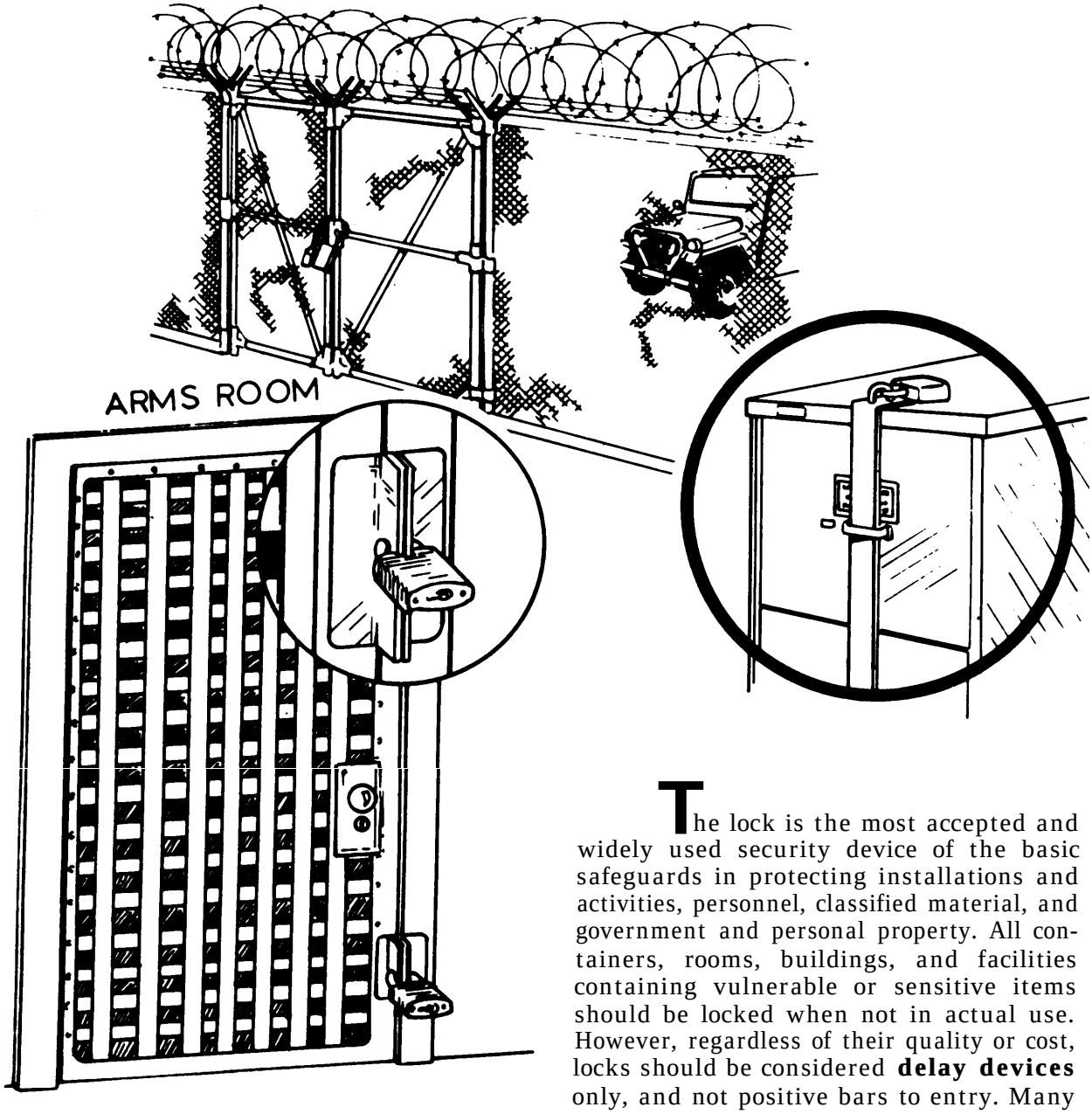
Chapter 8

Lock and Key Systems



The lock is the most accepted and widely used security device of the basic safeguards in protecting installations and activities, personnel, classified material, and government and personal property. All containers, rooms, buildings, and facilities containing vulnerable or sensitive items should be locked when not in actual use. However, regardless of their quality or cost, locks should be considered **delay devices** only, and not positive bars to entry. Many

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ingenious locks have been devised, but equally ingenious means have been developed to open them surreptitiously. Some types of locks require considerable time and expert manipulation for covert opening, but all will succumb to force and the proper tools. Therefore, the locking system must be backed up with other security measures.

8-1 Installation And Maintenance

a. The Army Corps of Engineers is responsible for installation and maintenance of locks, latches, padlocks, or other locking devices on doors, cabinets, vaults, and similar built-in items that are an integral part of a building or structure. Locks and locking devices are listed by manufacturer and catalog number in TM 5-805-8. Conversely, locking devices for safes, lockers, cabinets, desks, and similar items that are not an integral part of a building are not the responsibility of the Army Corps of Engineers (AR 420-70).

b. Certain Army regulations (such as 190-11, 50-5, 50-6) prescribe specific types of locks for specific types of installations or facilities, and provide the National Stock Number (NSN) in each case. AR 380-5 prescribes standard facilities for storage of classified material.

8-2 Types of Locking Devices

The degree of protection afforded by any well-constructed vault, safe, or filing cabinet may be measured in terms of the resistance of the locking mechanism to picking, manipulation, or drilling. Types of locking devices include:

(1) Key locks. Most key locks can be picked by an expert in a few minutes. The possibility of the loss and compromise of a key and the possibility of an impression being made should also be considered in determining the security value of a key-type lock.

(2) Conventional combination locks. This type lock may be opened by a skillful manipulator, who may be able to determine the settings of the tumblers and construction of a common three-position dial-type combination lock through his sense of touch and hearing. Although the manipulation of some combination locks may require several hours, a skillful manipulator can open an average con ventional combination lock in a few minutes.

(3) Manipulation-resistant combination locks. A manipulation-proof lock is designed so that the opening lever does not come in contact with the tumblers until the combination has been set. Such a lock furnishes a high degree of protection for highly-classified or important material.

(4) Other combination locks. Combination locks with four or more tumblers may be desirable for containers of highly important items.

(5) Relocking devices. A relocking device on a safe or vault door furnishes an added degree of security against forcible entry. Such a device appreciably increases the difficulty of opening a combination lock container by punching, drilling, or blocking the lock or its parts, and is recommended for heavy safes and vaults.

(6) Interchangeable cores. The interchangeable core system uses a lock with a core that can be removed and replaced by another core using a different key. Its main features include:

(a) Cores may be quickly replaced, instantly changing the matching of locks and keys if their security is compromised.

(b) All locks can be keyed into an overall complete locking system.

(c) Economical due to reduction in maintenance costs and new lock expense.

(d) System is flexible and can be

engineered to the installation's needs.
(e) Simplifies recordkeeping.

(7) Cypher locks. A cypher lock is a digital (pushbuttons numbered from 1 through 9) combination door locking device used to deny area access to any individual not authorized or cleared for a specific area.

8-3 Understanding Lock Security

a. Combination locks— This popular type of lock is incorporated in padlocks, vaults, and doorlocks. The operation principle of most combination locks is a simple one. The operator uses numbers (or other symbols) as reference points to enable him to aline tumblers so that the locking parts of the lock can move to an unlocked position.

