UL 681

STANDARD FOR SAFETY

Installation and Classification of Burglar and Holdup Alarm Systems

UL Standard for Safety for Installation and Classification of Burglar and Holdup Alarm Systems, UL 681

Fifteenth Edition, Dated January 16, 2014

Summary of Topics

This revision of ANSI/UL 681 dated January 15, 2021 is to Unify Nomenclature and Correct Cellular DACT References; 1.8, 2.2.1, 2.2.6, Table 19.1, Table 19.2, Figure 19.4, Figure 19.5, 19.3.1.9, 19.3.2.1, Appendix A

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated July 17, 2020 and October 30, 2020.

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UL 681

Standard for Installation and Classification of Burglar and Holdup Alarm Systems

The first through the sixth editions were titled Installation, Classification, and Certification of Burglar-Alarm Systems. The seventh through the eleventh editions were titled Installation and Classification of Mercantile and Bank Burglar-Alarm Systems.

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Fifteenth Edition

January 16, 2014

This ANSI/UL Standard for Safety consists of the Fifteenth Edition including revisions through January 15, 2021.

The most recent designation of ANSI/UL 681 as an American National Standard (ANSI) occurred on December 17, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page. Any other portions of this ANSI/UL standard that were not processed in accordance with ANSI/UL requirements are noted at the beginning of the impacted sections.

The Department of Defense (DoD) has adopted UL 681 on January 2, 1992. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements provide criteria for the installation of protective wiring and devices for burglar alarm systems covering premises, stockrooms, alarmed areas, safes, vaults, night depositories, automated teller machines, and other security containers. The amount of alarm protection installed in a system is designated as the extent of protection.

1.2 Burglar-alarm systems are classified by type of system. The types of systems covered by these requirements include central station, mercantile, bank, proprietary, and national industrial security systems. Requirements for residential burglar alarm systems are covered in the Standard for Installation and Classification of Residential Burglar Alarm Systems, UL 1641.

1.3 These requirements also cover the installation of holdup alarm initiating devices used to send holdup or duress signals to an off premises location.

1.4 These systems employ Class 2 remote-control and signal circuits as defined by Article 725 of the National Electrical Code, ANSI/NFPA 70.

1.5 The requirements assume that standard communication industry operating practices are acceptable for leased or other lines connecting to a police or central station as defined by Article 800 of the National Electrical Code, ANSI/NFPA 70.

1.6 A central station burglar alarm system shall transmit signals to a central station operated by the alarm service company and complying with the Standard for Central-Station Alarm Services, UL 827.

1.7 A bank or mercantile burglar alarm system that provides signal transmission to a remote location shall transmit the signals to:

a) The dispatch location of the law enforcement agency having jurisdiction over the protected property; or

b) A central station or residential monitoring station complying with the Standard for Central-Station Alarm Services, UL 827.

When signals from a bank or mercantile burglar alarm system are monitored in a remote location the alarm service company and an authorized representative of the protected property shall agree to the signals that are monitored, and the actions that are taken. The alarm service company shall notify the monitoring station of the agreed upon signals and the actions.

1.8 A proprietary burglar alarm system shall transmit signals to a proprietary central supervising station operated by personnel responsible to the owner of the protected property and complying with the Standard for Proprietary Burglar Alarm Units and Systems, UL 1076, or the Standard for Commercial Premises Security Alarm Units and Systems, UL 2610.

1.9 A national industrial security system shall transmit signals to:

a) A monitoring station operated by a government contractor and complying with the Standard for National Industrial Security Systems, UL 2050; or

b) A central station or residential monitoring station complying with the Standard for Central-Station Alarm Services, UL 827; or

c) The dispatch location of the law enforcement agency having jurisdiction over the protected property.

1.10 An alarm service that is new or different from that covered in this standard shall be evaluated using the appropriate additional service requirements to determine that the level of safety as originally anticipated by the intent of this Standard is maintained. A service that conflicts with the specific service provisions in this standard shall not be judged to comply with this standard. Where appropriate, the revision of service requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 General

2.1 Units of measurement

2.1.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2 Components

2.2.1 All detection devices, including floor traps, intrusion detection devices, holdup alarm initiating stations, and similar devices; power supplies, relays, sounding devices (alarm, trouble, warning), cellular telephone communicator units, code transmitters, digital alarm communicator transmitters, Private Radio (one-way) and Private Radio System (Two-way) units, and other auxiliary devices; interconnecting wire; and protective wiring in excess of that which is required shall be equivalent to devices and material required for the application.

2.2.2 The requirement specified in 2.2.1 applies to the protection of a separate building area or floor outside of the premise covered and to additional protection within the premises that is in excess of the protection required. Such protection shall be connected in the circuit so that shunting or tampering will not defeat the protection of the primary area.

2.2.3 Equipment used in a burglar-alarm system shall comply with the requirements for that product and shall not be modified before, during, or after installation into the system.

2.2.4 To permit entry into or exit from alarmed areas protected by mercantile systems, a timer or shunting device may be employed. See 19.2.6 and 19.2.8.

2.2.5 Each burglar alarm system shall be provided with a complete physical boundary. See 3.7.

2.2.6 Communication Cloud quality, reliability and infrastructure are not evaluated by this standard.

2.3 System stability

2.3.1 Alarm systems shall be designed, installed, and operated in such a manner to minimize the likelihood the system will send unintended signals, such as alarms that are not caused by burglaries, attempted burglaries or vandalism.

2.3.2 The area in which an alarm system is to be installed or areas in which additions and revisions to an existing alarm system are to be made shall be examined to identify environmental factors and housekeeping issues that will have an impact on the stability and operation of the alarm system. The selection of equipment, loading of zones, and the method or methods of protection employed and placement of devices shall be based on this assessment.

2.3.3 The manufacturer's instructions for each control unit, transmitter, sensor, device and component that is used to form the alarm system shall be followed for the mounting, placement, wiring, adjustment and maintenance.

2.3.4 Personnel at the protected property that are authorized to arm and disarm the alarm system shall be trained in this process by either a qualified representative of the alarm service company or by a representative of the protected property that has been trained by the alarm service company.

2.4 Undated references

2.4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3 Glossary

3.1 For the purpose of this standard, the following definitions apply.

3.2 ALARMED AREA – A vault, closed area, or container on which an alarm system is installed.

3.3 ALARM SOUNDING DEVICE – An audible signal appliance (bell, horn, siren, or speaker) that is used to signal unauthorized entry into a protected area and which complies with the requirements for an alarm sounding device in the Standard for Police Station Connected Burglar Alarm Units and Systems, UL 365, or the Standard for Audible Signal Appliances, UL 464 or the Standard for Local Burglar Alarm Units and Systems, UL 609.

3.4 ALARM SOUNDING DEVICE HOUSING – A housing, or an equivalent enclosure, that complies with the applicable requirements in the Standard for Police Station Connected Burglar Alarm Units and Systems, UL 365 and is used to provide attack resistance for an alarm sounding device that is mounted outside of the area that is protected by an alarm system. See ALARM SOUNDING DEVICES, General, Section 20.

3.5 APPROVED GSA CONTAINER – A security container that conforms to federal specifications and bears a GSA "Test Certification Label" attesting to the security capabilities of the container and integral combination lock.

3.6 APPROVED VAULT – An assembly of brick, concrete, tile or other masonry material which has been constructed in accordance with the construction requirements in "National Industrial Security Program Operating Manual (NISPOM)" DoD 5220.22-M. This vault must also have a GSA approved door, frame and combination lock.

3.7 AUTOMATED TELLER MACHINE (ATM) – An unattended machine available to the public that will dispense cash, and may also accept deposits or perform other banking functions, or both, when accessed by an authorized user. The cash and deposits are protected by a security container.

3.8 BOUNDARY, PHYSICAL – A barrier such as a wall, ceiling, floor, partition, window, wire and mesh screening (5.3.1) or door enclosing an alarm system. An opening that is covered with protective wiring such as an alarm screen is also considered to have a physical boundary.

3.9 CABLE, ELECTRICALLY PROTECTED – Installation wiring that is encased within two shields composed of conductive foil or braided wire, one of which is connected to the positive and the other of which is connected to the negative polarities of the protection circuit.

3.10 CABLE, EMBEDDED – Protective wiring installed in a monolithic concrete, or equivalent, structure at the time of construction.

3.11 CIRCUIT, DOUBLE – Protective wiring of opposite polarities, applied and arranged "one and three" or "one and four." In the "one and three" arrangement, alternate protective conductors are of opposite polarity; in the "one and four" arrangement, the first and fourth conductors are one polarity and the second and third are the other.

3.12 CIRCUIT, SINGLE – Protective wiring of a single polarity.

3.13 CLOSED AREA – An enclosed area meeting the construction requirement in the "National Industrial Security Program Operating Manual (NISPOM)" DoD 5220.22-M.

3.14 COMMUNICATION CLOUD – The area in the communication path that is supported by providers of communication services in which signals travel between a protected property and a monitoring station. Depending on the type of transmission that is used, signals may travel on a single defined route or through various routes depending on what is available when the signal is initiated. See Table 19.1.

3.15 CONNECTOR – A device installed in a burglar alarm system that is intended to join various parts of protective circuit devices and installation wiring and which complies with the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634.

3.16 CONNECTOR, FLEXIBLE – A device that is designed to extend installation wiring on to a movable opening such as a door, roof hatch, window and the like, and which complies with the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634.

3.17 CONTACT – A device complying with the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 that is installed on a movable opening and that, when actuated, initiates an alarm condition. See 3.50.

3.18 GROOVED STRIPPING – Wooden strips grooved to accept fine wire, secured to a surface or across an opening to be protected.

3.19 INTRUSION DETECTOR – One or more unit assemblies of electrical components that are intended to detect the presence, movement, sound, or other activity of an intruder.

3.20 LACING – A circuit of fine wire or foil applied to a door or similar surface in continuous parallel strips, a maximum of 4-in (102-mm) center to center and mechanically protected by covering.

3.21 LINE SECURITY, ALTERNATE PRIMARY – A method of activating one or more signal paths to maintain the same level of supervision without interruption.

3.22 LINE SECURITY, STANDARD AND ENCRYPTION – Methods of supervising the communication path used to transmit signals between the alarm system and a remote monitoring location. This supervision serves to detect compromise attempts on the communication path that are intended to prevent signals indicating entry into the protected area or object from being received by the monitoring location.

3.23 MAINTENANCE – Required inspections and tests at prescribed intervals that are performed to keep the burglar alarm system and all installed equipment in a fully operative condition. See 3.38 and COMMISSIONING, SERVICE AND MAINTENANCE, General, Section 22.

3.24 MOTION DETECTOR – A special form of an intrusion detection device that is intended to detect the movement of an intruder (see Section 7).

3.25 NIGHT DEPOSITORY OR NIGHT SAFE – A safe located within a building and connected by a metal chute or equivalent to a depository head on the outside of the building wall to permit deposits after hours. See 3.36.

3.26 OPENING – A point at which entry can be gained through an aperture of manhole size without cutting or tearing down any part of the building structure. An opening can be fixed or movable and may singly or in combination be nailed, bolted, screwed, welded, barred shut, or boarded-over. When secured by screws, the screws shall be nonremovable. See 5.1 – 5.4.

3.27 OPENING, ACCESSIBLE – An opening that does not comply with the requirements for an inaccessible opening.

3.28 OPENING, INACCESSIBLE – An opening:

a) More than 18 feet (5.5 m) above either the ground or the roof of an adjoining building;

b) More than 14 feet (4.3 m) from a directly or diagonally opposite window, fire escape, or roof; or

c) More than 3 feet (0.9 m) from an opening, fire escape, ladder, and the like, that is in or projecting from the same or adjacent wall and leads to other premises. See Figure 5.1 – Figure 5.5.

3.29 OPENING, MANHOLE SIZE – An opening with a clear cross-section area of 96 in^2 (619 cm^2) or more, and with the smallest dimension exceeding 6 in (152 mm).

3.30 POLLING DATA LOOPS – An installation wiring circuit in which each device or component of an alarm system that is attached to the loop is polled to verify the continuity of the circuit.

3.31 PREMISES – Any building or part of a building that has a complete physical boundary. Examples of premises include stores, banks, offices, manufacturing facilities, warehouses, lofts, and stockrooms, and similar locations, used for the storage, manufacturing, sale, or handling of merchandise, valuables, and the like.

3.32 PROTECTION, CONTACT – Contacts installed on a movable opening.

3.33 PROTECTION, FULL – Protective wiring or intrusion detection units installed to protect an opening (fixed or movable), a wall, a floor, a ceiling, or surface. A movable opening shall include the installation of contacts.

3.34 PROXIMITY DETECTOR – A device that utilizes mutual capacitance between an object, itself and an intruder so that persons approaching the object will be detected.

3.35 ROOF HATCH – A covered and secured opening that allows access to the roof of a building. May be secured by a thermal link that will open the hatch in the event of a fire and allow the venting of smoke and heat.

3.36 SAFE – An iron or steel, or equivalent, container that has its door(s) equipped with a combination lock.

3.37 SCREEN – A fully framed assembly of grooved-wood dowels having fine wire secured in the grooves. Polymeric material or insect screening may be used to support the fine wire and polymeric or metal may be used for the frame and cross members. The entire assembly shall comply with the Standard for Linings and Screens for Use with Burglar-Alarm Systems, UL 606.

3.38 SERVICE – Repair work initiated at the request of the user of the system or in response to the receipt of an alarm or trouble signal. See COMMISSIONING, SERVICE AND MAINTENANCE, General, Section 22.

3.39 SERVICE CENTER – A location that may be separate from the alarm service company's main business location providing alarm investigator (where required), installation, maintenance, and repair service to systems served by the company. If keys for protected premises are required, they are retained at the service center. The service center is to keep maintenance records for the systems that it serves unless the records can be accessed from another location.

3.40 SERVICE PERSON – A person (s) from an alarm service company that provides service and maintenance for the alarm equipment that forms an alarm system.

3.41 SERVICE TERRITORY – A geographic area, that is measured by driving time in a road based vehicle, within which a service center provides alarm investigator (where required), installation, maintenance, and repair service to systems served by the alarm service company (see 22.4.6).

3.42 SERVICE VEHICLE – A vehicle used to provide alarm investigator (where required), installation, maintenance, and repair service to systems served by the company.

3.43 SHOWCASE WINDOW – A structure of clear glass or other glazing material, such as plastic, acrylic, polycarbonate, and the like that forms a part of the perimeter of the premises and is used to display or store merchandise or other material.

3.44 SHOW WINDOW – A fixed window constructed of clear or opaque glass or other glazing material, such as plastic, acrylic, polycarbonate, and the like.

3.45 SIGNAL PATH, SINGLE – Signals from a protected property to a remote monitoring location are sent by a single transmission technique and pass through a single demarcation point as they leave the protected property.

3.46 SIGNAL PATH, DUAL – Signals from a protected property to a remote monitoring location are sent by different transmission technique, which pass through separate demarcation points as they leave the protected property.

3.47 STOCK CABINET – A fully enclosed container that is used for the display or storage of materials, goods, records, or the like.

3.48 STOCKROOM – A room with a complete physical boundary that is used for the storage of materials, goods, records, or the like.

3.49 STREET OR HIGHWAY, PUBLIC – A road that is accessible by the public for vehicular traffic.

3.50 SWITCH (CONTACT) – A device complying with the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, and which is intended for use in protective circuits to supervise doors, windows, hatches, vents, trapdoors, and the like to initiate an alarm condition when activated. A switch is usually referred to as a contact. See 3.17.

3.51 TRANSOM – A fixed or movable window constructed of glazing material, either transparent, translucent, or opaque, mounted in a frame and located immediately above a door or show window.

3.52 TRAP – A conductor or device fastened between a building structure and a screen, stripping, foiled or wired panel, fan, removable air conditioner or heating unit, or similar device so that the two cannot be separated without initiating an alarm.

3.53 USER INTERFACE DEVICE – The part of an alarm system that enables an authorized user to arm and disarm the alarm system or portions of the system, manipulate the system operation or otherwise interact with the system from a point on the premises.

3.54 VAULT – A room constructed of iron, steel, brick, concrete, stone, tile, or similar masonry units permanently built into or assembled on the premises and having an iron or steel, or equivalent, door and frame with a combination lock. A vault may also consist of a door and modular panels constructed in compliance with the requirements in the Standard for Burglary Resistant Vault Doors and Modular Panels, UL 608.

3.55 VISIBLE (FROM PUBLIC STREET OR HIGHWAY) – Any point on a building up to 400 feet (122 m) from a public street or highway, that can be seen by an observer positioned on a public street or highway is considered "visible from the public street or highway."

3.56 WIRE, FINE – Bare, hard-drawn, solid copper wire not larger than 24 AWG (0.21 mm^2) or film-coated solid copper wire not larger than 26 AWG (0.13 mm^2), or the equivalent.

3.57 WIRING, INSTALLATION – Alarm system wiring that is used to interconnect equipment (contacts, intrusion detection units, foil, sounding devices, controls, protective wiring, and the like) installed to form a burglar alarm system or holdup alarm system.

3.58 WIRING, OPEN (LACING) – A form of protective wiring consisting of bare, hard-drawn solid copper wire not larger than 24 AWG (0.21 mm^2). This type of wiring may be used for protection under limited circumstances and must be mechanically supported at its ends with additional support at required intervals. See Open wiring, lacing and stapled wire, 9.2.

3.59 WIRING, PROTECTIVE – Conductor such as foil, fine wiring, open-wiring, grooved stripping, a screen, or other wiring that is installed on an opening or on a wall, floor, or ceiling to form protection within an alarm system.

PROTECTION OF PREMISES OR AREAS WITHIN PREMISES

4 General

4.1 Installation design for central station, mercantile, and proprietary systems

4.1.1 Details

4.1.1.1 An individual alarm system protecting a premises, stockroom, or stock cabinet shall provide a level of protection designated as Extent Number 1, as specified in 4.2.1.1; Extent Number 2, as specified in 4.2.2.1 and 4.2.2.2; or Extent Number 3, as specified in 4.2.3.1 – 4.2.3.3; or Extent Number 4 as specified in 4.2.4.1 and 4.2.4.2. See Table 4.1.

