fails to respond, reinterrogate. Failure to respond a second time shall cause a line supervision alarm. Remote units in the RF system shall be individually polled in turn. Polling response time and transmission data rate, data error rate, and equipment reliability shall ensure that overall IDS alarm annunciation time reliability and Ps is not degraded. Provide RF transmitters, receivers, or transceivers in sufficient quantities to meet specified requirements. RF link transmissions shall be on one or more of the frequencies within the specified band as required to meet specified requirements and shall neither interfere with other IDS components nor any facility electronic components. Provide transmitters which are in accordance with applicable requirements of 47 CFR 15. Message types and content shall be identical to those transmitted by other portions of the IDS data communications subsystem. IDS alarms sent by RF link shall not fail to be transmitted by the RF link due to event occurrence during "off air" periods. RF link shall provide message transmission priority in the following order:

- a. Intrusion alarms
- b. Tamper alarms
- c. Access denial alarms
- d. Other alarms on a first-in, first-out basis including loss of communication signal, fail-safe, low battery, and power loss.

Provide [omnidirectional, coaxial, half-wave dipole] [\_\_\_\_\_] antennas for alarm transmitters and transceivers with a driving point impedance to match transmission output. Antennas and antenna mounts shall be corrosion resistant and designed to withstand wind velocities of [160] [\_\_\_\_\_] km/h [100] [\_\_\_\_\_] mph and physical damage caused by vandalism. Antennas shall not be mounted to any portion of the facility fence or roofing system. Antennas shall be furnished by the same manufacturer as the rest of the RF link. Provide coaxial cable in lengths as required. Cable shall

use PL-type fittings or connectors, properly protected against moisture. Cables shall match output impedance of transmitters.

#### 2.4.17 Closed-Circuit Television (CCTV) System

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NOTE: Scene illumination shall be even across the field of view of the camera, with a maximum light to dark ratio of 8 to 1. Minimum illumination level shall be 11 lux one footcandle.  
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NOTE: For visual assessment of IDS alarms, specify the optimum number of monitors for the number of cameras required. It is difficult to view and respond to too many monitors. Typically, for six cameras or less, use one monitor per camera. For a larger number of cameras, consider sequential switchers, four quadrant multiplexers, or a combination of both.  
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Provide CCTV components to provide visual assessment of IDS alarms. Subsystem shall continuously view remote areas with video cameras and display the areas automatically upon IDS alarm, or upon operator selection. Provide the number of alarm monitors indicated. Video switcher shall be capable of automatic and manual operation. Alarm monitors shall display alarm areas only when an alarm condition exists. In systems where monitors may display more than one camera scene, provide on-screen camera identification. Subsystem shall be composed of components which are integrated to provide a quality video system. The scene from each camera shall appear clear, crisp, and stable on the respective monitor during both daytime and nighttime operation. Horizontal resolution shall reflect quality video components, and system shall have a minimum of 5 MHz bandwidth. Component equipment shall minimize both preventive and corrective maintenance. Components shall be compatible with other components and with system as a whole and shall, to the greatest extent possible, be supplied by the same manufacturer.

##### 2.4.17.1 Cameras

- a. Except as specified herein, CCTV camera shall comply with SMPTE 170M for standard monochrome camera and shall:
  - (1) Consist of support structure, base plate, lens plate, [image sensor,] and printed circuit boards with electronic components;
  - (2) Be identified with the manufacturer's part number, model number, lens installed, and a serial number;
  - (3) Operate over a voltage range of 105 to 130 volts ac or low voltage ac at 60 Hz;
  - (4) Have electronic circuits which use solid-state devices. When object distance resolution is acceptable, a solid-state imaging device may be used;
  - (5) Be constructed to provide rigid support for electrical and

optical systems so that unintentional changes in alignment or microphonic effects will not occur during operation, movement, or lens adjustments;

(6) Have standard "C" lens mount;

(7) Be designed to protect personnel from exposure to high voltage during operation and adjustment; and

(8) Meet requirements specified herein with either side of the power source line grounded. Minimum essential requirements shall include the following:

(a) Sensitivity: Produce a 100 Institute of Radio Engineers (IRE) unit output with a minimum faceplate illumination of 0.538 lux  $5 \times 10^{-2}$  footcandles.

(b) Signal-to-noise ratio: Show a signal-to-noise ratio of not less than 40 decibels (dB) when present at the specified sensitivity and measured at 1.0 gamma.

(c) Resolution: Provide a horizontal resolution of at least 750 lines in Zone 1 with automatic gain and bandwidth at the specified sensitivity.

(d) Gray scale: Produce at least 10 shades of gray at the minimum specified sensitivity and at 1.0 gamma, using EIA standard gray scale chart.

(e) Bandwidth: Be a minimum of 10 MHz +0, -0.5 dB.

(f) Gamma: Provide gamma selections of not less than 1.0 and 0.7.

(g) Geometric distortion: Camera shall be accurate to within a maximum 1.5 percent geometric distortion in Zone 1 and to within 2 percent in Zones 2 and 3.

b. Camera signals: CCTV camera vertical sync signal shall be phase-locked to the ac power line frequency and shall remain line locked at 60 Hz, plus or minus 0.3 Hz. Synchronization at the video output shall conform to the timing specified by SMPTE 170M. Camera shall operate on internally generated sync automatically upon loss of external sync.

c. Camera resolution

(1) Exterior: Horizontal resolution shall be 650 TV lines in the center, greater than 500 TV lines in three corners, and greater than 400 TV lines in the fourth corner. Vertical resolution shall be 350 TV lines in the center. Resolution shall be maintained over the specified input voltage and frequency range, and shall not vary more than 100 TV lines from minimum specification over the specified operating temperature range. Composite video output level shall be automatically maintained to within plus or minus 0.1 volt over scene changes of 2.69 lux to 107,600 lux 0.25 footcandle to  $1 \times 10^4$  footcandles with lenses of f/1.4 and greater.

(2) Interior: Horizontal resolution shall be at least 400 TV lines. Vertical resolution shall be at least 350 TV lines.

