

7 TRUCK COMPANY TASK IDENTIFICATION

7.1 OVERVIEW

7.1.1 Simply put, fireground operations for the truck company are those which enable the engine company to extinguish the fire. Truck company operations are required at every fire, regardless of who does it. The fire often cannot be extinguished without adequate support in the form of forcible entry, ventilation and determining the location of the fire initially.

7.2 STRATEGY

7.2.1 Strategy is the game plan to deal with the incident. Strategy is determined after size up. The factors that influence strategy are the incident priorities:

- life safety
- fire suppression
- property conservation

7.3 TACTICS

7.3.1 Tactics are the operations that accomplish the incident priorities and support the strategy the incident commander has defined to deal with the incident.

7.4 TASKS

7.4.1 Tasks are the all the jobs performed to accomplish the tactics. Truck company tasks include:

- Forcible entry
- Search
- Rescue
- Ventilation
- Laddering
- Elevated Streams
- Checking for extension
- Utility Control
- Overhaul
- Salvage

8 **FORCIBLE ENTRY**

- 8.1 Forcible entry means the techniques used to get into buildings or other areas of confinement when normal means of entry are locked, blocked or non-existent. An *efficient* forcing operation should also, by definition, be accomplished within a relatively short time. Today's trend is for stronger and more numerous locking mechanisms. They are designed to keep out intruders and lock designs have become more complex. Door and window construction has become more resistant to forcible entry. Building familiarization and pre-fire training on specific forcible entry situations is essential. Efficiency and speed in forcing entry is dependent on three major factors: skill of the crew, choosing the appropriate tools, and applying the proper technique. This section of the manual will discuss tools and some technique. Actual application of the techniques should be accomplished through the appropriate training classes.
- 8.2 The crew responsible for entry must do a size up, not only to determine the best route of entry, but also the best way to accomplish it. The type of entry method will be determined from the size-up. This manual will discuss three broad types of forcible entry: conventional, "through-the-lock", and special (usually involving power tools).
- 8.3 If entry is being forced for attack line deployment, route of entry shall be decided in concert with the engine officer. If it is not for attack line deployment, it will be for primary search and/or interior exposure protection.
- 8.4 The entry location decision is based on time available for entry, occupancy type, construction, location of the fire, location of endangered occupants, and the reason for rapid entry, such as for fire attack or conducting a primary search. Sometimes the presence of a lock box, such as a "Knox" or "Supra" box, will affect the entry location.

8.4.1 Identifying entry priority:

- Immediate – emergency condition – Life hazard or fire condition exists. Speed takes precedence over property damage. The only exception to speed is fire in a smoldering (third stage) or backdraft stage. In third stage or backdraft conditions, companies should prepare for entry (e.g. pull locks) but not open until topside ventilation is complete.
- Delayed – potential emergency – entry to verify. Entry with the least amount of damage is the main objective. Public opinion about the department's action at investigative calls is part of the reason that close attention must be paid to methods of forcing entrance.
Crews should do everything possible to secure the premises or turn it over to proper authority.

8.5 DOORS

8.5.1 Doors are preferred for entrance over windows. On occasion a wall, fence, floor or roof must be used.

8.5.2 Size-up for forcing doors

8.5.2.1 Private Dwelling – inward opening. These are usually the main entrance door, the bedrooms, and the bathrooms. Outward opening doors found in residential occupancies lead to closets, mechanical areas and the basement stairs.

8.5.2.2 Multiple Dwellings – Public exits swing outward and private entrances to individual apartments swing inward. Outward opening doors found in individual apartments lead to closets and mechanical areas. Outward opening doors in the public hallways typically serve maintenance closets, electrical vaults and mechanical rooms.

8.5.2.3 Commercial – outward opening. These are the main entrance doors, secondary egress doors, interior doors to suites or offices. Inward opening doors in commercial occupancies lead to closets, mechanical rooms, stairwell doors (from corridor), and formal entrances not classified as exits.

8.5.2.4 To confirm the swing of the door, check the doorframe and hinges. Inward opening doors will be recessed in the frame with no hinges exposed. Outward opening doors are flush with the frame and have the hinges exposed. This could be important to feel in poor or no visibility.

- 8.5.2.5 In general, the door to be forced will be the one the occupant locked last or the one that the occupant uses to enter and exit on a normal basis. For example, the rear door in a store in a strip shopping center may be heavily secured and the front door has one lock because the proprietor exits the front when securing it at night.
- 8.5.2.6 Is the door to be attacked weak or is it strong? An example of a weak door is one that is metal covered with light wood supports inside or composite wood covered with light wood supports. A strong door is one that is metal with metal supports inside, solid wood, or tubular metal and tempered glass (aluminum stile).
- 8.5.2.7 What are the number and location of locking devices? Locking devices can be found in various configurations from doorknob locks to multiple add-on locks (rim) or mortise locks. Sometimes, not all of the locks found on a door are locked.
- 8.5.2.8 Are there windows in the door near the locking devices? Windows found near the locking devices are easily broken which exposes the interior of the lock. This method is only effective if it is a single cylinder lock or the key is in place on a double cylinder lock.
- 8.5.2.9 Are there window lights on the side panels adjacent to the door? Windows found near the locking devices are easily broken which exposes the interior of the lock. This method is only effective if it is a single cylinder lock, a doorknob, or the key is in place on a double cylinder lock.
- 8.5.2.10 Are there weak walls holding up strong doors? An example of a weak wall would be a studded wall with drywall or siding covering the studs. The wall may be easier to breach than forcing the door. An example of a strong wall would be solid masonry. While a masonry wall can be breached, it may be more practical to go through the door.
- 8.5.2.11 What is the construction of the doorjamb or frame? Is it wood or metal?

8.5.2.12 What kind of locking device(s) is present?

8.6 FORCIBLE ENTRY TOOLS

8.6.1 Tools used for forcible entry will be determined by the occupancy; residential or commercial.

8.6.2 This section recommends standard tools for forcible entry. The list is not all-inclusive. Tools for checking extension and other tasks are not listed for simplicity. Special situations in a company's first-due area may require deviation from this standard tool complement.

8.6.3 The following tool complement is recommended for forcible entry in residential structures:

- The set of irons, which is a flathead axe and a halligan bar.
- The K-Tool with key tools
- The A-Tool
- Sledge hammer (minimum of 12 lbs.)

8.6.4 For multiple-family dwellings, add:

- A hydraulic ram (rabbit tool or hydra ram).
- A grab bag containing items such as screwdrivers, a shove knife (modified putty knife), key tools, J-tool, locking pliers with chain attached, needle-nosed pliers, slim jim, nails, small bolt cutter, and a spring-loaded center punch. Other items may be included.
- Door chocks and straps.

8.6.5 The following tool complement is recommended for forcible entry in commercial structures:

- A set of “irons” which are a flathead axe and a halligan bar. (Sometimes called “married pair”).
- A hydraulic ram
- The K-Tool
- The A-Tool or Guardian tool.
- Sledge hammer (minimum of 12 lbs.)
- An additional halligan bar.
- A gasoline powered circular saw with a metal cutting blade.
- The grab bag
- Door Chocks

8.6.6 Occupancies that have multiple padlocks should incorporate a duck-billed lock breaker, a hammer head pick, or other similar padlock breaking tool.

8.6.7 The tools mentioned above will enable a crew to force entry in almost all of the situations you may come across. Companies should have knowledge of special forcible entry situations requiring specific tools in their first-due areas.

8.7 Rapid Key Entry systems

8.7.1 Whenever rapid key entry systems are found, they are the preferred method of entering the building in all cases. There are several brands of rapid key entry systems used in Northern Virginia:

- Knox Box system
- Supra Key system
- Lock-Box system

8.7.2 All Northern Virginia fire companies carry rapid entry keys. Some key systems in building occupancies contain keys to the building and elevators. Other building key systems may contain an entrance key and a key to the fire control room. Inside the fire control room may be a key box which contains the building and elevator keys. This latter system allows maintenance members to keep keys up to date without having to call a department unit out to open the rapid entry box.

8.8 FORCING DOORS – CONVENTIONAL FORCIBLE ENTRY

8.8.1 The term, “conventional forcible entry” for doors consists of the following:

- prying open with a Halligan bar
- breaking open with a sledge hammer
- breaking open with a battering ram
- pushing open with a hydraulic tool
- breaking glass and operating the lock from inside
- removing hinge pins.

8.8.2 The locked condition of the door should be confirmed. “Try before you pry.” If it is locked, push on the door to see where it is being held.

8.8.3 A word of caution is in order here for firefighter safety. On “food on the stove” calls or entry to verify, extreme caution should be exercised before entering an occupancy, locked or unlocked. On more than one occasion a sleeping or intoxicated occupant has been surprised by a fire crew rapidly entering their “domain”. Crews should continually announce themselves by shouting “fire department!” Even then, members may find themselves in a dangerous situation such as being faced with a dazed occupant wielding a weapon. If crews fail to announce themselves, they may simply be viewed by the occupant as an intruder.

