NOTICE OF CHANGE

MIL-HDBK-1013/1
NOTICE 1
31 July 1989

MILITARY HANDBOOK

DESIGN GUIDELINES FOR PHYSICAL SECURITY OF FIXED LAND-BASED FACILITIES

TO ALL HOLDERS OF MIL-HDBK-1013/1:

1. THE FOLLOWING PAGES OF MIL-HDBK-1013/1 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
69	31 July 1989	69	9 October 1987
70	31 July 1989	70	REPRINTED WITHOUT CHANGE
73	31 July 1989	73	9 October 1987
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2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-HDBK-1013/1 will verify that all changes indicated above have been made. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military handbook is completely revised or cancelled.

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authorized for installation in AA&E storage facilities. A typical GSA Class 5 vault door is illustrated in Figure 12. The estimated penetration time for a Class 5 vault door is less than 1 minute against optimal attack tools, as shown in Table 11.

3.2.2.3 Hardening Options. The preceding paragraphs clearly illustrate the need for increased penetration resistance of doors. This subsection presents ideas for improving penetration times for both new construction and retrofit programs. General hardening suggestions are identified that may deter a casual intruder but are not based on specific barrier tests. Penetration times for hardening options are identified and estimated that have either been tested or derived from test results.

General hardening concepts described in Tables 13 and 14 are the minimal designs that should be considered in constructing a door with enhanced attack resistance. They apply to both new designs and to later upgraded or retrofits. Specific hardening options include the hardening of door face panels and internal construction, door frames, anchoring devices, locking devices, and operating hardware.

(1) Door design/construction. Tests have confirmed that the two types of threats most effective against conventional design hollow-metal (steel) doors are: the power-operated portable circular saw ("Target Quickie") using abrasive blades, and thermal tools such as the oxy-acetylene torch and thermal lance (burn bar) that cut or burn through the door. Either of these methods creates a man-passable opening or allows separation of vital components to allow the door to be opened. None of the conventional doors tested could resist attacks using these two types of attack tools for any appreciable length of time. A prototype personnel door is currently being designed using selected materials shown to have high resistance to both abrasive-cutting and thermal-burning tools. Steel, by itself, does not provide any meaningful delay times or penetration resistance in a door system or assembly. Typical times to make a man-passable opening with an oxy-fuel torch are 2 minutes 1 second for 1/2-inch-thick (13-mm) steel, 3 minutes 5 seconds for 1-inchthick (25-mm) steel, and 3 minutes 47 seconds for 1-1/2-inch-thick (32-mm) steel.

Factors that increase the penetration resistance of door systems and assemblies include the use of:

o Hard materials that resist boring, drilling, sawing, cutting, shearing, and perforating types of attacks.

o High-tensile strength materials that resist bending, breaking, buckling, deforming, separating, or spreading types of attacks.