Resolution shall be maintained over the specified input voltage and frequency range.

d. Camera sensitivity and dynamic range

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**NOTE: International Electrical and Electronics Engineers (IEEE) was formed by the merger of the Institute of Radio Engineers (IRE) and the American Institute of Electrical Engineers (AIEE). Although IEEE has the most current unit of measure abbreviations, the CCTV industry continues to use IRE units as the standard measurement.**

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- (1) Faceplate illumination shall be referenced to color temperature of 2854 K.
- (2) Nominal 0.538 lux 0.05 footcandle highlight illumination on the faceplate shall produce 100 IRE units of picture video output. The rms noise at the output with 0.538 lux 0.05 footcandle shall be equal to or less than 0.011 volt with a signal-to-noise ratio of 36 dB or greater.
- (3) Nominal 0.0538 lux 0.005 footcandle highlight illumination on the faceplate shall produce 100 IRE units of picture video output from a 10:1 (20 dB) video gain increase from automatic gain control (AGC) action. The rms flat noise with 0.0538 lux 0.005 footcandle shall be equal to or less than 0.011 rms volt with signal-to-noise ratio of 16 dB or greater and resolution shall be greater than 200 lines at center of picture.
- (4) Automatic line control (ALC) and AGC shall maintain highlight video output at 100 plus or minus 10 IRE units when focused on a fixed average picture level (APL) test chart of 20 percent white, 80 percent black, and highlight ranges between 107,600 lux 10,000 footcandles and a minimum that gives 0.0538 lux 0.005 footcandle on the faceplate.
- (5) ALC and AGC shall maintain highlight video output at 100 plus or minus 10 IRE units with APL between 0.2 and 0.8 in a constant highlight level greater than 0.0538 lux 0.005 footcandle on the faceplate.
- (6) ALC response of fixed focus lenses shall stabilize the video level within 5 seconds after a change in light between maximum and minimum.
- (7) Video black level shall be maintained at a setup level of 7.5 plus or minus units, with black area equal to 10 percent or greater in the scene.
- (8) Blanking level shall be a fixed reference at or near zero volts.
- (9) White peaks: Bright going video white output peaks shall reach a level of at least 120 IRE units before clipping.
- (10) Black peaks: Dark going video output peaks shall be clipped



to prevent them from going below blanking level by less than 5 IRE units.

- e. CCTV lenses: Provide lenses with automated light level metering device and an auto-iris. Provide each lens with a metal density spot filter. Light adjustment by the automatic metering device shall be a weighted average rather than a simple average or a peak response. Provide lenses for both 25 and 16.9 mm one and 2/3 inch format cameras. Provide lenses which are mountable with standard "C" mounts.
- f. Auxiliary CCTV camera equipment: Equipment shall consist of camera mounts and housings with environmental protection as applicable for each camera. Camera mounts shall be heavy duty industrial type, shall provide stable support for the camera, and shall be the configuration specified for each individual camera location. Housing shall protect the camera to ensure continuous 24-hour per day operation under specified environmental conditions. Housing shall be constructed of a durable material. Access to housing shall allow for camera and auto-iris removal and replacement within plus or minus 0.0087 rad 0.5 degree, both vertical and horizontal centerline alignment. Sealed housings shall be pressurized with dry nitrogen, or contain two units of desiccant in the camera body area. Install a 10, 20, and 30 percent humidity level indicator strip in a position that allows inspection through the enclosure faceplate. Where used, thermostatically controlled heaters shall be located near the auto-iris and faceplate and near the midsection of the camera body. Where ventilation blower is used in housing to prevent high temperature, it shall be thermostatically controlled. Hinged louvers shall close over blower exhaust when blower is off. For exterior cameras, video, sync, tamper, and power cables shall enter camera housing via weatherproof fittings. Entry into housing shall not interfere with housing heaters or blower operation. Provide terminal strips for power inside environmental housings to distribute 120 volts ac for the camera, heater, and blower, as applicable. [Provide enclosure sunshade as indicated for exterior camera location.] [Provide indoor environmental enclosures which are lockable and dustproof.] [Enclosures shall be tamper alarmed.]

#### 2.4.17.2 Video Signal

Requirements apply to the video signal present at the video monitor input. Standard system video level shall be one volt peak-to-peak (Vp-p) composite video and sync. Standard system impedance shall be 75 ohms over the frequency range 0 to 5 MHz. System timing and synchronizing waveform shall be according to SMPTE 170M. Peak-to-peak amplitude of the composite TV waveform shall be one volt and shall be referred to as standard system video level. Waveform shall be measured in IRE units on the IRE scale graticule where 140 IRE units represent one volt. Synchronizing pulse amplitude of a composite video signal of standard system video level shall be measured from blanking level to negative peak of the sync pulse and shall be 40 IRE units, 0.3 volt nominal. Video amplitude of a composite video signal of standard system video level shall be measured from blanking level to reference white level and shall be 100 IRE units, 0.7 volt nominal. Picture setup of a composite video signal of standard system video level shall be 7.5 IRE units, 7.5 percent of the video amplitude. Pulse overshoot shall be less than 2 percent of the pulse amplitude. Video

signal voltage frequency response shall be measured from camera output to video monitor input. It shall be plus or minus 2 dB from 60 Hz to 5 MHz and not more than 3 dB down at 6 MHz. The low frequency distortion shall be measured for every camera output over every normal program path to the input of the associated monitor. Distortion shall be less than 2 percent at line and field rates. Peak-to-peak signal-to-rms noise ratio shall be measured for every camera output via the normal program path at input of the associated monitor. Terminate circuits, except the one under test, at inputs and outputs. Hum and noise shall be 60 dB below 1.0 Vp-p.

#### 2.4.17.3 Video Switchers

Switching shall interface multiple video signals, cameras, with one or more monitors. Switching shall be timed to occur during the video signal blanking period, vertical interval switching. When an IDS zone goes into alarm, a signal shall be sent from the alarm reporting and display processor to the switcher. When the zone is covered by CCTV cameras, switcher shall call up the camera views for display on one or more of the dedicated video monitors wired to the switcher. In the case of multiple alarms, applicable camera numbers shall be stored in an alarm queue until zones are manually called up for viewing. First video display out of the queue shall be from the last reported alarm. Active alarms shall cycle between the alarm queue and video monitors as various zones are called up for viewing. Alarms shall not leave the cycle until secured, reset or placed in access at the alarm reporting and display processor. Additionally, a sequential monitoring capability shall permit alarm reporting and display subsystem operation to view zones in numerical order at an operator adjustable scan rate. Individual cameras shall be capable of being called up to display zones on the video monitors. Manual controls for camera switching shall be on front panel of switcher. Switcher shall be configured [to fit in a standard 480 mm 19 inch rack] [for desk top console operation]. [Switcher shall be tamper alarmed.] Performance requirements shall be as follows:

- a. Bandwidth: 30 Hz to 10 MHz with less than plus or minus 0.5 dB deviation from a flat response;
- b. Tilt: Less than one percent;
- c. Differential phase: Less than 0.0174 rad one degree at 10 to 90 percent automatic phase level (APL);
- d. Differential gain: Less than one percent at 10 to 90 percent APL;
- e. Crosstalk: 55 dB at 3.58 MHz;
- f. Gain: Unity, adjustable plus or minus 3 dB;
- g. Level: 1.0 Vp-p;
- h. Signal-to-noise ratio: 60 dB below 1.0 Vp-p for the frequency band from 50 Hz to 5 MHz; and
- i. Video connectors: UHF or BNC.