- 8.8.4 Report the following to the incident commander and fire investigators after the fire: an unlocked door, an open door, or a door that shows signs of previous forcible entry. All of the above conditions should be documented on the primary incident report.
- 8.8.5 Entry may need to be forced through several doors and not just the main door before the fire is located. Therefore, the truck crew shall keep a minimum of forcible entry tools with them at all times. Forcible entry tools become forcible exit tools in an emergency.
- 8.8.6 Technique and application need to be learned through formal training and perfected through experience and informal (in-station) training. This manual is not intended to teach actual methods but will highlight some key points and common failures.
- 8.8.7 Use of the Halligan bar
 - 8.8.7.1 On inward opening doors, make sure the fork of the Halligan is driven at least an inch past the doorjamb on the inside of the door. The control of the door is important, especially when inside of a building, to prevent fire from exiting and endangering members or contaminating means of egress. This device can be a short piece of rope with one end slip-knotted over the knob and the other secured by a foot or knee of one of the firefighters. A pair of vice grips with a chain attached can be substituted in the same manner.
 - 8.8.7.2 On inward opening doors, the adz of the halligan can be driven between the door and the jamb. The tool is used as a lever prying open the door.
 - 8.8.7.3 On outward opening doors, make sure the fork of the Halligan is driven at least an inch past the door on the inside and wrapped around the door.
 - 8.8.7.4 The most common error is failing to drive the fork end of the halligan past the inside of the jamb.

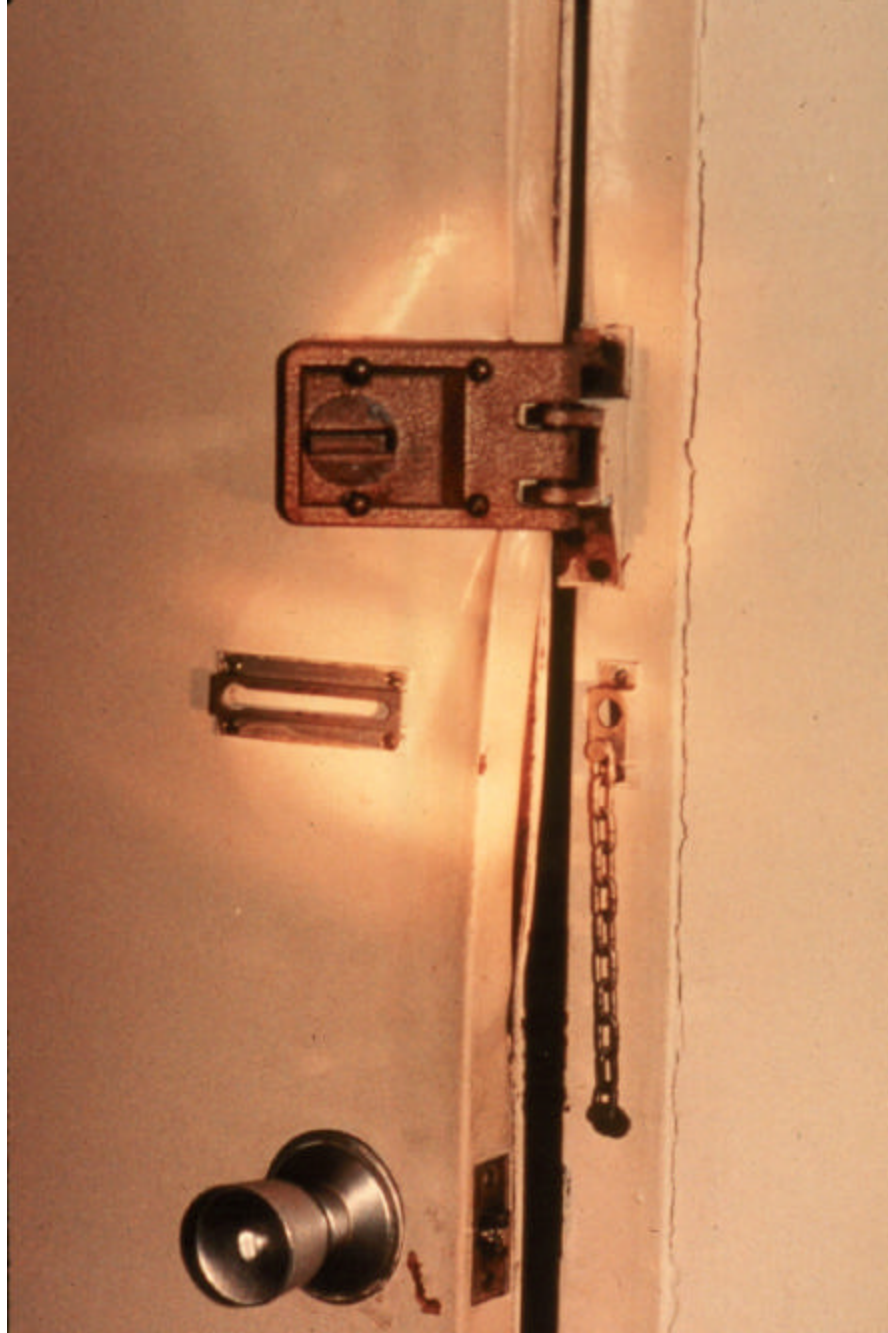
- 8.8.7.5 Prying open with a Halligan bar is preferred over hydraulic forcible entry tools in single-family dwellings. This is because only one door is usually all that needs to be forced. The operator(s) are left with a tool that will aid them after entry.
- 8.8.7.6 Prying open with a Halligan bar is the most effective method of conventional forcible entry on outward opening doors.
- 8.8.8 Breaking doors open with a sledge hammer, maul or "Denver Tool"
 - 8.8.8.1 This is only effective on inward opening doors when used alone. It is most effective on multiple inward opening doors when the hydraulic tools are not available. This is accomplished with the entry team moving "door to door", before entry. It is also effective on inward opening doors secondary to the main entrance.
 - 8.8.8.2 Strike the door over the lock or strike in the center of the (metal) door to crease. Use a full swing.
 - 8.8.8.3 The heavier the tool, the fewer swings required to open the door.
 - 8.8.8.4 The tool may also be held like a battering ram for effective use in tight quarters.
- 8.8.9 Battering ram
 - 8.8.9.1 It is only effective on inward opening doors. It can be extremely effective on multiple inward opening doors when hydraulic tools are not available or are in use somewhere else. This is accomplished with the entry team moving "door to door", before entry. After several doors are opened, the tool is set aside. It is usually only effective on the main entrance door because crews should not take the tool inside past that point.
 - 8.8.9.2 Strike the door over the lock or strike in the center of the (metal) door to create a crease.



- 8.8.9.3 The disadvantages of the battering ram are that it is not effective for anything else after the door(s) is/are open.
- 8.8.10 Hydraulic ram (rabbit tool or hydra ram)
 - 8.8.10.1 The hydraulic ram is effective when you need to force multiple inward opening doors to apartments and hotels.
 - 8.8.10.2 The doorway must have a metal jamb or frame that is one piece (rabbeted). This is one reason it has a high failure rate on single family dwelling doors. Single family dwellings usually have a wood jamb. The tool tends to rip the rabbet from the jamb leaving the secured door intact and unopened.
 - 8.8.10.3 On the “Rabbit Tool” brand (the tool is named after the inventor, Captain James Hare of the Prince George’s County MD Fire Department, whose nickname is “rabbit”), the pump should be left in the manufacturer's bag. The bag is designed to be carried over the shoulder, which facilitates going door to door. The pump is operated while it is in the bag.



- 8.8.10.4 On all hydraulic rams, open the relief valve (non-pressure) and activate the pump for several strokes to remove air in the system. If this is not done, the air bubbles compress during operation and rob the ram of power. After this has been done, close the relief valve (pressure) and the ram is ready for use.
- 8.8.10.5 The hydraulic fluid should be checked on a regularly scheduled day such as first day of a tour or on a designated day of the week. A ram that is slightly low can rob as much as one ton or more of power. When a hydraulic tool has failed to open a door, it is usually due to the above two points.



This door was forced with a Rabbit tool that was later found to be low on hydraulic fluid. The tool failed to open the door because it lacked its full power.

- 8.8.10.6 The hydraulic ram is not effective for any task other than opening doors. Therefore, it should be left at the landing or corridor and not taken into the apartment. Leaving it outside the apartment (on the floor up against the wall) also enables later arriving crews to find it and use it to gain entrance to other apartments. It is imperative that the member responsible for bringing this tool also bring tools suitable for other tasks such as primary search, ventilation, checking for extension, etc.
- 8.8.10.7 Consideration should be given to having one member open all the doors on a landing at one time. It may be more efficient than picking it up and setting it down for each door.



