



UL 681

STANDARD FOR SAFETY

Installation and Classification of Burglar and
Holdup Alarm Systems

UL 681 2014

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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 editorial new edition of ANSI/UL 681 is being issued to remove the future effective date of January 1, 2017 from the entire standard and apply it only to the specific paragraphs of 4.4.2.1, 19.2.7, 19.3.1.2, and 19.4.3. No changes in requirements have been made.

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. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

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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The following table lists the future effective dates with the corresponding reference.

Future Effective Date	Reference
January 1, 2017	Paragraphs 4.4.2.1, 19.2.7, 19.3.1.2, and 19.4.3



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The most recent designation of ANSI/UL 681 as an American National Standard (ANSI) occurred on January 10, 2014. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information. 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 <http://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.

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

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- 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, one-way and two-way radio 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.

2.3 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 Figures 5.1 – 5.5.

3.29 OPENING, MANHOLE SIZE – An opening with a clear cross-section area of 96 in² (619 cm²) 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 mm²) or film-coated solid copper wire not larger than 26 AWG (0.13 mm²), 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 mm²). 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.

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Extent	Method	External openings		External surfaces	Special considerations
		Accessible ^{a)}	Inaccessible	Walls, floors and ceilings	
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 feet² (93 m²) 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). ^{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.

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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 feet² (93 m²) 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.

4.4.2.1 effective January 1, 2017

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.

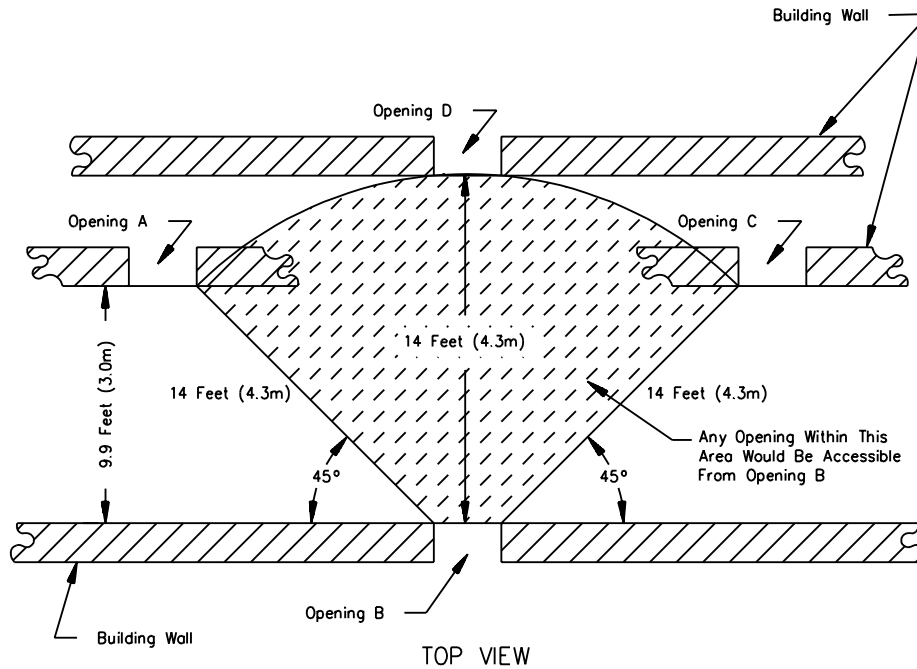
c) Openings or ledges in opposite walls and directly above or below where a line between them forms a 150° angle consisting of 75° above and 75° below. See Figure 5.3.

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 foot (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.

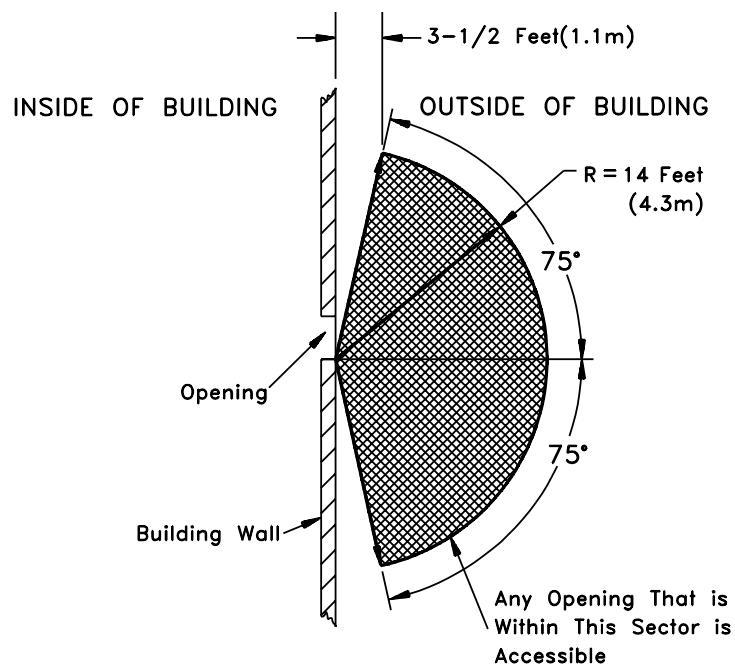
5.1.7 Any opening or ledge within 3 feet (0.91 m) of another opening or ledge is accessible regardless of the angle or direction between them, except for openings or ledges in the same wall and below. See Figure 5.5.