#### 2.4.17.4 Video Transmission

Transmission shall be by 75-ohm coaxial cable or fiber optics dedicated to the associated circuit. Interior cable shall be installed in conduit

unless indicated otherwise. Cable shall be designed for the installation method intended. Exterior cable runs shall be underground.

#### 2.4.17.5 Video Monitors

- a. Except as specified herein, design video monitors to comply with SMPTE 170M for distribution monitors and:
  - (1) Video monitors shall be designed for continuous operation and shall incorporate printed circuit modular construction.
  - (2) Monitor design shall provide for easy replacement of printed circuit modules.
  - (3) Electronic circuits shall use solid-state devices with the exception of the cathode ray tube (CRT).
  - (4) Each monitor shall be constructed to provide rigid support for electrical systems so that unintentional changes in alignment or microphonic effects will not occur during operation or movement.
  - (5) Circuit design shall incorporate safety margins of not less than 25 percent where possible, with respect to power dissipation ratings, voltage ratings, and current carrying capacity.
  - (6) Provide monitors with a rectangular picture tube that nominally measures [228] [300] [380] [432] mm [9] [12] [15] [17] inches diagonally.
  - (7) Provide adequate safeguards to protect personnel from exposure to high voltage during operation or adjustment.
  - (8) Front panel controls shall include a monitor power switch, horizontal hold, vertical hold, height, contrast, brightness, and focus.
  - (9) Monitors shall have the following minimum essential requirements:
    - (a) Resolution: Horizontal resolution of not less than 450 TV lines, at 171.3 candela per square meter 50 foot lamberts brightness.
    - (b) Geometry: No point in the active raster shall deviate from its correct position by more than 2 percent of raster height.
    - (c) Gray scale: Reproduce not less than 10 discernible shades of gray.
- b. Mounting and identification
  - (1) Mount the monitor CRT and other devices subject to burnout or short operating life to facilitate easy replacement.
  - (2) Label the printed circuit board's function and provide component numbers or markings.
  - (3) To maintain a standard quality and reliability, components shall be conservatively rated.

(4) Mount monitors in a frame for mounting in a [480 mm] 19 inch rack] [desk top console].

(5) Two [228] [\_\_\_\_\_] mm [9] [\_\_\_\_\_] inch diagonal monitors shall be dually mounted in the [rack] [console]. Protect monitors from circuit overloads by fuse or fuses in the power source line. Power source line fuses shall be mounted in finger-operated extractor fuseposts. Fuseholders shall be located in a readily accessible position.

c. Video and signal input

(1) Monitors shall operate with video input requiring a one Vp-p nominal composite video signal switchable to either loop-through or internal 75-ohm terminating impedance.

(2) Signal input shall be UHF or BNC connectors.

2.4.17.6 Ancillary Equipment

Equipment shall consist of the items specified below.

a. Video date/time generator: Generator shall insert the year, month, day, hour, minute, and second information on the video signal applied to the input. Display shall be capable of character heights adjustable from 5 to 15 percent of picture height. Date/time generator shall automatically display proper number of days in each month and automatically compensate for leap years. Provide looping inputs to prevent picture loss when the generator is turned off or fails. Operator adjustments shall include size, horizontal and vertical position, brightness, and selection of horizontal or stacked format. Position controls shall permit date/time display information to be located any place within the video picture. The horizontal or stacked selection shall allow the time numerals to be placed beside the date numerals or time above the date. Performance requirements shall be as follows:

(1) Character format: Seven-bar matrix, white with black outline. Zoom size control, 2:1 aspect ratio, height 5 to 15 percent of picture height;

(2) Timing accuracy: Power line accuracy. No cumulative error;

(3) Standby: Preserve timing up to 10 minutes;

(4) Video input: Looping. Passive circuit to provide flat response to 10 MHz with no deterioration of color or monochrome signals. Random or positive interlace. Composite video;

(5) Video connectors: BNC or UHF; and

(6) Mounting: Generator shall be equipped to allow mounting in a [19-inch equipment rack] [desk top console].

b. Video sync generator: Generator shall operate at a frequency of 31.5 kHz with integrated circuitry for counting and timing functions. Generator shall have its own internal crystal

oscillator for accurate synchronization signals if ac power fails. Under normal conditions, the output shall be phase-locked to the 60 Hz power frequency. [When master sync from motion detector is provided, provide gen-lock.] Performance requirements shall be as follows:

- (1) Pulse waveform: SMPTE 170M, 525 line, 60 Hz;
  - (2) Pulse amplitude: 4 Vp-p plus or minus 0.5 volt into a 75-ohm load pulse;
  - (3) Pulse outputs: Sync, blanking, and horizontal and vertical drive;
  - (4) Pulse jitter: Less than one nanosecond;
  - (5) Pulse rise and fall time: 120 plus or minus 20 nanoseconds;
  - (6) Mounting: Enclosed cabinet for [rack mounting] [desk top console].
- c. Video sync distribution amplifier: Amplifier shall ensure proper phase and amplitude of composite video signals where signals input to switcher. Performance requirements shall be as follows:
- (1) Inputs: High impedance loops through 50,000 ohm minimum unbalanced one to 5 volts p-p composite return loss (on or off) of 40 dB minimum to 5 MHz;
  - (2) Outputs: 75 ohms. Level adjustable 3 to 5 Vp-p dc couplings (base level at zero volts pulse negative). Isolation between outputs of 40 dB minimum to 5 MHz;
  - (3) Rise time: 100 plus or minus 20 nanoseconds;
  - (4) Ringing: One percent maximum;
  - (5) Tilt, H & V: One percent maximum;
  - (6) Hum and noise: Greater than 60 dB below one Vp-p;
  - (7) Delay: Adjustable 0.5 to 5.0 microseconds;
  - (8) Delay stability: 100 nanoseconds maximum;
  - (9) Adjustments and indicators level: adjustable 3 Vp-p; delay: adjustable 0.5 to 5.0 microseconds; and output: pulse presence indicator; and
  - (10) Mounting: Provide amplifier with card cage, cabinet, or housing to enable internal mounting of the power supply. Mount entire unit in a [480 mm19 inch equipment rack] [desk top console].
- d. Camera identifiers: Video signal from each camera shall be identified by a two-digit (minimum) number. Device shall be a stand-alone identifier or internal to another piece of equipment (camera, switcher, etc.) and shall meet the following requirements:
- (1) Character format: 5 by 7 matrix, white;