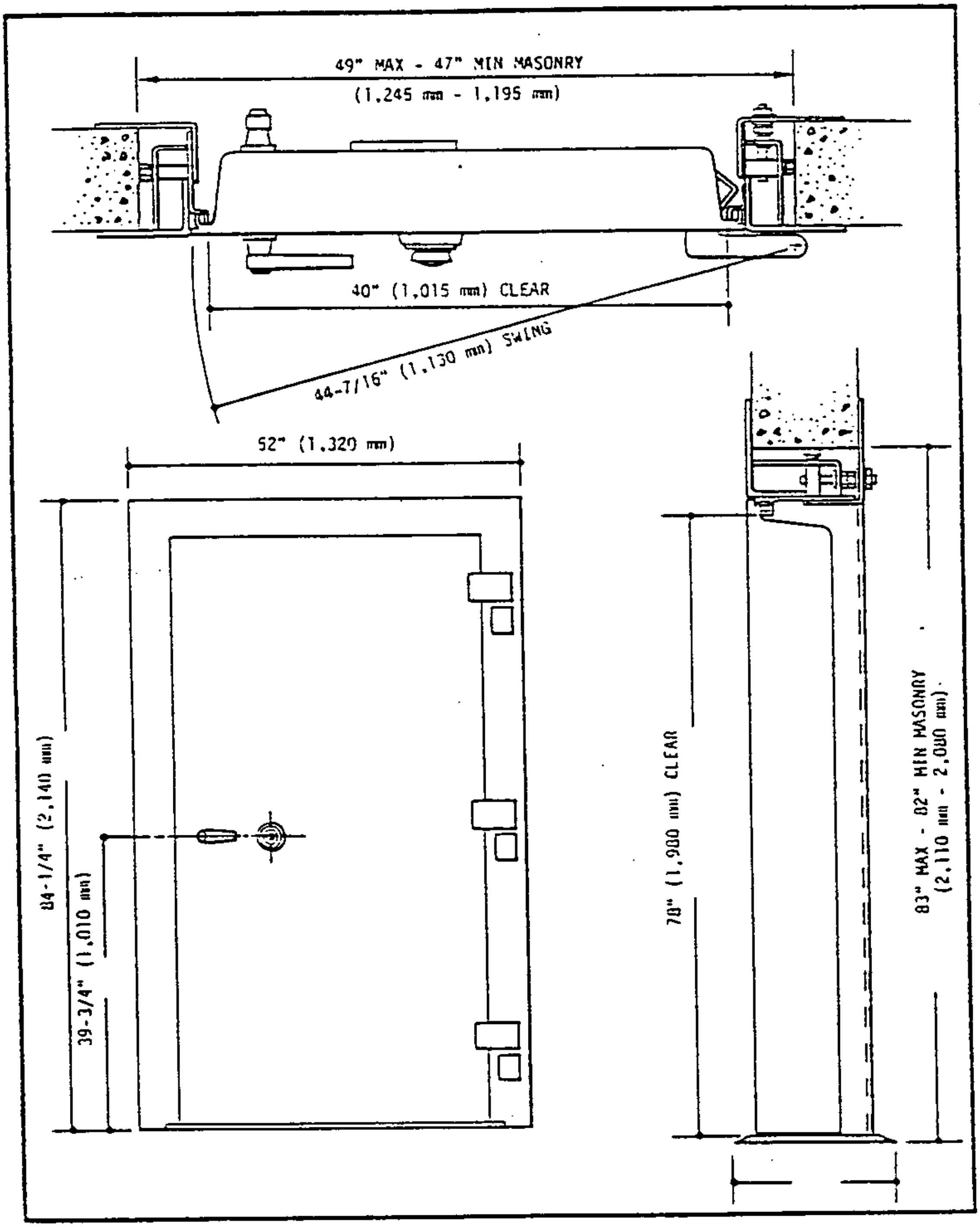

FIGURE 12. Representative GSA Class 5 vault door.

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o High-density materials to provide mass that resists or absorbs large amounts of force, energy, or pressure like that generated by heavy impacts or explosives.

o High melting point materials to resist attacks by thermal tools.

o Materials that interfere with the effective operation of attack tools (such as a soft, sticky material to "gum up" abrasive wheels or saws).

o Materials that generate excessive amounts of flames, heat, or obnoxious smoke or fumes when attacked by thermal tools.

o Door designed with a maximum overall thickness to require the opening on the attack side of the door to be larger than the final man-passable opening made through the protected side of the door.

A door panel using a combination of materials with various thicknesses, each having some specific properties, is needed. Such a composite or laminated door that combines all or most of the properties required will be more penetration resistant and cost-effective than will a door system built using large amounts of only one material. A variety of materials would result in a composite door that would greatly increase penetration resistance by requiring the attack force to have a variety of attack tools available, to face increased logistic problems, to contend with increased environmental disturbance, to cause delays in the attack by frequent tool changes, and to contend with obnoxious smoke or fumes that interfere with the operators of thermal/heat tools.

The composite door is made of 16-gauge (1.5-mm) steel with an internal construction of propitiatory rare earth metals, alloy steel, plastic polycarbonate, and red oak. Such a composite or laminated door will be more penetration resistant and cost-effective than building the door system using large amounts of only one material. This door design will be representative of a class of construction that may be increased or decreased in thickness (amount of core material) to provide a varied range in levels of security and may be utilized in the construction of most all operating types of personnel doors such as swing, sliding, tilt-up, sectional-overhead, bifolding, etc.

(2) Door surfaces. Table 13 provides design and single barrier penetration time information for attack-hardened doors using sandwich combinations of materials that consist of steel and plywood, steel and redwood, and steel and polycarbonate. (The steel/polycarbonate composites can also be used to retrofit existing doors.) Depending upon the combination of materials, penetration times of approximately 27 minutes are possible, as shown in Table 13. Other combinations of door materials, including standard steel outer layers with an

inner layer composed of cyclone fencing fabric, welded link chain, lightweight conventional concrete or fibrous concrete, barbed tape inserts, metal grating inserts, rubber, etc., are possible. Complete penetration time information on these possibilities is unavailable, and is not included in the handbook at present. Moreover, if it is consistent with the functional requirements of the facility, other options that might be considered (for a smaller, limited volume secured area) are the use of turnstiles, where practicable, e.g., a post with steel arms pivoted on the top, set in a passageway so that persons can pass through on foot one by one; thick, massive, blast-hardened doors made out of reinforced concrete; or the use of thick, metallic, bank vault-like doors. The turnstile approach necessitates cutting enough of the steel arms in the secure mode to offer some delay to intruders. These doors also have yet to be evaluated as barriers and their penetration times have yet to be established. In the case of reinforced concrete doors, the information on reinforced concrete walls in Subparagraph 3.1.2.1 may be of use.

(3) Locking systems. Locking systems can be broadly divided into either externally surface-mounted or internally surface-mounted systems. External systems typically involve some type of lock with an external hasp that is exposed to a potential attack from the outside. Internal locking systems are preferred, particularly for high-security applications. Unfortunately, applicable designs for internal locking systems are under development and recently completed penetration data are not yet available. The best presently available systems recommended in subsequent paragraphs, therefore, emphasize external systems. The types of approved locks and hasps are listed in Table 15. In general, the types of approved locking systems used by the U.S. Government can be divided into low-, medium-, and high-security categories. For attacks involving optimal combinations of tools, one can expect penetration times by forced entry attacks ranging from less than 7 minutes for high-security systems to practically no time for the low-security systems. For less than optimal attacks, penetration times as high as 15 minutes may be possible for the high-security systems. In general, it should be noted that a lock and hasp system offers its maximal potential penetration resistance only when it is properly installed on a strong door with appropriate hardware. The weakest part of the door system is the locking cylinder component of the lock or locking device. Typical delay times or penetration resistance is less than 10 seconds for standard architectural hardware grade locks. The next weakest part of the door system is the lock or locking device, and, on outswing doors, the exposed hinges. Typical delay times or penetration resistance ranges from 9 seconds to 3 minutes. Because it is easier and faster to compromise or defeat the locking cylinder, priority in designing secure door systems must be given to the protection of the locking cylinder. Locking systems under each of the above three security categories are described separately. The installation of multiple locking devices at several points on a door is one method of increasing the penetration resistance of locking devices so that