(1) Figure 53 represents a three-tumbler combination lock mechanism. (A combination lock has the same number tumblers as there are numbers in the combination. Therefore, a lock having three numbers in the combination has three tumblers; four numbers, four tumblers, etc.) In figure 53 "A" represents the dial, which is firmly fixed to the shaft "E". Any movement of the dial is directly imparted to the shaft. Letters "B," "C," and "D," identify the tumblers.

Each tumbler resembles a disc with a notch cut into its circumference. This notch is called a gate. "D" represents the driver tumbler. It, like the dial, is firmly fixed to the shaft so that when the dial is moved, the driver tumbler also moves. "B" and "C" are called rider tumblers. They merely rotate around the shaft. Therefore, movement of the dial may not immediately impart corresponding movement to the rider tumblers.

To operate the lock, one must aline the gates with the fence; when the fence is free

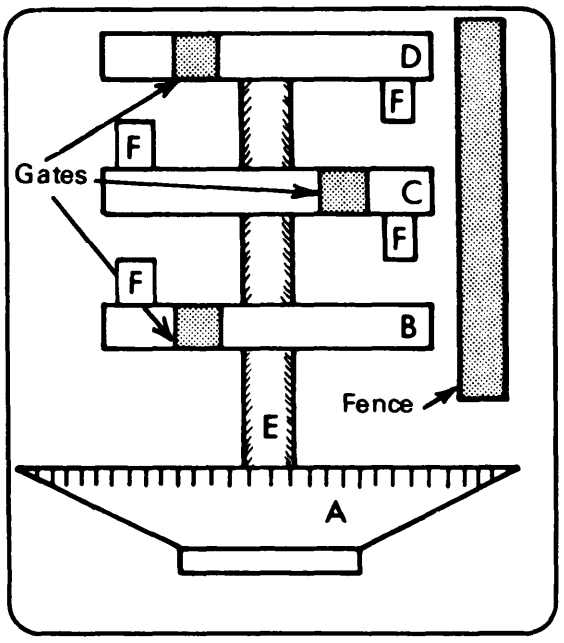

Figure 53—How a three-tumbler combination lock works.

to move into the space made by the gates, the lock will operate. First, the dial is rotated in one direction several times. The driver follows the dial and within a 360-degree turn, the drive pin "F" on the driver comes into contact with the drive pin on rider "C" causing "C" to rotate in the same direction. As the dial continues to turn in the same direction, the drive pin on "C" contacts the drive pin on "B" and then all the tumblers are nested (that is, all tumblers are going in the same direction).

The operator then stops the dial when the first number of the combination comes into alinement with the index mark on the front of the lock. This will aline the gate on tumbler "B" with the fence. He then reverses direction and rotates the dial one less turn to the next number of the combination. This allows "B" to remain in alinement while "C" comes into alinement. Changing direction and turning the dial one less turn again brings "D" into alinement and the lock will now open.

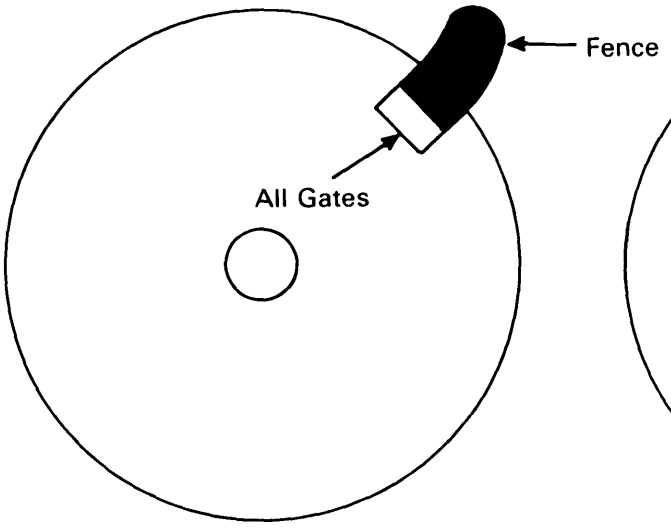

Figure 54—Example of combination lock gates alined and fence in open position.

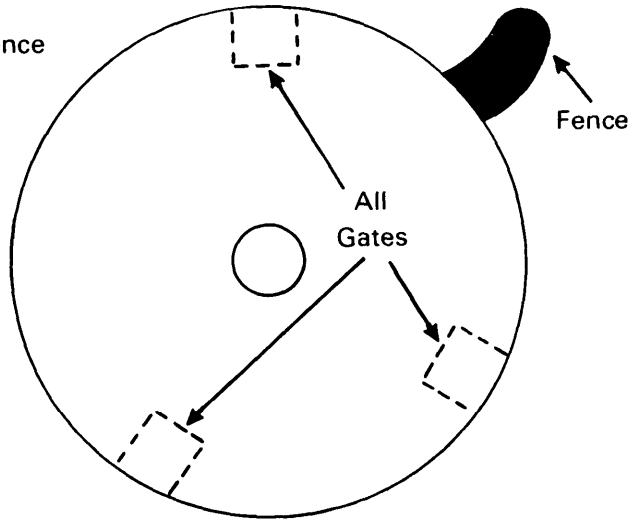

Figure 55—Example of combination lock with gates not alined.

(Figure 54 shows gates and fence in open position.)

(2) Figure 55 portrays improper alinement of gates and fence, caused by applying the wrong combination, preventing operation of the lock.

(3) To determine the number of possible combinations on a lock, you raise the total number of reference points on the dial to the power equal to the number of tumblers. Example: A lock has 40 numbers on the dial and a three-number combination. The three-number combination indicates that there are three tumblers in the lock. Therefore, the number of combinations possible is 40^3 or 64,000. How can someone find one combination out of 64,000 in less than an hour?

(4) On inexpensive combination padlocks there is usually a serial number stamped on the back. These serial numbers can be checked in a code book (available from locksmith supply houses) and the combination of any such lock can be obtained. This is one way an intruder can neutralize the combination lock. Incidentally, a code book for some Master brand combination padlocks can be purchased for very little cost from one major supplier. With inexpensive locks there is a certain amount of tolerance between the widths of the gates and the width of the fence. This tolerance allows for some leeway with respect to the combination numbers. In other words, with these locks, applying the exact combination is not critical. If the exact combination were 1-3-8, for example, the lock might also open on 2-4-7 or 1-4-9. Therefore, manipulation would require the intruder to try every other combination instead of every single one. This cuts the intruder's time considerably.