- (2) Number of digits: Two minimum, 00 to 99;
  - (3) Horizontal position: Screwdriver adjust;
  - (4) Vertical position: Screwdriver adjust;
  - (5) Character retention: Either hardwired or battery backup for 15 minutes minimum;
  - (6) Connectors: UHF or BNC; and
  - (7) Inputs: Looping: Identifier shall not interfere with video signal quality when in line with power on or off.
- e. Video tape recorder: Recorder shall be of the helical scan format and shall accept standard 12.7 mm 1/2 inch VHS video cassettes. Time for a stable picture lock from the standby mode shall be 2 seconds or less. Recorder shall provide continuous recording times of 2 hours per cassette. Time lapse recording up to 24 hours selectable shall be possible. Tape motion controls shall be pushbuttons. Provide for remote starting and stopping of video recorder. Recorder shall be capable of stop motion and slow motion. Provide a tracking control to ensure precise tracking of playback. Provide 10 standard 12.7 mm 1/2 inch VHS video cassettes. Mount recorder in a [standard 480 mm 19 inch equipment rack] [desk top console].
- (1) Video performance requirements shall be as follows:
    - (a) Bandwidth: 30 Hz to 3.5 MHz plus or minus one dB, down no more than 4 dB at 5 MHz;
    - (b) Signal-to-noise ratio: 46 dB peak-to-peak composite signal to rms noise with high energy tape;
    - (c) Differential gain: 10 IRE units maximum deviation (10 to 90 percent APL);
    - (d) Input level: 0.5 to 2.0 Vp-p, 1.0 Vp-p nominal;
    - (e) Output level: One Vp-p composite video into 75 ohms;
    - (f) Horizontal tilt: Less than plus or minus one percent;
    - (g) Vertical tilt: Less than plus or minus 5 percent.
  - (2) Audio performance requirements shall be as follows:
    - (a) Number of channels: One minimum;
    - (b) Bandwidth: Audio one 75 Hz to 10 kHz plus or minus 4 dB, audio two 250 Hz to 7.5 kHz plus or minus 4 dB;
    - (c) Signal-to-noise ratio: 40 dB relative to 3 percent total harmonic distortion (THD) level at one kHz;
    - (d) Flutter: Less than 0.25 percent rms 0.5 to 250 Hz;

(e) Input: Microphone: 0.4 mV minimum, 200 ohms. Line: minus 20 to 16 dBm, 600 ohms unbalanced or balanced;

(f) Output: Balanced or unbalanced into 600 ohms.

f. Four quadrant multiplexer: Unit shall digitally capture full video from four unsynchronized sources and reduce these images to quarter screen size and combine images to provide a real time video output for display of the four inputs in four quadrants of a single monitor.

(1) Video performance requirements shall be as follows:

(a) Input level: One Vp-p nominal into 75 ohms from a 525 line, 60 fields per second source;

(b) Output level: One Vp-p nominal into 75 ohms;

(c) Alarm inputs: Four, rear panel mounted;

(d) Alarm outputs: Relay contacts, rear panel mounted;

(e) Video inputs: Four, looping;

(f) Switching: Five position, front panel mounted;

(g) Memory: 512 by 512 pixels, minimum, digital; and

(h) Gray scale: 64-level.

#### 2.4.18 Alarm Reporting and Display

Display shall integrate signals from and provide control to IDS sensors. Major components shall be as follows:

a. Control units;

b. Local annunciator unit; and

c. Central alarm reporting and display unit.

##### 2.4.18.1 Control Units

Unit shall provide for connection and control of the IDS sensors and shall report status to the [local annunciator unit] [and] [central alarm reporting and display unit]. Control unit enclosure shall be tamper protected so that openings cannot be created to defeat the system.

a. Each control unit shall provide the power and data interfaces to and control of a group of up to [four] [eight] [12] [16] sensor zones and shall perform the following functions:

(1) Continuously monitor status (secure or alarm) of sensor zone status outputs connected to each control unit zone input by [monitoring current through the end-of-line resistor] [interrogating a communications device at the sensor zone].

(2) Continuously supervise lines connecting each sensor zone status output to each control unit zone input.

- (3) Respond immediately to alarm reporting and display unit interrogation.
  - (4) Generate immediately up to two control output signals when commanded by the alarm reporting and display unit.
  - (5) Report sensor zone status to the local annunciator unit.
- b. Provide [microprocessor based] control units of modular assembly to facilitate expansion to maximum sensor zone monitoring and control capability, as well as maintenance. Control units shall have electronic diagnostic aids to facilitate troubleshooting and maintenance. Control units shall be capable of interfacing with other control units to modularly increase the number of sensor zones controlled from a single point. Provide control units [in locked NEMA ICS 6, Type 4 enclosures for outdoor applications and] in locked metal enclosures to provide protection for the environment in which installed. [Control unit shall be capable of functioning independently of the central alarm reporting and display unit.] [Provide a separate power supply for each control unit.]

#### 2.4.18.2 Local Annunciator Unit

Unit shall operate as a slave unit of one or more control units. Unit shall be designed to display visually and audibly for each sensor zone all conditions displayed and signals annunciated for the facility location. Provide space for additional visual and audio annunciators in the local annunciator to accommodate expansion. Clearly label visual displays to identify the pertinent circuit or zone. Unit shall be the closed front type. [Local annunciator unit shall not contain controls except a switch for its own power.] Local annunciator unit shall be powered from [the alarm reporting and display unit power supply] [control unit power supply] [an independent power supply].

##### a. Modular construction

- (1) Each sensor zone circuit at the local annunciator unit shall be accompanied by an individual annunciator module to be mounted in the unit.
- (2) Modules shall be plug-in modular units built from solid-state components.
- (3) Each module shall provide three distinct and independent visual signals in duplicate: SECURE, ACCESS, and ALARM.
- (4) Modules that use light-emitting diodes (LEDs) shall be required to duplicate only the ALARM signal.
- (5) Module shall also provide an audible alarm with silencing switch [, an ACCESS-SECURE toggle switch,] [and TEST] and RESET [pushbutton] switches.
- (6) 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 switches or signals.



b. Visual indicators

- (1) Each visual signal and switch shall be clearly marked to indicate its function by machine engraving and color contrast with the background.
- (2) Switches shall operate independently.
- (3) Mode in which each sensor 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.
- (4) Indicators shall be brightly lit and visible from a distance of 9 meters 30 feet.
- (5) 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.
- (6) Switches, buttons, keys, jacks, and plugs that correspond to a visual indicator shall be installed in or adjacent to the indicator. Clearly mark each item to indicate its function.
- (7) Audio signal devices shall be solid-state tone generators audible to a distance of 9 meters 30 feet.
- (8) An audio device provided for common use by several annunciator modules shall be capable of independent activation from any of the modules it serves.

c. Silencing controls

- (1) Silencing control shall be provided to mute the alarm after activation.
- (2) Silencing the audio alarm triggered by one annunciation module shall not mute the alarm's response to subsequent alarms from other modules.
- (3) The audio signal shall sound if the SILENCE control is put in the SILENCE position and an ALARM condition does not exist.
- (4) Silencing control shall be designed to prohibit disabling of alarm annunciation by holding or taping down the RESET contact.
- (5) If individual audio signaling devices are provided with each annunciator module, the silencing control shall be a toggle switch.
- (6) Silencing switches shall be positive-reset; when the annunciator module is reset, the audio signal shall sound until the silencing switch is returned to the non-SILENCE position.

d. Enclosure

- (1) House local annunciator unit in a metal enclosure.