their combined times are equivalent to the penetration resistance of the door surface. Some commercially available locking systems have multiple dead bolts, locking at a number of points between the periphery of the door panel and the door frame (hinge, top, and lock jambs) or a sliding bar that extends in the locked position to interlock the door panel and the jambs together. A hollow-metal personnel door made of heavy steel, 10 (3.4 mm) to 12 (2.7 mm) gauge, with one of these locking systems provides a penetration resistance equal to or greater than the resistance of the mandated wall systems (greater than 4 minutes) for medium-security facilities when coupled with outswing hinge protection. However, a well-anchored and fully grouted hollow-metal door frame of gauge steel equal to or heavier than the door panels is also required. In general, state-of-the-art developments in locking systems are changing so rapidly that the security engineer should contact qualified RDT&E personnel at the Naval Civil Engineering Laboratory that conducts ongoing RDT&E on high-security locking systems. For information relating to hardening of locking systems, including external locking devices, interior locking devices integral to door systems, and hasps, the security engineer should contact:

Naval Civil Engineering Laboratory
Security Engineering Division (Code L56)
Port Hueneme, CA 93043-5003
(AV) 360-4284

High-security locks and hasps meeting the high-security level requirements are used where the greatest degree of protection is required against forced and surreptitious entry. A high-security level is required, for example, for missiles, conventional arms, ammunition, explosives, and other related spaces. The following describes the various types of high-security locks and hasps.

(a) Shrouded shackle padlock, key operated, high security. Currently, there is only one padlock authorized to be procured under MIL-P-43607 (Figure 13). This padlock is called the shrouded shackle padlock because of its design. The body of the padlock is extended high enough to provide a complete protective cover (shroud) around the shackle, which prevents easy access for attacks directly against the shackle. This padlock is equipped with a 1/2-inch (13-mm) shackle and is keyed individually. When used with a high-security hasp, the high-security padlock provides a high degree of resistance to surreptitious entry and offers the most resistance to forced entry currently available. It should be noted that a high-security padlock provides the specified degree of security when it is used with a high-security hasp. Investment in an expensive high-security padlock is overcome if it is attached to an inexpensive low-security hasp.

TABLE 15.

Summary of locks and hasps.

TYPE OF UNIT/ SECURITY LEVEL	MILITARY/ FEDERAL SPECIFICATION	LOCK/HASP DESCRIPTION	FORCED ENTRY PENETRATION TIME (MINUTES)	SURREPTITOUS ENTRY-PICKING TIME (MINUTES)
HIGH SECURITY				
Key Padlock	MIL-P-43607	Shrouded Shackle Padlock, Key Operated High Security		15
Key Locking Device	MIL-L-29151	Locks and Lock Sets, Exterior, High Security	<7	15
Hasp	MIL-H-29181	Hasp, High Security, Shrouded for High and Medium Security Padlocks		NA
MEDIUM SECURITY				
Key Padlock	MIL-P-43951	Padlock and Padlock Sets, Key Operated, Medium Security, Regular Shackle	<4	15
LOW SECURITY				
Key Padlock	MIL-P-17802	Padlocks and Padlock Sets, Low Security, Key Operated Regular (Open) Shackle		0.67-1