(5) There are still other ways to neutralize small combination padlocks. The bolt (that part engaging the shackle) is spring-loaded in most models. Therefore, a sharp blow on part of the lock will cause the bolt to jump toward the blow. If this is done properly, the bolt will disengage from the shackle and the lock will open. This operation is known as **rapping.** The combination padlock with the spring-operated bolt can also be opened by

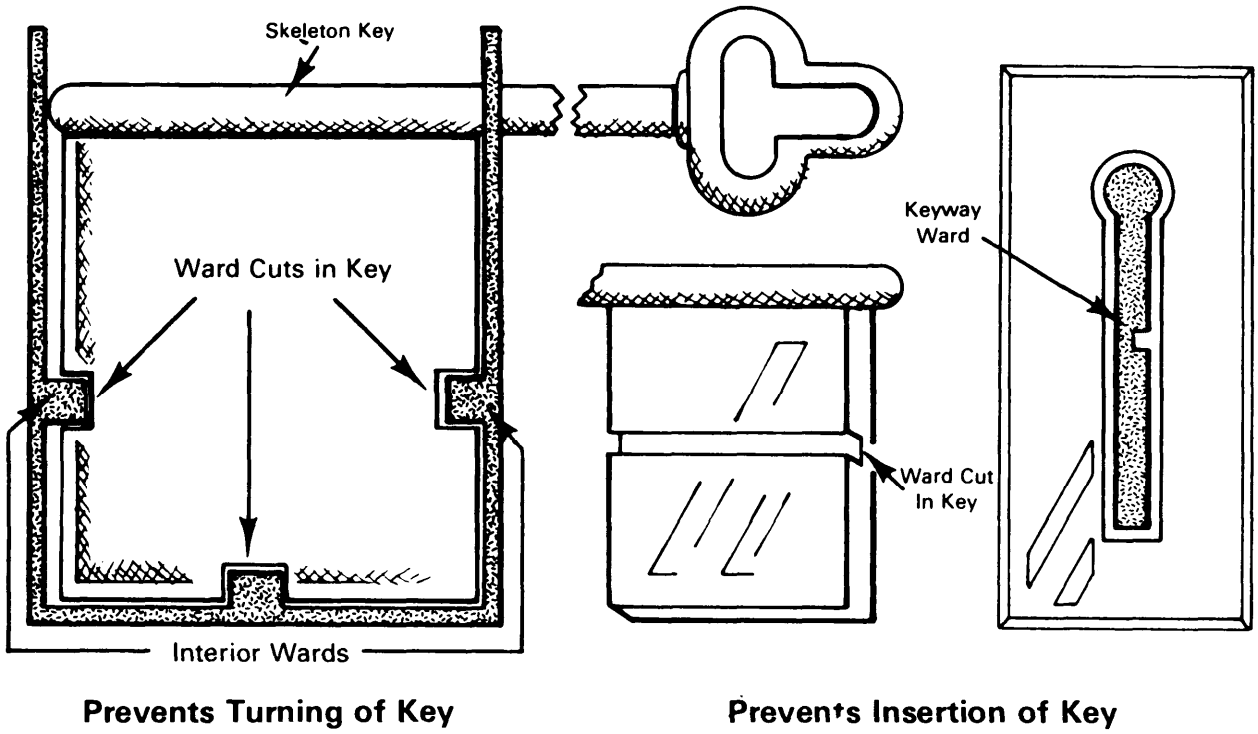

Figure 56—Examples of interior wards and matching ward cuts in keys.

shimming with a small piece of thin metal known as a sneaker. This is an amazingly quiet, simple, and fast operation.

(6) Manipulation can be done on safe locks as well as on simple locks. However, it is not as easy as it appears on TV and in the movies. Most big combination locks employ very close tolerances between gates and fences, balanced tumblers, and false gates to foil surreptitious burglary attempts.

b. Warded locks— While combination locks are popular, key-operated locks are even more popular. One type of key-operated lock is called the warded lock. Wards are defined as obstructions in the keyway (keyhole) and/or inside the lock to prevent all but the properly-cut key from entering or working the lock (figure 56). The key must have the proper ward cuts to bypass the wards in the keyway or in the lock. There are keys made to bypass most wards in any warded lock. These are known as skeleton-keys. However, a skeleton key is not absolutely necessary to bypass a warded lock. A piece of wire bent to the right shape will bypass the wards yet still make contact with the bolt of the lock.

(1) Warded padlocks are frequently seen in barracks and on storage sheds. These locks actually offer very little security. Most are of laminated type construction and to the unaware seem quite secure. They can be identified by a free-turning keyway. An object, such as a nail file, inserted into the free-turning keyway will turn the keyway but will not operate the lock because the keyway is simply a guide for the key, not a functional part of the lock. However, if this object is inserted too far into the lock, it will not turn at all.

(2) Figure 57 depicts a warded padlock. On this type of lock, the shackle is secured not by a bolt, but by a flat spring, the leaves of

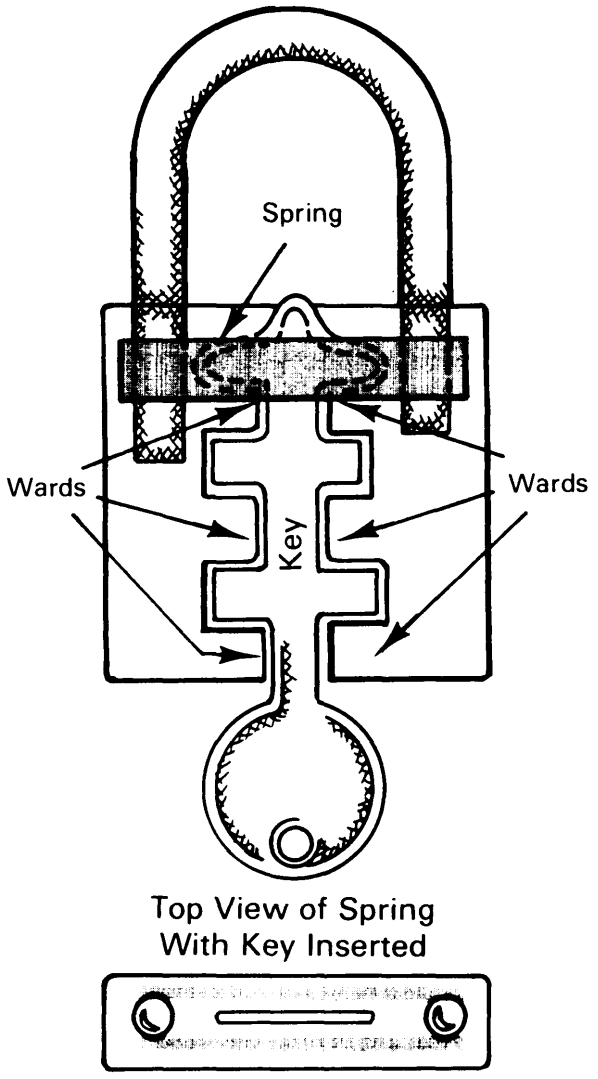

Figure 57— Warded padlocks with spring secured shackle.