(2) Provide an enclosure with two doors, one behind the other. Outer door shall consist of a metal-framed sheet of acrylic plastic not less than 6.35 mm 1/4 inch thick. Inner door shall serve as the mounting surface for annunciators with silencing switches mounted outside the two doors. Opening inner door shall give access to enclosure interior for maintenance. Provide locks and tamper switches for both doors.

#### 2.4.18.3 Central Alarm Reporting Display Unit

a. Unit shall perform the following functions through use of integral processor assemblies and time-division-multiplex digital communications:

- (1) Continuously monitor detection subsystem outputs, sensor zones [and access control subsystem inputs].
- (2) Continuously monitor the status of sensor zones [and access control subsystem elements].
- (3) Continuously supervise monitoring system lines including detection [and access control] subsystem lines connected to alarm reporting and display subsystem inputs.
- (4) Immediately annunciate IDS status changes.
- (5) Permanently print a record, including time, date, and descriptor, of IDS status changes by zone.
- (6) Provide a capability for operator sensor zone status control.
- (7) Provide a capability for user entry of installation-related sensor zone information.
- (8) Provide a capability for monitoring and controlling sensors requiring a test control input and a capability to monitor an audio output.
- (9) Interface with automatic CCTV video signal switching in response to a sensor zone alarm, assessment subsystem.
- (10) Provide automatic CRT sensor zone alarm display with user-entered small-area maps and instructions for actions required of the operator in response to the alarm.
- (11) Provide sensor zone status and alarm display on a fixed format map display with LEDs and audio annunciator.

b. Central alarm and display unit design requirements: Design shall be as follows:

- (1) Provide microprocessor-based central alarm reporting and display unit. Operating programs, firmware, shall be furnished as an integral part of the processor assembly furnished with each microprocessor-based component. Within the capability of the unit as specified herein, the unit operating program shall not require modification to increase the number of electronic IDS zones after initial system installation. Manufacturer shall maintain the capability to update, revise, or otherwise modify firmware as

required to incorporate manufacturer-developed improvements and to provide for other modification to the IDS. Design of processor assemblies shall preclude user alteration of the integral firmware and shall preclude use of the processor assemblies for purposes other than the intended system and zone status monitoring, control, and display.

(2) Unit design shall provide the capability for user-entered time, date, and installation-related data such as sensor zone numbers, zone descriptors, and control unit addresses. Design of the memory in which user-entered data is stored shall ensure storage of entered data for a minimum of 30 days in the absence of power from external sources.

(3) Provide unit components of modular construction designed for on-site equipment repair by module replacement.

(4) Unit shall be designed for minimum power consumption to reduce required backup battery capacity.

(5) Unit shall switch automatically and instantaneously from ac primary power to battery backup power on loss of ac primary power, and from battery backup power to ac primary power on restoration of ac primary power. Unit shall maintain the performance specified herein during either change of power source.

(6) Unit power supplies shall fully recharge backup batteries within 12 hours after restoration of ac primary power following no more than 4 hours of system battery operation.

(7) Properly installed components shall exhibit intersystem and intrasystem electromagnetic compatibility and shall not cause performance degradation or malfunctions of other interconnected electronic equipment with which the components interface.

\*\*\*\*\*  
**NOTE: At the text below, RF signal communications  
can only operate at a very low baud rate, 150 baud  
or less. Confirm product sources before including  
baud rates for RF data transmission.**  
\*\*\*\*\*

- c. Processing: Unit shall operate in a continuous interrogation, control, and response mode, using time-division-multiplex digital communications techniques at a data rate of [5.12] [10.24] [\_\_\_\_\_] kilobaud for central processor and control unit data flow. Interrogation, control, and response communications between the processor and control units shall be half-duplex, bidirectional on one control unit bus, dual twisted pair cable (one pair for interrogation, one for response) which may have one or more parallel branches. Individual data bus lines shall be 22 AWG or larger wire. Connect control units parallel to the bus. The central processor shall provide for the connection of at least [127] [\_\_\_\_\_] control units to the bus. Processor shall operate in a continuous mode, using time-division-multiplex digital communications techniques at a data rate of [10.24] [\_\_\_\_\_] kilobaud for central processor to fixed and CRT map display data flow. Communications between central processor and map displays shall be simplex, unidirectional on one map bus single twisted

pair cable, which may have one or more parallel branches. Connect map displays parallel to map bus. Monitoring system shall have the capability for map bus connection of an unlimited number of map displays and other components requiring map data. [Control alarm reporting and display unit shall provide a capability for annunciation of analog, audio frequency signals for the detection subsystem using a 600-ohm time-multiplexed audio bus. Bus shall consist of one twisted pair cable which may have one or more parallel branches. Individual audio bus lines shall be 22 AWG or larger wire. Connect control units parallel to the audio bus. Processor shall have the capability for audio bus connection of at least 127 control units and one audio annunciator.] When operating without line repeaters or other signal regenerating or amplifying devices, the central processor shall maintain the performance specified herein over a control unit or map data bus length of 2287 meters 7500 feet. When operating with signal-regenerating line repeaters, central processor shall maintain the performance specified herein over a control unit or map data bus length of 22,866 meters 75,000 feet. [When operating without line amplifiers, monitoring system shall maintain the performance specified herein over an audio bus length of 8 km 5 miles.] Central processor shall be capable of monitoring, annunciating, controlling, and displaying the status of at least [508] [\_\_\_\_\_] uniquely identified zones. Central processor shall complete each interrogation cycle of a full-capability [508] [\_\_\_\_\_] -zone system in which the status of all zones is secure in no more than [1.3] [\_\_\_\_\_] seconds. In smaller systems, interrogation cycle time shall be less. Monitoring system shall initially annunciate an alarm in a full-capability [508] [\_\_\_\_\_] zone system within [700 milliseconds average] [1.4 seconds maximum] [\_\_\_\_\_] after detection subsystem alarm output occurs. Monitoring system shall complete the printout phase of alarm annunciation within 5 seconds average, 6 seconds maximum. In smaller systems, alarm annunciation time shall be less.