Table 4.1
Extents of protection for premises

Extent	Method	External openings		External surfaces	Special considerations
		Accessible[a]	Inaccessible	Walls, floors and ceilings	
4 (See 4.2.4)		Contact[c), e)]			Contacts on at least 2 interior doors; OR motion or sound detection in 1 or more areas; OR 1 or more channels of invisible beams or motion detectors to limit movement.
3 (See 4.2.3)	Perimeter	Full[b)]			Protection installed at each accessible opening.
	Motion	Contact[c), d)]			Four-step[e)] movement in each enclosed area with external openings.
	Sound	Contact[c)]			Sound detectors in each enclosed area with external openings. Limited to buildings with stable acoustics.
	Channels	Contact[c)]			Minimum length of beam or beams equal to longest dimension of each enclosed area with external openings.
2 (See 4.2.2)	Perimeter	Full[b)]		Full[f)]	Exterior surfaces of monolithic concrete and ones that are inaccessible do not require protection.
	Motion	Contact[c)]			Four-step[e)] movement in each enclosed area with inaccessible external surfaces not of monolithic concrete.
	Sound	Contact[c)]			Sound Detectors in each enclosed area with accessible external surfaces. Limited to buildings with stable acoustics.
	Channels	Full[b)]			Detectors arranged to divide each enclosed area with external surfaces into at least 3 subdivisions. Maximum 1000 feet^2 for each subdivision.
1 (See 4.2.1)	Perimeter	Full[b)]	Full[b)]	Full[f)]	Protective wiring installed on all surfaces.
	Sound or Vibration	Contact[c)]	Contact[c)]		Detectors adjusted to initiate an alarm if a manhole size opening is created in an opening, ceiling, floor or wall.

[a)] Accessible means under 18 feet from grade or adjacent roofs; less than 14 feet from horizontally, or less than 3 feet from openings on same wall (See 3.27).

[b)] Full protection of an opening is wiring or other means applied to protect the opening and contacts on movable openings (See 3.33).

[c)] Contact protection means a contact installed on a movable opening (See 3.32).

[d)] Doors only [See 4.2.3.1(b)].

[e)] Four-Step movement is a means of confirming motion detection coverage by a series of walk tests through the enclosed area (See 7.3.2 and 7.3.3).

[f)] Full protection of a surface means wiring or other means to protect a wall, floor or ceiling [See 4.2.1.1(a)].

4.1.1.2 Premises with more than one room or area shall be protected by protective wiring applied to all openings or vulnerable surfaces, by the use of an acceptable sensing device including an intrusion detection unit, or by any combination of protective wiring or devices so that the same extent of protection is provided in each room or area as required by the alarm system. Motion detection is not required to be installed in an area such as a washroom, furnace room, clothes closet, utility closet, janitor's closet, stairway, telephone room or sprinkler room, or above a suspended ceiling (see 5.2) within the physical boundary of the alarm system. Any opening in such an area that leads outside of the area covered by the alarm system shall be provided with full protection or the door into the area shall be protected as required by the method used in the alarm system.

4.2 Extents of protection for central station, mercantile, and proprietary systems

4.2.1 Extent Number 1

4.2.1.1 Extent Number 1 protection shall consist of either of the following methods of installing alarm protection. Extent Number 1 protection shall apply to a central station alarm system only. An alarm system may utilize a single method or a combination of methods:

a) Perimeter Only – Full protection of all openings, ceilings, floors, and walls enclosing the premises with the use of protective wiring (See 9.1.7, 9.2 and 9.3).

b) Sound or Vibration Detection – Contact protection of all movable openings leading from the premises and an acceptable sound or vibration system installed on all openings, ceilings, floors, and walls enclosing the premises and adjusted so that an alarm will be initiated if a manhole size opening is made in any opening, ceiling, floor or wall (See 9.7).

4.2.2 Extent Number 2

4.2.2.1 Extent Number 2 protection shall consist of any of the following methods of installing alarm protection. Accessible ceiling, floors, and walls constructed of monolithic concrete or pre-cast concrete building panels do not require protection. Inaccessible ceiling, floors, and walls of any construction do not require protection. An alarm system can utilize a single method or any combination of methods:

a) Perimeter Only – Full protection of all accessible openings, ceilings, floors, and walls enclosing the premises (See 9.1.7, 9.2 and 9.3).

b) Motion Detection – Contact protection of all accessible movable openings leading from the premises, and a system of intrusion detection in all sections of each enclosed area that has any accessible surface such as a ceiling, floor or wall that is common to the outside of the premises so as to detect movement as specified in 7.3.2 or 7.3.3.

c) Sound Detection – Contact protection of all accessible movable openings leading from the premises, and a sound detection system in all sections of each enclosed area that has any accessible surface such as a ceiling, floor or wall that is common to the outside of the premises in accordance with 9.7.1 – 9.7.8.

d) Channels –

1) Full protection of all accessible openings leading from the premises and

2) A network of invisible beams or motion detectors arranged to subdivide the floor space of each floor or separate section of the protected area that has any accessible surface such as a ceiling, floor or wall that is common to the outside of the premises into at least three approximately equal areas. Each subdivision shall not exceed 1000 feet^2 (93 m^2) of floor space. See 7.2.1 and 7.3.1.

4.2.2.2 For the type of protection specified in 4.2.2.1 (d), where merchandise is concentrated in wall cases, additional beams or channels of radiation shall span the entire length of the cases to detect the approach of an intruder to the cases.

4.2.3 Extent Number 3

4.2.3.1 Extent Number 3 protection shall consist of any of the following methods of installing alarm protection. An alarm system can utilize a single method or any combination of methods:

a) Perimeter Only – Full protection of all accessible openings (See 9.1.7, 9.2 and 9.3).

b) Motion Detection – Contact protection of all accessible doors leading from the premises and a system of intrusion detection in all sections of each enclosed area that has exterior openings so as to detect movement as specified in 7.3.2 or 7.3.3.

c) Sound Detection – Contact protection of all accessible movable openings leading from the premises and a sound detection system in all sections of each enclosed area that has exterior openings in accordance with 9.7.1 – 9.7.8.

d) Channels – Contact protection of all movable accessible openings leading from the premises and a system of invisible beams or motion detectors arranged so that the minimum length of the beams or motion detection is equal to the longest dimension of each enclosed area that has an exterior opening. The channels shall be arranged to provide the most effective coverage of the premises. A channel of protection along one wall, with or without openings, does not meet the intent of this requirement. See 7.2.1 and 7.3.1.

4.2.3.2 For the type of protection specified in 4.2.3.1 (d), irregularly-shaped areas are to be divided into sections approximating rectangles as closely as possible. The longest dimension is then considered to be the sum of the longest dimension of each section.

4.2.3.3 For an Extent Number 3 system a movable window fronting and within 50 feet (12.4 m) of a public street or highway and between 14 and 18 feet (4.3 and 5.5 m) above ground and not otherwise accessible (as from a ledge, fire escape, adjacent opening, and the like), need only be provided with contact protection. A fixed window under these conditions does not require protection.

4.2.4 Extent Number 4

4.2.4.1 Extent Number 4 shall consist of any of the following:

a) Contact protection on accessible doors and on two or more interior doors. See 4.2.4.2;

b) Contact protection on accessible doors and motion or sound detection in one or more selected areas; or

c) Contact protection on accessible doors and a system of one or more invisible beams or motion detectors arranged to limit movement within the premises. See 7.2.1 and 7.3.1.

4.2.4.2 If the premises has only one interior door or no interior door, 4.2.4.1 (a) shall not be used. The requirement in 4.2.4.1 (b) or (c) shall be used. Protection of a door to an area such as a washroom, furnace room, clothes closet, utility closet, or janitor's closet, will not meet the requirement of 4.2.4.1(a).

4.3 Installation design for national industrial security systems

4.3.1 Details

4.3.1.1 An individual alarm system that is installed in a closed area, alarmed room or arms, ammunition, and explosives storage area and which is operated by a contractor providing services to the U. S. government, shall provide a level of protection designated as:

a) Extent Number 2 as specified in 4.4.1 (see Table 4.2); or

b) Extent Number 3 as specified in 4.4.2 (see Table 4.2); or

c) Extent Number 5 as specified in 4.4.3 (see Table 4.2).

Table 4.2
Extents of protection for closed areas

Extent	Method	External openings		External surfaces	Special considerations
		Accessible[a]	Movable accessible	Walls, floors and ceilings	
5 (See 4.4.3)		Full[b] When not visible to patrolling personnel.	Contact[c] When visible to patrolling personnel		If fixed openings are visible to patrol, but can be removed and replaced without notice, electrical trapping is required. If they cannot be removed without noticeable disassembly or being broken, protection is not required.
3 (See 4.4.2)	Perimeter	Full[b]			Protection installed at each accessible opening.
	Motion		Contact[c], [d]		Four-step[e] movement in each enclosed area with external openings.
	Channels		Contact[c]		Minimum length of beam or beams equal to longest dimension of each enclosed area with external openings. Motion detectors can be used for channel protection.
2 (See 4.4.1)	Perimeter	Full[b]		Full[f]	Exterior surfaces of monolithic concrete and ones that are inaccessible do not require protection.
	Motion		Contact[c]		Four-step[e] movement in each enclosed area with accessible external surfaces not of monolithic concrete.
	Channels	Full[b]			Detectors arranged to divide each enclosed area with external surfaces into at least 3 subdivisions. Maximum 1000 feet^2 for each subdivision.

[a] Accessible means under 18 feet from grade or adjacent roofs; less than 14 feet from horizontally, or less than 3 feet from openings on same wall (See 3.27).

[b] Full protection of an opening is wiring or other means applied to protect the opening and contacts on movable openings (See 3.33).

Table 4.2 Continued on Next Page

Table 4.2 Continued

Extent	Method	External openings		External surfaces	Special considerations
		Accessible[a)]	Movable accessible	Walls, floors and ceilings	
[c)] Contact protection means a contact installed on a movable opening (See 3.32).					
[d)] Doors only [See 4.4.2.1(b)].					
[e)] Four-Step movement is a means of confirming motion detection coverage by a series of walk tests through the enclosed area (See 7.3.2 and 7.3.3).					
[f)] Full protection of a surface means wiring or other means to protect a wall, floor or ceiling [(See 4.4.1.1(a)].					

4.3.1.2 Some details regarding the design, installation and operation of these systems are found in the Standard for National Industrial Security Systems, UL 2050.

4.3.1.3 A closed area, alarmed room, or AA&E storage area with more than one room or area shall be protected by:

a) Protective wiring applied to all openings by the use of an acceptable sensing device including an intrusion detection unit; or

b) Any combination of protective wiring or devices so that the same extent of protection is provided in each room or area as required by the alarm system.

Motion detection is not required to be installed in an area such as a washroom, furnace room, clothes closet, utility closet, janitor's closet, telephone room, or sprinkler room, or above a suspended ceiling within the physical boundary of the alarm system. Any opening in such an area that leads outside of the area covered by the alarm system shall be provided with full protection, or the door or suspended ceiling tiles that provide access into the area shall be protected as required by the method used in the alarm system.

4.4 Extents of protection of national industrial security systems

4.4.1 Extent Number 2

4.4.1.1 Extent Number 2 protection shall consist of any of the following methods of installing alarm protection. Accessible ceiling, floors, and walls constructed of monolithic concrete or pre-cast concrete building panels do not require protection. Inaccessible ceiling, floors, and walls of any construction do not require protection. An alarm system can utilize a single method or any combination of methods:

a) Perimeter Only – Full protection of all accessible openings, ceilings, floors, and walls enclosing the room or area being protected. See 3.27.

b) Motion Detection – Contact protection of all accessible movable openings leading from the room or area, and a system of intrusion detection in all sections of each enclosed area that has any surface common to the outside of the room or area so as to detect movement as specified in 7.3.2 or 7.3.3.

c) Channels –

1) Full protection of all accessible openings leading from the room or area; and

2) A network of invisible beams or motion detectors arranged to subdivide the floor space of each floor or separate section of the protected area that has any surface common to the outside of the room or area into at least three approximately equal areas. Each subdivision shall not exceed 1000 feet^2 (93 m^2) of floor space.

4.4.1.2 For the type of protection specified in 4.4.2.1(c), where material is concentrated in wall cases, additional beams or channels of motion detection shall span the entire length of the cases to detect the approach of an intruder before gaining access to the cases.

4.4.2 Extent Number 3

4.4.2.1 Extent Number 3 protection shall consist of any of the following methods of installing alarm protection. An alarm system can utilize a single method or any combination of methods:

a) Perimeter Only – Full protection of all accessible openings (See 3.27).

b) Motion Detection – Contact protection of all accessible doors leading from the room or area and a system of intrusion detection in all sections of each enclosed area that has exterior openings so as to detect movement as specified in 7.3.2 or 7.3.3.

c) Channels – Contact protection of all movable accessible openings leading from the room or area and a system of invisible beams or motion detectors arranged so that the minimum length of the beams or motion detection is equal to the longest dimension of each enclosed area that has an exterior opening. The channels shall be arranged to provide the most effective coverage of the room or area. A channel of protection along one wall, with or without openings, does not meet the intent of this requirement. This method may only be used when the specification for the alarm system is based on the National Industrial Security Program Manual, DoD 5220.22-M, or the Physical Security of Sensitive Conventional Arms, Ammunition, and Explosives, DoD 5100.76-M.

Exception: When the alarm system is based on Physical and Technical Standards for Sensitive Compartmented Information Facilities, ICS 705-1 or the Physical Security Standards for Special Access Program Facilities, JAFAN 6/9 it shall be provided with full protection of all accessible openings and motion detection arranged to detect entrance through boundary surfaces separating the protected area from other rooms or areas that do not conform with these manuals. Accessible ceiling, floors, and walls constructed of monolithic concrete or pre-cast concrete building panels do not require protection.

4.4.2.2 For the type of protection specified in 4.4.2.1(c), irregularly-shaped areas are to be divided into sections approximating rectangles as closely as possible. The longest dimension is then considered to be the sum of the longest dimensions of each section.

4.4.2.3 For an Extent Number 3 system a movable window fronting and within 50 feet (12.4 m) of a public street or highway and between 14 and 18 feet (4.3 and 5.5 m) above ground and not otherwise accessible (as from a ledge, fire escape, adjacent opening, and the like), need only be provided with contact protection. A fixed window under these conditions does not require protection.

4.4.3 Extent Number 5

4.4.3.1 To provide Extent Number 5 protection, an alarm system shall include all of the following methods:

a) Full protection of all fixed and movable accessible openings (see 3.27) that are not visible to patrolling personnel.

b) Contacts installed on all movable accessible openings that are visible to patrolling personnel.

c) Electrical supervision in the form of traps on all accessible openings that are visible to patrolling personnel but can be removed and replaced without the disassembly being noticed by the patrol. Examples of openings needing traps are metal grates, removable panels, and wall-mounted air conditioners.

Exception: Under Extent Number 5, protection need not be provided for plate-glass window panels and for other openings if the panels and openings are:

a) Visible to patrolling personnel;

b) Fixed in place; and

c) Deny access unless broken or removed by disassembly.

5 General

5.1 Details

5.1.1 An opening in a building wall filled in by glass blocks bonded together with mortar is not considered to be an opening.

5.1.2 A window, door, or similar opening in a building structure may no longer be considered to be an opening requiring protection if the frame is removed and replaced with construction equivalent to the adjacent wall. This construction is not required to exceed 8 inches (203 mm) in thickness. A recessed door or window is not required to be removed if an 8-in thick wall can be built over the opening with the door or window still in place.

5.1.3 An opening facing an adjacent building wall without openings where the walls are spaced not more than 6 in (152 mm) apart does not require protection for Extent Number 3.

5.1.4 An opening 18 feet (5.5 m) or less above an adjoining or adjacent roof or any accessible horizontal supporting surface is considered accessible if this supporting surface is at least 6-feet (1.8-m) wide.

5.1.5 A 14-feet (4.3-m) distance determines the accessibility of an opening or ledge from another opening or ledge under the following conditions:

a) Openings or ledges in adjacent walls on the same floor level where a line between them forms a 45° angle with each wall. See Figure 5.1.

b) Openings or ledges in opposite walls and on the same floor level where a line between them forms an angle of 90°, consisting of 45° to the left and 45° to the right. See Figure 5.2.

c) Openings or ledges in opposite walls and directly above or below where a line between them forms a 150° angle consisting of 75° above and 75° below. See Figure 5.3.

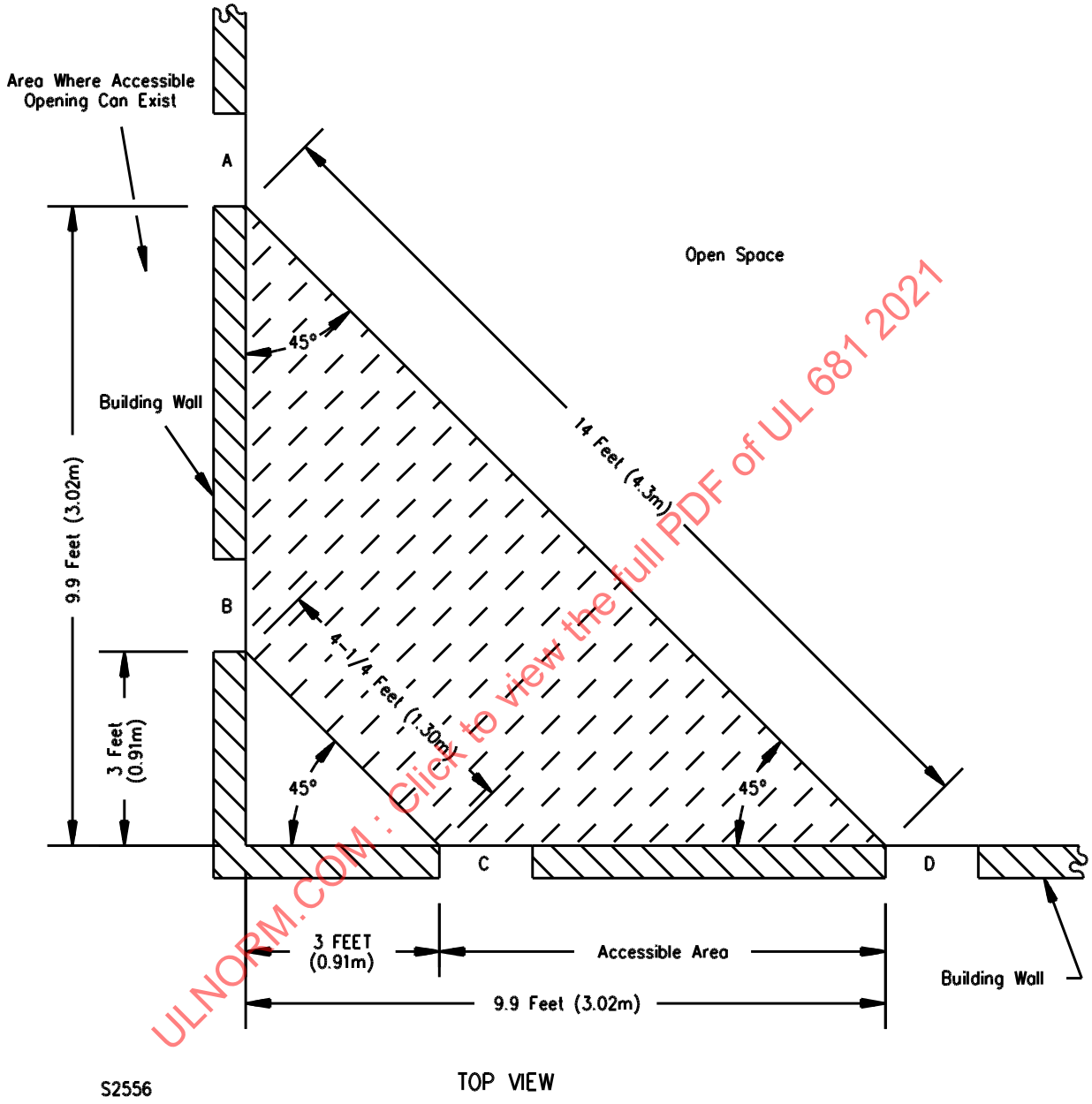
d) Openings on the same wall above a ledge between 3 feet, 6 in (1.07 m) and 5 feet, 11 inches (1.80 m) in width. See 5.1.7.