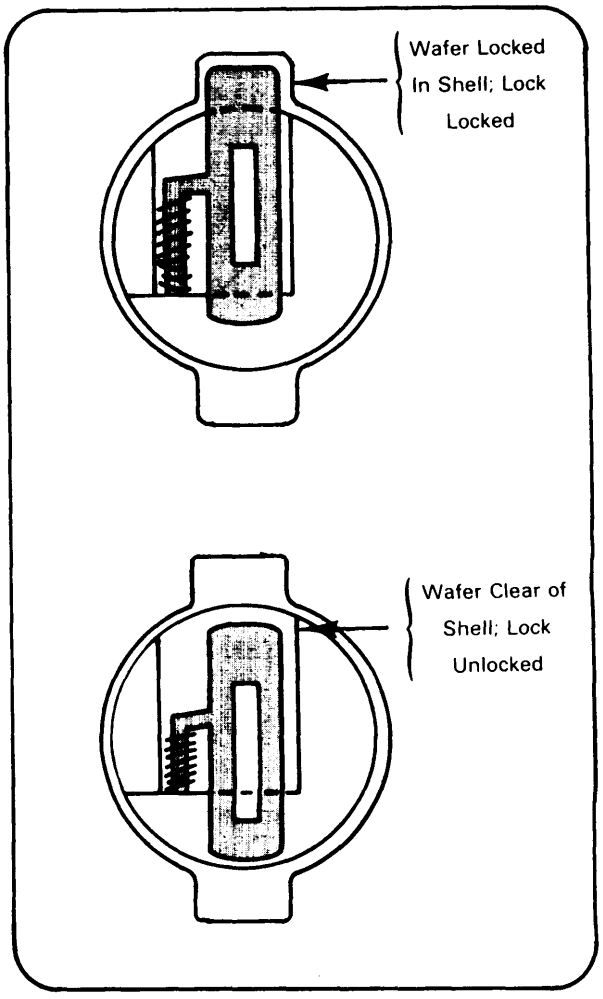

Figure 58— Wafer lock operations.

which press together on the sides of the shackle, engaging a notch on each side of the shackle. To open this lock, all that is needed is to spread the leaves of the spring. This can be done with the proper key, by a specially designed key, or by an ingeniously bent paper clip.

(3) Any lock that relies entirely upon wards for its delay factor is not a good lock for security purposes. Most modern locks employ wards to curtail insertion of unauthorized keys; however, these locks have other security features besides the wards.

c. Wafer or disc tumbler locks— This is another type of key-operated lock. Generally, these devices are more secure than warded locks. Wafer locks are used on most automobiles, desks, cabinets, and in some padlocks. The operation principle of the wafer or disc tumbler lock is as follows: several wafers are located in the core or plug of the lock (the part that turns). The wafers are under spring

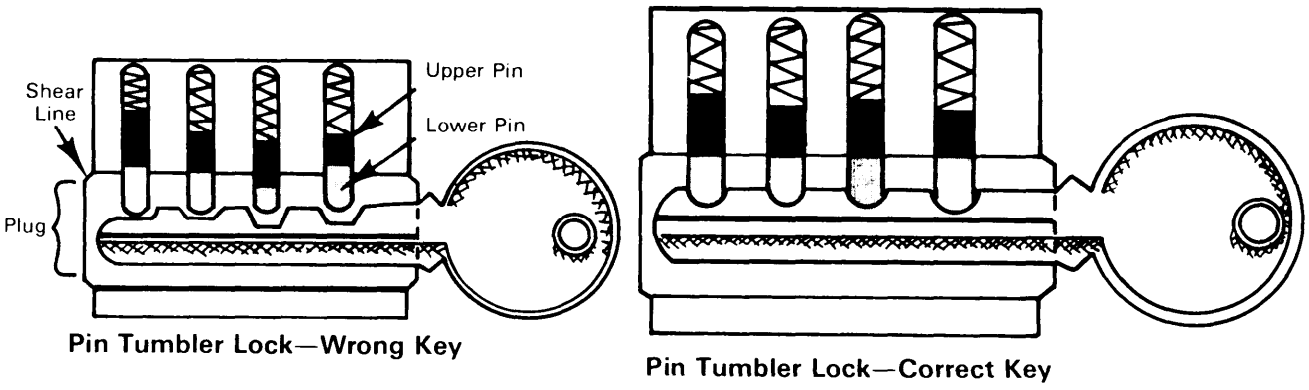

Figure 59—Example of pin tumbler lock operation.

tension and protrude outside the diameter of the plug into a shell formed by the body of the lock (see figure 58, locked), thus keeping the plug from turning and keeping the lock locked. Insertion of the proper key causes the wafers to be pulled out of the shell into the diameter of the plug, allowing the plug to be turned (figure 58, unlocked). If the wafer lock is in a door or a desk and has a spring-operated bolt, it can be shimmed open. If it's in a padlock and has a spring-operated bolt, it can also be rapped open. If it is in a vehicle or if it employs a deadbolt (a bolt which operates only when the key plug is turned) the lock can be picked open.

d. Pin tumbler locks— These are used extensively in commercial, military, and residential security. The pin tumbler lock, generally, is more secure than the warded or wafer tumbler lock. In this lock, pins are moved by a key so that a shear line can be obtained thus allowing the key to turn the plug and operate the lock (see figure 59).

(1) Pin tumbler locks may be incorporated into padlocks, door locks, switches, machinery, etc. The padlocks, if the bolts are spring-operated, may be rapped or shimmed open. In other devices such as door locks, if the pin tumbler lock operates a spring-operated bolt, the bolt may be shimmed open. Specifically, shimming a door open is known as loiding, after the word "celluloid," a material commonly used in this technique.

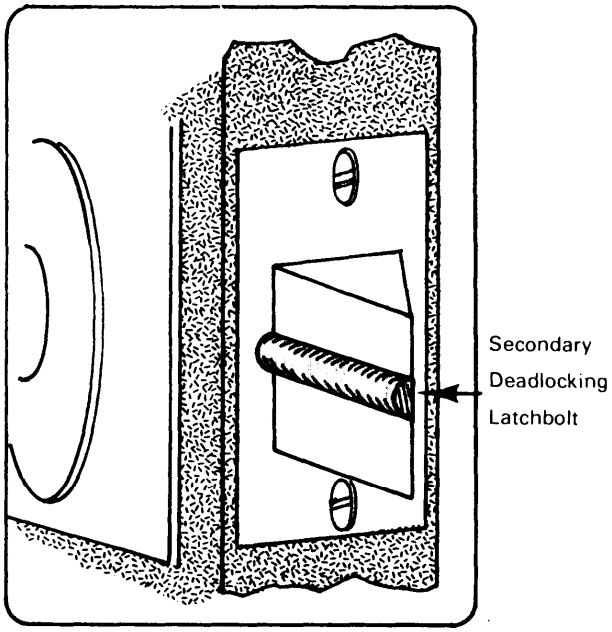

Figure 60—Secondary deadlocking latchbolt.

(2) As in wafer locks, a dead bolt maybe incorporated into a pin tumbler lock to prevent rapping or shimming. The plug of the lock must turn to operate the dead bolt. In this case the lock must be picked. In residential type locks a feature known as a secondary deadlocking latchbolt is often used (figure 60). If properly adjusted so that when the door is closed the bolt is fully extended into the strike (recess for the bolt in the doorframe) and the secondary bolt is

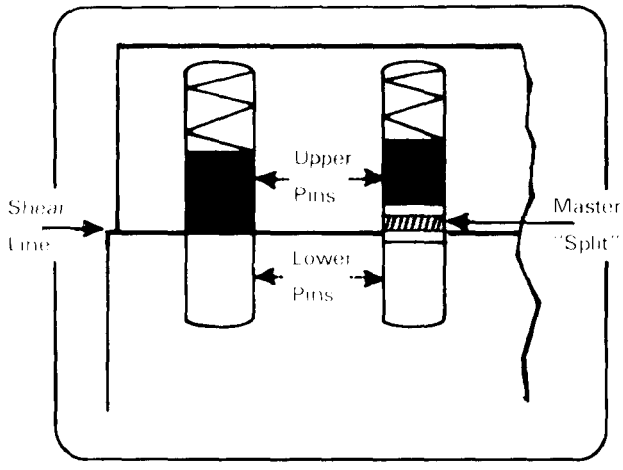

Figure 61—Example of master split in pin tumbler lock.

fully depressed, the secondary deadlocking latchbolt will prevent loiding or shimming. This type of lock should be used on residences—it is cheap security.