- d. Data entry: Installation-related characteristics shall be user-entered by simple control keyboard operations prompted by printed displayed instructions for the operator. Entry of installation-related data shall not require specific computer training or knowledge of computer operation, languages, or programming procedures, and shall neither require nor permit processor assembly or microprocessor programming or any modification of integral firmware. Access to data entry functions shall be controlled by a key-operated switch or lock to prevent data entry access by unauthorized persons. Installation-related data entry shall include entry of the following:

(1) Time and date

(2) For each zone: Zone number, control unit address, control unit input number, and one of the following IDS zone descriptors:

UNUSED	HALL	LOCK	MICROW
PANIC	ELEVTR	TOUR	VIDEO
HOLDUP	ALARM	DURESS	GATE
ENTRY	IR	BUILDG	ALERT
DOOR	FENCE	OFFICE	AREA
ROOM	TAMPER	WINDOW	POWER

NOTE: Other 6- to 12-character words may be specified as substitutes for any of the descriptors above other than UNUSED and POWER.

- e. Operation: Operation shall be entirely automatic under control of the central processor except for simple control key operations required for control processor, map display, and sensor tests; alarm acknowledgement; zone status change operations; map display audible alarm silencing; and audio annunciation. Alarm reporting and display unit shall immediately annunciate any change in zone status. Unit integral printer shall print a permanent record of each alarm in red characters; other printouts shall be printed in black characters. Monitoring system shall not annunciate any change of detection subsystem zone status to alarm when the annunciated zone status is in ACCESS. Regardless of zone status served by a control unit, monitoring system shall immediately annunciate a change of control unit status to communications failure when communications with that control unit are interrupted. [Each map display shall immediately annunciate any change of zone status other than a change from ACCESS to ALARM, to the extent permitted by the zone status indicators installed for the map displays. Each map display shall continuously display the current zone status, to the extent permitted by the zone status indicators installed for map displays.] Unit shall provide capability to display immediately the current status of a zone by simple keyboard operations, except that while the unit is annunciating an unacknowledged zone alarm, keyboard operations other than alarm acknowledgement shall not be possible. When an alarm is first annunciated, the central processor shall preclude other operator control keyboard operations until after the operator has acknowledged the alarm by operation of one control key. Unit shall provide capability to change zone status from ALARM, after alarm acknowledgement, or ACCESS to SECURE, from ALARM after alarm acknowledgement, or SECURE to ACCESS, or from ACCESS to SECURE by simple control keyboard operations. When the operator attempts to change zone status to SECURE while there is a detection system alarm output in that zone, unit shall immediately annunciate an alarm for that zone.

- (1) Automatic control

- (a) Monitor zone status;

- (b) Annunciate zone status changes;

- (c) Permanently record (print) each zone status change, the time and date thereof, and the descriptor assigned to the zone;

- (d) Control map display zone status annunciation;

- (e) Supervise monitoring system data lines and control unit input (detection [and access control] subsystem output) lines;

- (f) Display time and date;

- (g) Annunciate unit ac primary power failure and subsequent restoration, 2 minutes after the failure or restoration occurs;

- (h) Annunciate a zone alarm to indicate successful completion of

a sensor test;

(i) Switch detection subsystem zone analog, audio frequency output from the corresponding control unit audio input terminal to the audio bus for annunciation on the audio annunciator when the status of that zone changes from SECURE to ALARM.

(2) Keyboard control

(a) Change zone status to ACCESS or SECURE;

(b) Display current zone status;

(c) Permanently record (print) current zone status and the time and data thereof;

(d) Accept, store, and permanently record (print) user-entered installation-related data;

(e) Initiate sensor self-tests;

(f) Switch operator-selected detection system zone analog, audio frequency output from the corresponding control unit audio input terminal to the audio bus for annunciation on the audio annunciator in response to simple control key operations.

Display unit shall continue to monitor zone status; annunciate zone alarms, monitor and control unit ac primary power failure and restoration, and communications failures; control map display zone status annunciation; and supervise communication lines while operator-controlled functions are performed.

#### 2.4.18.4 Central Processor Requirements

- a. Mounting: [Desk mount] [19 inch electronic equipment rack mount];
- b. Input power: 115 volts plus or minus 10 percent (switch selectable), 60 Hz, single-phase ac primary power, circuit breaker protected, 150 to 200 watts average;
- c. Storage temperature: Minus 55 to plus 52 degrees C;
- d. Operating temperature: 0 to plus 50 degrees C;
- e. Relative humidity: 20 to 95 percent, noncondensing;
- f. Inputs: Control unit response;
- g. Outputs: Alarm relay (NO, NC, common ground) on computer console; Control unit interrogation and control map data plus 9 to 15 volts dc local (audio annunciator power only); and
- h. Controls: As specified in paragraph entitled "Display and Keyboard Requirements."

#### 2.4.18.5 Display and Keyboard Requirements

- a. Display and keyboard: [Mount as the front panel of the central processor unit] [A detachable unit] including the display panel,

control panel, and keyboard/processor interface cables.

- b. Inputs: Display data.
- c. Output: Control data.
- d. Display panel shall contain displays and indicators with characteristics and functions noted and shall be a [four-character, seven-segment light-emitting diode] [300] [380] [430] [480] [mm CRT] [12] [15] [17] [19] [inch CRT] display:

<u>Display/Indicator</u>	<u>Function</u>
TIME	Displays time of day
DATE	Displays month and day
ZONE	Displays number of zone for which status is indicated; displays entered data during user entry of installation-related data
[Light-emitting diode] [CRT] indicators:	
ZONE ALARM	Indicates zone status alarm when lighted or displayed; unacknowledged if flashing, acknowledged if continuous (see POWER FAIL below)
ZONE ACCESS	Indicates zone status access when lighted or displayed
ZONE SECURE	Indicates zone status secure when lighted or displayed
ZONE INVALID	Indicates zone does not exist (has not been user entered) when lighted or displayed
COMM FAIL	Indicates zone status communications failure when lighted or displayed and zone number is displayed; indicates failure of communications with one or more control units when zone display is blank; unacknowledged if flashing, acknowledged if continuous. Addresses of communications failure control units shall be printed immediately following communications failure; zones in status communications failure as a result of communications failure are displayed and printed by pressing STATUS on the keyboard.
POWER FAIL	Indicates loss of monitor and control unit ac primary power for more than 2 minutes when lighted or displayed and zone display is blank; indicates zone ac primary power failure when zone number displayed and ZONE ALARM indicator lighted or displayed; unacknowledged if flashing, acknowledged if continuous. POWER FAIL indicator will end 2

Display/IndicatorFunction

minutes after ac primary power is restored to the monitor and control unit.

e. Keyboard shall contain control switches with the functions noted:

ControlFunction

## ON/PROGRAM

## Lockswitch

Select mode of operation:

ON

Normal monitor and control operation

PROGRAM

User entry, installation-related data

## 10-key numeric number switchpad:

ON mode

Zone number entry to zone display

PROGRAM

Enter installation-related numeric data to zone display

## CLEAR DISPLAY

Clear zone number display to permit new zone number entry

## ACCESS

Change status of displayed zone from ALARM or SECURE to ACCESS

## SECURE

Change status of displayed zone from ALARM or ACCESS to SECURE

## RECALL

Display zone in numeric order within each status group in status communications failure, ALARM, ACCESS