5.1.6 An opening on the same wall is accessible from a ledge that is between 1 feet (0.30 m) to 3-1/2-feet (1.07-m) wide, if the width of the ledge is at least one-fourth the vertical distance to the opening. See Figure 5.4.

5.1.7 Any opening or ledge within 3 feet (0.91 m) of another opening or ledge is accessible regardless of the angle or direction between them, except for openings or ledges in the same wall and below. See Figure 5.5.

Figure 5.1

Accessibility of openings from adjacent wall on same level



1. Opening B is accessible from opening C.
2. Opening A is accessible from opening D.
3. Opening B is not accessible from opening D because the angle formed with the building wall is not 45°.
4. Opening A is not accessible from opening C because the angle formed with the building wall is not 45°.

Figure 5.2

Accessibility of opening from opposite wall (horizontal plane)

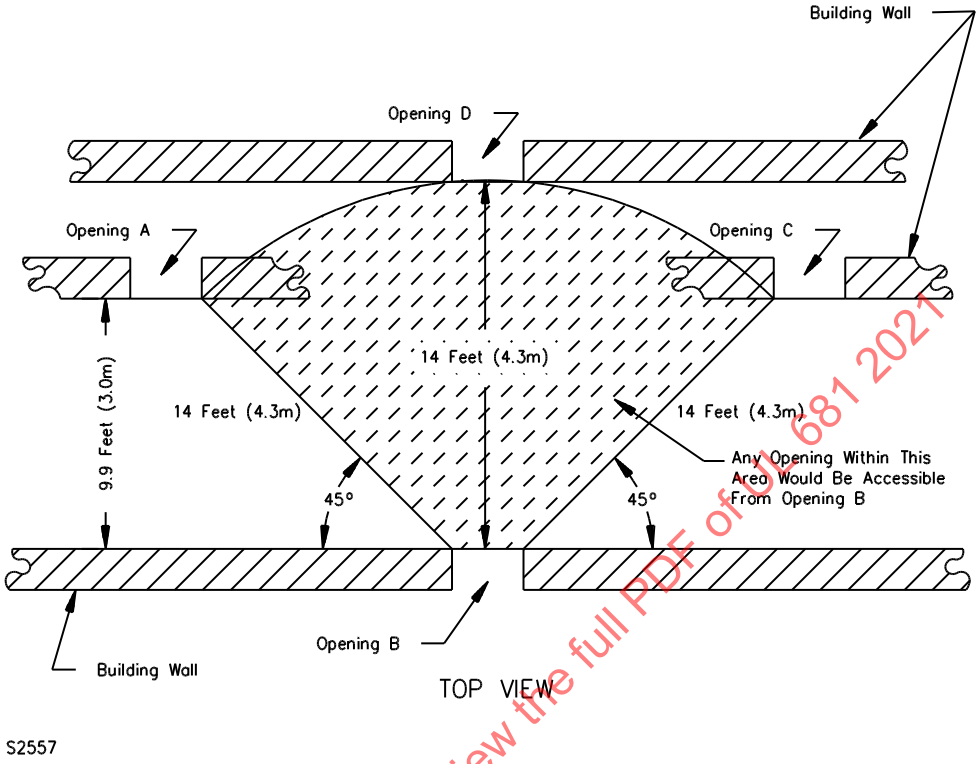


Figure 5.3

Accessibility of openings from opposite wall

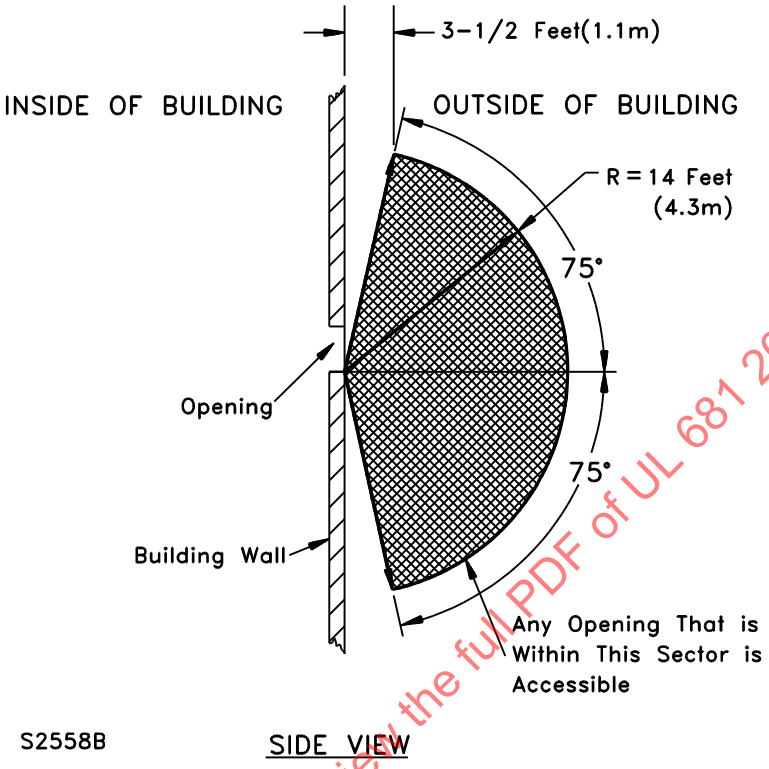
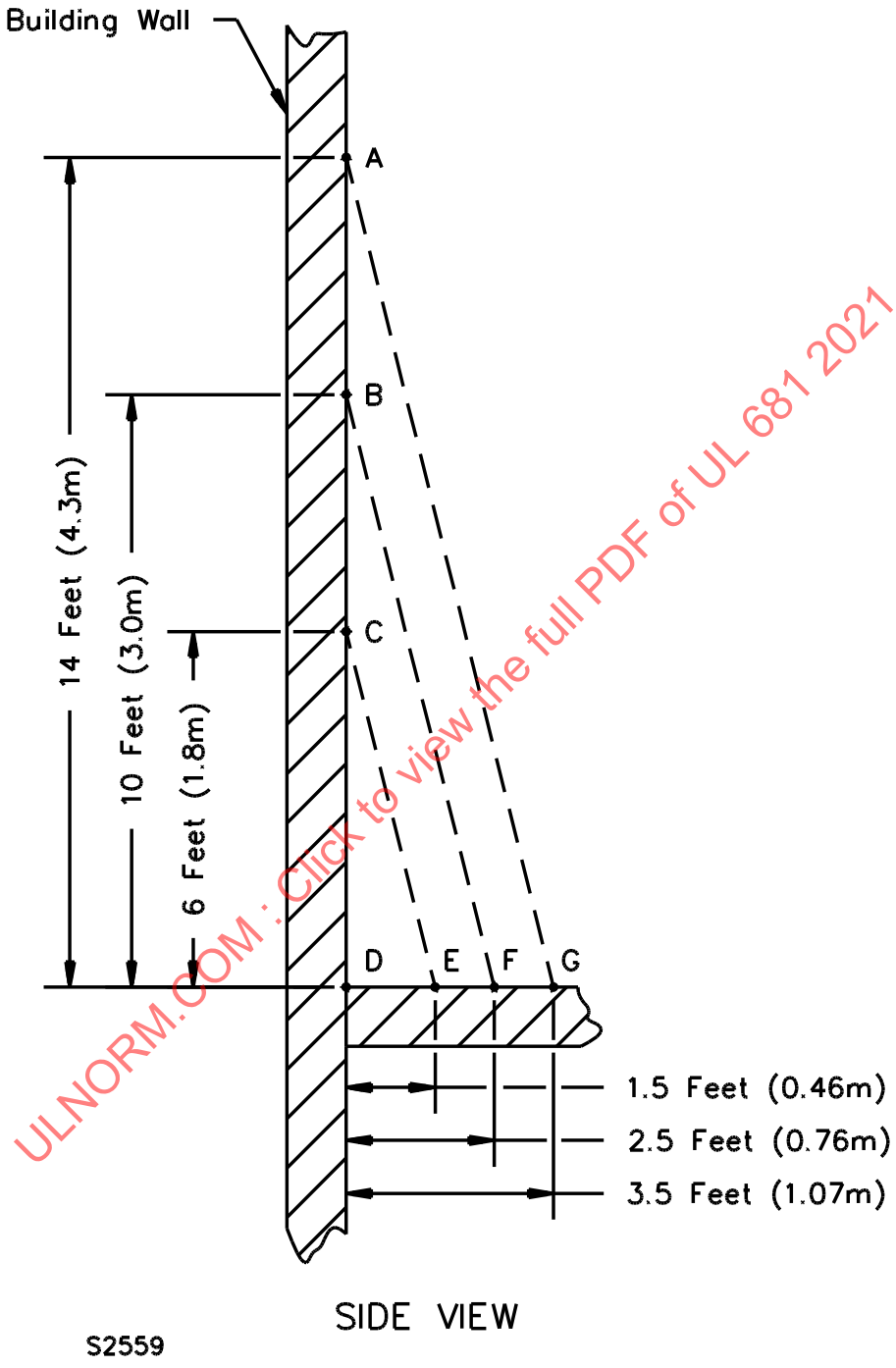


Figure 5.4

Accessibility of openings from same wall

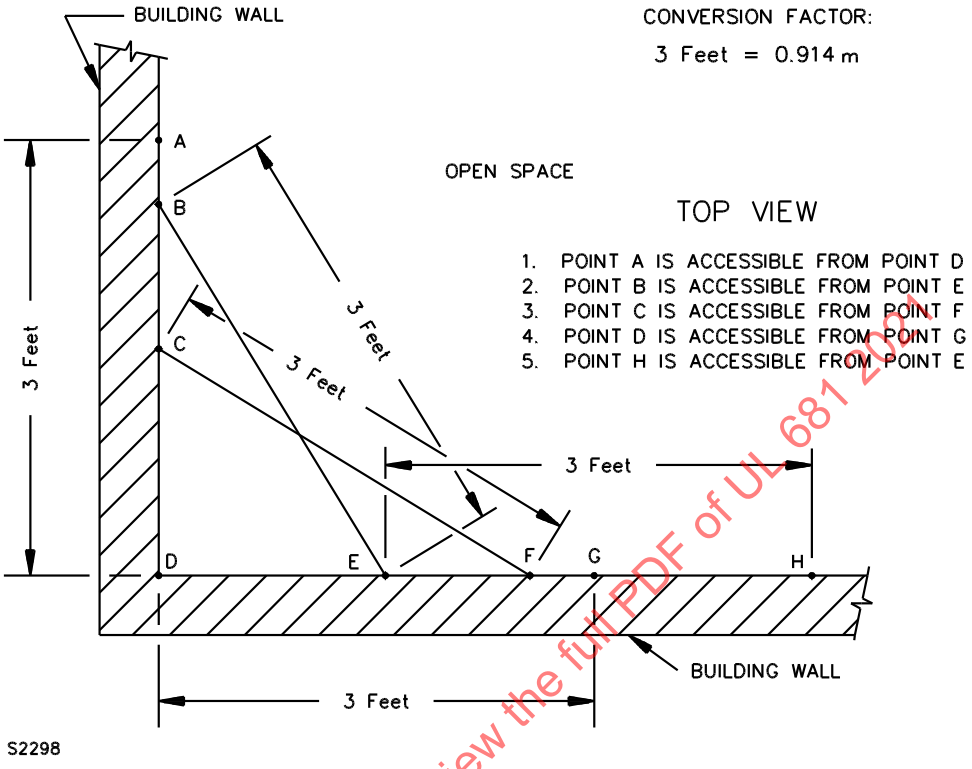


1. Any opening within C D is accessible from E.
2. Any opening within B D is accessible from F.
3. Any opening within A D is accessible from G.

Each distance is determined by the ratio 1 to 4.

Figure 5.5

Accessibility of openings from adjacent wall and on same wall on same floor level



5.1.8 Accessible ledges between 4 to 12 in (102 to 305 mm) in width make openings along the ledge accessible only if there are handholds at intervals of 3 feet (0.91 m) or less in the wall above the ledge. Non-continuous footholds similar to a ledge are considered to provide accessibility only if they occur at intervals of 3 feet (0.91 m) or less, and with handholds.

5.1.9 When the requirements for accessibility are applied, any opening, ledge, roof, fire escape, or other building projection that is accessible from any other opening, ledge, roof, fire escape, or other building projection makes the other location mutually accessible. For example, if an opening is accessible from the roof of an adjoining building, the roof is also to be considered accessible from the opening in question.

5.2 Removable ceilings

5.2.1 If the area above a liftout ceiling is common to more than one premises and party walls extend only to the ceiling:

a) For Extent Number 2, the premises shall be protected in accordance with 4.2.2.1 (b) or (d), or 4.4.1.1 (b) or (c).

b) For Extent Number 3, the premises shall be protected in accordance with 4.2.3.1 (b) or (d), or 4.4.2.1 (b) or (c).

5.3 Wire-mesh barrier

5.3.1 For Extent Numbers 3 and 4 see 4.2.3.1 and 4.2.4.1 installations, a wire mesh barrier is considered a wall and does not require protection if it is constructed of at least 0.053 in (1.35 mm) minimum thickness expanded sheet steel or 10 AWG (0.10-in diameter) (5.3-mm^2) steel wire with openings not greater than 2

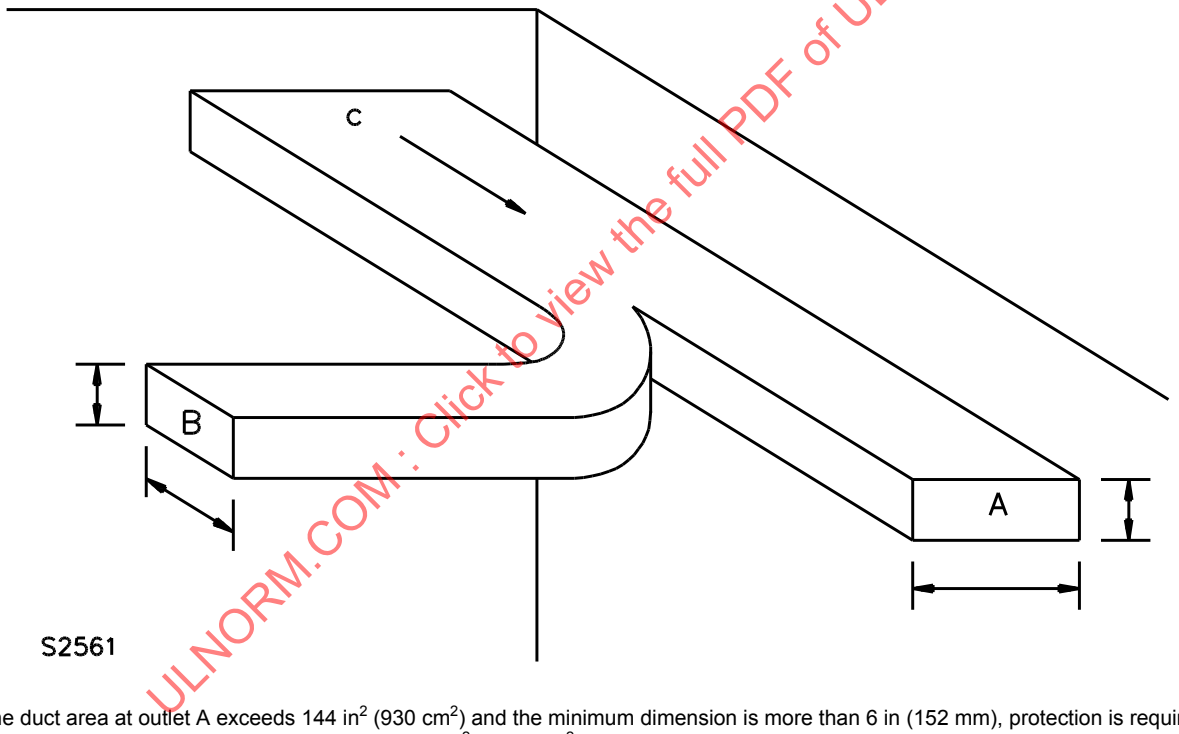
in (51 mm). Protection, such as alarm screens or linings and similar devices (see Section 9), is required for Extent Number 1 and for compliance with 4.2.2.1 (a) or (d) for Extent Number 2 installations.