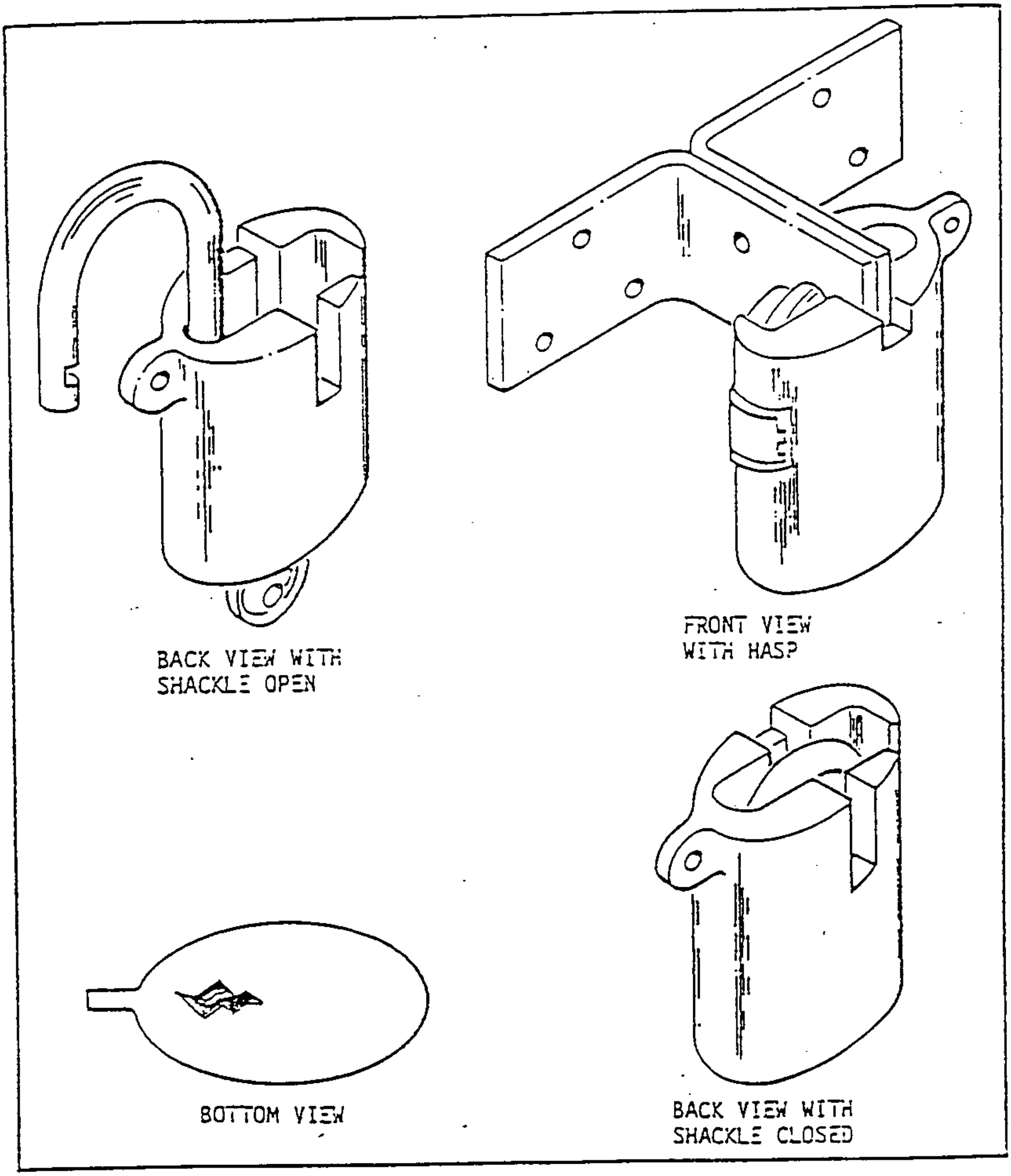

Figure 13. Shrouded shackle padlock, key operated, high security MIL-P-43607 (typical).

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(b) Medium-security locks. Padlocks meeting medium-security requirements must provide protection against forced and surreptitious attacks. Medium-security padlocks may be used in some instances on conventional AA&E spaces when used with high-security hasps, as discussed below. In general, these locks provide a high degree of resistance to surreptitious entry (15 minutes) but only minimal resistance (4 minutes) to forced entry. They are expensive and, therefore, should be used only when prevention of surreptitious entry is essential. There are only two medium-security padlocks currently qualifying under MIL-P-43951 that are in use. They differ in the diameters of their shackles and in the way each model is keyed.

(c) Low-security locks and hasps. Low-security locks and hasps satisfy most access control requirements for offices and other noncritical spaces where hasps and padlocks can be used. Control of access offers protection for records, office equipment, supplies, and personal items and limits accountability to personnel designated for staffing and maintaining these spaces. These locking systems should only be used when their intended purpose is to deter unauthorized entry. They provide no resistance to forced entry and only minimal resistance to surreptitious entry.

(d) Lock and lock sets, exterior, high security. The high-security locking device, meeting MIL-L-29151, a precision cast, stainless steel lock, is a unique, self-contained, low-profile locking device that provides a high level of security (Figure 14). Its design allows it to be used for outward, double-swinging, sliding, and roll-up doors. This locking device incorporates a durable interlocking cast construction with an integral hasp and a central bolt assembly. The two interlocking wings are mounted directly to the closure, either welded or bolted, and are free of annoying hasps, chains, or other loose parts. This design ensures that the lock cannot be removed for unauthorized use. This unit is keyed individually, and the key retaining function results in a locked open or closed position when the key is removed. The concept allows versatile mounting and is suitable for most security applications.

(e) High-security, shrouded hasp for high and medium padlocks. The hasp approved for high-security applications meeting MIL-H-29181 is the high-security shrouded hasp system. When secured with an approved high-security padlock, this hasp protects the padlock shackle from attack. This system is illustrated in Figure 15.

(f) Locks, combination (safe and safe locker). The mounted combination locking unit, which includes the Group 1R combination lock that meets MIL-L-15596, is specially designed for use on wood and metal doors on secure spaces such as communications and intelligence spaces (Figure 16). It is a reversible, interior surface-mounted lock recommended for use on doors in