- 8.8.11 Breaking glass
- 8.8.11.1 Breaking glass is effective when a lock can be manipulated with the glass removed. Once the glass is removed, the member reaches in and unlocks the door. This method is only effective on single cylinder locks or on double cylinder locks with the key in the lock on the inside.

- 8.8.11.2 There are four basic types of glass: plate, tempered (safety glass), laminated, and thermoplastic (lexan or plexiglass). Each has unique characteristics when encountered. It may be possible to determine the type of glass through size-up or pre-fire familiarization. The type of glass will definitely be determined when attempting to break it.
- 8.8.11.3 Crews should attempt to break the glass by striking it with a tool. The tool should be held or moved in such a way as to avoid shards of glass from riding down the handle. If the glass is plate glass, it will break into shards and can easily be removed.
- 8.8.11.4 The framing around the glass should always be "cleaned out" to avoid injury should entry or egress be necessary. If the glass is laminated it will be held together with flexible plastic. Continue striking it until all of it is clear. If the glass is tempered or thermoplastic, the tool will more than likely bounce off and not break.
- 8.8.11.5 If the glass is tempered, it should be struck in a corner with a sharp point from a Halligan or pick-head axe. Tempered glass is strongest in the center and weakest at its edges. The corners are the weakest of all. Once the glass is broken, it will usually shatter and fall to the ground in small round pieces.



Firefighter breaking glass with a pick-head axe.

8.8.11.6 If the glass is thermoplastic, it will have to be cut with a saw. The cuts should be made along the edge where it meets the frame. The entire perimeter of the glass will need to be cut to make the opening as large as possible. If the objective in breaking glass is to reach in and operate a lock, and thermoplastic is encountered, it will usually be faster to force through other conventional or through-the-lock methods.

8.8.12 Removing Hinge Pins

8.8.12.1 Hinge pins found on outward opening doors have several different configurations. The pin can be tack welded to the hinge or may have a hex head set screw in the bottom to secure it from being removed. In these cases, some success is achieved by placing the blade of the flathead axe on the bottom of the pin. The bottom of the pin is sheared off by driving the blade of the axe into the pin. In this case the sledge is the preferred striking tool, but the Halligan can also be used. After the bottom of the pin is sheared, the blade of the axe is placed at the top of the hinge pin and used as a lever to complete removal of the pin. When this technique fails, the hinge must be cut off with a saw. Another configuration is the recessed pin. The pin is completely encased by the hinge and is not visible. In this case, the hinge must be cut off with a saw.

8.8.13 Through-the-Lock Forcible Entry

8.8.13.1 In order to successfully disable all types of locks encountered, preparation is required in three areas:

- Locking device type and function
- Through-the-lock entry methods
- Pre-incident planning and familiarization

8.8.13.2 Pre-incident planning is listed last because members who are well trained in the first two areas accomplish the most effective planning. The key to success in through-the-lock entry is to go through the door the occupant locked last (when leaving the structure).

8.8.13.3 The American National Standards Institute (ANSI) and most lock manufacturers divide locks into five categories:

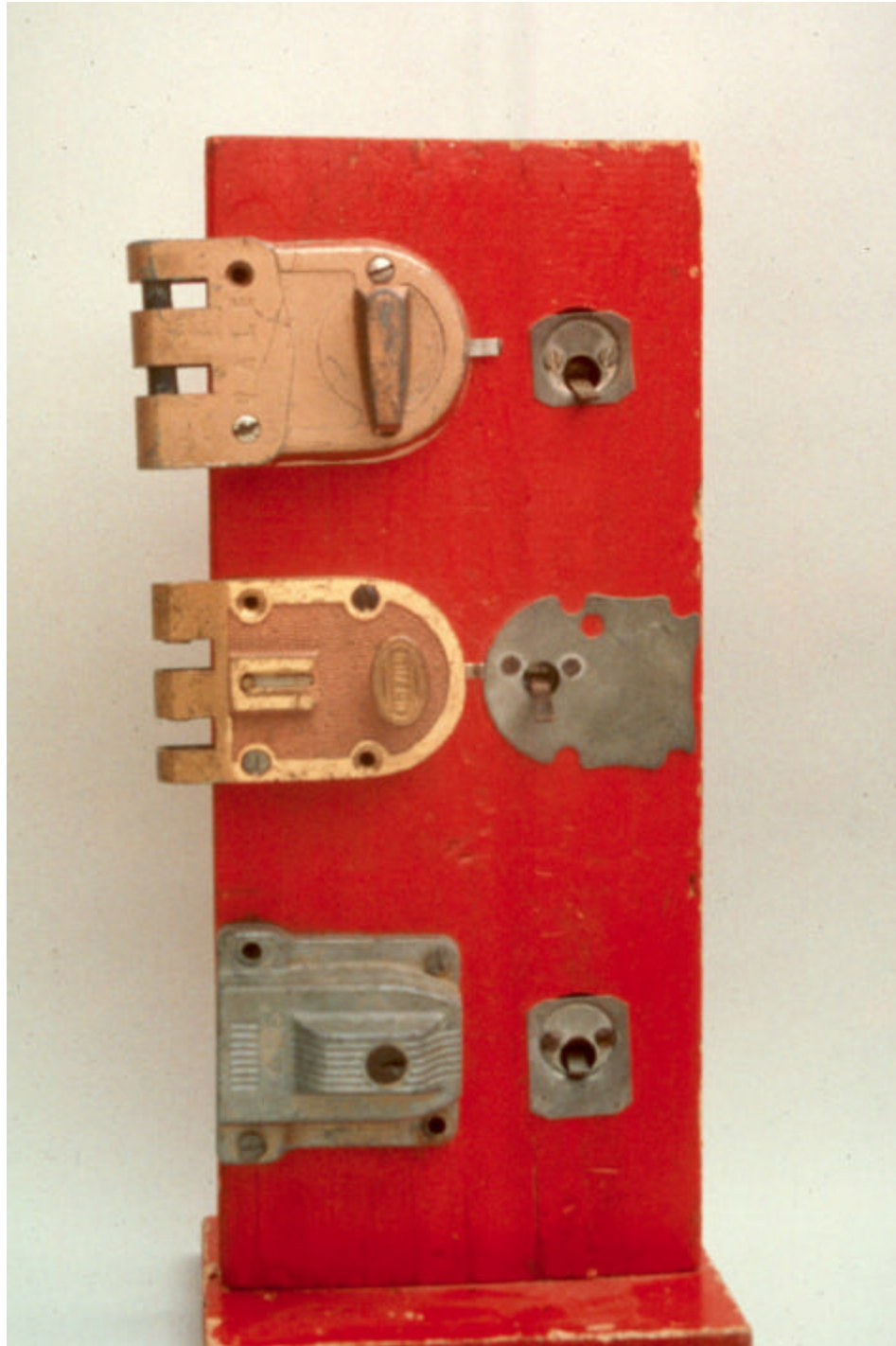
- Rim
- Mortise
- Bored (Cylindrical) - doorknob
- Pre-assembled (sometimes called unit-locks)
- Exit Device

The rim lock and mortise lock may not be easily identified from the size up. It is critical to save the lock cylinder after it is pulled, as it will be needed to identify the type of lock.

8.8.14 Rim Lock

8.8.14.1 Key points of the rim lock:

- It is held in the face of the door by a rim.
- The rim is larger than the hole in the door.
- The cylinder held in place by screws.
- A stem protrudes from the cylinder, which turns the lock mechanism.
- The lock is best described as being surface-mounted and for this reason is used as an add-on lock for doors that have other types of locks. It only requires a single hole drilled in the face of the door. A hole in the edge of the door is not needed.
- The more modern rim locks have a “guillotine” that springs shut when the lock cylinder is pulled. This shields the lock mechanism and prevents it from being manipulated by a key tool.



On the right side of the demo board, the lock cylinders are held by various shapes of "back plates". On the left side of the board are the locking mechanisms that would be installed over the plates.

8.8.14.2 The rim lock is usually installed above an existing lock as an auxiliary security device. Apartment dwellers will often add this lock so the management does not have keyed access to their apartment. This lock can be found in ALL types of occupancies, including houses, apartments, and some commercial buildings.





In this particular photo, the locks are installed without the lock cylinders on the exterior. This enables the door to be locked from the inside with nothing showing from the exterior.