5.4 Ventilating shafts and ducts

5.4.1 For an Extent Number 3 installation, a ventilating shaftway or duct exceeding 144 in^2 (930 cm^2) in area with the smallest dimension exceeding 6 in (152 mm) is an opening and shall be protected where it crosses the boundary of the protected property or at the point where it opens into the protected area. A ventilating shaftway or duct having approximately a right-angle bend shall require protection over the opening only if the cross-section area of the duct exceeds 192 in^2 (1240 cm^2) and the smallest dimension is not less than 8 in (203 mm). Such protection is not required if the area is protected as specified in 4.2.3.1 (b) or (d) for premises systems, or 4.4.2.1 (b) or (c) for national industrial security systems. See Figure 5.6.

Figure 5.6

Protection of ducts for Extent Number 3



If the duct area at outlet A exceeds 144 in^2 (930 cm^2) and the minimum dimension is more than 6 in (152 mm), protection is required at A or C. If the duct area at outlet B exceeds 192 in^2 (1240 cm^2) and the minimum dimension exceeds 8 in (203 mm), protection is required at B or C. Such protection is not required by the specifications in 4.2.3.1 (b) or (d) for premises systems, or 4.4.2.1 (b) or (c) for national industrial security systems.

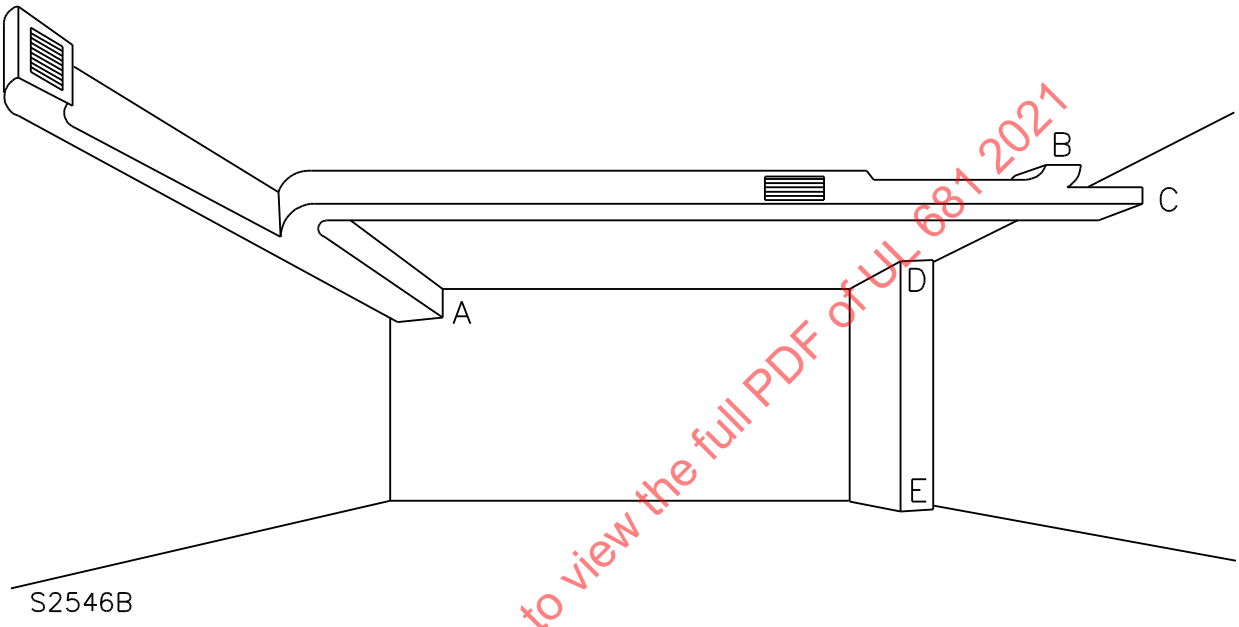
5.4.2 For Extent Number 3 installations, an unperforated access door on a metal duct may be protected by contacts only if the door is of the same material as the duct.

5.4.3 Small louvered registers may be protected by contacts or trapped if it is necessary to remove the entire register in order to create an opening of manhole size. Such protection is not required by the specifications in 4.2.2.1 (b) or (d), 4.2.3.1 (b) or (d) for premises systems, or 4.4.1.1 (b) or (c), 4.4.2.1 (b) or (c) for national industrial security systems.

5.4.4 For an Extent Number 1 or Extent Number 2 system, a ventilating shaftway or duct exceeding 96 in^2 (619 cm^2) in area with the smallest dimension exceeding 6 in (152 mm) is an opening and shall be protected at the point where it crosses the boundary of the protected area. For an Extent Number 2 system, such protection is not required if the area is protected as specified in 4.2.2.1 (b) or (d) for premises systems, or 4.4.1.1 (b) or (c) for national industrial security systems. See Figure 5.7.

Figure 5.7

Protection of ducts for Extent Number 1 and 2



Points where ventilating ducts enter a premises or an alarmed area (A, B, C, D, and E) shall be protected unless the cross sectional area of the duct is less than 96 in^2 (619 cm^2) or the minimum dimension is 6 in (152 mm) or less. For Extent Number 2, such protection is not required by the specifications in 4.2.2.1 (b) or (d) for premises systems, or 4.4.1.1 (b) or (c) for national industrial security systems.

5.4.5 For an Extent 3 national industrial security system, a ventilating shaft way or duct exceeding 96 in^2 (619 cm^2) in area with the smallest dimension exceeding 6 in (152 mm) does not require protection when it is covered at the point where it crosses the boundary of the protected area with 1/2-in (13-mm) steel bars that are welded vertically and horizontally at 6 in (152 mm) on center, or penetrated with 1/2-in threaded rods that are secured with welded bolts and nuts, or a grill constructed of number 10 gauge case hardened sheet steel that is made non-removable. Any opening in the grill shall not be greater than 3/4 in when measured in any direction.

6 Wiring, Optical, Low Power Wireless and Other Nonmetallic Methods

6.1 General

6.1.1 Installation wiring complying with the requirements for burglar alarm wire and cable shall be used to interconnect various detection, control, and sounding device equipment installed to form a burglar alarm system. This wire shall not be smaller than 24 AWG (0.32 mm^2) copper wire and shall comply with Article 725 of the National Electrical Code, ANSI/NFPA 70.

6.1.2 Telephone cable installed in accordance with standard telephone company practices is acceptable for wiring used to connect a control unit to the telephone network.

6.1.3 Cabling used to send signals to a monitoring location shall not be marked as being part of the alarm system.

6.1.4 Special purpose wiring such as RF cable shall be installed to interconnect a device to special equipment such as an antenna as required by a manufacturer's installation instructions for the device.

6.1.5 Unless otherwise stated in this Standard, any reference to conduit, flexible tubing, conduit boxes or junction boxes shall mean these items are constructed of metal.

6.1.6 The size of installation wiring between a battery or power supply and a sounding device shall comply with Table 6.1.

Table 6.1
Wire size for an alarm sounding device

Wire size,		Maximum wire length,	
AWG	(mm^2)	feet	(m)
16	(1.30)	more than 60	(18.3)
18	(0.82)	60	(18.3)
20	(0.52)	40	(12.2)
22	(0.32)	20	(6.1)
24	(0.201)	10	(3.05)

6.2 Running and fastening

6.2.1 Installation wiring shall be located where it will be least subject to damage. A nonjacketed wire routed over a sharp corner or projection shall be protected from abrasion by two layers of electrical tape or the equivalent electrical insulation.

6.2.2 Installation wiring shall be attached to gypsum wallboard (dry wall) or plaster or wood by staples, drive rings, wire ties, or the equivalent. Wire shall be attached to a masonry surfaces by expansion bolts, plugs and eyelets, drive rings, or the equivalent.

6.2.3 Staples or brads shall be spaced not more than 2 feet (610 mm) apart on gypsum wallboard (dry wall), or wood or plaster.

Exception No. 1: A wire resting on top of a molding, cabinet, and the like, may be stapled at intervals of 4 feet (1.2 m) or less.

Exception No. 2: Areas that are not accessible, such as a duct, a plenum, the space above a suspended ceiling, and the like, where the wiring is supported and protected from damage, need not comply with these requirements.

6.2.4 Installation wiring that is run along mesh barriers (See 5.3.1) or on doors and other openings that may provide access to the installation wiring (See 8.1.7) shall be housed in metal conduit or otherwise protected against circumvention.

6.3 Splices and connections

6.3.1 A metallic conductor shall be spliced or joined with a splicing device acceptable for this purpose. A splice intended to be soldered shall be joined mechanically before being soldered. Each splice and joint shall be covered with an insulation equivalent to that of the conductors or with not less than two layers of electrical tape. A splice located in an area subjected to dampness shall be treated with an acceptable sealant or equivalently treated.

6.3.2 Wires shall be connected to terminals by means of upturned lugs, washers, or equivalent types of pressure connectors. Where such connectors are not available and stranded wire is used, the uninsulated end of the wire shall be tinned with solder or otherwise treated to assure a solid connection.

6.4 Connectors

6.4.1 A flexible connector intended to carry a circuit onto a movable opening shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634.

6.5 Separation of wiring

6.5.1 Alarm system wiring shall be spaced at least 2 in (51 mm) from conductors of any electric light, power, or Class 3 circuits unless one of the circuits is in conduit.

6.6 Entrance to building and remote areas

6.6.1 The point of entrance of an overhead outside wire shall be as inaccessible as practicable. A wire passing through a wall shall have an insulating bushing, conduit, or electrical metallic tubing slanting upward from the outside. If slanting is impossible, a drip loop shall be used. Conduit shall be equipped with a service head.

6.6.2 Installation wiring connected to a separate building, garage, storeroom, or to another floor outside the main premises shall comply with the applicable requirements specified in ALARM SYSTEM CONTROL UNITS AND TRANSMITTERS, General, Section 19.

6.7 Grounding

6.7.1 A control unit transmitter, power supply or other such devices shall be connected to an earth ground as required by the manufacturer's installation instructions for the product.

6.8 Outside wiring and other communication media

6.8.1 For leased or other wires and other communication media used to connect the protected premises with a remote monitoring location, standard communication industry operation practice will be accepted. For requirements pertaining to protectors on each circuit, aerial or underground, refer to the National Electrical Code, ANSI/NFPA 70.

6.8.2 Wires and other communication media used outside buildings to connect the protected premises with a remote monitoring location shall be run underground.

Exception: When not permitted by the installation, the wires may be run overhead.

6.9 Low power wireless

6.9.1 Depending on the type of service for which it is used, low power wireless equipment shall comply with:

a) The Standard for Police Station Connected Burglar Alarm Units and Systems, UL 365; or

b) The Standard for Local Burglar Alarm Units and Systems, UL 609; or

c) The Standard for Proprietary Burglar Alarm Units and Systems, UL 1076; or

d) The Standard for Central-Station Burglar-Alarm Units, UL 1610.

6.9.2 Short range wireless transmitters / transceivers that are fully integrated with sensors shall also comply with the applicable standard for the sensors as shown below:

a) The Standard for Connectors and Switches for Use with Burglar Alarm Systems, UL 634;

b) The Standard for Holdup Alarm Units and Systems, UL 636; or

c) The Standard for Intrusion Detection Units, UL 639.

6.9.3 Wireless equipment shall be installed, adjusted and maintained in accordance with the manufacturer's instructions. The strength of the radio frequency (RF) shall be assessed during the installation and while performing maintenance on the RF system. Independent sensors and devices may be connected to transmitters / transceivers that are designed for such use by the manufacturer. The number of independent sensors or devices and length and gage of wiring to devices shall be within the limits of the manufacturer's technical specifications and 6.9.4.

6.9.4 An individual transmitter / transceiver may be connected to one or more sensors or devices if the following conditions exist:

a) The transmitter / transceiver and the device(s) are located in the same room; and

b) The devices all serve the same functions such as:

1) All are door contacts; or

2) All are window contacts; or

3) All are motion detectors; or

4) All are glass break detectors.

Where the sensors or devices that are connected to the individual transmitter / transceiver require a power supply, such as a motion detectors or glass break detectors, the power supply shall be independent of the power for the transmitter / transceiver and comply with the Standard for Power Supplies for Use with Burglar Alarm Systems, UL 603 (See 19.4.3). The power supply shall also provide sufficient standby power to maintain the sensors or devices in normal operating condition in accordance with 19.4.2 (a) – (e).

6.9.5 Wireless products that are intended to be burglar alarm system control unit accessories shall only be used with control units with which they have been evaluated and determined to be compatible. Such determination will be noted in the instructions of the manufacturer of the wireless equipment.

6.9.6 The area in which the wireless equipment is to be installed shall be examined to determine there are no sources of interference that will destabilize or degrade the operation or the wireless system. Such

factors as sources of RF interference, unintentional jamming from sources of radiated energy, building construction, stored objects, rotating inventory or and the like shall be considered.

6.9.7 The wireless equipment shall be installed within the area that is being protected by the alarm system. Wireless systems shall not be used for the protection of stockrooms, safes, vaults, automated teller machines, and night depositories unless the transmitters, transceivers and receivers can be installed within the protected area (See 19.1.5).

6.9.8 Wireless equipment that is mounted on wall surfaces shall positioned at a height and in a location at which it will not be subject to damage or blockage.

6.9.9 All wireless equipment shall be securely mounted to fixed-in-place wall or ceiling surfaces with screws, screw anchors, bolts or similar mechanical attachments.

6.9.10 Removal of a transmitter / transceiver from its installed location or the removal of a cover exposing its battery shall cause an immediate transmission of a signal to the receiver or control unit that will, in turn, result in an audible and visual signal individually identifying the affected wireless device when the system is disarmed and an alarm signal individually identifying the affected wireless device when the system is armed.

7 Intrusion Detection Units and Systems

7.1 General

7.1.1 Intrusion detection equipment complying with the Standard for Intrusion-Detection Units, UL 639, may be used in combination with or in place of protective wiring.

7.1.2 When an intrusion detection unit used in a mercantile system is controlled by a shunt switch, there shall be a positive indication of whether or not the shunt circuit is closed. The indication shall be located at, or be visible outside, the entrance/exit door where the shunt switch is installed.

Exception: Such indication is not required when an exit time-delay shunt is used.

7.1.3 A tamper switch provided as part of an intrusion detection unit shall be connected in the installation wiring circuit. Where a separate 24-h circuit is available at the detection unit, the tamper switch shall be connected to that circuit.

7.2 Photoelectric units

7.2.1 A photoelectric unit used for channel type protection shall be installed so that the beam is not less than 18 in (457 mm) nor more than 36 in (914 mm) from the floor.

7.2.2 A photoelectric unit used to protect a specific opening shall be installed in accordance with the requirements for the protection of the opening. See Doors, Windows, And Other Openings, Section 8.

7.3 Motion detection units

7.3.1 Motion detection units used for channel-type protection of Extent Numbers 2 and 3 shall initiate an alarm when a person walks across each channel at any point at the rate of one step, 30 ±3 in (760 ±80 mm) per second.

7.3.2 If motion detection (full area) coverage is used for protection of Extent Numbers 2 and 3 the system shall respond to the movement of a person walking in an upright position not more than four consecutive

steps at a rate of one step, 30 ±3 in (760 ±80 mm), per second. The four-step movement shall constitute a "trial," and a sufficient number of detection units shall be installed so that, upon test, an alarm will be initiated in at least three out of every four such consecutive "trials" made moving progressively through the protected area. The test is to be conducted by taking a four step trial, stopping for 3 to 6 s, taking a four step trial, stopping for 3 to 6 s, repeating the process throughout the protected area. Whenever possible, the direction of the next trial is to be in a different direction.

7.3.3 If the area protected by full area motion detection can be traversed in four steps or less in any direction, movement shall be detected when the walk test in that direction is made.

7.3.4 Each system shall be provided with a test device or method to indicate the overall operability of the system.

7.3.5 A motion detection unit shall be installed so that it will not be influenced by movement outside the protected area.

7.3.6 A motion detection unit shall not be installed within a protected area if it will be influenced by moving objects, air turbulence or movement, noise, electrical interference, and the like in a manner that will cause the motion detector to go into an alarm condition.

7.3.7 A motion detection unit shall not be installed where its field of view can be blocked by inventory, storage racks, shelving and similar fixtures.

8 Doors, Windows, and Other Openings

8.1 General

8.1.1 A door, window, and other opening may be protected as specified in 8.1.2 – 8.7.1, depending on the construction, location, and material of the opening. These requirements cover full protection of the opening as required in 4.2.1.1, 4.2.2.1 (a) and (d), 4.2.3.1 (a) and (d), 4.4.1.1 (a) and (c), 4.4.2.1(a) and 4.4.3.1(a). See Table 8.1 for a summary of the protection requirements for doors.

Table 8.1
Summary of protection requirements for doors

Type of door	Extent Number 3	Extent Number 2
Metal, metal-sheath or solid wood door – visible from public street or highway	(1) Contacts if grade level	(2) Contacts and motion detector or shock sensor
Metal, metal-sheath or solid wood door – not visible from public street or highway	(1) Contacts and motion detector or shock sensor, or (2) Contacts and PE beam	(1) Contacts and motion detector or shock sensor
Heat treated, tempered glass door – visible or not visible from public street or highway	(1) Contacts and motion detector or shock sensor/glass break detector	(1) Contacts and motion detector or shock sensor/glass break detector
Laminated, wired glass or plastic glazed door – visible or not visible from public street or highway	(1) Contacts and motion detector or shock sensor/glass break detector	(1) Contacts and motion detector or shock sensor/glass break detector
Door of any construction – visible from public street or highway	(1) Contacts and motion detector or shock sensor/glass break detector, or (2) Contacts and a PE beam	(1) Contacts and motion detector or shock sensor/glass break detector

Table 8.1 Continued on Next Page

Table 8.1 Continued

Type of door	Extent Number 3	Extent Number 2
Door of any construction – not visible from public street or highway	(1) Contacts and motion detector or shock sensor/glass break detector, or (2) Contacts and two PE beams	(1) Contacts and motion detector or shock sensor/glass break detector
Trap doors	(1) Contacts and motion detector or shock sensor, or (2) Contacts and PE beam	(1) Contacts and motion detector or shock sensor, or (2) Contacts PE beam

8.1.2 Requirements for the use of foil, screens, protective wire or wire lacing on doors, windows, and other openings are stated in Section 9.

8.1.3 Where protection is installed on a movable door, window or other opening the installation circuit shall be brought on to the opening with a flexible connector. See 6.4.1.

8.1.4 Contacts are only required to be installed on openings that are able to be moved from a closed position without disassembly.