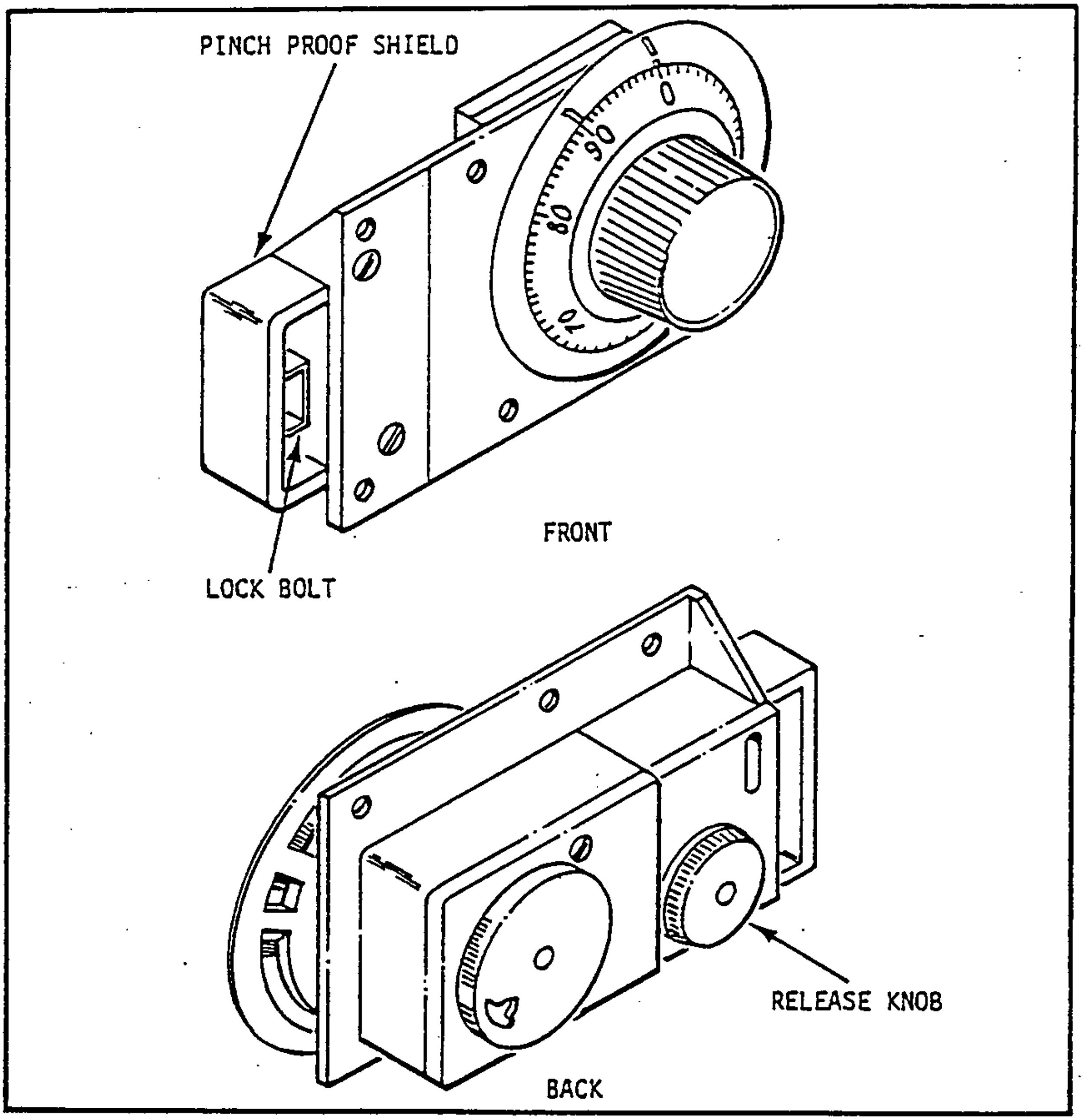

FIGURE 16. Locks, combination (safe and safe locker) MIL-L-15596.

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high-security areas. In essence, it is two locks in one, a deadbolt and a combination lock. The deadbolt section features hardened steel pins and an interlocking strike and frame to prevent jimmying or spreading of the door frame. It has an inside release knob for convenient exiting and an automatic deadlocking trigger. This trigger enables it to be locked while the door is open, but activates the bolt when the door is closed.

(4) Hinges and door/frame interface hardening options. A number of concepts for use on personnel-type outswing doors involving positive interlocking hardware for coupling the hinge sides of the doors to the door frames are illustrated in Figure 17. Hinge side protection options specifically related to AA&E magazine facilities are discussed in Section 5. In the case of installation of hardened doors, the facilities engineer should consider the strength of the door jamb as a part of a secure door system. Hardening the upright surfaces into which the door is fitted (e.g., installing steel uprights) will prevent jamb attacks.

3.2.3 Windows.

3.2.3.1 General. As a general principle, windows present a significant weak point in any balanced physical security design because they provide low penetration times. Conventional window assemblies offer only nominal resistance against even the unskilled intruder. As the test data show, the solutions are limited even among hardening options that offer significant penetration times equivalent to penetration times provided by other building components such as walls, floors, and roofs. The available hardening options impose penalties on functional performance of windows, including reduced light transmission and air flow for ventilation. Hence, in any facility design where there is a penetration time requirement beyond what conventional window assemblies or hardening options can provide, the simplest and most obvious solution is to omit windows, except where there is an overriding operational requirement for them. Such a requirement could be, for example, the necessity for an observation port for security or safety purposes, or for essential business transactions. Even when observation is required, the possibility of substituting a closed circuit television system for windows should receive consideration. When observation ports are essential, they should be kept as small as possible, preferably less than the area [96 square inches (0.06 m^2)] required for man-passable openings.

3.2.3.2 Conventional Window Penetration Times. In general, conventional window assemblies provide penetration times equal to or less than 2 minutes, and usually provide penetration times of 1/2 minute or less. Even bar and grill security enhancements, of the type shown in Table 16 offered as conventional security solutions in general use, add only 1/2 to 1-1/2 additional minutes of penetration time against a skilled, motivated intruder. It is significant that, with the proper choice of tools, only the riveted steel

TABLE 34.

Security levels for selected buildings.