8.8.14.3 Rim locks are found in the following configurations:

- Dead bolt
- Night latch
- Vertical dead bolt - also called interlocking dead bolt

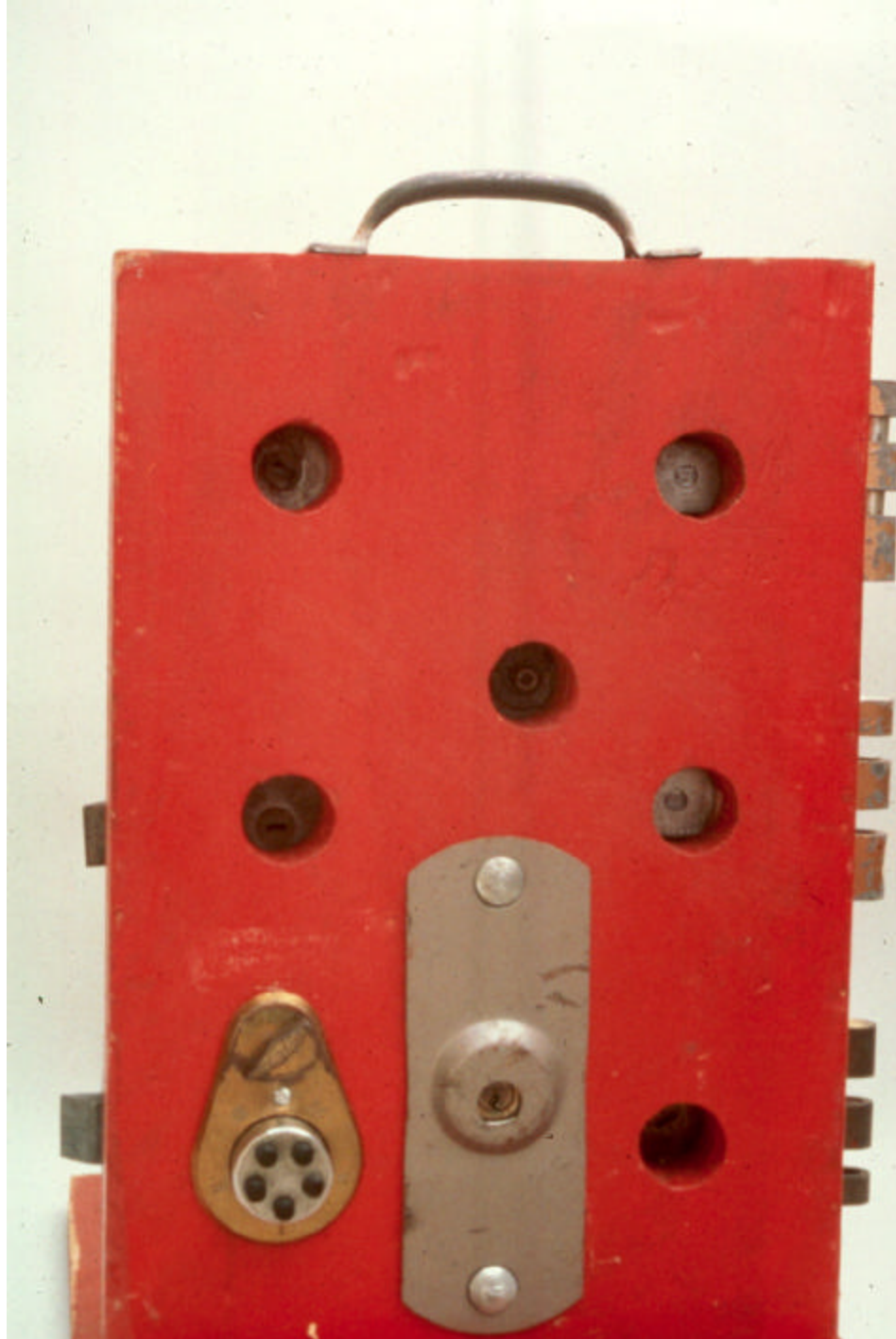
8.8.14.4 Forcing rim locks. A rim cylinder appears identical to a mortise cylinder when it is mounted in a door. A rim lock is usually mounted higher in the door than a mortise lock. The best way to recognize the difference is to look at the lock cylinder after it is pulled.

8.8.14.5 There may be several rim locks installed in one door. Not all of the locks may be in the locked position. Look for fresh key marks around the key way. One that is painted over is probably not used. Apply slight force against the door to see which one is locked. When in doubt, pull all the lock cylinders. If unable to unlock the combination of locks, see "Modified-Through-the Lock" below.



Note fresh key marks in the lock cylinder above. The one below it is no longer used.

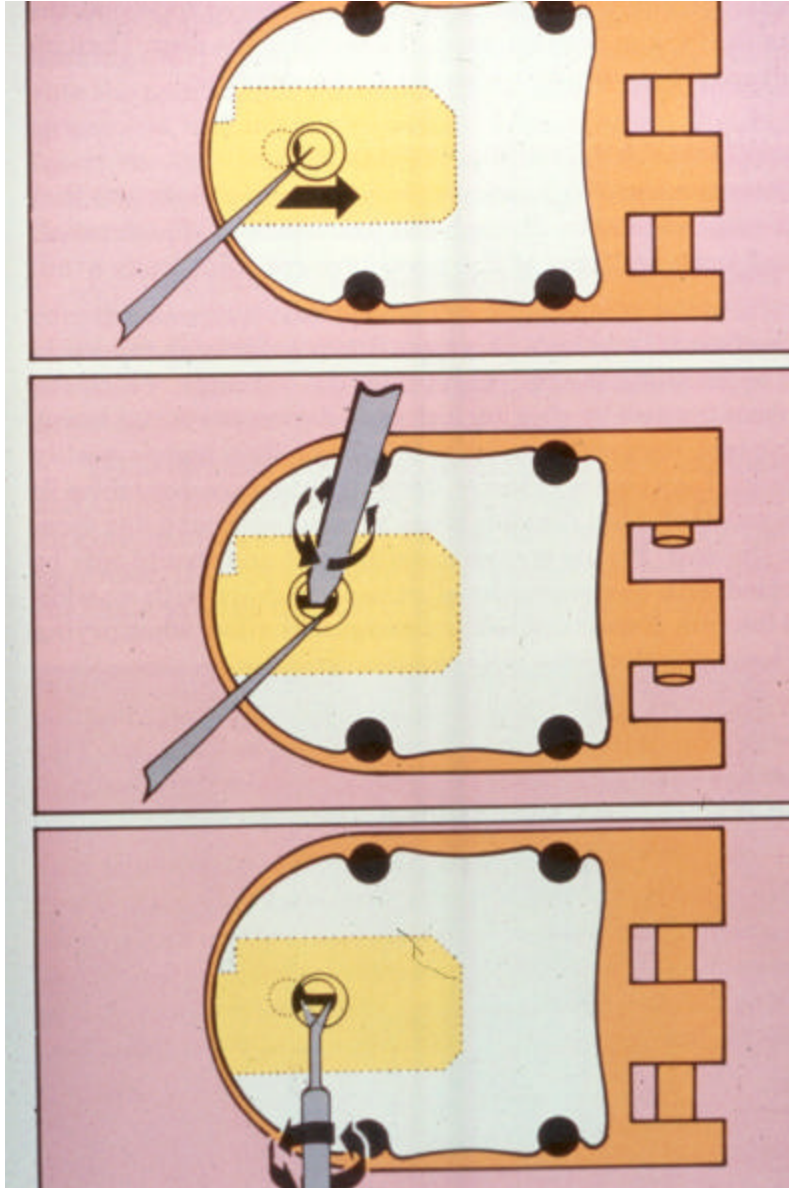
8.8.14.6 Plate steel may have been installed to protect the lock cylinder and prevent it from being pulled. Remove guards by shearing the bolts with the flathead axe or the adz of the Halligan.



A steel plate is installed over this lock cylinder on this demo board. It is used to prevent the cylinder from being pulled.

- 8.8.14.7 Pull lock cylinders with KTool or ATool. The KTool was designed specifically for these types of locks and therefore is preferred over the A-Tool.

- 8.8.14.8 If the lock has a guillotine, use a pick or sharp object to slide the guillotine back and expose key way. A spring-loaded center punch also works well for this.



Guillotine (Sketches from IFSTA Forcible Entry)

- 8.8.14.9 On rim locks there is a device called a night latch. The night latch is engaged from the inside and prevents the lock from turning, even with the key. It gives the occupant an extra measure of security. If, after the cylinder is pulled, the key tool will not turn the lock, the night latch is engaged. This signifies the possibility of a rescue, as a person has to be inside to engage it. In this instance, the lock must be removed using the “Modified Through-the-Lock” method.

8.8.14.10 After the lock cylinder is pulled, a stem will protrude from the lock cylinder indicating use of the flat blade key tool or slotted screw driver.

8.8.14.11 Modified through-the-lock is **effective on rim locks only!** This method should not be used on any other type of lock. When a night latch is encountered or there are several rim locks on one door, the modified through-the-lock is required. With the lock cylinder already removed, place the pick of the Halligan against lock and drive the lock off of the inside of the door.