(3) The principal operation of pin tumbler locks makes possible the technique of mastering. Mastering allows the use of several differently cut keys to operate the same lock. In mastering (with the exception of one or two particular makes of pin tumbler locks), the pins are segmented by splits which allow several possible pin alinements at the lock's shear line (see figure 61). Because of this, mastering makes picking easier.

(4) To counter this susceptibility to picking, a mushroom or spool tumbler or pin should be used in the lock. This type of pin makes picking considerably more difficult because picking tools tend to cant the tumbler sideways and bind it at the shear line (figure 62). figure 62). The mushroom type pin can also be used effectively in nonmastered locks.

e. Lever locks— Some locks use a system of levers under spring tension to provide security. The properly cut key will move the levers so the gates will be properly alined with the fence, thus allowing movement of the bolt (see figure 63). Levers are used on some doors

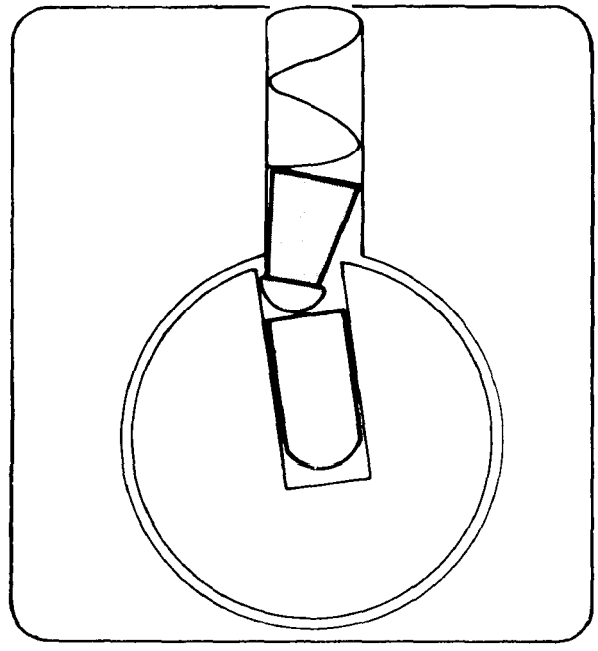

Figure 62—Example of mushroom tumbler action during picking.

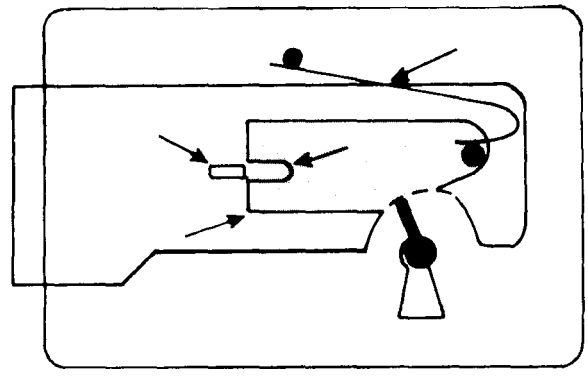

Figure 63—Example of lever lock mechanism.

(prison type doors) and padlocks. Large lever locks can be made quite pick-resistant since the springs can be made to exert considerable pressure to resist picks. However, lever locks can be picked. If the lever lock has a spring-operated bolt, it can be shimmed or rapped open.

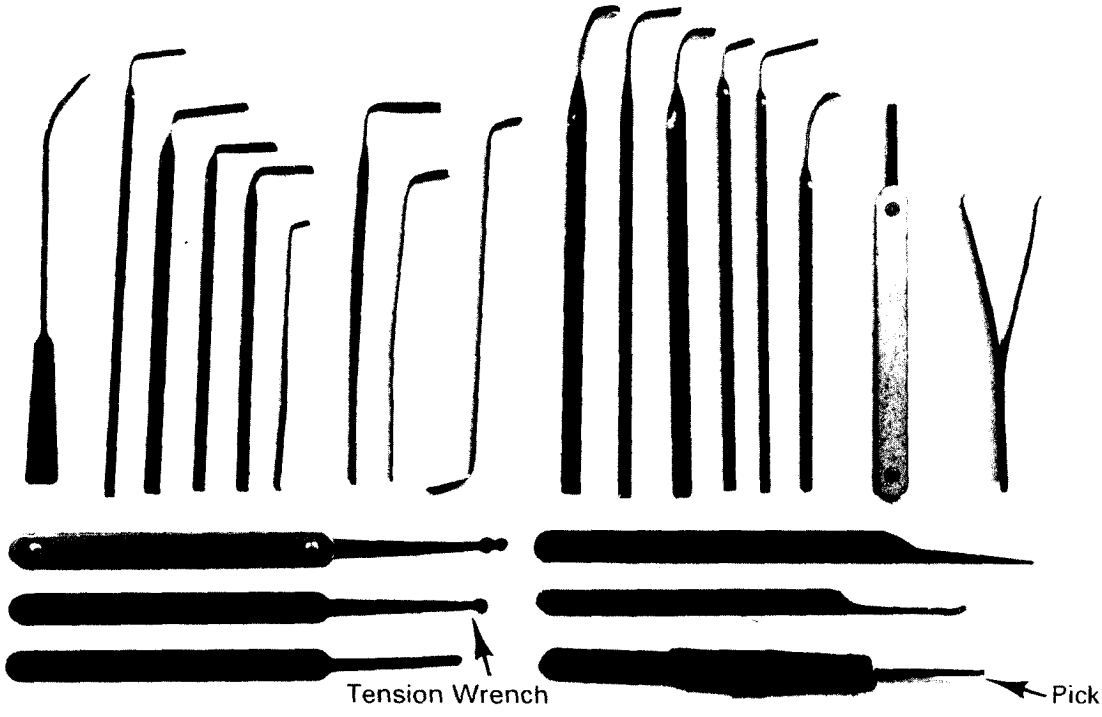

Figure 64—Professional lock picking kit.

8-4 Picking

Since locks are manmade, men can defeat them. For this reason it is foolish to state that a lock is pick-proof. A lock can be called only pick resistant and that is a relative term. In reality, picking is normally quite simple. Picks can be purchased from locksmith supply houses, made at home, or fashioned out, of spoons in confinement facilities.

a. A professional picking kit is shown in figure 64. Basic picking tools are the tension wren ch and the pick. Both are necessary. Without going into detail, the tension wrench imparts a rotary motion to the key plug of the lock and aids in finding the bindings or locking tumblers of the lock. The pick is used to move the binding tumblers, one at a time, to the shear line. When all tumblers are alined properly with the shear line, the lock opens.

b. Picking takes practice, skill, and a little luck. However, it seems that most intruders use other methods to bypass locks. They may cut them, pull them apart, blast them, or rip them off the door. In some doors, the intruder simply spreads the door frame away from the door to release the bolt from the strike. This can be combatted by using locks with long bolts (up to 1 inch) and by using grouting a-round the door frame (this holds the frame rigidly).

c. At times, intruders saw the bolts of locks by putting a saw blade in the space between the door and the frame. Some bolts have floating hardened bearings in the middle of the bolts themselves—this foils the saw attack because the saw cannot get a bite. Hasps are often defeated because they are installed improperly and the screws holding them on the door can be removed.