Security Level	Design Threat	Type of Building	Penetration Delay Time
Low	Pry Bars, Bolt Cutters, Body Force Unlimited hand,	Commissary, Storage Administration, Shops Exchanges, Warehouses	1 min.
Medium	Tools, Limited power tools	Operations buildings	4 min.
High (Terrorist)	Unlimited tools, Torches, Truck bombs, Rocket propelled grenades, and Light Anti-Tank weapons	Security centers, Nuclear, Command, Aircraft hangers, AA&E, POL	15 min.

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SECTION 7: VAULTS AND STRONGROOMS

7.1 Summary.

7.1.1 Overview. A vault is a room or compartment designed to store classified material or other valuable resources. It is designed to provide entrance and working space for one or more persons. Vaults within the Department of Defense (DOD) are categorized by class and purpose. Those required to store classified documents or material are discussed in Paragraph 7.3. Those required for other purposes such as the storage of money, pharmaceuticals, records, or other sensitive resources are addressed in Paragraph 7.4. In many cases the most cost-effective approach to protect DOD assets may be the use of a strongroom as addressed in Paragraph 7.5, rather than the construction of a vault.

7.1.2 Basic Considerations. The most cost-effective method of providing adequate storage for Government resources should always be selected. If, after a thorough analysis, the need for a security vault is validated, attention should focus on the items to be stored. Classified documents, material, and equipment require a Class A, Class B, Class C vault or strongroom depending on the classification level of the documents, material, or equipment. If the items to be stored are not classified, a modular vault or strongroom may be the preferred option.

7.1.3 Vaults. Vaults required to store classified items should meet the specific requirements outlined in this handbook. Any deviation, unless approved in writing by appropriate authority, may preclude the utilization of the structure for storage of classified material. Vaults should be periodically inspected and properly maintained. New vaults should be designed and built in accordance with these guidelines. Modular vaults, although not formally approved for the storage of classified items, offer several distinct advantages. They are more quickly constructed, more movable, and cost less than the typical Class A, B, or C vaults. In addition, against some threats, they provide penetration times equal to or greater than the Class A, B, or C security vaults.

7.2 Strongrooms.

A strongroom is a six-sided room, with all sides built of solid materials. Although built with physical security in mind, a strongroom provides little protection against an individual determined to steal or commit other such crimes. Strongrooms should be used, therefore, in areas that are frequently observed by on-duty personnel. A strongroom is authorized for classified documents and is appropriate for storage of highly-pilferable items and property of large bulk, such as office furniture, recreational equipment, office supplies, food items, audio-visual equipment, and musical instruments.

7.3 Class A, B, and C Vaults.

7.3.1 Introduction. The Navy has a document outlining the protection of classified material. Fences, alarms, lights, security containers, vaults, etc., when applied in accordance with procedures explained in OPNAVINST 5510.1G, provide a secure environment for classified material and equipment. Selection of the appropriate vault depends on the classification of the material or equipment to be stored and the value of facility construction supporting physical security equipment or supporting guard forces. Close coordination with the security manager is essential.

7.3.2 General. This section is divided into three distinct subsections applicable to Class A, B, and C security vaults. Each subsection delineates completely the requirements for that particular class of vault. While this causes some duplication, it benefits the reader in that all data for each vault are presented in the subsection pertaining to that vault, negating the necessity to move from one subsection to another.

7.3.3 Class A Vault. A Class A vault offers maximum protection for classified material and equipment. General dimensions are outlined in Table 35 and explained in greater detail below.

7.3.3.1 Floors and Walls. Floors and walls shall be constructed of reinforced concrete in accordance with the requirements imposed by the design dead and live loads. As a minimum, floors and walls shall be 8 inches thick and reinforced. The wall must extend to the underside of the roof or ceiling slab above. When the vault wall is also a part of the exterior wall, that portion of the vault wall that coincides with the exterior wall shall be at least 12 inches thick with the interior portion of the wall being of at least 8 inches of reinforced concrete.

7.3.3.2 Roofs and Ceilings. Roofs and ceilings shall be designed in accordance with the structural requirements dictated by the clear spans between supports to meet dead and live loads and safety factors. A monolithic reinforced-concrete slab shall extend across the entire vault and shall rest on the perimeter vault wall on all sides. Roofs and ceilings shall be not less thick than the interior vault floors or walls. Where a roof is not provided, the reinforced ceiling slab shall not be higher than 9 feet above the vault floor.

7.3.3.3 Vault Entrances. Since openings in vaults are more vulnerable to attack than the vault enclosure itself, only one entrance should be provided where possible; however, when a vault exceeds 1,000 square feet in floor space or will have more than eight occupants, it should have a minimum of two exits for safety purposes. When more than one entrance is required, each shall be equipped with an approved vault door (Figure 46) with only one used for normal access. Where continued use of an entry barrier is required at a vault door, a day gate (Figure 46) shall be provided for the primary entrance to preclude undue wear of the door, which could eventually weaken the locking mechanism or cause malfunctioning. Vault doors and frame units shall conform to Federal Specification AA-D-600 for class 5 vault doors. Requirements of this specification are summarized as follows.