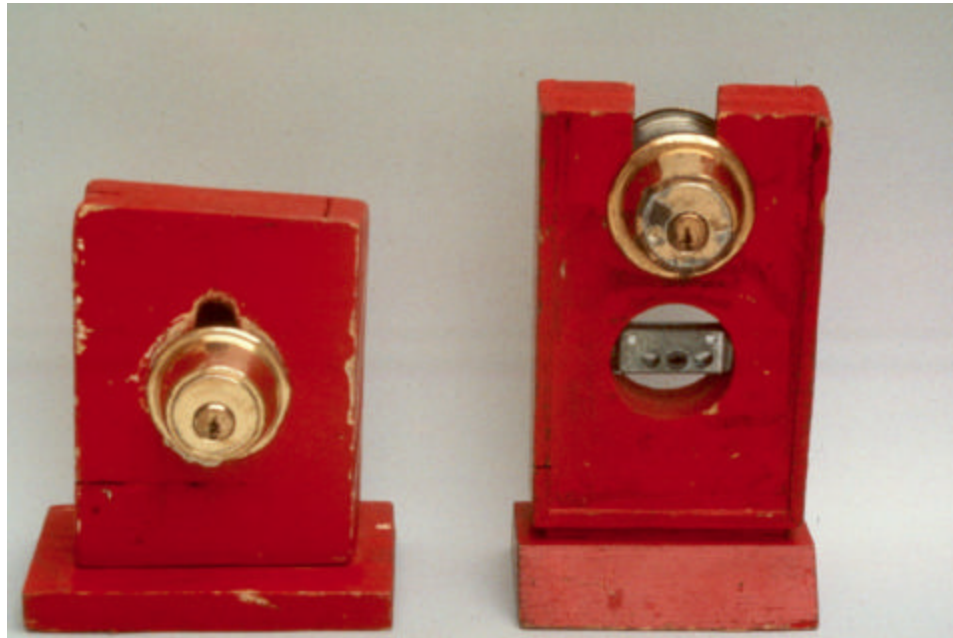
8.8.15 Tubular Dead Bolt Locks

8.8.15.1 Key points of the tubular dead bolt lock:

- It is a combination of a Bored lock and a Rim lock. It is classified by ANSI as a Bored lock and by the fire service as a Rim lock.
- It is installed like a doorknob but is held in the face of the door by a large over-sized rim. A large hole is drilled through the face of the door and a small hole is drilled in the edge of the door.
- It can be identified from the outside by an over-sized rim with the lock cylinder extended out from the door approximately 1-2 inches.

8.8.15.2 Operation of the lock:

- The tubular dead bolt lock consists of a stem protruding from the back of the lock cylinder which passes through a sliding bolt mechanism fastened in the edge of the door.
- The stem turns the sliding bolt mechanism, which causes the bolt to slide 1-1/2 to 2 inches into a strike, mounted in the edge of the doorjamb.
- When mounted in a metal jamb, it is almost impossible to open with conventional forcible entry (even the hydraulic ram).
- The lock cylinder is connected by two screws to a knob or lever (single cylinder), or another lock cylinder (double cylinder), on the other side of the door. The screws pass through the sliding bolt mechanism much the same way a doorknob does.
- The cylinder(s) are prevented from passing through the bored hole by the large "rim" or ring of metal.



Demo board showing a tubular deadbolt lock.

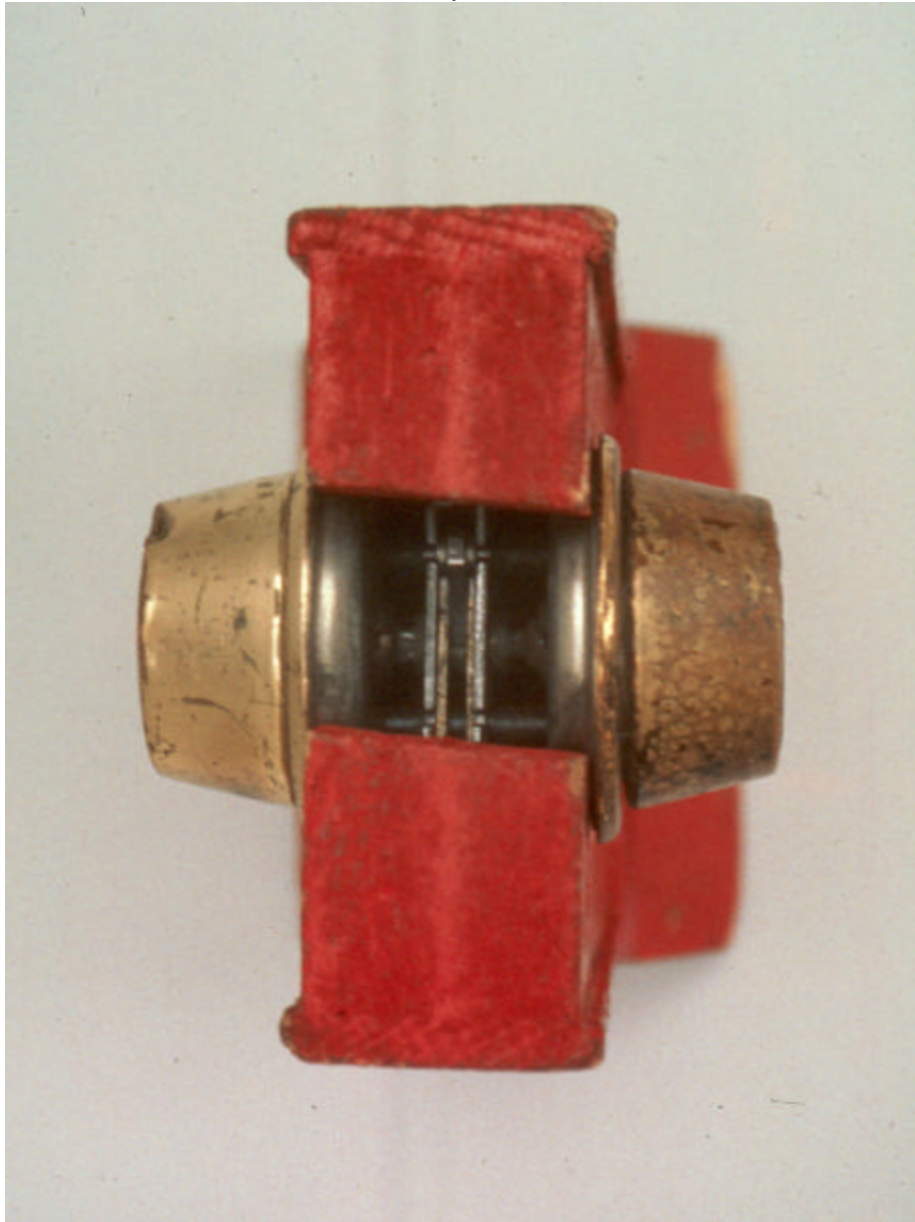
- 8.8.15.3 This lock is found in ALL types of occupancies, including houses, apartments, and some commercial buildings. A lot of new residential construction in lower- to middle-income neighborhoods uses this type of lock almost exclusively. Homeowners in existing homes will often add this lock for extra security.



A tubular deadbolt lock added to a residential door.

- 8.8.15.4 Forcing Tubular Deadbolt locks. These locks are the most difficult to perform through-the-lock entry. There is a high failure rate and a lot of damage caused. They are also very difficult to force conventionally if they are mounted in a strong door with a metal jamb.

- 8.8.15.5 The least damaging method of through the lock involves making a small hole between the door and the top of the lock. The construction of the door needs to be wood or light metal covered. If the door is heavy metal, it may not work. This method involves holding the pick of the Halligan where the hole is to be made and striking it with a flathead or sledge.
- 8.8.15.6 After the hole is made, use a key tool or slotted screwdriver to slide the bolt mechanism to the unlocked position.



This demo board shows the mechanism that needs to be moved after making the hole at the top of the lock.

8.8.15.7 If the lock has been installed upside down, the hole must be made at the bottom of the lock. The normal position for the lock is to have the key plug off center at the 6 o'clock position. If the key plug is at the 12 o'clock position, the lock is upside down.

8.8.15.8 The other method for through-the-lock entry is to pull the lock cylinder with the A-Tool. The K-Tool will not work because the cylinder is larger than the K-Tool. This works extremely well on commercial doors constructed of heavy metal.

8.8.15.9 Extreme care must be exercised when pulling this lock so as not to damage the sliding bolt mechanism in the edge of the door. If the sliding bolt mechanism becomes bent, it will not retract into the door to unlock.

8.8.15.10 Another effective method when extreme care is required is pulling the lock far enough to expose the screws holding the lock cylinder. The screws can then be cut with a small bolt cutter.

8.8.15.11 After the lock cylinder is pulled, a stem will protrude from the lock cylinder indicating use of the flat blade key tool or slotted screwdriver.

8.8.16 Mortise Locks

8.8.16.1 Mortise Locks are among the oldest locks in use today.

8.8.16.2 Earlier mortise locks, found on some older residences (usually balloon frame), have a "peeping tom" keyhole for a skeleton key. This is known as a "warded lock" and few are in use today because they can be easily picked.