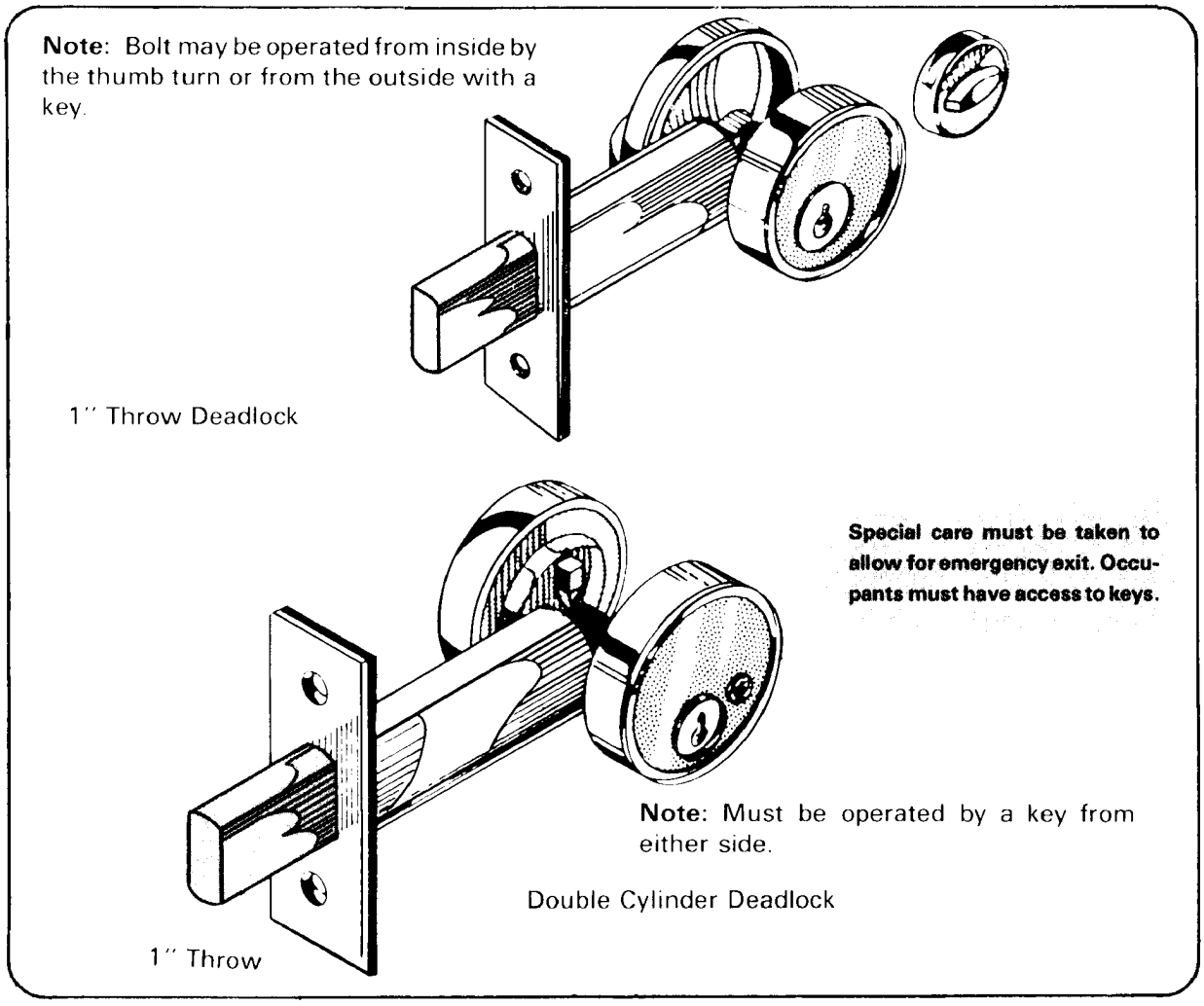

Figure 65—Examples of dead bolt (deadlock) latches.

8-5 Dead Bolt Latches

a. The dead bolt latch may be used on almost any door, is easy to install and inexpensive, and increases the security posture of the facility. For most effective application, the bolt of the latch should be applied so the bolt slides into the door casing frame or into a keeper firmly attached to the frame (not the door facing). Look at the examples of best dead bolt installation in figure 65. The dead bolt latch is recommended for use in military housing as an effective security measure in the installation crime prevention program.

b. Chain latches are not recommended as effective security measures. Because of their usual installation onto door facings, as opposed to door frames, little effort is needed to force entry with a chain latch in the "safe" position (see figure 66).