8.1.5 Contacts are not required on a normally movable opening that has been permanently sealed to prevent it from being opened. This includes a metal door or window welded to its frame, doors or windows secured with one-way screws or screws that have had the slots or the like destroyed to prevent the engagement of a tool, and a door or window secured with nails or screws that have their heads recessed.

8.1.6 Contacts or an equivalent device complying with the requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm System, UL 634, shall be installed so that a movable door, movable window or other movable opening cannot be opened more than 2 in (51 mm) without initiating an alarm.

Exception: Wide overhead doors require more than one contact if either side of the door can be lifted more than 6 in (152 mm) without initiating an alarm.

8.1.7 A double door shall have contacts on each door or be equivalently protected.

8.1.8 A door or other opening having an opening less than manhole size but large enough to provide access to its contact shall have the contact or its wiring protected against circumvention.

Exception: Protection is not required if the alarm system is installed in compliance with 4.2.2.1 (b), 4.2.3.1 (b) or (d), 4.4.1.1(b) or 4.4.2.1 (b) or (c).

8.2 Metal, metal-sheath, solid wood doors

8.2.1 A grade level metal door, metal-sheath door, or solid wood door not less than 1-1/2-in (38-mm) thick, and visible from a public street or highway may be protected for an Extent Number 3 [see 4.4.1.1 (a) and 4.4.2.1(a)] installation by means of contacts.

8.2.2 A manhole size glass panel or a removable panel of other material installed in a metal, metal-sheath, or solid wood door shall have full protection of the panel. This is required for panels in doors that are either visible or not visible from a public street or highway.

Exception: Protection is not required if the alarm system is installed in compliance with 4.2.2.1 (b), 4.2.3.1 (b) or (d), 4.4.1.1(b) or 4.4.2.1 (a) or (c).

8.2.3 A metal door, metal-sheath door or solid wood door not less than 1-1/2-in (38-mm) thick and not visible from a public street or highway, may be accepted for an Extent Number 3 installation if, in addition to contacts, a photoelectric beam is installed across the protected door not more than 24 in (610 mm) from the inner surface and not less than 6 in (152 mm) nor more than 36 in (914 mm) from the floor.

8.2.4 A trapdoor in the floor of a premises may be protected with any of the following:

a) Contacts on the door and a photoelectric beam arranged to span the entire length of the door away from the hinges at a height of not less than 6 in (152 mm) nor more than 10 in (254 mm) away; or

b) A motion detection unit installed so that an alarm will be initiated if an intruder enters the protected area by penetrating the trap door and before the intruder advances 10 feet (3 m) into the premises; or

c) Two independent photoelectric beams traps shall be installed across the width of the door.

8.3 Doors of any construction

8.3.1 A door of any construction that is visible from a public street or highway may be protected with contacts and an intrusion detection unit for Extent Number 3.

a) If a motion detector is used, it shall be installed so that an alarm will be initiated if an intruder enters the protected area by penetrating the opening and before the intruder advances 10 feet (3.05 m) into the premises.

b) If a photoelectric beam is used, the beam shall be located not more than 24 in (610 mm) from the door and not less than 6 in (152 mm) nor more than 36 in (914 mm) from the floor.

8.3.2 A door of any construction that is not visible from a public street or highway may be protected with contacts and an intrusion detection unit for Extent Number 3.

a) If a motion detector is used, it shall be installed so that an alarm will be initiated if an intruder enters the protected area by penetrating the opening and before the intruder advances 10 feet (3 m) into the premises.

b) If a photoelectric beam is used, two beams shall be used and located not more than 24 in (610 mm) from the door. The lower beam shall be horizontal and shall be located between 6 in (152 mm) and 24 in from the floor. The second beam shall be horizontal or diagonal with a height above the floor level at the center of the door of 4 feet (1.2 m).

8.3.3 The view of a motion detection unit used to protect a door shall be arranged so that it will not be obstructed.

8.4 Windows

8.4.1 Full protection of a window shall consist of a contact installed on a movable window and either protective wiring applied to the window (see Section 9) or an appropriate intrusion detection unit installed to signal breakage or penetration of the window or movement of an intruder in the vicinity of the window. See 8.5.2 and 8.5.3.

8.4.2 A window that is visible from a public street or highway may be protected with a motion detector or photoelectric beam for Extent Number 3 (see 4.2.3 and 4.4.2).

a) If a motion detector is used, it shall be installed so that an alarm will be initiated if an intruder enters the protected area by penetrating the window and before the intruder advances 10 feet (3 m) into the premises.

b) If a photoelectric beam is used, the beam shall be not more than 12 in (305 mm) from the wall that the window is in and not less than 6 in (152 mm) nor more than 24 in (610 mm) above the window sill; except that if the window is 48 in (1.2 m) or less in height, the beam shall not be placed above the horizontal centerline of the window.

c) Contacts shall be used if the window is movable.

8.4.3 A window that is not visible from a public street or highway may be protected with a motion detector or two photoelectric beams for Extent Number 3 (see 4.2.3 and 4.4.2).

a) If a motion detector is used, it shall be installed so that an alarm will be initiated if an intruder enters the protected area by penetrating the window and before the intruder advances 10 feet (3 m) into the premises.

b) If photoelectric beams are used, the beams shall be not more than 12 inches (305 mm) from the wall that the window is in. The lower beam shall be horizontal and between 6 inches (152 mm) and 12 in above the window sill. The second beam shall be horizontal or diagonal and shall pass through the vertical centerline of the window or 36 inches (914 mm) above the window sill, whichever is lower.

c) Contacts shall be used if the window is movable.

8.4.4 The view of a motion detection unit used, to protect a window shall be arranged so that it will not be obstructed.

8.4.5 A shock sensor or glass break detector employed to protect a window shall be appropriate for the type of window involved and shall be installed in accordance with the product's installation instructions. It shall comply with the Standard for Intrusion-Detection Units, UL 639.

8.4.6 For Extent Number 3 central station, mercantile and proprietary system (see 4.4.2.1), show windows, transoms, or side panels visible from a public street or highway and constructed with glazing complying with the requirements in the Standard for Burglary Resisting Glazing Material, UL 972, do not require protection. If a transom is movable, contact protection shall be provided.

8.5 Showcases and showcase windows

8.5.1 Showcases and showcase windows manhole size or larger that normally form part of the perimeter of a premises shall be protected as required by 4.2.1.1, 4.2.2.1, and 4.2.3.1 – 4.2.3.2.

8.5.2 Showcases 3 feet (914 mm) or less in depth, as measured from the window to the main floor area of the premises may be protected utilizing the existing motion detection that is used to protect the main area of the premises.

8.5.3 Showcases deeper than 3 feet (914 mm) as measured from the window to main floor area of the premises shall be protected utilizing a method or intrusion detection device that is specifically intended for protection of the opening. See 4.2.1.1, 4.2.2.1, and 4.2.3.1 – 4.2.3.2.

Exception: Showcases that are deeper than 3 feet and that are fully partitioned from the main area of the premises (such as an entirely walled-off showcase or a shadow box type showcase window) may be accepted without protection of the showcases if the partition providing access to the showcase has

protection consisting of motion detection or photoelectric units installed to protect the surface of each partition, panel or door providing access to the showcases. See 7.2.2, 7.3, 8.3, and 8.5.

8.5.4 If channel protection 4.4.1.1 (c) or 4.4.2.1 (c) is used to provide protection for showcases or showcase windows, calculation of the longest dimension of the area is to include the showcase area.

8.6 Jalousie windows

8.6.1 For contact protection, a movable jalousie window shall be provided with a contact on one of the movable panes or on the mechanism used to open and close the window.

8.6.2 Full protection of a fixed or movable jalousie window shall be provided by a protective screen (see 3.37 and Section 9), foil on each pane (see Section 9), or protection can be provided under the conditions in 4.4.1.1 (b) or (c), or 4.4.2.1 (b) or (c). A movable jalousie window shall be provided with a contact as specified in 8.6.1.

8.7 Roof hatches

8.7.1 A roof hatch shall be protected as an opening that is not visible from a public street or highway. The roof hatch may be protected with a contact if the premises that it leads from is protected in accordance with 4.2.2.1 (b) or (d), 4.2.3.1 (b) or (d), 4.4.1.1 (b) or (c), or 4.4.2.1 (b) or (c).

8.8 Air conditioners, exhaust fans, and similar units

8.8.1 For an Extent Number 2 or 3, alarm system, a removable air conditioner or heating unit, side walk hatch, metal coal chute cover, metal panelboard, or similar device whose removal will create a manhole size opening does not require full protection but shall be electrically trapped to the building structure at two or more opposite points by traps or contacts.

Exception: Trapping is not required under the conditions in 4.2.2.1 (b) or (d), or 4.4.1.1 (b) or (c) for Extent Number 2, and 4.2.3.1 (b) or (d), or 4.4.2.1 (b) or (c) for Extent Number 3. This exception also applies to 8.8.2 – 8.8.4.

8.8.2 A manhole size opening adjacent to an air-conditioning unit or heating unit shall be filled. The filler shall be equivalent to construction of the adjacent wall or shall have full protection.

8.8.3 If the internal assembly of an air-conditioning unit or heating unit can be removed from outside of the protected area by pushing or pulling the assembly, the movable section shall be trapped to the building structure.

8.8.4 An exhaust fan or blower, permanently mounted in a metal frame that limits the clear opening for access (disregarding the fan blades) to less than manhole size shall be trapped to the building at two or more opposite points, if removal of the frame will provide a manhole size opening.

8.8.5 If the opening specified in 8.8.4, disregarding the fan blades, is manhole size, full protection is required. Cage screens, wired dowels, or grooved stripping trapped to the building structure are acceptable methods of complete full protection.

8.9 Floors, walls and ceilings

8.9.1 Full protection of an Extent Number 1 stockroom or premises floor, wall, or ceiling in accordance with 4.2.1.1(a) shall be in the form of double circuit lacing or foil linings installed so that the protection is guarded against mechanical damage, moisture, and corrosion.

8.9.2 Full protection of an Extent Number 1 stockroom or premises floor, wall or ceiling in accordance with 4.2.1.1(b) shall include the installation of a recognized sound or vibration detection system that has been tested and found satisfactory for the type of floor, wall and ceiling construction involved in the installation.

9 Special Applications for Premises Systems

9.1 Foil

9.1.1 General

9.1.1.1 The requirements in 9.1.2 – 9.1.7.3 apply when foil is used to protect an opening or a surface.

9.1.2 Glass

9.1.2.1 Foil used on a glass surface shall be not more than 1/2-in (13-mm) wide and not more than 0.0015-in (0.038-mm) thick for ordinary window, heat treated or tempered, or plate (float) glass and not more than 0.003-in (0.08-mm) thick for wired glass. It shall be applied evenly and secured to the surface so that it will not blister or loosen in service. It shall be protected by a varnish covering or the equivalent.

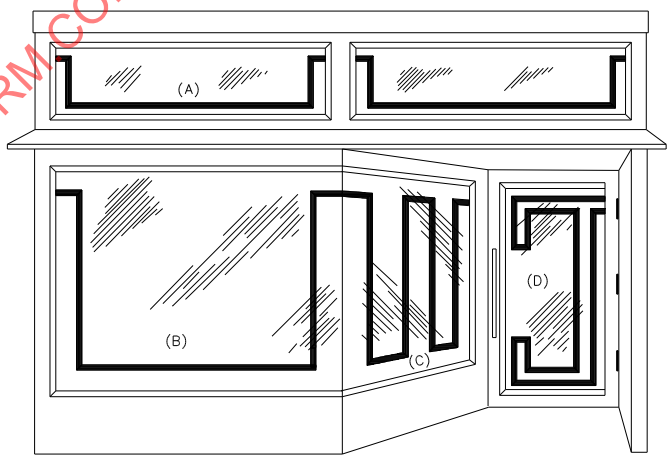
9.1.2.2 Any protective covering applied to or over foil or glass that may hinder breakage of the foil shall not be used.

9.1.2.3 A single conductor of foil connected in the ungrounded side of the protection circuit is acceptable for the protection of glass.

9.1.2.4 Foil on ordinary window glass shall be applied to the sides and across the bottom of each section of glass, and spaced 2 to 4 in (51 to 102 mm) from the edge of the glass. See Figure 9.1(A).

Figure 9.1

Foil installation



(A) Plate or Ordinary Glass

(B) Plate glass

(C) Wired Glass, Laminated Glass, Polymeric-Coated Glass, or Polymeric Glazing Material

(D) Plate or Ordinary Glass

9.1.2.5 If an ordinary glass panel is 16 in (406 mm) or less in width, a single, centrally located strip of foil may be applied to the longest dimension of the pane.

9.1.3 Wired, laminated, polymer-coated glass or polymeric glazing

9.1.3.1 Foil on wired glass, laminated glass, laminated tempered glass, polymer-coated glass, or polymeric glazing material shall be spaced 2 to 4 in (51 to 102 mm) from the edge of the glazing and arranged in parallel lines over the entire surface. The distance between centers of adjacent strips of foil shall not exceed 8 in (203 mm).

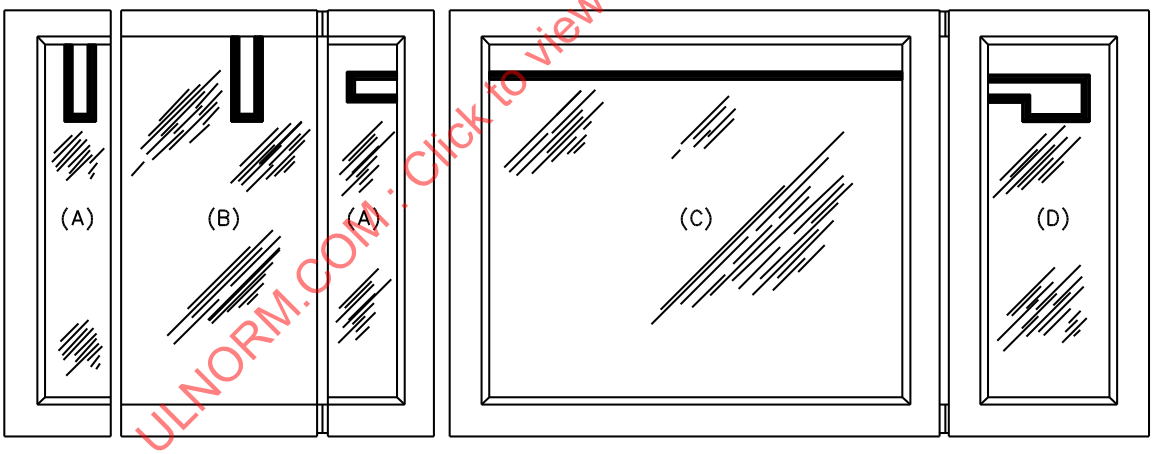
9.1.3.2 Show windows, transoms, or side panels visible from a public street or highway and constructed of glazing material complying with the requirements in the Standard for Burglary Resisting Glazing Material, UL 972, do not require foil protection for Extent Number 3.

9.1.4 Heat treated or tempered glass

9.1.4.1 Glazing material of heat-treated or tempered glass may be protected by a single strip of foil extending completely across the top, at least 6 in (152 mm) from the frame. If the sides are foiled, the construction shall comply with 9.1.5.1. See Figure 9.2(C).

Figure 9.2

Foil installation



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(A) Heat-treated or tempered glass side panel, framed on three sides.

(B) Unframed heat-treated or tempered glass door.

(C) Heat-treated or tempered glass show-window, fully framed.

(D) Heat-treated or tempered glass fully framed door.

9.1.4.2 Heat treated or tempered-glass side panels that are framed on three edges or less may be protected by a closed-circuit loop of foil extending on the glass either vertically or horizontally, between 6 in (152 mm) and 24 in (610 mm), from the top frame member. See Figure 9.2(A). For laminated tempered glass, see 9.1.3.1.

9.1.5 Plate (float) glass

9.1.5.1 Foil on plate (float) glass show windows shall be spaced not less than 3 in (76 mm) nor more than 6 in (152 mm) from the edges of the glass. See Figure 9.1(C). For laminated tempered glass, see 9.1.3.1.

9.1.5.2 Where permanent display platforms prevent foiling at the specified location on a show window, the horizontal run of foil shall be run as low as practicable, but not more than 3 in (76 mm) above the lowest platform level.

9.1.5.3 Foil shall extend across the bottom and up the sides of each section of the show window to a height of not less than 7 feet (2.1 m) from grade level, or within 3 in (76 mm) of the top of the show window.

9.1.6 Door panel

9.1.6.1 For a glass panel mounted in a door, a single circuit of foil may be applied in accordance with the requirements for the application of foil to glass surfaces. For a glass door, foil shall be applied 2 to 4 in (51 to 102 mm) from the framed edges of the glass and shall extend along the top, bottom, and sides to cover not less than 75% of the perimeter. See Figure 9.1(D).

9.1.6.2 If foil is used to protect a window, refer to 9.1.2 – 9.1.6 for requirements pertaining to the installation of foil.

9.1.7 Walls, ceilings, floors, and doors

9.1.7.1 Foil used on a wall, ceiling, floor, or door shall be not less than 3/8 in (9.5 mm) nor more than 1-in (25-mm) wide and not more than 0.003-in (0.08-mm) thick. It shall be applied using a moisture-resistant insulating adhesive.

9.1.7.2 Foil shall be applied double circuit. The distance between centers of adjacent strips of foil shall not be more than 6 in (152 mm).

Exception: Single-circuit foiling of metal doors is acceptable, provided the foil is acceptably insulated from the metal and is covered or concealed.

9.1.7.3 A foiled panel prepared for mounting on a surface shall be trapped to the structure at all four corners so that the traps will not be visible from the outside of the premises and the panel cannot be moved more than 2 in (51 mm) without actuating an alarm.

9.2 Open wiring, lacing and stapled wire

9.2.1 Open wiring shall be arranged double circuit, with the distance between conductors not greater than 4 in (102 mm).

9.2.2 Open wiring on skylights shall consist of two layers or banks of wires. The wires in the upper layer shall be installed at right angles to those in the lower layer. The two layers shall be separated by a distance of 2 to 6 in (51 to 152 mm) and each shall be double circuit.

Exception: Open wiring is acceptable on a ceiling less than 8 feet (2.44 m) above the floor in a closed-off or unused portion of the premises, and in situations where the wiring is not subject to mechanical damage.