(1) Assembly. The door frame shall afford the same security protection as that of the door. Protection for the extended locking bolts shall be built into the door frame. The overall width of the door frame shall not exceed the width of the clear door opening by more than 16 inches. The width of the necessary opening through the structural wall shall not exceed the width of the clear door opening by more than 10 inches. The height of the necessary opening through the structural wall shall not exceed the height of the clear door opening by more than 5 inches. The door shall be assembled in such a manner as to preclude the removal or loosening of any of the door's components when the door is closed and locked. All welding and brazing shall be sound without porosity and shall result in secure and rigid joints in proper alignment. All protruding or depressed welds on the door's exterior surface shall be filled and sanded or ground smooth. The door and frame shall be in perfect alignment to ensure smooth and unrestricted operation of the locking mechanism. The locking bolts shall be smooth and positive without binding or jamming of parts.

(2) Door frame. The door frame shall be of the nongrout type and the frame and door shall be mounted so that there shall be not more than 1/8-inch of clearance between the door and the door frame. The frame shall be designed so that, when attached to the wall, the wall clamping bolts will be exposed only on the inside of the vault. The frame shall have leveling and adjusting screws to compensate for any building sag that may occur in the future.

(3) Door pull and throw-bolt handles. The door pull and throw-bolt handles shall be not less than 4 inches in length and shall be of designs consistent with their intended usages. The handles shall be without burrs, nicks, scratches, and sharp edges. They shall be securely and firmly attached to the door front to withstand loosening resulting from testing or operation during the service life of the door. The door pull handle may be integral with the throw-bolt handle. Removal of the handle arbor shall be controlled only from the inside of the door. The throw-bolt handle shall require not more than 5 pounds to engage or disengage the bolt work mechanism, and the initial force required to swing the unlocked door from any position shall not exceed 10 pounds at the operating handle.

(4) Door stop. A door stop to prevent the door's face hardware from striking wall surfaces shall be furnished with the door. The stop shall be designed to be mounted on a wall or floor and not on the door. The stop shall be able to withstand hard usage and shall not scratch or scar the door's painted finish when the door is swung open against the stop.

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Table 35
Minimum Vault Construction Requirements

	CLASS		
	A	B	C
Walls	8-in. RC (1,4)	8-in. (2,4,5)	8-in. (3,4,5)
Floors	8-in. RC (1)	4-in. (6)	4-in. (6)
Ceiling	8-in. RC	(7)	(7)
Roof	8-in. RC	(7)	(7)
Door/Frame	Class 5	Class 5	Class 5
Misc Openings	(96 sq in.)	(96 sq in.)	(96 sq in.)
Lock	UL 768 1-R	UL 768 1-R	UL 768 1-R

NOTES:

(1) Determined by structural requirements but not less than 8 inches of reinforced concrete (RC).

(2) Brick, concrete block, or other masonry units. Hollow masonry units shall be vertical cell-type (load bearing) filled with concrete and steel reinforced bars.

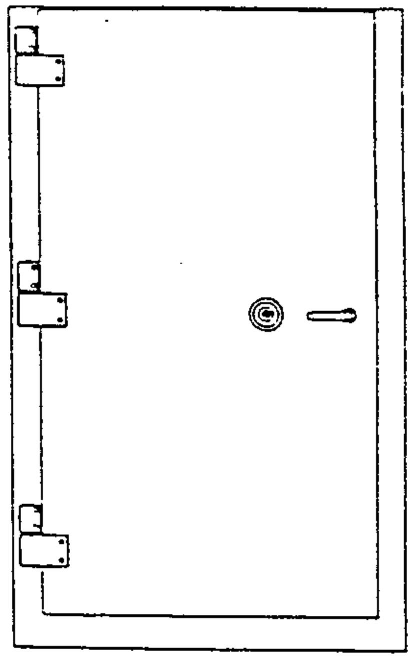
(3) Hollow clay tile (vertical cell double shells) or concrete blocks (thick shells). Where hollow clay tiles are used and such masonry units are flush or in contact with facility exterior walls, they shall be filled with concrete and steel reinforced bars.

(4) Walls are to extend to the underside of the roof or ceiling slab above.

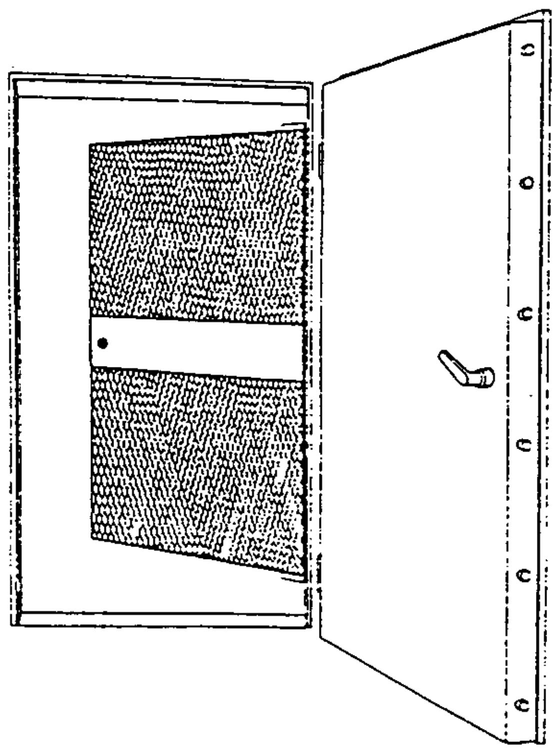
(5) Monolithic steel-reinforced concrete walls at least 4 inches thick may be used (recommended for Class B vaults in seismic areas).

(6) Monolithic concrete construction of the thickness of adjacent concrete floor construction, but not less than 4 inches thick.

(7) Monolithic reinforced concrete slab of a thickness determined by structural requirements, but not less than 4 inches thick.