8.8.16.3 Key points of the mortise lock include:

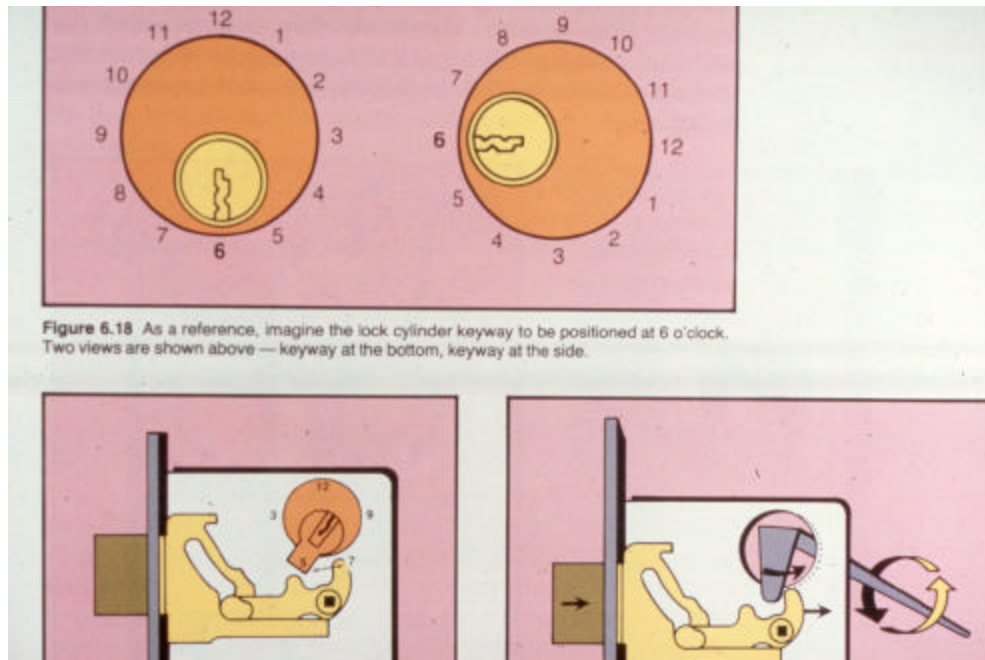
- It is chiseled or "mortised" into the cavity of a door.
- The lock cylinder is threaded into the lock (no screws).
- The activation principal is the cam on the rear of the cylinder.

8.8.16.4 The locking mechanism is found in four configurations:

- Sliding latch
- Dead bolt and latch
- Latch
- Pivoting dead bolt

8.8.16.5 Forcing Mortise Locks. A mortise cylinder appears identical to a rim cylinder when it is mounted in a door. A lock cylinder above a doorknob or lever may identify a Mortise lock with no keyway. The mortise cylinder is fat and symmetrical with a threaded body. There are no screws in the lock cylinder.

8.8.16.6 The first thing to do *before* pulling a mortise lock cylinder is to note the position of the key plug as it relates to a clock face. The eccentric position of the key plug will become 6 o'clock. This will be important after the lock cylinder is removed.



(Sketches taken from IFSTA Forcible Entry)

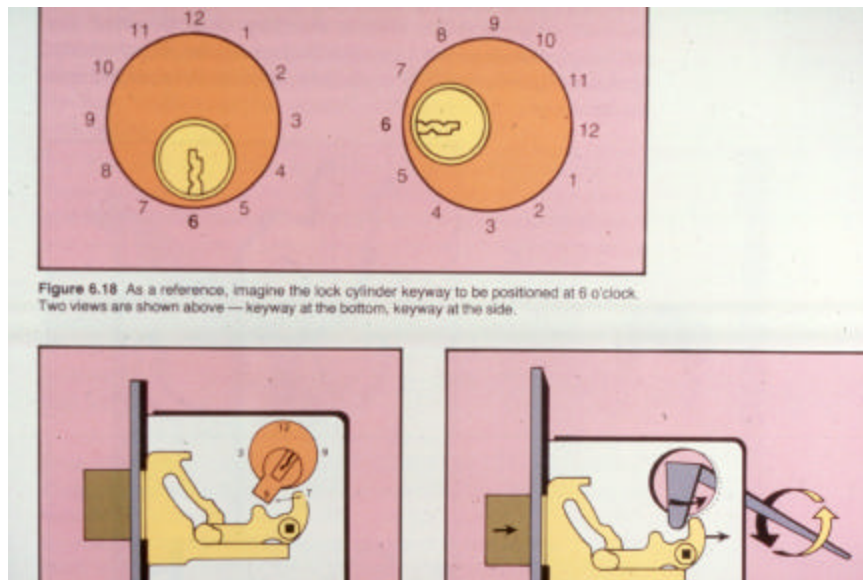
- 8.8.16.7 There are two ways to remove the lock cylinder. The lock cylinder can be unscrewed by gripping it with a pair of locking pliers (vise-grips). To do this, grip the circumference of the cylinder and lock the pliers. Turn the cylinder one-eighth of a turn clockwise to break off the tip of the set screw. Then turn counter-clockwise to unscrew the cylinder out of the lock casing. The set screw may jamb the cylinder while unscrewing. If this occurs, pull the lock cylinder.



- 8.8.16.8 Pull the lock cylinder with a K-Tool or A-Tool. The K-Tool is preferred. Use a striking tool to tap the K-Tool over the cylinder. Use care to avoid shearing the face of the cylinder off the door. Do not insert the Halligan first when striking it because it may cut through the lock cylinder.



- 8.8.16.9 After the K-Tool is seated, slide the blade of the axe behind the halligan before prying. Use caution while prying as the force is released suddenly.
- 8.8.16.10 With the lock cylinder removed, the 90° end of the key tool is used to unlock the mechanism. The motion of the key tool is dependent on the configuration of the lock.
- 8.8.16.11 The sliding latch and the pivoting deadbolt use a 5 o'clock to 7 o'clock (or vice versa) motion to unlock the mechanism. Remember the position of the key plug became 6 o'clock.



- 8.8.16.12 The deadbolt and latch uses a 5 o'clock to 7 o'clock (or vice versa) motion to unlock the deadbolt. After the deadbolt is unlocked, a lever will appear at the 3 o'clock or 9 o'clock position. The key tool must be repositioned to this lever and the lever moved from 3 o'clock to 6 o'clock or from 9 o'clock to 6 o'clock. The lever must be held there while the door is opened because it is spring-loaded and will move back to the locked position if released.

8.8.16.13 The latch (usually found on interior doors) is similar to the deadbolt and latch except the deadbolt is absent. The lever is in place at 3 o'clock or 9 o'clock and should be moved to 6 o'clock. Again, it is spring-loaded so it should be held at the 6 o'clock position while the door is opened. Sometimes the latch configuration is difficult to identify. If a deadbolt cannot be located at the 5 o'clock or 7 o'clock position, it is a latch configuration.

8.8.16.14 Something unique with mortise locks is the lock cylinder can be used as a door chock. After the door is opened, the lock cylinder is placed above the center hinge to prop the door open.

8.8.17 Bored Locks (Doorknobs) - commonly called key-in-the-knob locks.

8.8.17.1 Doorknobs are classified in three weights:

- Light, such as a closet door or bedroom door in a residence.
- Standard, such as a residential front door.
- Heavy, such as an exterior door in a commercial occupancy

8.8.17.2 Forcing Doorknob Locks. Doorknob locks are so varied; there are a number of methods to get through them. On lightweight doorknobs with no sliding pin or dead-latch, the door can be pried open (conventional forcible entry). Another method would be to "jimmy" the latch with a shove knife. This method may also be referred to as "loiding" which was a phrase coined from using a celluloid credit card as a shove knife.

8.8.17.3 On medium and heavy doorknobs, the door usually has a tighter fit and damage will be caused by conventional forcible entry (which is fine if that is what the condition warrants). These doorknobs will also have a dead-latch. A dead-latch is a latch that has a sliding pin along side the latch. When the pin is pushed in (as is when the door is closed), the latch cannot be pushed back into the door. This dead latch was designed to render jimmying ineffective. One technique to overcome this is to push on the door until the pin slides into the keeper. The latch can then be jimmied in the normal manner.