9.2.3 Fine wire applied directly to a wood door or like surface that is in good condition and in a dry location shall be:

a) Stapled at intervals not exceeding 8 in (203 mm); and

b) Covered with hardboard, or similar moisture-resistant material.

9.2.4 A prewired panel shall be trapped to the building structure at all four corners so that the:

a) Traps will not be visible from the outside; and

b) The panels cannot be moved more than 2 in (51 mm) without actuating an alarm.

9.3 Grooved stripping

9.3.1 Fine wire in grooved stripping may be used on a surface (such as a wall or ceiling), on a door and over an opening.

9.3.2 The wiring shall be arranged double circuit. The distance between conductors shall not be more than 4 in (102 mm).

9.3.3 The fine wire shall be firmly fastened in grooves at intervals of not more than 18 in (457 mm) and in such a manner that their removal from the groove is difficult.

9.3.4 Grooved stripping used over an opening shall be secured to cross pieces that are spaced no more than 18 in (457 mm) apart or shall be applied or trapped to the building so that the strips cannot be spread to give an opening of more than 6 in (152 mm) without initiating an alarm. The fine wire in the groove of a strip over an opening shall be completely covered by a hard drying compound.

9.4 Screens

9.4.1 The requirements of 9.4.2 – 9.4.4 apply when a screen assembled from wood dowels, polymeric material or insect screening (see 3.37) is used to protect an opening.

9.4.2 A screen (see 3.37) over an opening shall not leave an unprotected space in excess of 4 in (102 mm) between the building structure and top, bottom, or side members of the screen.

9.4.3 A removable screen shall be mounted so that an alarm will result if any portion of the screen frame is moved more than 2 in (51 mm). The fixed portion of the screen contacts shall be trapped to the building structure.

9.4.4 A fixed screen shall be trapped to the building structure at all four corners so that:

a) The traps will not be visible from the outside; and

b) The screen cannot be moved more than 2 in (51 mm) without actuating an alarm.

9.5 Doors, windows and other openings

9.5.1 Protective wiring applied to a door shall be double circuit and extend to within 6 inches (152 mm) of the edge of the door at the top, bottom, and sides. At the junction of double doors, the distance between protective conductors shall not be more than 6 inches. All such wiring shall be protected against mechanical damage and covered so as not to be visible. See Table 9.1.

Table 9.1
Summary of protection requirements for doors

Type of door	Extent Number 3	Extent Number 2
Metal, metal-sheath or solid wood door – visible from public street or highway	(1) Contacts if grade level	(1) Contacts and protective wiring or
Metal, metal-sheath or solid wood door – not visible from public street or highway	(1) Contacts and protective wiring	1) Contacts and protective wiring
Heat treated, tempered glass door – visible or not visible from public street or highway	(1) Contacts and foil loop	(1) Contacts and foil loop
Laminated, wired glass or plastic glazed door – visible or not visible from public street or highway	(1) Contacts and foil on 8 inch centers	(1) Contacts and foil on 8-in centers
Door of any construction – visible from public street or highway	(1) Contacts and protective wiring	(1) Contact and protective wiring
Door of any construction – not visible from public street or highway	(1) Contact and protective wiring	(1) Contacts and protective wiring
Trap doors	(1) Contact and protective wiring, or (2) Contacts and floor trap	(1) Contact and protective wiring, or (2) Contacts and floor trap

9.5.2 A manhole size glass panel or a removable panel of other material installed in a metal, metal-sheath, or solid wood door shall have full protection of the panel. This is required for panels in doors that are either visible or not visible from a public street or highway.

Exception: Protection is not required if the alarm system is installed in compliance with 4.2.2.1(b), 4.2.3.1 (b) or (d), 4.4.1.1(b) or 4.4.2.1 (a) or (c).

9.5.3 A wood door base less than 10-in (254-mm) high may be protected by single circuit wiring.

9.5.4 A trapdoor in the floor of a premises may be protected with contacts on the door and a floor trap arranged so that its conductor spans the entire length of the door away from the hinges at a height of not less than 6 in (152 mm) nor more than 10 in (254 mm) away. If the floor trap cannot be arranged to extend the full length of the trapdoor, two traps shall be installed across the width of the door.

9.6 Heat treated or tempered glass doors

9.6.1 A frameless, heat-treated or tempered glass door, at least 1/2-in (13-mm) thick may be protected by contacts and a closed circuit foil loop extending on the glass, either vertically or horizontally, between 6 and 24 in (152 and 610 mm) from the top frame member. See Figure 9.2(B).

9.6.2 A heat treated or tempered glass side panel that is framed on three edges or less may be protected by a closed circuit foil loop extending on the glass, either vertically or horizontally, between 6 and 24 in (152 and 610 mm) from the top frame member. See Figure 9.2(A).

9.6.3 A fully framed, heat treated or tempered glass door may be protected by contacts, and a closed circuit foil loop across the top of the glass. The spacing of the foil from the top and sides of the frame shall comply with the requirements specified in 9.1.4.1. See Figure 9.2(D).

9.7 Sound detection units

9.7.1 These requirements are for sound detection equipment used in premises for the detection of forcible entry through openings or building structure.

9.7.2 The use of sound detection equipment shall be limited to buildings of substantial construction in which a forcible entry through a ceiling, roof, wall, or floor will create a significant amount of sound energy. Also, the construction shall be such as to reduce extraneous outside noise.

9.7.3 The requirement specified in 9.7.2 restricts applications of such systems to building or areas constructed of masonry, metal, and glass, except that wood deck roofs of the built-up, fire-resistive type are acceptable for sound detection protection. For a construction other than that specified, additional protection is required.

9.7.4 Sound detection equipment shall not be used for protection of a building or area where the average ambient sound exceeds 65 dbA during the protection "on" period unless such sound can be shown not to affect the system detection or monitoring capability.

9.7.5 Sound detection equipment shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so as to respond to attack sounds on the protected building or area.

9.7.6 Sound levels are to be measured by a sound-level meter designed, constructed, and calibrated in accordance with the Specification for Sound-Level Meters, ANSI S1.4.

9.7.7 The area covered by a single detector shall not exceed the area of coverage specified by the detector manufacturer. Detectors shall be located to provide coverage of the protected area(s) as required in 9.7.6.

9.7.8 A sound detection system shall be provided with a test device or method which tests operation of the system.

9.7.9 Sound detection shall not be used for a National Industrial Security System.

PROTECTION OF SECURITY CONTAINERS

10 General

10.1 Installation design for security containers in bank, central station, mercantile and proprietary station systems

10.1.1 An alarm system protecting a security container such as a safe, vault, night depository, or automatic teller machine shall provide a level of protection designated as Extent Complete, as specified in 10.2.1; or as Extent Partial as specified in 10.2.2. See Table 10.1.

Table 10.1
Extents of protection for safes, vaults, night depositories and ATM systems

Extent	Protected area	Method	Reference	Protection	Special considerations
PARTIAL (See 10.2.2)	Safe[a)]	Applied Protection	See 11.1.6	Contact Each Door and Contact or Trap Each Access Panel	Contacts mounted on the outside of the protected area shall be High Security Switches in compliance with the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634.
	Vault[b)]		See 12.1.6		
	Night Depositories[c)]		See 13.1.8		
	ATM[d)]		See 14.1.8		

Table 10.1 Continued on Next Page

Table 10.1 Continued

Extent	Protected area	Method	Reference	Protection	Special considerations
COMPLETE (See 10.2.1)	Safe[a]	Proximity System	See 11.1.1(a)	Contact Each Door and Provide Protection on All Six Sides of Safe	The safe is required to be insulated from ground by mounting it on glass, phenolic or similar blocks that cannot absorb moisture.
		Vibration (Seismic)	See 11.1.1(b)		Limited to safes that are a minimum of 1-in (25.4-mm) solid steel or rated burglary resistant.
		Applied Protection	See 11.1.1(c)		The specific protection methods are described in Section 18.
	Vault[b]	Sound Detection	See 12.1.1(a)	Protect All Sides, Doors and Emergency Ventilating Ports	Doors must be 1.5-in (38.1-mm) solid steel with a smoke or heat detector mounted above the door.
		Vibration (Seismic)	See 12.1.1(b)		If the doors are less than 1.5-in (38.1-mm) thick solid steel a double circuit panel or equivalent is required.
		Applied Protection	See 12.1.1(c)		A test unit is required when sound and vibration units are used.
	Night Depositories[c]	Vibration (Seismic)	See 13.1(a)	All sides, Chute and Outside head	Detectors that are rated as suitable for use on ATMs are required.
		Applied Protection	See 13.1(b)		If the depository complies with the Standard for Night Depositories, UL 771, any outside head that is exposed may be trapped or contacted.
	ATM[d]	Vibration (Seismic)	See 14.1(a)	All sides and Access panel and doors	
		Applied Protection	See 14.1(b)		If the ATM complies with the Standard for Automated Teller Systems, UL 291, customer access panel may be trapped or contacted.

[a] Safe – An iron or steel, or equivalent container that has its doors equipped with a combination lock (See 3.36).

[b] Vault – Constructed of metal, concrete, or similar masonry units permanently assembled on the premises, having a metal door with a combination lock (See 3.54).

[c] Night Depository – A safe located within a building and connected to a chute and depository head to permit deposits after hours (See 3.25).

[d] Automatic Teller Machine – A machine used to dispense cash and accept deposits (See 3.7).

10.1.2 One or more safes, vaults, night depositories or automated teller machines may be protected by an individual alarm system utilizing protective wiring applied to all openings and vulnerable surfaces, or by the use of intrusion detection devices that are suitable for the construction of the container that is being protected. If more than a single container is being protected by an alarm system, each container may utilize the same methods of protection or different methods of protection.

10.1.3 An alarm system protecting a security container may be installed as an independent system or may be operated in conjunction with an alarm system that is operated by the same subscriber and which is protecting a premises, stockroom or stock cabinet at the same protected property. The interconnection of such systems may utilize a common control or may utilize separate control units for each system.

10.1.4 A tamper switch provided as part of an intrusion detection unit protecting a security container shall be connected in the installation wiring circuit. If the alarm system provides for a 24-h supervision circuit that will provide a trouble or alarm signal when the system is disarmed and an alarm signal when the system is armed, the tamper switch shall be connected to that circuit. The tamper switch may be in the same installation wiring circuits as other tamper switches.

10.2 Extents of protection for security containers in bank, central station, mercantile and proprietary station systems

10.2.1 Extent Complete

10.2.1.1 Extent Complete shall consist of full protection on all enclosing surfaces and contacts on each outer door or contacts on the lock and bolt mechanism of each outer door. Contacts mounted on the outside of a door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts also complying with UL 634 are acceptable if mounted inside, or if mounted outside when the container is protected with a proximity detection unit.

10.2.2 Extent Partial

10.2.2.1 Extent Partial shall consist of protection of each outer door or the lock and bolt mechanism of each outer door with contacts. Contacts mounted on the outside of a door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts also complying with UL 634 are acceptable if mounted inside.

11 Safes

11.1 General

11.1.1 Protection of all surfaces of a safe as an Extent Complete (see 10.2.1.1) shall consist of any of the following:

a) A contact installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm and a proximity detection alarm unit intended for protection of a safe, and complying with the Standard for Intrusion-Detection Units, UL 639 or

b) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm and a vibration or seismic detection device intended for protection of a safe, and complying with the Standard for Intrusion-Detection Units, UL 639, or

c) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 and a method intended for protection of a safe described in Section 18, Special Applications for Security Containers.

Exception: High Security Switches described in (b) and (c) are not required if the contact(s) is mounted on the inside of the safe(s).

11.1.2 The protection required by 10.2.1 shall be arranged so that an alarm will be initiated if an opening 4 inches (102 mm) in diameter or larger is made in the safe or safe door by any method of attack.

11.1.3 Proximity, vibration or seismic detection equipment shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so that it will to respond to attack on the safe.

11.1.4 A flexible connector used for the connection of installation wiring to a safe door shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. A flexible connector shall be located where least subject to damage (See 6.4.1).

11.1.5 A flexible connector described in 11.1.4 that is mounted on the exterior of the safe shall be designed for such application or shall comply with 19.2.2 (a) or (b).

11.1.6 A junction box for an installation wiring circuit installed on the outside of a protected safe shall be provided with the following:

a) Electrically protected in accordance with 19.1.5; and

b) Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box; and

c) Removable covers or plates shall be tampered or permanently secured with one-way screws or a similar fastening device.

11.1.7 Protection of a safe as an Extent Partial shall consist of contacts installed so that a door cannot be opened more than 2 in (51 mm) without causing an alarm condition. Contacts mounted on the outside of a safe door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts complying with UL 634 are acceptable if mounted inside the safe.

12 Vaults

12.1 General

12.1.1 Protection of a vault as an Extent Complete (see 10.2.1.1) shall consist of any of the following:

a) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm, protection of the each vault door in accordance with the applicable requirements in 12.3, and sound detectors intended for the protection of vaults, and complying with the Standard for Intrusion-Detection Units, UL 639; or

b) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm, protection of the each vault door in accordance with the applicable requirements in 12.3, and vibration detectors intended for the protection of vaults, and complying with the Standard for Intrusion-Detection Units, UL 639;or

c) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm, protection of the each vault door in accordance with the applicable requirements in 12.3, and a method intended for protection of a vault described in Section 18, Special Applications for Security Containers;

Exception: High Security Switches described in (a), (b) and (c) are not required if the contact(s) is mounted on the inside of the vault.

12.1.2 The protection required in 12.1.1 shall be arranged so that an alarm will be initiated if a manhole size opening (see 3.29) is made in any surface of the vault or vault door by any method of attack.

12.1.3 A flexible connector used for the connection of installation wiring to a vault door shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. A flexible connector shall be located where least subject to damage.

12.1.4 A flexible connector described in 12.1.3 that is mounted on the exterior of the vault shall be designed for such application or shall comply with 19.2.2 (a) or (b).

12.1.5 A junction box for an installation wiring circuit installed on the outside of a protected vault shall be provided with the following:

a) Electrically protected in accordance with 19.1.5; and

b) Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box; and

c) Removable covers or plates shall be tampered or permanently secured with one-way screws or a similar fastening device.

12.1.6 Protection of a vault as an Extent Partial shall consist of contacts installed so that a door cannot be opened more than 2 in (61 mm) without causing an alarm condition. Contacts mounted on the outside of a vault door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts complying with UL 634 are acceptable if mounted inside the vault.

12.2 Sound and vibration detectors

12.2.1 The vault shall be of masonry construction, or at least 1/4-in (6.4-mm) steel plate, or constructed of modular panels that comply with the requirements in the Standard for Burglary Resistant Vault Doors and Modular Panels, UL 608 that are assembled in accordance with the manufacturer's instructions. Mortar used to bond the blocks together shall be equivalent in strength and hardness to portland cement mortar.

12.2.2 Sound or vibration detection equipment, or both, shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so as to respond to attack sounds on the vault.

12.2.3 Sound or vibration detection systems, or both, are not acceptable for protection against a cutting torch attack on nonreverberant vaults unless they have been specifically tested for this purpose.

12.2.4 A vault having an interior maximum ambient sound level that exceeds 70 dbA for monolithic concrete or 55 dbA for block masonry construction shall not be protected by acoustical means. The sound levels are to be determined when the vault is empty.

12.2.5 A "nonreverberant" vault is one in which the average coefficient of sound absorption of exposed interior surfaces exceeds 0.05 or is variable because of merchandise in storage. All others are termed "reverberant." Nonreverberant vaults require systems constructed for such use.

12.2.6 In reverberant vaults, systems shall be adjusted to transmit an alarm at sound levels of 80 to 90 dbA for a sound of impact origin. In nonreverberant vaults, systems shall be adjusted to transmit an alarm at a sound level 16 dbA above the intended ambient for the vault for impact-generated sounds.

12.2.7 Systems shall be adjusted to remain stable at the maximum normal ambient sound level in the vault under normal operating conditions when the alarm system is armed.

12.2.8 A supervisory sound test device shall be adjusted to generate an interior sound level not to exceed 96 dbA for reverberant vaults nor 86 dbA for nonreverberant vaults as measured with the vault empty.

12.2.9 Sound levels are to be measured by a sound-level meter designed, constructed, and calibrated in accordance with the Specification for Sound-Level Meters, ANSI S1.4.

12.3 Doors

12.3.1 Full protection of a door having a total thickness of steel equal to or exceeding 1-1/2 in (38 mm) shall consist of either a sound, smoke, or heat detector constructed for the purpose and mounted above the interior face of the door to detect mechanical as well as torch attacks.

12.3.2 A door having a net thickness of steel less than 1-1/2 in (38 mm) shall be provided with full protection to protect against mechanical as well as torch attack. This protection shall consist of an electrical lining of the door or an acceptable detector installed on the door complying with the Standard for Intrusion-Detection Units, UL 639, or that has been specifically tested for protection of a vault door.

12.3.3 The thickness of the steel mentioned in 12.3.1 and 12.3.2 is the total thickness of all steel plates used to construct the vault door. Other door construction material such as glass, insulation, metal spacers, and the like is to be disregarded when measuring the door thickness.

12.3.4 An emergency vault door or ventilator and a vault ventilating port shall be provided with contacts. If the opening is manhole size, full protection is required (see 12.3.1 and 12.3.2).

12.3.5 An emergency vault ventilator or port complying with the requirements in the Standard for Emergency Vault Ventilators and Vault-Ventilating Ports, UL 680, and also providing an opening less than manhole size does not require protection.

13 Night Depositories

13.1 General

13.1.1 Extent Complete (see 10.2.1.1) protection of a night depository shall consist of protection of the door and body of the depository chest or vault, the connecting chute, and the outside entrance or head with any of the following:

a) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, installed on each door so that the door(s) cannot be opened more than 2 inches (61 mm) without causing an alarm and a vibration or seismic detection device intended for protection of a night depository, and complying with the Standard for Intrusion-Detection Units, UL 639, or

b) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 and a method intended for protection of a night depository described in Section 18, Special Applications for Security Containers.

Exception: High Security Switches described in (a) and (b) are not required if the contact(s) is mounted on the inside of the night depository(s).

13.1.2 A sound and vibration detector complying with the Standard for Intrusion-Detection Units, UL 639, that is intended for the protection of night depositories may be used.