Figure 5.2
Accessibility of opening from opposite wall (horizontal plane)



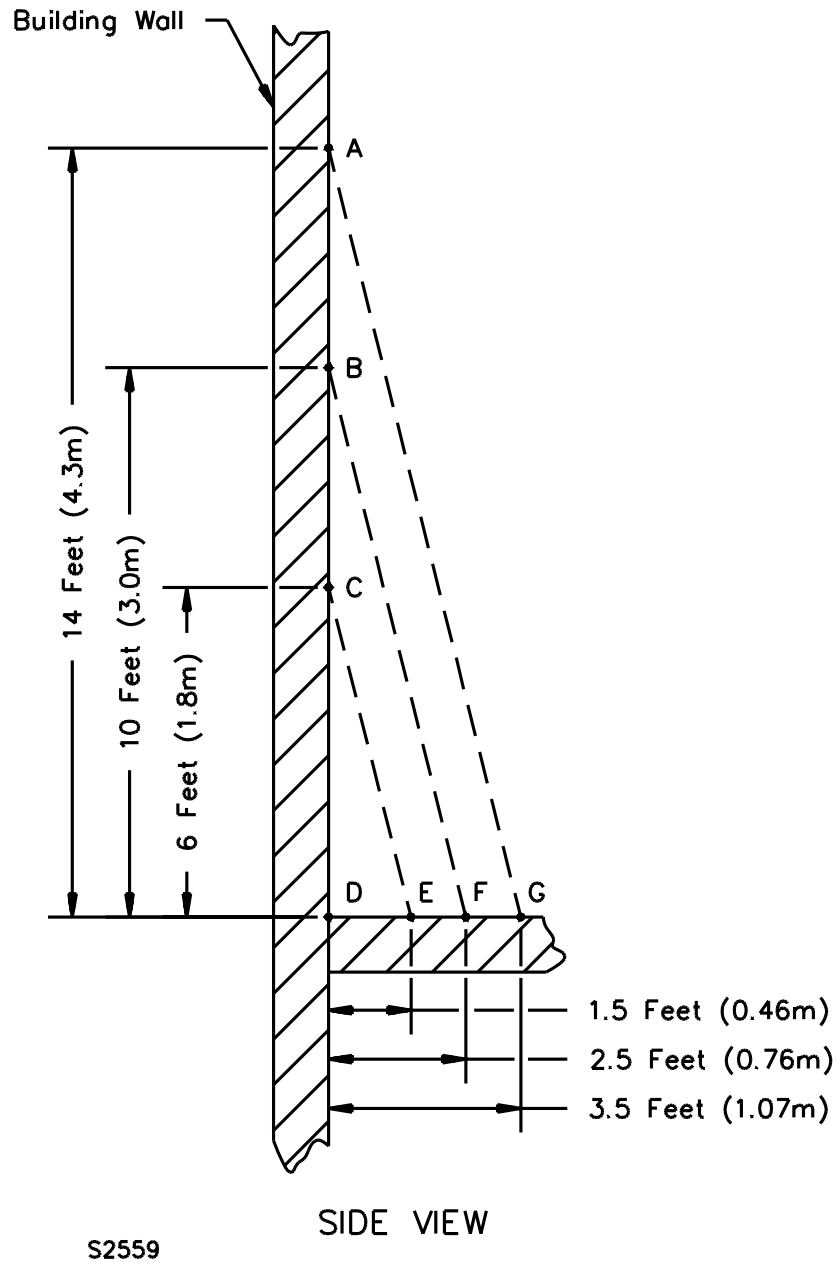
S2557

Figure 5.3
Accessibility of openings from opposite wall



S2558B

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.

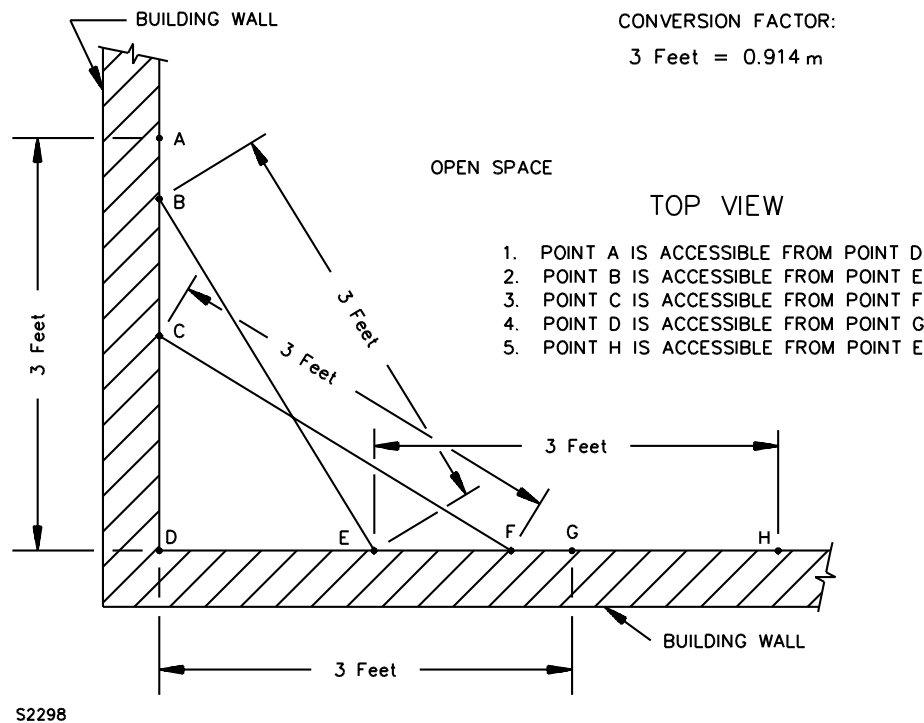
Each distance is determined by the ratio 1 to 4.

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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.

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