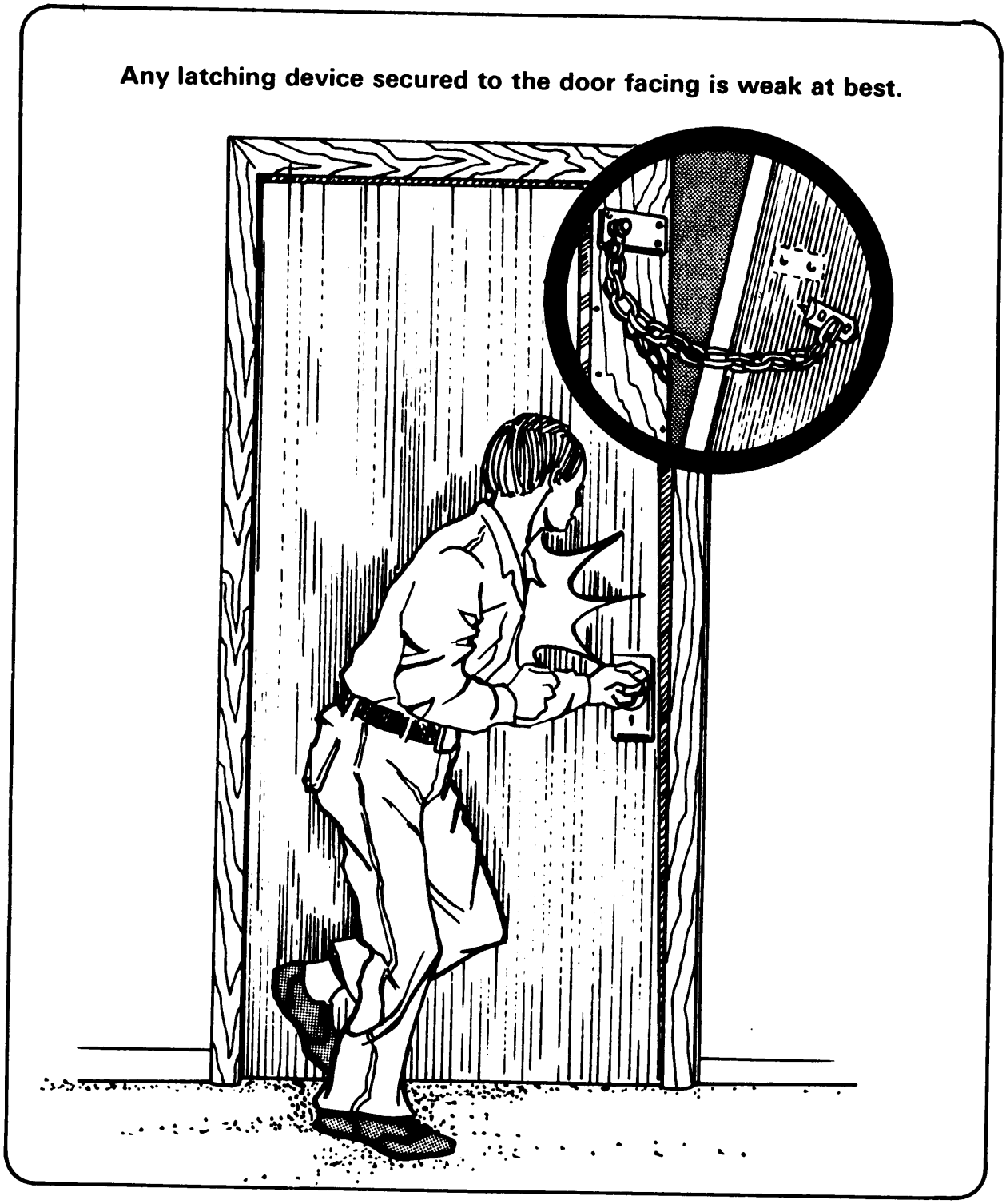

Figure 66—Most chain latches require little effort to neutralize.

8-6 Issue and Control Locks and Keys (General)

Of primary importance in safeguarding property or classified material is a good lock and key issue and control system. Such a system includes control of the combinations of locks.

a. For effective control, accurate records should be maintained and periodic physical inspections and inventories made. The main principles of this system include:

(1) Combinations or keys should be accessible only to those persons whose official duties require access to them.

(2) Combinations to safe locks and padlocks securing containers for classified information will be changed at least once during each 12-month period (AR 380-5), and at such other times as deemed appropriate, and at the earliest practical time following:

(a) Loss or possible compromise of the combination or key.
(b) Discharge, suspension, or reassignment of any person having knowledge of the combination.
(c) Receipt of a container with built-in combination lock.

(3) More frequent rotation of key padlocks may be required in certain instances. This is a recommended practice in all situations.

(4) In selecting combination numbers, multiples and simple ascending or descending arithmetical series should be avoided.

(5) When padlocks with fixed combinations are used with bar locks as supplemental locking devices, an adequate supply should be maintained to permit frequent interchange of locks among users. This type of lock is not considered to provide adequate security unless it is used in large numbers over extensive areas, which permits a successful interchange without compromise. Fixed combination locks should never be used for the protection of classified material.

(6) Records containing combinations should be placed in the same security classification as the highest classification of the material authorized for storage in the container which the lock secures.

(7) Use of keys must be based on the same general concept as applied to safe combinations. Issue of keys must be kept to a minimum and retained under constant key control supervision. Generally, the installation key system should be under control of the installation provost marshal or physical security manager. However, where this is not feasible, the provost marshal should have staff supervision over the system. The following measures are recommended for control of keys to magazines, trailers, warehouses, and other structures containing classified matter or highly pilferable materials:

(a) Keys should be stored in a locked, fireproof container when not in use.

(b) Access lists for persons authorized to draw keys to classified storage facilities should be maintained in the key storage container.

(c) Keys should not be issued for personal retention, or removal from the installation.

(d) Key containers should be checked at the end of each shift and all keys must be accounted for.

b. Key control records should be maintained on all key systems. Accountability can be maintained by records, key cards, and key control registers. Each record must include at least the following information:

(1) Total number of keys and blanks in the system.

(2) Total number of keys by each keyway code.

(3) Number of keys issued.

(4) Number of keys on hand.

(5) Number of blanks on hand for each keyway code.

(6) Persons to whom keys have been issued.

c. Inventories of key systems should be conducted at least annually. Requests for issuance of new, duplicate, or replacement keys should be approved or monitored by the official responsible for key control.

d. A key depository should be provided at installations where keys are secured during nonoperational hours. Supervisors should be required to sign a register for the keys at the beginning of each working day and to turn in keys at the end of the working day. Security personnel should check the key board and register to insure accountability for all keys.

e. Key control systems will normally be engineered to provide the degree of security required with a minimum impairment of the operational mission. Basic requirements for all key control systems are as follows:

(1) High security pin tumbler cylinder locks will normally be specified for use.

(2) Key control systems will be developed to insure against usable keys being left in possession of contractor or other unauthorized personnel. Such assurance is normally achieved by using locks with restricted keyways and issuing new keys on key blank stock that is not readily available to commercial keymakers.

(3) Masterkeying is prohibited except in rare minimum security cases. When pin tumbler systems are masterkeyed, the use of several shorter pins to facilitate two or more acceptable pin positioning reduces the security afforded by use of a maximum number of pins in a nonmasterkeyed lock. One or more mushroom-typed pins or a variation of this type pin will be used in each such lock. Also, individual pins should not be segmented more than two times on those locks being used to secure more sensitive materiel.

(4) All locks (lock cylinders when appropriate) and keys in a masterkeyed system should be numbered with unrelated number system. The words—US government—DO NOT REPRODUCE—should be imprinted on all master and higher level control keys.

8-7 Key Control Officer

a. A key control officer should be appointed by the commander. He maybe the provost marshal, his physical security manager, or other designated individual. This officer should be concerned with the supply of locks and how they are stored; handling of keys; records maintenance; investigation of loss of keys; inventories and inspections; custody of master keys and control keys if applicable; regulations concerning locks and keys on the installation and facility; maintenance and operation of the installation's key depository; and the overall supervision of the key program at the installation.

b. The key control officer should maintain a permanent record of the following:

(1) Locks by number, showing–

(a) Location of each lock;
(b) Key combination, i.e., pin lengths and positions;
(c) Date of last key change.

(2) Keys by number, showing–

(a) Location of each key;
(b) Type and key combination of each key.
(c) Record of all keys not accounted for.

c. The key control officer should also be responsible for the procurement of locks and keys. Based on determined requirements, he should coordinate procurement with the installation or facility engineer, and keep abreast and know the availability of improved locks and keys.

8-8 Mechanics Of Implementation

Since each installation or facility will have conditions and requirements peculiar to its activity, key control systems will vary. Before establishing a system, a survey should be conducted to determine actual requirements and to identify all warehouses, shops, storage areas, safes, filing cabinets, etc., that require the additional protection afforded by locking devices and security of keys. When this determination has been made, an annex to the physical security plan can be prepared to show the following:

a. Location of key depositories.

b. Keys (by building, area, or cabinet number) to be turned in to each depository.

c. Method of marking or tagging keys for ready identification.

d. Method of control for issue and receipt of keys to include maintenance of register and identification of personnel authorized possession of keys.

e. Action required if keys are lost, stolen, or misplaced.

f. Frequency and method of lock rotation.

g. Assignment of responsibilities by job or position title.

h. Emergency type keys, which would be readily available to the security supervisor.

i. Other controls as deemed necessary.

8-9 Keys and Locks For Ammunition Storage (AR 190-11)

a. All doors used for access to arms storage rooms must be locked with approved locking devices. On storage facilities, the locking devices used on the most secure door must be high security padlock and hasp. The secondary padlock, mortise locks, or rim dead locks must be used to secure the other door or the double door requirement. Mortise locks and rim dead locks must meet the following specifications:

(1) Be a key-operated mortised or rim-mounted dead bolt lock.