## ACKN

Acknowledge alarm annunciation

## ENTER PROGRAM

Transfer installation-related numeric data displayed in zone display to memory

## STATUS

With zone number displayed, print current zone status for zone displayed. With zone number display blank, print zone in numeric order within each status group in status communications failure, ALARM, ACCESS

## PAPER

Advance printer paper

## SYS TEST

Initiate 10-second central alarm reporting and display unit test when zone number is not displayed; initiate sensor self-test when zone number is displayed; and [for RF system test,] initiate sensor test and verify system response as described in paragraph entitled "RF Link Supervision"

## LISTEN

Cause annunciation of analog, audio



Control

Function  
frequency signal from displayed zone

2.4.18.6 Printer Requirements

- a. Input: Printer control data;
- b. Output: Printer status data;
- c. Controls: [None] [Keyboard];
- d. Components: Printer, printer base subassembly, printer I/O PCB assembly, printer/processor interface cable; and
- e. Characteristics: [21] [40] [\_\_\_\_\_] -character line, rotating drum, replaceable two-color (red, black) ribbon, roll or fanfold [96.84 mm] [216 by 280 mm] [3 13/16 inch] [8 1/2 by 11 inch] [\_\_\_\_\_] paper.

2.4.18.7 Fixed Map Display

Display shall consist of a geographic, tabular, or combination geographic and tabular representation of monitored zones in which status of each zone is displayed by light-emitting diode zone status indicators which shall be multiplexed for reduced power consumption. Display shall contain an integral specific-purpose processor assembly which shall decode map bus data and drive the zone status indicators. Under continuous central processor automatic control, integral processor assembly autonomous control, or local operator control, each map display shall:

- a. Under Monitor and Control Unit Control:
  - (1) Annunciate zone status changes; and
  - (2) Continuously display current zone status.
- b. Under Integral Processor Assembly Autonomous Control:
  - (1) Continuously supervise map bus lines from the monitor and control unit; and
  - (2) Annunciate failure of communications from the monitor and control unit.
- c. Under local operator control: Self-test processor assembly functions and zone display status indicator operation.
- d. Conform to the following general requirements:
  - (1) Size: [1232 mm W by 757 mm H by 38 mm D] [48.5 inches W by 29.8 inches H by 1.5 inches D] [\_\_\_\_\_] ;
  - (2) Mounting: Wall;
  - (3) Input power: 9 to 15 volts dc at 2 amperes for each processor assembly;
  - (4) Storage temperature: Minus 55 to plus 71 degrees C;

- (5) Operating temperature: 0 to plus 50 degrees C;
- (6) Relative humidity: 20 to 95 percent, noncondensing;
- (7) Inputs: Map data;
- (8) Outputs: Tamper alarm;
- (9) Controls: MAP TEST switch; and
- (10) Capability: 192 zone displays per processor assembly; [576]  
[\_\_\_\_\_] zone displays maximum

e. Have a display which conforms to the following requirements:

- (1) Display shall be mounted as the front panel assembly of the map display and include individual zone displays; an external map display test switch; and internal, display panel to processor assembly interface wiring.
- (2) Display shall be screen-printed with a geographic, tabular, or combined geographic and tabular arrangement of zone displays in accordance with local map display design drawings.
- (3) Each zone display shall consist of the following light-emitting diode (LED) zone status indicators with the functions noted:

<u>LED Color</u>	<u>Function</u>
RED	Indicates zone alarm when illuminated; unacknowledged alarm when flashing, acknowledged alarm when continuous
YELLOW	Indicates zone status access when illuminated
GREEN	Indicates zone status secure when illuminated continuously; indicates zone status communications failure when flashing

(4) Each map display shall indicate failure of communications from the alarm reporting and display unit by flashing zone status indicators which were illuminated when communications failure occurred.

(5) Each map display shall indicate a successful map test by sequential steady illumination of zone status indicators in order of color: red, yellow, green, when MAP TEST switch is pressed momentarily. Each map display processor assembly shall continue to process zone status data received from the monitor and control unit, but zone status changes received during the map test shall not be annunciated until the map test has been terminated.

#### 2.4.18.8 CRT Displays

Displays shall show the [graphic and] visual data normally displayed by

colored lights in annunciators or maps. A color-graphic CRT shall be used with messages displayed in the English language. ALARM related messages shall be displayed in red. ACCESS related messages shall appear in yellow. SECURE messages shall be displayed in green. Initiation of an ALARM shall cause an audio alarm to sound and the ALARM message to flash in red. Silencing of the audio alarm shall cause the CRT to display a constant red alarm message. Keyboard, as specified in paragraph entitled "Display and Keyboard Requirements," shall be used to perform the functions required to operate the CRT. A full keyboard shall be available for use, when required, in subsystem setup and maintenance and shall not be available for use by operational personnel. CRT shall have the capability to display [an overall facility map and] [in conjunction with a fixed overall facility map] enlarged maps of the sensor zones controlled by each single control unit. CRT shall be [a separate unit] [mountable in a 480 mm 19 inch rack]. CRT shall meet requirements of paragraph entitled "Video Monitors" except that minimum size shall be 300 mm 12 inches diagonal measure.

#### 2.4.18.9 Control and Display Integration

Accomplish so that central alarm reporting and display unit displays and controls are human engineered as specified in paragraph entitled "Human Engineering" so the entire unit can be operated by a single operator. In addition, switching and monitoring components of the assessment subsystem shall also be integrated with the central alarm reporting and display unit so that one single operator can effectively monitor and assess IDS alarms and control the IDS. [Method of system integration shall be as a single console. Provide chassis, modules, and furniture required for console configuration of central IDS control and monitoring components.]

### PART 3 EXECUTION

#### 3.1 EQUIPMENT INSTALLATION

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.

##### 3.1.1 Cable and Wire Runs

\*\*\*\*\*  
**NOTE: Where design requirements must conform to  
NACSIM 5203, "Guidelines for Facility Design and  
RED/BLACK Installation," refer to Military Handbook  
MIL-HDBK-232.**  
\*\*\*\*\*

NFPA 70 [and] [Section 16402 INTERIOR DISTRIBUTION SYSTEM,] [applicable DOD directives] [, DIA DCID 1/21], and as specified herein. Conduits including flexible metal and armored cable shall terminate in the sensor or device enclosure. Ends of conduit shall be fitted with insulated bushings. Exposed conductors at ends of conduits external to sensors and devices are not acceptable.