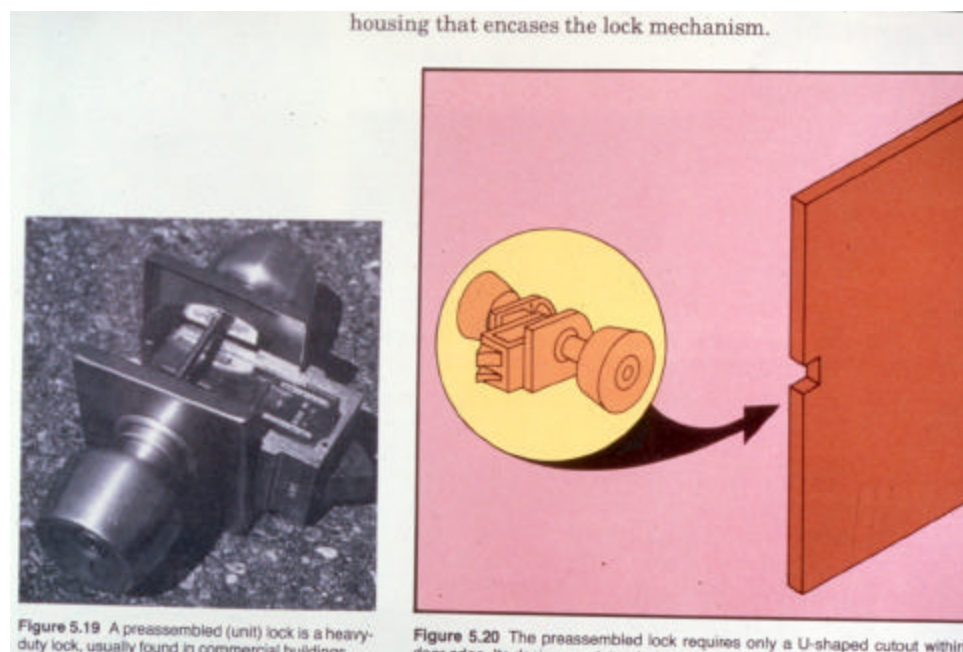
8.8.17.4 Some lock cylinders on doorknobs can be pulled and unlocked successfully. These doorknobs are brand specific and require recognition by the crewmember.

- 8.8.17.5 The most common technique for forcing entry through doorknobs will involve removal of the knob to expose the lock mechanism. This can be done in two ways. One way is to knock off the doorknob with a striking tool. While this method is successful, it can damage the lock and render it useless. This would require the use of conventional forcible entry to overcome this condition (which defeats the purpose of going through the knob in the first place). The most effective method is to pry the doorknob with the A-Tool. The flathead axe is placed against the door (flat) above the knob. The A-Tool is used to pry the knob off using the flathead axe to prevent damage to the door. The axe also acts as a fulcrum to further assist in the prying action.
- 8.8.17.6 Once the knob is removed, a key tool is used to unlock and operate the latch. Some heavy doorknobs contain a "T" that is visible when the knob is removed. Grasp the "T" with a pair of needle-nosed pliers (or other suitable tool) and turn to unlatch.



8.8.18 Pre-assembled locks.

- 8.8.18.1 Pre-assembled locks, also called unit locks, are locks that are completely assembled and do not require installation. They may come assembled in the door already or come as a unit that is installed as a section of the door. Examples of these locks are electric locks that have an electric release on the doorjamb. The doorknob (or other configuration) remains locked and latched while the section of the jamb releases after receiving the correct signal from an electronic device (such as swiping a card or dialing a combination).



- 8.8.18.2 These types of locks are extremely difficult to force conventionally (especially if they are outward opening) as they are usually set in a metal frame. The door is usually very strong and is designed to resist prying.
- 8.8.18.3 There are several methods to overcome these doors. If the building is equipped with a fire alarm system, pull a manual station on the floor where the door is located. If this unlocks the door, prop or chock the door to keep it open or it will re-lock when the alarm is reset.
- 8.8.18.4 In the doorknob configuration, removal of the doorknob and manipulation of the door latch is effective.

8.8.19 Exit Devices or Panic Hardware

8.8.19.1 An exit device, otherwise known as panic hardware, is a locking mechanism on doors usually found in public assemblies. The door requires an occupant to push a plate or bar to activate the lock. This lock was developed after several mass fatality fires where occupants died because of the inability to operate a lock. Occupants would panic and converge on the exit en masse. Death was usually caused by suffocation or crushing injuries rather than byproducts of combustion. The design of this lock inherently unlocks the door should a panic situation occur at the exit. The exit device will use conventional locking mechanisms which are operated by the push plate or bar. In a locked condition, the door is secured from the outside while egress is maintained from the inside.

8.8.19.2 Exit Device or Panic Hardware can be found in four configurations:

- Rim Lock
- Mortise Lock
- Surface Vertical Rod
- Concealed Vertical Rod

8.8.19.3 The rim lock and mortise lock exit devices consist of an aluminum stile, tubular metal door with a static push plate. The push plate does not activate any type of lock mechanism. There is a separate rim or mortise lock that secures the door. When the door is locked, it is secure from the inside and the outside.

8.8.19.4 The Surface Vertical Rod has hardware installed on the face of the door. The hardware has rods that run vertically to the top of the door jamb and to the bottom into the floor or kick plate. When the spring loaded panic bar is pushed, the rods retract and allow the door to open from the inside. When the panic bar is released, the rods extend and re-lock on the top and bottom. This type of door allows it to be secured from the outside, while allowing egress from the inside. On the opposite side of the door is a lock cylinder. The lock mechanism will be rim or mortise. It is possible to have surface vertical rod and not have the capability of unlocking it from the outside.

8.8.19.5 Concealed Vertical Rod has the locked hardware concealed in the channel of the aluminum stile door. The rods are not visible from either side of the door. The operation is the same as the surface vertical rod. That is, when the spring-loaded panic bar is pushed, the rods retract and allow the door to open. This type of door also allows it to be secured from the outside, while allowing egress from the inside. These will have a lock cylinder on the outside. The lock mechanism is rim or mortise.

8.8.20 Forcing Exit Devices

8.8.20.1 On double doors, the mojo tool can be used by going between the doors and hooking the panic hardware on the inside to release the door.

8.8.20.2 On doors constructed of tubular metal and tempered glass, the glass may be broken when there is no concern for damage.

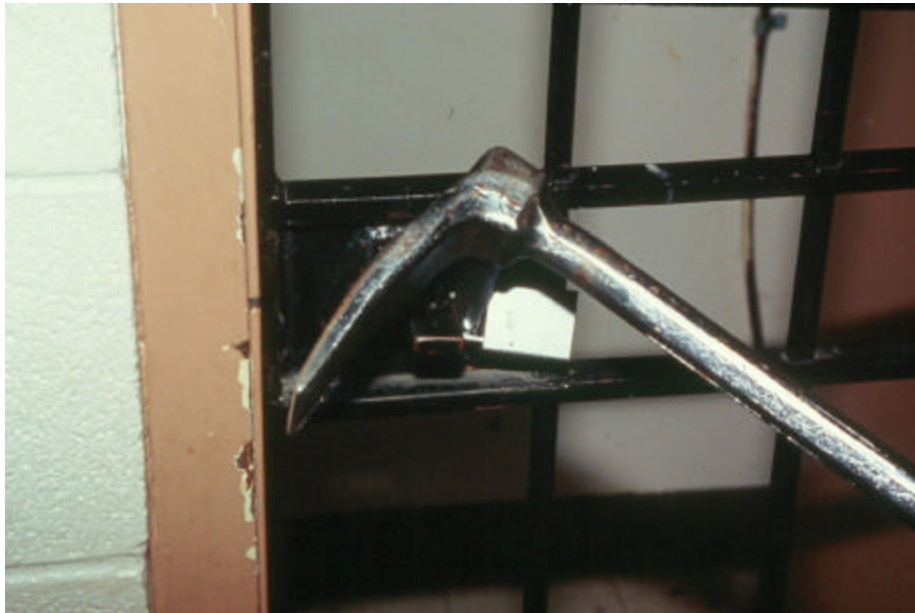
8.8.20.3 On doors that do not have glass, or where damage is of concern, pull the lock cylinder and examine it to determine the type (rim or mortise). Use the key tool to unlock it based on that configuration.

8.8.20.4 Sometimes the lock cylinder appears to be recessed. This is because of the type of pull handle on the outside. The handle should be removed by laying the flathead axe against it and driving it off the door with a striking tool. This will expose the lock cylinder to allow it to be pulled in the normal manner.

8.9 SPECIAL FORCIBLE ENTRY SITUATIONS

8.9.1 Padlocks

8.9.2 Padlocks are manufactured in various weights and styles. Multiple locks are easily forced with a lock breaking tool and a striking tool. Smaller padlocks can be forced using the pick of the Halligan and a striking tool. Insert the pick of the Halligan between the hasp and the lock body.