(2) Have a dead bolt throw of 1 inch.

(3) Be of double cylinder design.

(4) Cylinders are to have five-pin tumblers, two of which are to be of mushroom or spool type drive pin design.

(5) Have 10,000 key changes.

(6) No master keying of lock to be permitted.

(7) If bolt is visible when locked, it should contain hardened saw resistant inserts or be made of steel.

b. At least one lock must secure each door in the triple barrier system. Vehicles and storage facilities in which items are stored must be secured by approved secondary padlocks. Aircraft must be secured with locking devices specified in modification work orders; devices must not be designed and produced locally without approval from the US Army Aviation Systems Command. Doors that cannot be secured from the inside with locking bars or deadbolts will be secured on the inside with secondary padlocks.

c. Keys to arms storage buildings, rooms, racks, and containers must be maintained separately from other keys and must be accessible only to individuals whose official duties require access to them. A current roster of these individuals must be kept within the unit, agency, or organization and must be protected from public view. The number of keys will be held to the minimum. If an alternate set of keys is maintained, they must be secured at the next higher headquarters and inventoried monthly. When the next

higher headquarters is not on the same installation as the unit, the alternate set of keys must be secured by the unit separate from the operational set of keys. Custody of keys will be transferred between authorized individuals after both parties have conducted a visual inventory of weapons, including a total count of weapons on hand. The change of custody and physical inventory must be recorded as prescribed. After duty hours, keys will be secured in a locked container constructed of at least 20-gauge steel or material of an equivalent strength away from the storage area or in the custody of responsible duty officer, NCO, or individuals authorized unaccompanied access. At no time will keys be left unattended or unsecured. Key containers when not in use must be placed in a secure location. Keys to arms storage buildings, rooms, racks, and/or containers must not be removed from the installation. The use of master key system is prohibited. In the event of lost, misplaced, or stolen keys, affected locks or cores to locks must be replaced immediately. Replacement or reserve locks, cores, and keys must be sufficiently secured to preclude them from being readily accessible to unauthorized individuals.

d. A key and lock custodian must be appointed and his or her duties will include insuring the proper custody and handling of keys and locks. A key control register must be maintained at all times to insure administrative accountability for keys. Key control registers must contain the signature of each individual receiving the key, date and hour of issuance, serial number of key, initials of person issuing the key, date and hour key was returned, and signature of the individual receiving the returned key. Key control registers must be retained in unit files for one year and then destroyed.

e. Organizations or agencies maintaining keys to arms storage buildings, arms storage rooms, and arms racks must establish a key control accountability system which will include, in addition to the key control register mentioned in paragraph c above, records that identify:

(1) Total number of locks and keys in the lock system used by the organization or agency, including replacement or reserve locks.

(2) Total number of keys for each lock.

(3) Number of keys issued.

(4) Number of keys on hand.

(5) Number of keys and locks retained in reserve.

(6) Persons to whom keys have been issued.

f. Padlocks must be locked to the staple or hasp when the area or container is open to preclude theft, loss, or substitution of the lock.

g. Inventories of keys and locks must be conducted semiannually. Inventory records must include the information contained in paragraph e, above, and be retained in unit files according to regulations.

h. Combinations to locks on vault doors or class V containers will be changed semiannually and the combinations safeguarded in accordance with AR 380-5. Padlocks used to secure entrances to arms storage facilities must be rotated at least semiannually, and a record maintained reflecting the date of rotation. All other locks used to secure weapons will be rotated at least annually. Rotation of locks will be such that none of the locks formerly used to secure the doors, racks, or containers securing weapons will be used, after rotation for a period of 3 years, within the same arms storage facility. Rotation will include exchange of locks among units or from another geographical area. Each arms room will maintain on hand a back-up set of locks amounting to 15 percent of the number of locks in use. Keys to locks to be used must be inventoried at the time of rotation. The loss of or inability to account for any key to a lock makes that lock unauthorized for the purpose

of securing arms or ammunition. Lock combinations will be changed—

(1) When placed in use after procurement.

(2) At least semiannually.

(3) On transfer, reassignment, resignation, or relief of any person having the combination.

(4) When the combination has been compromised or the lock has been found unlocked and unattended.

8-10 Lock and Key Control For Nuclear Storage (AR 50-5)

a. Each nuclear weapons storage structure entrance in a permanent exclusion area must be locked with at least two key-operated high-security padlocks with shrouded shackles which meet military specification MIL-P-43607 (GL) and with appropriate style high-security hasps, as described in amendment 1 to this military specification.

b. A custodian must be designated by the commander to control, issue, and maintain adequate records of all keys and locks to buildings or areas containing nuclear material. Keys must be made available only to designated personnel whose official duties require access to them. Key registers, to indentify keys for each lock, their current locations, and custody, will be maintained. Repositories must be provided in areas where keys are secured during nonworking hours. Key repositories, racks, boxes, rings, and boards will be secured when not in use. All keys must be jointly inventoried with each change of key custodians. Keys stored in two-man control containers need only be inventoried when containers are opened. Keys and locks must be inventoried every month and must be given routine maintenance at that time. The number of installed padlocks should be supported with a 5 percent backup of serviceable padlocks.

c. Active entrances to all permanent storage structures must be equipped with dual high-security locking systems or one high-security locking system equipped with an anti-tamper device. All other exterior storage structure doors must be secured by a substantial dead-bolt device from inside the structure.

d. No one individual may have access to or possession of the keys to both locks of a structure containing nuclear weapons. Keys to nuclear weapon storage structures must be controlled as classified material at least equal to the classification of the material being protected.

e. Key padlocks must be changed, have their cylinders replaced, or be rotated randomly between structures or sites at least annually. They must be replaced upon loss or compromise of their operable keys. Rotation of padlocks is not required when either of the following exists—

(1) Two padlocks are installed on each structure and a system established for separating these locks into A- and B-series locks. Personnel must be identified and authorized to have in their possession the keys to either the A-series locks or the B-series locks, but not both.

(2) The locking mechanism is protected by an anti-tamper bar that will activate an alarm when it is moved.

f. Master keys are prohibited.

g. Keys to currently installed locks must not be removed from the site.

h. Keys and spare locks must be protected in a secure container when they are not needed for authorized operational purposes.

8-11 Inspection Procedures for Defective Locks

a. A periodic inspection should be instituted upon all locks to determine the locking mechanism's effectiveness, detect tampering, and to make replacements. This may be accomplished by inserting a test key (any comparable key other than the assigned key) no more than one-quarter inch into keyway. Turn test key by hand using the normal amount of force required to open lock. If the lock opens during inspection, it should be replaced immediately. Care must be taken during inspection to prevent jamming of test key into key recess. Jamming will cause severe damage to locking levers and may preclude removal of test key.

b. Defective locks. Locks found defective during test inspections must be reported to Defense Industrial Supply Center (DISC) on SF 368, Quality Deficiency Report. Defective locks will be retained until disposition instructions have been received.

c. Periodic maintenance. In addition to the above, periodic preventive maintenance of locks should be performed to insure adequate lubrication, employment of rust preventive on outer surfaces and clearing of dust and moisture from keyways.