##### 3.1.2 Soldering

ASTM B 32. For soldering electrical connections, use composition Sn60, Type AR or S, for general purposes; use composition Sn62 or Sn63, Type AR or S, for special purposes. When Type S solder is used for soldering

electrical connections, flux shall conform to ASTM B 32.

### 3.1.3 Galvanizing

Ferrous metal shall be hot-dip galvanized in accordance with ASTM A 123/A 123M. Screws, bolts, nuts, and other fastenings and supports shall be corrosion resistant.

### 3.1.4 Fungus Treatment

Completely treat system components for fungus resistance. Do not use treated materials containing mercury-bearing fungicide. Treating materials shall not increase flammability of material or surface being treated. Treating materials shall not cause skin irritation or other personnel injury during fabrication, transportation, operation, or maintenance of equipment, or during use of finished items when used for the purpose intended.

### 3.1.5 Conduit

\*\*\*\*\*  
**NOTE: Where design requirements must conform to  
NACSIM 5203, "Guidelines for Facility Design and  
RED/BLACK Installation," refer to Military Handbook  
MIL-HDBK-232.**  
\*\*\*\*\*

Install in accordance with NFPA 70 and Section 16402 INTERIOR DISTRIBUTION SYSTEM.

### 3.1.6 Underground Cable Installation

Underground conductors connecting protected structures and objects to the central alarm updating and display unit shall be run direct burial or in conduit as specified in Section 16302N UNDERGROUND TRANSMISSION AND DISTRIBUTION. Coaxial cable shall not be spliced. If permitted, cables connecting protected structures and objects to the security control console shall be sized such that initially only approximately 60 percent of the circuit pairs will be used. Cable pairs not used shall be reserved for future use of additional detection circuits.

### 3.1.7 Exterior Fences

\*\*\*\*\*  
**NOTE: Coordinate this requirement with requirements  
of Section 02821, "Chain Link Fences and Gates."**  
\*\*\*\*\*

Preparation of existing fences [or installation of new fences] shall ensure a rigid fence system for installation of fence-mounted detection systems or a detection system where loose fence fabric might prove troublesome. A rigid fence and fence fabric shall be ensured to minimize nuisance alarms. Fences shall be additionally braced, provided with fabric ground anchors or curbs, tensioning devices, top and/or bottom rails, soft-seated gate latches, and reanchored outriggers for barbed wire to ensure a vibration-free installation. Relocate large signs which are fence supported to separate support posts to preclude interference with fence detection systems.

### 3.2 ADJUSTMENT, ALIGNMENT, SYNCHRONIZATION, AND CLEANING

Subsequent to installation, clean each system component of dust, dirt, grease, or oil incurred during installation or accrued subsequent to installation from other project activities, and prepared for system activation by manufacturer's recommended procedures for adjustment, alignment, or synchronization. Prepare each component in accordance with appropriate provisions of component installation, operations, and maintenance manuals. Remove large vegetation that may sway in the wind and touch fencing.

### 3.3 FIELD QUALITY CONTROL

#### 3.3.1 IDS Operational Test

Test shall ensure that the requisite degree of intrusion detection is provided. Initially, test each sensor and subsystem component individually. When the function of each component within a particular subsystem such as each sensor within a particular zone is verified, certify that subsystem of the entire IDS as satisfactorily meeting required specifications. Test each subsystem similarly until each detection zone has been certified. When subsystem certification is complete, test entire integrated system to ensure that subsystem elements are compatible and function as a complete system. Integrated system test shall be accomplished in linear fashion, end-to-end, and shall verify that each simulated intrusion performed within each detection zone produces an appropriate alarm or signal. Integrated system test shall also verify that alarm is correctly annunciated at the [local annunciator unit and the] central alarm reporting and display unit. Provide for approval, not later than 30 days prior to formal inspection and test, a detailed operational test plan of how each component, subsystem, and entire IDS will be tested. When tests are complete and corrections made, submit a signed and dated certificate with a request for formal inspection and tests.

#### 3.3.2 Formal Inspection and Test

##### 3.3.2.1 Final Inspection

\*\*\*\*\*  
**NOTE: For NORTHNAVFACENGCOM and other EFD's with a designated IDS engineer, select the first bracketed option for all projects. In all other areas, select the second bracketed option for all projects.**  
\*\*\*\*\*

The [\_\_\_\_\_] Division, Naval Facilities Engineering Command [IDS Engineer] [Contracting Officer] will witness formal tests after receipt of written certification that preliminary tests have been completed and that system is ready for final inspection. [Manufacturer's technical representatives shall be present for the final inspection and test.] Repeat preliminary tests and functional and operational tests, conducted as requested by the [IDS Engineer] [Contracting Officer]. Correct defects and conduct additional tests to demonstrate that system conforms to contract specifications.

##### 3.3.2.2 IDS Final Test

Test each sensor within a detection zone and then test the entire zone in accordance with applicable test procedures in the test plan for sensors

incorporated within that zone. As the test in that zone is proceeding, modifications or adjustments are prohibited. If, subsequent to the test, a modification or adjustment is necessary, retest the zone in the presence of the authorized representative of the [IDS Engineer] [Contracting Officer]. Test other components individually within each subsystem. Component or subsystem failure shall require retesting after needed repairs or adjustments have been accomplished. For testing purposes, computers, data managers, graphic displays, control units gathering panels and nonsensor-related cabling will be considered part of the central alarm reporting and display console. The integrated system test shall commence only when subsystem tests have been completed. In the interest of efficiency, major elements in a subsystem may be tested even if corrections for minor elements have not been completed. Testing of minor elements will be accomplished upon completion. Only when subsystem elements have been tested can subsystem be certified as complete. [When testing is complete, test plan, together with procedures and data sheets, shall become the substance of the final acceptance report. Test report documents and verifies the Government's acceptance and approval of equipment and installation required by the contract.]

#### 3.3.2.3 Fuses and Lamps

Replace blown fuses and burned out lamps during testing and will have on hand, prior to scheduling tests, not less than six spare lamps and fuses for each type, size, and rating of fuses and lamps used in the equipment provided under this section. Turn spare fuses and lamps not used during testing over to the Contracting Officer.

#### 3.3.2.4 Training Operating and Maintenance Personnel

Furnish instruction for operating staff in system operation and operator troubleshooting and preventive maintenance procedures. Instruction shall consist of [3] [\_\_\_\_\_] man-days, 8 hours per day, and shall be held during normal duty hours. Commence instruction after system is fully operational, and complete instruction prior to system acceptance and turnover to the Government. [Furnish maintenance instruction for Government maintenance personnel in adjustment, operation, and maintenance of [each system equipment] [\_\_\_\_\_]. Attendance at equipment manufacturer's recommended maintenance training schools may be substituted for this training. Costs associated with such schooling, less travel and per diem, shall be borne by the Contractor. Complete maintenance instruction prior to system acceptance and turnover to the Government.]

-- End of Section --