13.1.3 Sound and vibration detection equipment, or both, shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so that it will respond to an attack on the night depository.

13.1.4 A night depository complying with the requirements in the Standard for Night Depositories, UL 771, shall be protected as specified in 13.1.1.

Exception: The outside entrance may be trapped or contacted to the building structure in place of complete protection.

13.1.5 A flexible connector used for the connection of installation wiring to a night depository door shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. A flexible connector shall be located where least subject to damage (See 6.4.1).

13.1.6 A flexible connector described in 13.1.5 that is mounted on the exterior of the night depository shall be designed for such application or shall comply with 19.2.2 (a) or (b).

13.1.7 A junction box for an installation wiring circuit installed on the outside of a protected night depository shall be provided with the following:

a) Electrically protected in accordance with 19.1.5; and

b) Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box; and

c) Removable covers or plates shall be tampered or permanently secured with one-way screws or a similar fastening device.

13.1.8 Extent Partial shall consist of contacts on the outer door or the lock and bolt mechanism of the depository chest or vault and protection of the outside entrance or head against removal by means of a trap or contacts. Contacts mounted on the outside of the chest or vault door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, flexible connectors used for the connection of installation wiring to a night depository door shall comply with 13.1.5 and 13.1.6. Ordinary-use alarm contacts also complying with UL 634 are acceptable if mounted inside.

14 Teller Machines (ATMs)

14.1 General

14.1.1 Extent Complete (see 10.2.1.1) protection of an automated teller machine shall consist of protection of the door and body of the security container and access panel with any of the following:

a) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm and a vibration or seismic detection device intended for protection of an automated teller machine, and complying with the Standard for Intrusion-Detection Units, UL 639; or

b) A contact comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, and a method intended for protection of an automated teller machine described in Section 18, Special Applications for Security Containers.

Exception: High Security Switches described in (a) and (b) are not required if the contact(s) is mounted on the inside of the automated teller machine.

14.1.2 A sound and vibration detector complying with the Standard for Intrusion-Detection Units, UL 639 and that is intended for the protection of automated teller machines may be used.

14.1.3 Sound and vibration detection equipment shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so that it will respond to an attack on the automated teller machine.

14.1.4 An ATM complying with the requirements in the Standard for Automated Teller Systems, UL 291, shall be protected as specified in 14.1.1.

Exception: The customer access panel may be trapped or contacted against removal in place of complete protection.

14.1.5 A flexible connector used for the connection of installation wiring to an ATM door shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. A flexible connector shall be located where least subject to damage (see 6.4.1).

14.1.6 A flexible connector described in 14.1.5 that is mounted on the exterior of the ATM shall be designed for such application or shall comply with 19.2.2 (a) or (b).

14.1.7 A junction box for an installation wiring circuit installed on the outside of a protected ATM shall be provided with the following:

a) Electrically protected in accordance with 19.1.5; and

b) Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box; and

c) Removable covers or plates shall be tampered or permanently secured with one-way screws or a similar fastening device.

14.1.8 Extent Partial protection shall consist of contacts on the door or the lock and bolt mechanism of the security container and protection of the customer access panel against removal by means of a trap or contacts. Contacts mounted on the outside of the security container door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634, flexible connectors used for the connection of installation wiring to an automated teller machine shall comply with 14.1.5 and 14.1.6. Ordinary use alarm contacts also complying with UL 634 are acceptable if mounted inside.

15 Installation Design for Security Containers in National Industrial Security Systems

15.1 General

15.1.1 An alarm system protecting a security container such as a safe, GSA approved container, locking bar container, AA&E container, a non-standard container or a vault shall provide a level of protection

designated as Extent Complete, as specified in 15.2.1; or as Extent Partial as specified in 15.2.2. See Table 15.1.

Table 15.1
Extents of protection for safes, GSA approved containers, locking bar containers, AA&E containers, non-standard containers and vaults

Extent	Protected area	Method	Reference	Protection	Special considerations
PARTIAL (See 15.2.2)	Safe[a]	Applied Protection	16.1.6	Door or Drawers Only	Contacts mounted on the outside of the protected area shall be High Security Switches in compliance with the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634.
	GSA Container[b]		16.1.6		
	Locking Bar Container[c]		16.1.6		
	Vault[d]		17.1.6		
COMPLETE (See 15.2.1)	Safe[a] OR AA&E Container	Proximity System	16.1.1(a)	Contact Each Door and Provide Protection on All Six Sides	Glass or phenolic insulating blocks required under the safe
		Vibration (Seismic)	16.1.1(b)		Limited to safes that are a minimum of 1-in (25.4-mm) solid steel or rated as burglary resistant
		Applied Protection	16.1.1(c)		Protection may be a wire lining or a wired cabinet installed around the safe
	GSA Container[b]	Proximity System	16.1.1(a)	Contact Primary Door and Provide Protection on All Six Sides	Glass or phenolic insulating blocks required under the container
		Vibration (Seismic)	16.1.1(b)		Limited to containers that are a minimum of 1-in (25.4-mm) solid steel or rated as burglary resistant
		Applied Protection	16.1.1(c)		Protection may be a wired lining or a wired cabinet installed around the container
	Locking Bar Container[c]	Proximity System	16.1.1(a)	Contact All Drawers and Six Sides	Glass or phenolic blocks required under the container
	Approved Vault[d]	Sound Detection	17.1.1(a)	Protect All Sides, Doors and Any Emergency Ventilating Ports	Doors must be 1.5-in (38.1-mm) solid steel & have a smoke or heat detector mounted above the door.
		Vibration (Seismic)	17.1.1(b)		If doors are less than 1.5 in (38.1 mm) of solid steel a double circuit panel or equivalent is required.
		Applied Protection	17.1.1(c)		A test unit is required when sound and vibration units are used.

[a] Safe – An iron, steel or equivalent container with doors equipped with a combination lock (See 3.36).

[b] GSA Container – Any security container that bears a General Services Administration (GSA) Test Certification Label (See 3.5).

[c] Locking Bar Container – A metal file cabinet or the equivalent that utilizes a metal bar and lock to secure all drawers in the locked position.

[d] Approved Vault – A vault that has been constructed in accordance with the "National Industrial Security Program Manual (NISPOM) (See 3.6)

15.1.2 One or more safes, GSA approved containers, locking bar containers, AA&E containers, non-standard containers or vaults may be protected by an individual alarm system utilizing protective wiring applied to all openings and vulnerable surfaces, or by the use of intrusion detection devices that are suitable for the construction of the container that is being protected. If more than a single container is

being protected by an alarm system, each container may utilize the same methods of protection or different methods of protection.

15.1.3 An alarm system protecting a security container may be installed as an independent system or may be operated in conjunction with an alarm system that is operated by the same subscriber and which is protecting a premises, stockroom or stock cabinet at the same protected property. The interconnection of such systems may utilize a common control or may utilize separate control units for each system.

15.1.4 A tamper switch provided as part of an intrusion detection unit shall be connected in the installation wiring circuit. If the alarm system provides for a 24-h supervision circuit that will provide a trouble or alarm signal when the system is disarmed and an alarm signal when the system is armed, the tamper switch shall be connected to that circuit. The tamper switch may be in the same installation wiring circuits as other tamper switches.

15.2 Safes, GSA approved containers, locking bar containers, AA&E containers, non-standard containers and vaults

15.2.1 Extent Complete

15.2.1.1 Extent Complete shall consist of protection on all external surfaces and contacts on each outer door or contacts on the lock and bolt mechanism of each outer door. Contacts mounted on the outside of a door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts also complying with UL 634 are acceptable if mounted inside, or if mounted outside when protected by a proximity detection unit.

15.2.2 Extent Partial

15.2.2.1 Extent Partial shall consist of protection of each outer door or the lock and bolt mechanism of each outer door with contacts. Contacts mounted on the outside of a door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts also complying with UL 634 are acceptable if mounted inside.

16 Safes, GSA Approved Containers, Locking Bar Containers and AA&E Containers

16.1 General

16.1.1 Protection of all surfaces of a safe or container shall consist of any of the following:

a) A contact installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm and a proximity detection alarm unit intended for protection of a safe, and complying with the Standard for Intrusion-Detection Units, UL 639;

b) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 installed on each door so that the door(s) cannot be opened more than 2 in (61 mm) without causing an alarm and a vibration or seismic detection device intended for protection of a safe or container, and complying with the Standard for Intrusion-Detection Units, UL 639; or

c) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 and a method intended for protection of a safe described in Section 18, Special Applications for Security Containers.

Exception No. 1: High Security Switches described in (b) and (c) are not required if the contact(s) is mounted on the inside of the safe(s).

Exception No. 2: The protection methods described in (b) and (c) shall not be used for the protection of locking bar containers.

16.1.2 The protection required by 16.1.1 shall be arranged so that an alarm will be initiated if an opening 4 inches (102 mm) in diameter or larger is made in the body or door of the safe or container by any method of attack.

16.1.3 Proximity, vibration or seismic detection equipment shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so that it will respond to attack on the safe or container.

16.1.4 A flexible connector used for the connection of installation wiring to a safe door or a container door or drawer shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. A flexible connector shall be located where least subject to damage (See 6.4.1).

16.1.5 A flexible connector described in 16.1.4 that is mounted on the exterior of the safe or container shall be designed for such application or shall comply with 19.2.2(a) or (b).

16.1.6 A junction box for an installation wiring circuit installed on the outside of a protected safe or container shall be provided with the following:

a) Electrically protected in accordance with 19.1.5, and

b) Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box, and

c) Removable covers or plates shall be tampered or permanently secured with one-way screws or a similar fastening device.

16.1.7 If all of the drawers or doors of a GSA-approved container lock with a single mechanism and if none can be left unlocked or open when the mechanism is set, a single contact is acceptable if mounted on the control drawer or door on which the mechanism in installed.

16.1.8 Protection of a safe or container as an Extent Partial shall consist of contacts installed so that a door cannot be opened more than 2 in (61 mm) without causing an alarm condition. Contacts mounted on the outside of a safe door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts complying with UL 634 are acceptable if mounted inside the safe or container.

17 Vaults

17.1 General

17.1.1 Protection of a vault used to house material in a national industrial security system as an Extent Complete (See 15.1.1) shall consist of any of the following:

a) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 installed on each door so that the door(s) cannot be opened more than 2 inches (61 mm) without causing an alarm, protection of the each vault door in accordance with the applicable requirements in 17.3, and sound

detectors intended for the protection of vaults, and complying with the Standard for Intrusion-Detection Units, UL 639; or

b) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 installed on each door so that the door (s) cannot be opened more than 2 inches (61 mm) without causing an alarm, protection of the each vault door in accordance with the applicable requirements in 17.3, and vibration detectors intended for the protection of vaults, and complying with the Standard for Intrusion-Detection Units, UL 639; or

c) A contact complying with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634 installed on each door so that the door (s) cannot be opened more than 2 inches (61 mm) without causing an alarm, protection of the each vault door in accordance with the applicable requirements in 17.3, and a method intended for protection of a vault described in Section 18, Special Applications for Security Containers.

Exception: High Security Switches described in (a), (b) and (c) are not required if the contact(s) is mounted on the inside of the vault.

17.1.2 The protection required in 17.1.1 shall be arranged so that an alarm will be initiated if a manhole size opening (See 3.29) is made in any surface of the vault or vault door by any method of attack.

17.1.3 A flexible connector used for the connection of installation wiring to a vault door shall comply with the applicable requirements in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. A flexible connector shall be located where least subject to damage.

17.1.4 A flexible connector described in 17.1.3 that is mounted on the exterior of the vault shall be designed for such application or shall comply with 19.2.2 (a) or (b).

17.1.5 A junction box for an installation wiring circuit installed on the outside of a protected vault shall be provided with the following:

a) Electrically protected in accordance with 19.1.5; and

b) Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box; and

c) Removable covers or plates shall be tampered or permanently secured with one-way screws or a similar fastening device.

17.1.6 Protection of a vault as an Extent Partial shall consist of contacts installed so that a door cannot be opened more than 2 in (61 mm) without causing an alarm condition. Contacts mounted on the outside of a vault door shall be constructed for mounting outside the protected area and shall comply with the applicable requirements for High Security Switches in the Standard for Connectors and Switches for Use with Burglar-Alarm Systems, UL 634. Ordinary-use alarm contacts complying with UL 634 are acceptable if mounted inside the vault.

17.2 Sound and vibration detectors

17.2.1 The vault shall be of masonry construction, or at least 1/4-in (6.4-mm) steel plate, or constructed of modular panels that comply with the requirements in the Standard for Burglary Resistant Vault Doors and Modular Panels, UL 608 that are assembled in accordance with the manufacturer's instructions. Mortar used to bond the blocks together shall be equivalent in strength and hardness to portland cement mortar.

17.2.2 Sound or vibration detection equipment, or both, shall be installed, adjusted and calibrated using the manufacturer's recommended procedures and equipment so as to respond to attack sounds on the vault.

17.2.3 Sound or vibration detection systems, or both, are not acceptable for protection against a cutting torch attack on nonreverberant vaults unless they have been specifically tested for this purpose.

17.2.4 A vault having an interior maximum ambient sound level that exceeds 70 dbA for monolithic concrete or 66 dbA for block masonry construction shall not be protected by acoustical means. The sound levels are to be determined when the vault is empty.

17.2.5 A "nonreverberant" vault is one in which the average coefficient of sound absorption of exposed interior surfaces exceeds 0.06 or is variable because of merchandise in storage. All others are termed "reverberant." Nonreverberant vaults require systems constructed for such use.

17.2.6 In reverberant vaults, systems shall be adjusted to transmit an alarm at sound levels of 80 to 90 dbA for a sound of impact origin. In nonreverberant vaults, systems shall be adjusted to transmit an alarm at a sound level 16 dbA above the intended ambient for the vault for impact-generated sounds.

17.2.7 Systems shall be adjusted to remain stable at the maximum normal ambient sound level in the vault under normal operating conditions when the alarm system is armed.

17.2.8 A supervisory sound test device shall be adjusted to generate an interior sound level not to exceed 96 dbA for reverberant vaults nor 86 dbA for nonreverberant vaults as measured with the vault empty.

17.2.9 Sound levels are to be measured by a sound-level meter designed, constructed, and calibrated in accordance with the Specification for Sound-Level Meters, ANSI S1.4.

17.3 Doors

17.3.1 Full protection of a door having a total thickness of steel equal to or exceeding 1-1/2 in (38 mm) shall consist of either a sound, smoke, or heat detector constructed for the purpose and mounted above the interior face of the door to detect mechanical as well as torch attacks.

17.3.2 A door having a net thickness of steel less than 1-1/2 in (38 mm) shall be provided with full protection to protect against mechanical as well as torch attack. This protection shall consist of an electrical lining of the door or an acceptable detector installed on the door complying with the Standard for Intrusion-Detection Units, UL 639, or that has been specifically tested for protection of the vault door.

17.3.3 The thickness of the steel mentioned in 17.3.1 and 17.3.2 is the total thickness of all steel plates used to construct the vault door. Other door construction material such as glass, insulation, metal spacers, and the like is to be disregarded when measuring the door thickness.

17.3.4 An emergency vault door or ventilator and a vault ventilating port shall be provided with contacts. If the opening is manhole size, full protection is required (See 17.3.1 and 17.3.2).

17.3.5 An emergency vault ventilator or port complying with the requirements in the Standard for Emergency Vault Ventilators and Vault-Ventilating Ports, UL 680, and also providing an opening less than manhole size does not require protection.

18 Special Applications for Security Containers

18.1 Safes, GSA approved containers, AA&E containers, non-standard containers or vaults

18.1.1 In addition to the methods described in 11.1.1 and 16.1.1, safes or containers may be protected with linings complying with the Standard for Linings and Screens for Use with Burglar-Alarm Systems, UL 606, applied to the interior of a safe or container, or a cabinet lined with hard-drawn wire lacing or foil that completely surrounds the safe or container. The wiring or foil shall be arranged as double circuit (see 3.11) and covered to protect against mechanical damage. Each side of the cabinet shall be trapped to one another.

18.1.2 In addition to the methods described in 12.1.1 or 17.1.1, a vault may be protected with the use of any of the following:

a) Embedded cable,

b) Foil lining,

c) Grooved stripping, or

d) Protective screens.

18.2 Embedded cable, foil linings, grooved stripping, and protective screens

18.2.1 When foil linings, grooved stripping, protective screens, or embedded cable are used for vault protection, the protection shall be applied in accordance with the requirements in the Standard for Lining and Screens for Use with Burglar-Alarm Systems, UL 606.

ALARM SYSTEM CONTROL UNITS AND TRANSMITTERS

19 General

19.1 Details

19.1.1 Depending on the type of service for which it is used, a premises control unit or transmitter shall comply with:

a) The Standard for Police Station Connected Burglar Alarm Units and Systems, UL 365;

b) The Standard for Local Burglar Alarm Units and Systems, UL 609;

c) The Standard for Proprietary Burglar Alarm Units and Systems, UL 1076;

d) The Standard for Central-Station Burglar-Alarm Units, UL 1610; or

e) The Standard for Digital Alarm Communicator System Units, UL 1635.

19.1.2 The control unit, transmitter and devices used to interconnect the control unit to protection devices shall be located within the area of greatest protection unless it has been evaluated for use outside the area of greatest protection or is protected in accordance with 19.1.5.

19.1.3 The area of greatest protection for a safe, vault, or alarmed container alarm system is considered to be the interior of the safe or vault.

19.1.4 The area of greatest protection for a premises, stockroom or alarmed area is within the boundaries of the premises, stockroom or alarmed area.

19.1.5 A control unit, transmitter and devices that are located outside of the area of greatest protection and are used to interconnect the control unit to a transmitter or protection devices are considered to be adequately protected if they are:

a) Electrically lined; or

b) Protected by shock sensor or vibration detector complying with the requirements for intrusion detection units, in the Standard for Intrusion-Detection Units, UL 639; or

c) Protected by a proximity detector complying with the requirements of the Standard for Intrusion-Detection Units, UL 639; or

d) Located within an area of the property that is protected by an alarm system that complies with either 4.2.1 (Extent Number 1), 4.2.2 (Extent Number 2), or 4.2.3 (Extent Number 3). Both the alarm system in the area of greatest protection and this alarm system shall be armed and disarmed at the same time.