TYPICAL CLASS 5 VAULT DOOR



CLASS 5 VAULT DOOR WITH DAY GATE

FIGURE 46. Class 5 vault door and day gate.

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ceiling. The slab shall extend across the entire vault and rest on the perimeter vault wall on all sides. Where a roof is not provided, the reinforced ceiling slab shall not be higher than 9 feet above the vault floor level.

7.3.4.4 Vault Entrances. Since openings into vaults are more vulnerable to attack than the vault enclosure itself, only one entrance should be provided where possible; however, when a vault exceeds 1,000 square feet in floorspace, or when it will have more than eight occupants, it should have a minimum of two exits for safety purposes. When more than one entrance is required, each shall be equipped with an approved vault door (Figure 46), with only one used for normal access. Where continued use of an entry barrier is required at the vault door, a day gate (Figure 46) should be provided for the primary entrance to preclude undue wear of the door, which could eventually weaken the locking mechanism or cause a malfunction. Vault door and frame units shall conform to Federal Specification AA-D-600 for Class 5 vault doors. Requirements of this specification are the same as for Class A vault and are summarized in Subparagraph 7.3.3.3 (1) through (16).

7.3.4.5 Dimensions. The dimensions of the Class 5 vault door and the dimensions of the opening in the vault wall to accept the Class 5 vault door are shown in Figure 47.

7.3.4.6 Ducts, Pipes, and Conduits. Openings through the vault walls, ceilings, and floors will be held to a minimum consistent with security, safety, and adequate personnel health considerations. Any openings passing through the protective vault barrier shall not exceed 96 square inches. Preferably, such ducts, pipes, and conduits should be installed and cast in concrete during vault construction. When this is not possible, they shall be carried through snug-fitting pipe sleeves cast in the concrete. After installation, the annular space between the sleeve and the duct, pipe, or conduit shall be caulked solid with lead, wood, waterproof (silicone) caulking, or similar material that will give evidence of surreptitious removal. Ducts, pipes, and conduits shall not be allowed to pass through the vault perimeter or space unless they serve some specific safety, security, or personnel health purpose inside the vault itself. Refer to Subparagraph 1.3.2 for more detail regarding the definition of man-passable openings.

7.3.4.7 Additional Safety Measures. A Class B vault shall be equipped with an interior alarm switch or device (such as a telephone, radio, or intercom) to permit a person in the vault to communicate with the vault custodian or guard post to obtain release. Further, the vault shall be equipped with a luminous type lightswitch and, if the vault is otherwise unlighted, an emergency light shall be provided.

7.3.4.8 Construction Standards. In addition to the requirements given above, the floor, wall, and roof construction must be in accordance with nationally recognized standards of structural practice. The concrete must be poured in place and have a minimum 28-day compressive strength of 2,500 psi.

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7.3.5 Class C Vault. A Class C vault offers minimum protection for classified material and equipment. General dimensions are outlined in Table 35 and explained in further detail below:

7.3.5.1 Floor. The floor shall consist of monolithic concrete construction of the thickness of the adjacent concrete floor construction but not less than 4 inches thick. The floor should be reinforced with a minimum of 6- by 6-inch steel mesh, particularly where the slab is not on grade.

7.3.5.2 Walls. Walls shall be constructed of not less than 8-inch-thick hollow clay tile (vertical cell, double shell) or concrete block (thick shell) in accordance with the requirements imposed by the design dead and live loads. Monolithic steel-reinforced concrete walls at least 4 inches thick may also be used, and should be considered in seismic areas. As a minimum, reinforcement should be of No. 4 reinforcing bars. That portion of the vault wall that coincides with any exterior wall shall be at least of concrete, solid masonry, or hollow masonry units of the vertical cell type (load bearing) filled with concrete and steel reinforcement bars. No. 4 or larger reinforcement bars should be placed vertically in each core column.

7.3.5.3 Roofs and Ceilings. Roofs and ceilings shall be designed in accordance with the structural requirements dictated by the clear spans between supports to meet dead and live loads and safety factors. A monolithic reinforced-concrete slab not less than 4 inches thick shall constitute the roof or ceiling. The slab shall extend across the entire vault and shall rest on the perimeter vault wall on all sides. Where a roof is not provided, the reinforced ceiling slab shall not be higher than 9 feet above the vault floor.

7.3.5.4 Vault Entrances. Since openings into vaults are more vulnerable to attack than the vault enclosure itself, only one entrance should be provided when possible; however, when a vault exceeds 1,000 square feet in floor space, or when it will have more than eight occupants, it should have a minimum of two exits for safety purposes. When more than one entrance is required, each shall be equipped with an approved vault door with only one used for normal access. Where continued use of a barrier to entry is required at the entrance of the vault, a day gate (Figure 46) shall be provided for the primary entrance to preclude undue wear of the door, which could eventually weaken the locking mechanism or cause a malfunction. Vault door and frame units shall conform to Federal Specification AA-D-600 for Class 5 vault doors. Requirements of this specification are the same as for Class A vaults and are summarized in Subparagraph 7.3.3.3 (1) through (16).

7.3.5.5 Dimensions. The dimensions of the Class 5 vault door and the dimensions of the opening in the vault wall to accept the Class 5 vault door are shown in Figure 47. (NOTE: Because Class 6 doors are no longer available through GSA channels, the only way a Class C vault can be authorized for

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