Exception No. 1: The control unit for a safe or vault with Extent Partial protection need not comply with this requirement.

Exception No. 2: Item (d) does not apply to National Industrial Security Systems.

19.1.6 Removable covers or plates of conduit boxes or junction boxes shall be electrically tampered or permanently secured with one-way screws or similar type fastening device. Each unused knockout shall be secured in a manner that will prohibit its removal from outside of the junction box. Connectors used to join lengths of tubing need not be permanently secured, but shall be secured in a manner that prevents disassembly without hand tools.

19.1.7 A cover of a control unit, transmitter, power supply, or accessory unit containing circuits that can be tampered with to defeat the alarm system or silence the local alarm sounding device, shall be protected by a tamper switch. The tamper switches of an outside and an inside/visible alarm sounding device housing shall be connected in the installation wiring circuit. If the alarm system provides a 24-h supervision circuit that will provide a trouble signal or alarm signal when the system is disarmed and an alarm signal when the system is armed, the tamper switches shall be connected to that circuit. The tamper switches may be in the same installation wiring circuit as the tamper switches required by 7.1.3 and 10.1.4.

19.1.8 Control units, transmitters, power supplies, accessory units, and user interface devices, such as keypads and other mechanisms used to operate the system shall be securely attached to the surfaces upon which they are mounted, and readily accessible to authorized users of the system and service personnel.

19.2 Control units

19.2.1 The manufacturer's instructions for the installation of the alarm circuits, such as the location of end-of-line resistors in the installation wiring circuits and the alarm sounding device, shall be followed.

19.2.2 Installation wiring from a control unit or intrusion detection unit to an Extent Complete safe, container, or vault (see Sections 10 – 17), Extent Number 1 stockroom, or Extent Number 1 premises (see 4.2.1.1), or between Extent Complete safes, Extent Complete containers, Extent Complete vaults, Extent Number 1 stockrooms, or Extent Number 1 premises shall be:

a) Installed in electrically protected cable; or

b) A polling data loop type circuit that will detect tampering with or disconnection of the circuit; or

c) Installed in rigid metal conduit; or

d) Installed in electrical metallic tubing; or

e) Entirely concealed within building walls, floors, or ceilings that are fixed in place in such a manner that access to the wiring cannot be made without breaking or otherwise destroying the enclosing surface(s). Lift-out ceiling panels and similar materials are not considered fixed in place; or

f) Installed in flexible metal tubing where routed above ceilings that are provided with lift-out panels.

Exception: These requirements do not apply to an Extent Partial safe, or container, or vault, nor an Extent Number 2 or 3 stockroom, or Extent Number 2 or 3 premises in which the installation wiring is run within the protected area.

19.2.3 A control unit that has a field programmable alarm sounding circuit shall be programmed:

a) To conduct a test of the sounding device when the system is armed unless a signal is transmitted to a central station or residential monitoring station complying with the Standard for Central-Station Alarm Services, UL 827, or in a law enforcement center at the occurrence of each alarm condition.

b) To activate the sounding device of a mercantile alarm system at normal power for not less than 15 min upon alarm.

c) To activate the sounding device of a bank alarm system at normal power for not less than 15 min upon alarm. A bank alarm system may be programmed to be silenced after 6 min of alarm if the detector or component that initiated the alarm has restored and the alarm system is reset and will react to another alarm condition.

19.2.4 The control unit shall be programmed in accordance with the manufacturer's instructions for the type of service that is being provided (See 19.1.1).

19.2.5 An installer or programming code provided by the manufacturer shall be deactivated when the installation of the control unit is complete.

19.2.6 A delay circuit that allows entry into a protected premises shall be limited to those initiating devices that have to be bypassed to allow access to the mechanism that is used to place the system in a disarmed state.

19.2.7 The maximum interval of time between the opening of an entry door and reaching the mechanism that is used to disarm the system shall be no greater than one-half of the entry delay time programmed for the system.

19.2.8 To permit entry into or exit from mercantile systems, an external key-activated switch may be employed. When an external key-activated switch is used, it shall be trapped against removal.

19.3 Transmitter

19.3.1 General

19.3.1.1 The signal path from a protected property consists of the following four parts (See Table 19.1 and Table 19.2):

a) Part 1 – The means of transmission from the protected property and other equipment installed by the alarm service company.

b) Part 2 – The premises demarcation point, consisting of the connection point and intermediate premises communication equipment that is not supplied as part of the alarm system.

c) Part 3 – The communication cloud through which signals are sent to the monitoring station.

d) Part 4 – The monitoring station such as a central station, law enforcement center or the equivalent.

The alarm service company shall verify the operability of the signal path when the alarm system is placed into service and during inspections, maintenance activity or when servicing the system.

Table 19.1
Off-premises communication equipment at the protected property

Communication type	Transmitter method	Premises demarcation connection point	Intermediate protected property equipment	Backup power within the protected property (see 19.3.2)	Cloud
PSTN	DACT/MFVN/CEL-LULAR	RJ31X	NID	NA	Telco Cloud
MFVN Cable	DACT/MFVN/CEL-LULAR	RJ31X	e-MTA	Based on the number of paths (See 19.3.2)	Managed Data Network Cloud
MFVN Fiber Optic	DACT/MFVN/CEL-LULAR	RJ31X	Fiber Interface Unit	Based on the number of paths (See 19.3.2)	Managed Data Network Cloud
PSDN	IP (See 19.3.1.3)	RJ45	Router, Modem / Network Terminating	Based on the number of paths (See 19.3.2)	Internet or Intranet Cloud
Cellular Network	Cellular Network (See 19.3.1.3)	RJ Type, Bus or Relay Terminal	Radio Antenna	NA	Cellular Cloud (digital)
Private Radio (One-Way)	Private Radio (One-Way)	Relay Terminals	Radio Antenna	NA	Radio Cloud
Private Radio (Two-Way)	Private Radio (Two-Way)	Relay Terminals	Radio Antenna	NA	Radio Cloud
Private Mesh Radio	Mesh Radio	Relay Terminals	Radio Antenna	NA	Radio Cloud
Leased Line	Direct Wire	Telco Block	NID	NA	Leased Line
Multiplex	Multiplex	Telco Block	NID	NA	Leased Facilities
McCulloh	McCulloh	Telco Block	NID	NA	Leased Line

Table 19.2
Glossary of terms in Table 19.1

Type	Description
Cellular Network	A method that uses a cellular communication device that is triggered by a control unit's relay outputs for generic signaling, or the terminals in the key pad bus, then the signals leave the protected property and travel to the monitoring station via in a wireless data network communication path (not a voice network) operated by a commercial communications provider.
CELLULAR	Cellular Telephone – A wireless cellular technology extension of the PSTN that establishes a voice grade, switch circuit signal path (without the intermediate connection device described in IP below) initiated by use of a 10 digit (US) dialing number code.
Communications Cloud	1. Signals passing through a Communications Cloud shall be regarded as being processed if: a) Any decision is made based on the content of a signal; b) Any decision is made based on the receipt or non-receipt of a signal; c) Any acknowledgement of a signal being received is returned to the originated alarm signal transmitter; d) The message sent from the originating alarm signal transmitter is changed or modified in any way except as permitted in 2; or e) A signal is generated in the Communications Cloud as a result of signal or message content, the receipt of a signal, or the non-receipt of a signal. 2. Signals passing through a Communications Cloud shall not be regarded as being processed if: a) The signal transmitted from the originating alarm signal transmitter is passed through unaltered; and b) The signaling format (but not the message) is changed or converted so that the original message sent by the alarm signal transmitter is passed through to the Central-Station or Repeater station without modification or change. Example: Signals may be received as ASCCI data and retransmitted in another industry accepted format.
DACT/MFVN/CELLULAR	Digital Alarm Communicator Transmitter – a type of transmitter that transmits data on a public switched telephone network. Initiated by "autodialing" a 10 digit (US) dialing number code.
eMTA	Embedded Multimedia Terminal Adapter – a device that enables data from a variety of services across a common communication cloud. Cable television service (CATV), voice over internet protocol (VoIP) and internet protocol service (IP) is one example of the types of services an eMTA could facilitate.
IP	A method that uses a communication device that converts DACT/MFVN/CELLULAR signaling into Internet Protocol data packets for use with ISP, Internet, or Intranet. The IP device may be built-in to the control unit or retrofitted into an alarm system that uses a compatible control unit.
Private Radio System (One-Way)	A method that used a radio communication device that sends radio signals from the protected property.
Private Radio System (Two-Way)	A method that used a radio communication device that sends and receives radio signals to and from the protected property.
PSDN	Packet switched data network – a type of data transmission in which data is divided into packets, each of which has a destination address. Each packet is then routed across a network such as the internet. A packet may travel a different route than packets that are related to it.
PSTN	Public switched telephone network – a communication network that is operated & managed by a telephone communications company.
Private Mesh Radio	A privately owned and managed wireless network which utilizes equipment that can intelligently route signals through repeaters based in signal traffic.
McCulloh	A method that connects multiple protected properties in series to a common communication path. Typically leased copper lines are used.
MFVN Cable	Managed Facility Voice Network Cable – Voice services provided over equipment & facilities operated & managed by a Provider/Operator of a cable communication system.

Table 19.2 Continued on Next Page

Table 19.2 Continued

Type	Description
MFVN Fiber Optic	Managed Facility Fiber Optic Service – Voice and data services over fiber optic communication equipment and facilities that is managed by a Provider/Operator of the fiber optic network.
Multiplex	A method that sends signals, other than packet switched data, from multiple protected properties across a common communication path. Typically analog signaling over leased facilities are used.
NID	Network Interface Device – equipment that provides the interface to permit a transmitter to send signals through the communication cloud.

19.3.1.2 Any intermediate premises communication equipment located within the boundaries of the protected property in which the alarm system is installed that requires power to operate shall be provided with standby power that is equivalent to the capacity of the standby power in the control unit and transmitter or transceiver (See 19.4) if any of the following exists:

a) A single signal path is utilized (See Figure 19.1 and Figure 19.2); or

b) Multiple signal paths employing the same communication methods are utilized (See Figure 19.3); or

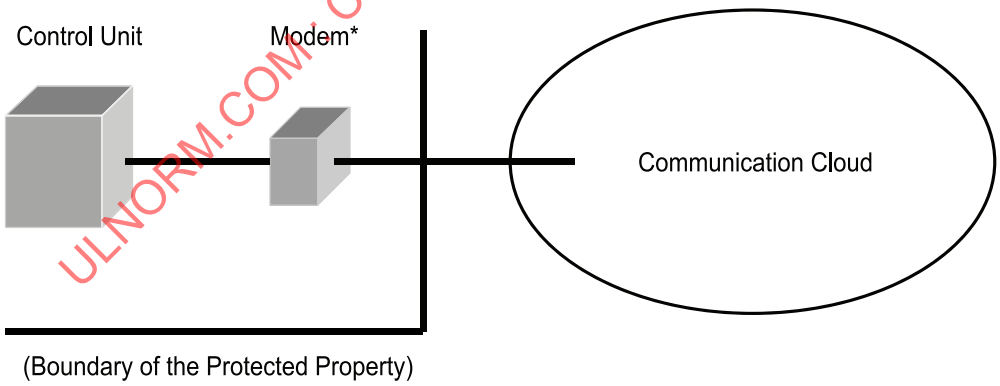
c) Multiple signal paths providing different levels of supervision are utilized (See Figure 19.4).

The alarm service company shall confirm this standby power has been provided with the equipment and shall verify its continued operability during each inspection of the system.

Figure 19.1

Intermediate premises communication equipment not maintained by the alarm service company & using a single signal path

Single signal path intermediate premises communication equipment within the protected property



su1435

* The device could be a modem, router, or network termination device.

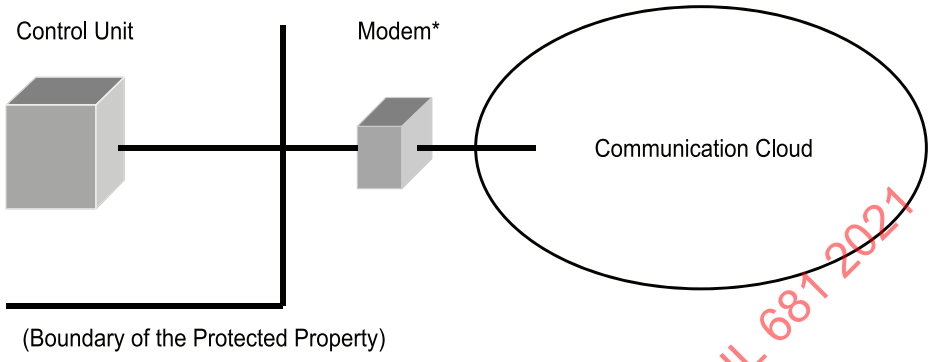
A. The modem is required to have standby power verified by the alarm service company because it is within the boundary of the protected property. [See 19.3.2(a)].

B. Check-in times are based on 19.3.1.9 and Table 19.3.

Figure 19.2

Intermediate premises communication equipment not maintained by the alarm service company & using a single signal path

Single signal path intermediate premises communication equipment outside the protected property



su1436

* The device could be a modem, router, or network termination device.

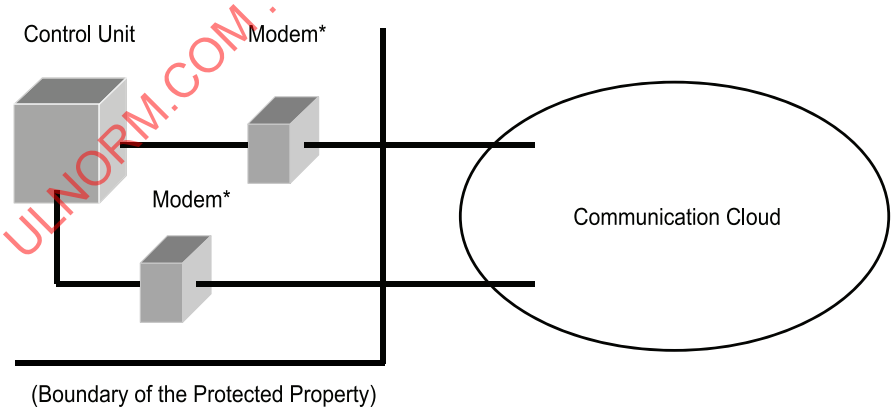
A. The modem is not required to have standby power verified by the alarm service company because it is not within the boundary of the protected property (See 19.3.2).

B. Check-in times are based on 19.3.1.11 and Table 19.3.

Figure 19.3

Intermediate premises communication equipment not maintained by the alarm service company & using dual signal path

Dual signal path with the same communication method



su1437

* The device could be a modem, router, or network termination device.

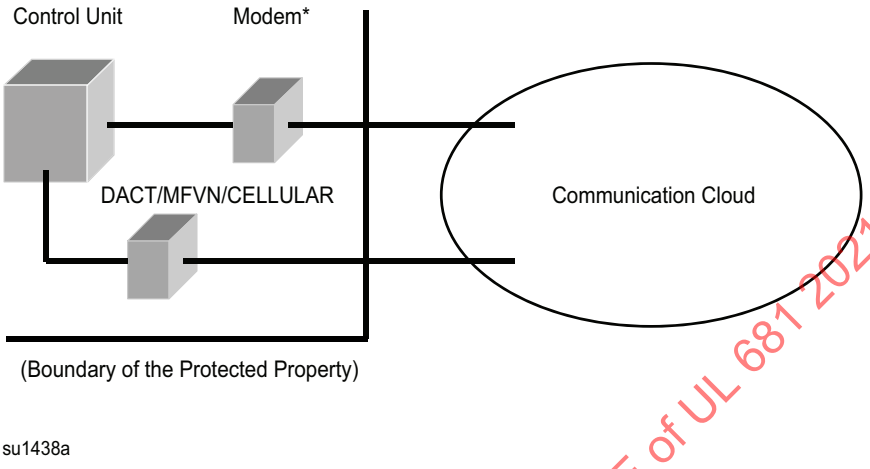
A. The modems are required to have standby power verified by the alarm service company because they are within the boundary of the protected property and both paths employ the same communication method [See 19.3.2(b)].

B. Check-in times are based on 19.3.1.12 and Table 19.3.

Figure 19.4

Intermediate premises communication equipment not maintained by the alarm service company & using dual signal path

Dual signal path with different levels of supervision



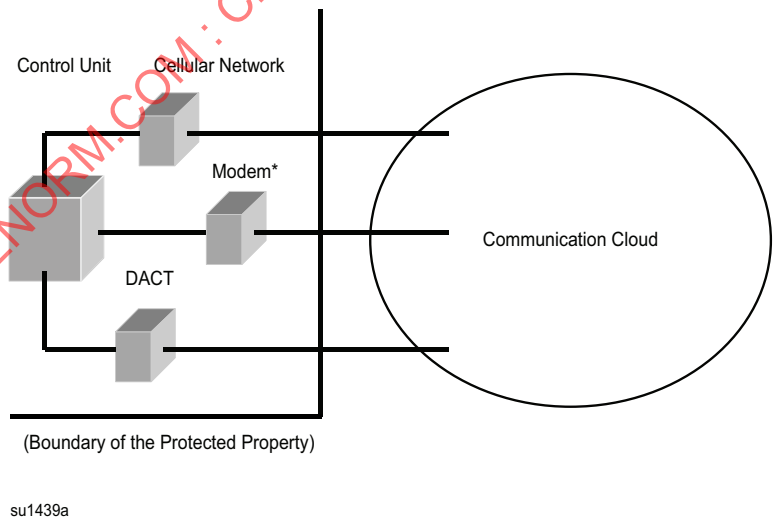
* The device could be a modem, router, or network termination device.

A. The modem is required to have standby power verified by the alarm service company because it is within the boundary of the protected property and the paths have different levels of supervision [See 19.3.2(b)].

B. Check-in times are based on 19.3.1.12 and Table 19.3.

Figure 19.5

Intermediate premises communication equipment not maintained by the alarm service company & using an alternate primary with dual signal path



* The device could be a modem, router, or network termination device.

A. The modem is not required to have standby power verified by the alarm service company because the alternate path formed by the Cellular Network provides the same level of supervision with a different method of communication [See 19.3.2(c)]. As alarm equipment, the Cellular Network requires standby power that is equivalent to the control unit.

B. Check-in times are based on 19.3.1.14 and Table 19.3.