8.9.3 Strike the Halligan to open the lock.

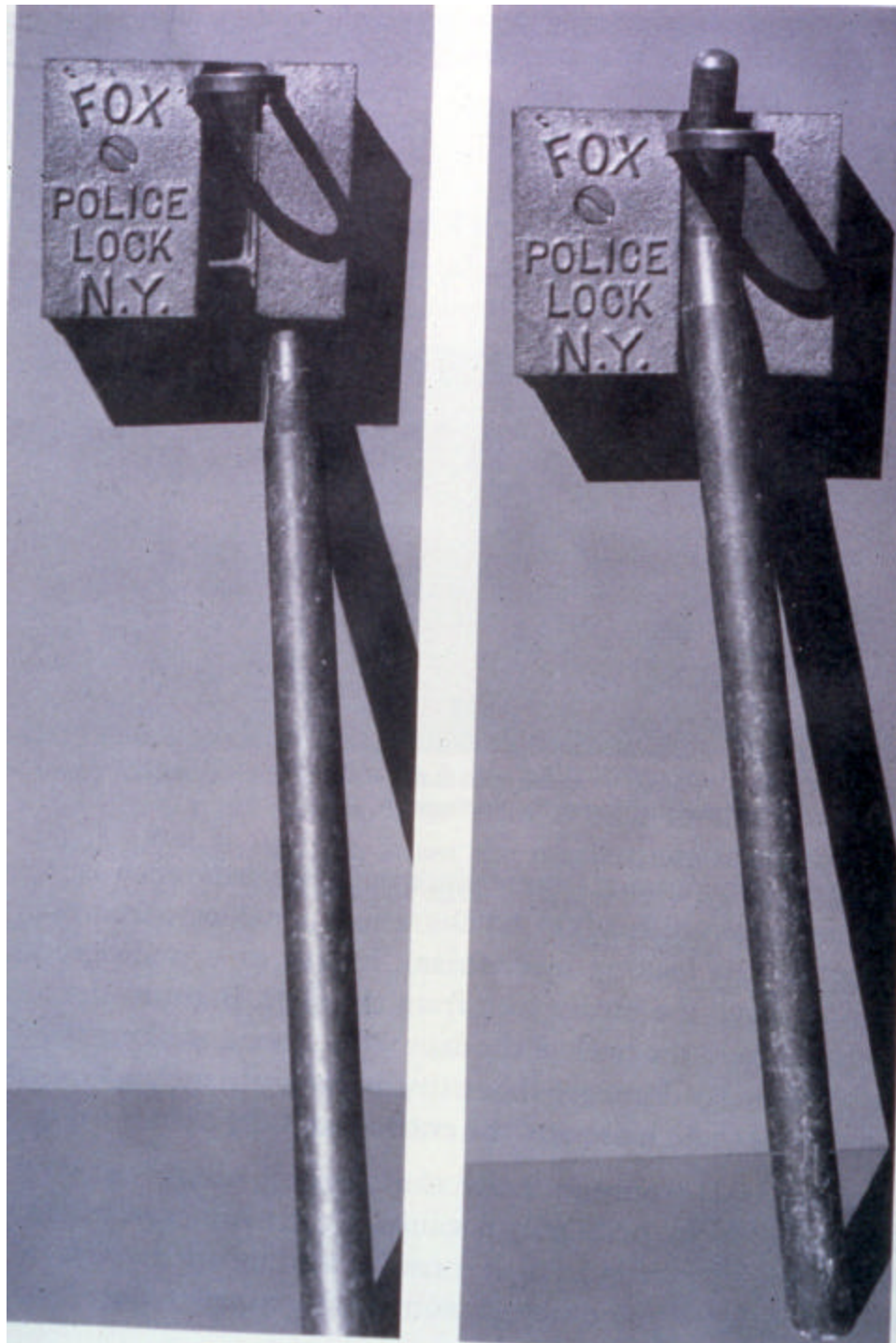


- 8.9.4 Larger padlocks require the use of something larger. The hammer-head pick or duck-billed lock breaker is used the same as the Halligan but is more effective. In cases where a guard is in place or access to a padlock is hampered, use the locking pliers (with chain or cable) to steady the lock and cut it with a power saw. The lock breaking tools and saws need to be personally carried when one knows they will encounter multiple padlocks (e.g. shopping mall after hours).



- 8.9.5 Bolt cutters will usually be effective in cutting the hasp on non-case hardened padlocks.

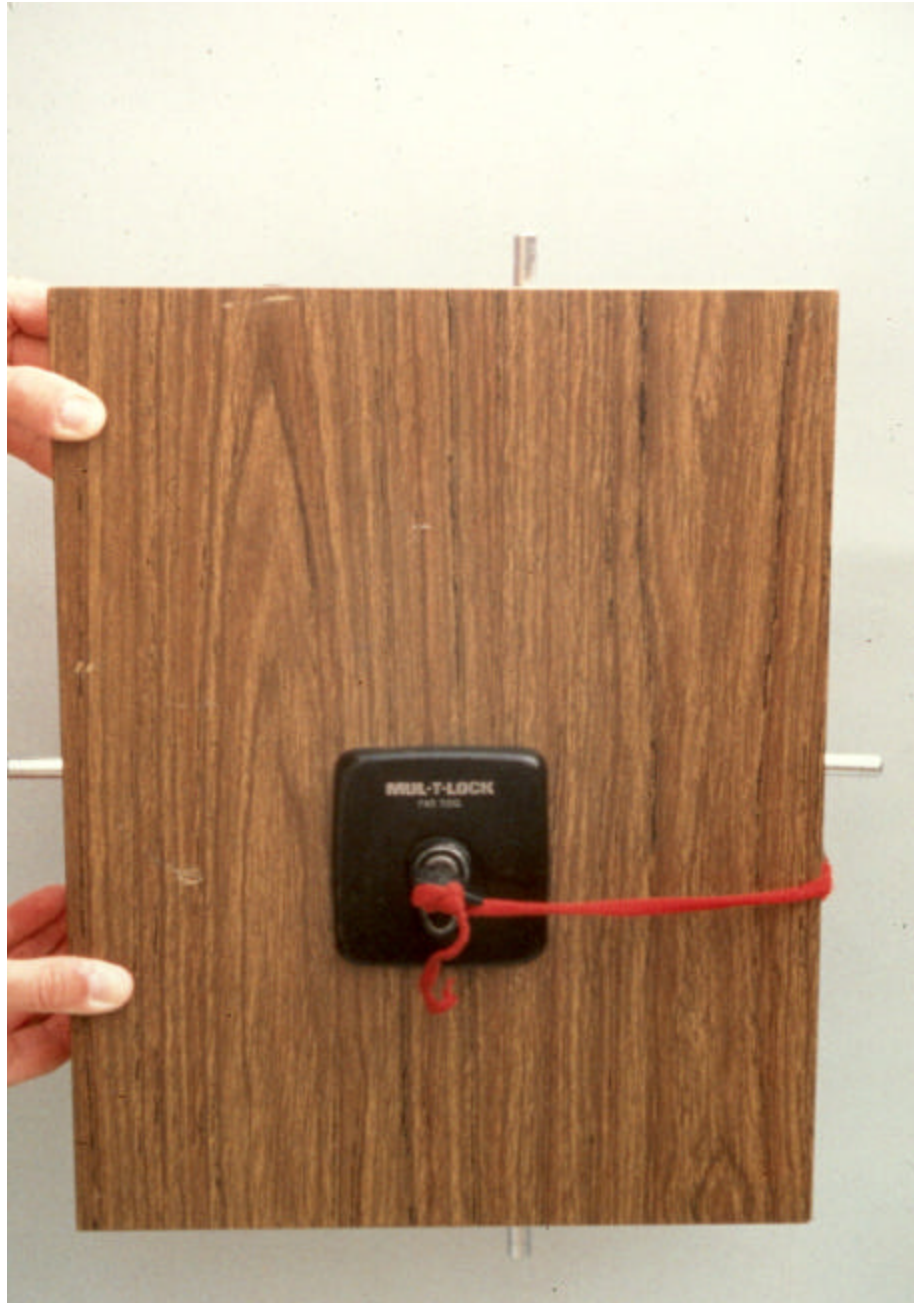
8.10 Fox Police Lock



8.10.1 The Fox Police Lock is a specific brand of security system that has been found on rare occasions. When it has been found, it has been in apartment buildings. This lock is exclusively manufactured for inward opening doors and therefore should only be found in residential occupancies. The device consists of a flush mounted plate on the floor and hardware mounted on the door just below the doorknob. To lock the device, the occupant takes a metal rod and inserts one end into the plate in the floor. The other end attaches to the door hardware and locks in place. There are at least two different models of this lock, one that is only secured from the inside (which means, if found, the occupant is inside) and one that is secured in such a way that it can be unlocked from the outside. In either case, they are extremely difficult to force conventionally. In situations where extreme resistance is found when forcing on the lock side of a door, the next procedure is to try to force on the hinge side of the door. In the case of the Fox Police Lock, success will be achieved by forcing on the hinge side. A power saw should only be used as a last resort because it would require sending a crew member back to get it and it may possibly require it to be operated in poor visibility (if it will start and run) such as found in a smoke filled stairwell. Evidence of these locks should be noted in "location of interest" information which would be available at the time of dispatch.

8.11 Mul-T-Lock

- 8.11.1 A Mul-T-Lock (brand name) is a unique lock which secures a door to a frame at all four sides (top, bottom, and both sides).



Note the rods that protrude from all four sides on this demo board. Rotating the key retracts the rods.

8.11.2 The device is manufactured and installed as a complete door, frame and lock assembly. The lock mechanism can be in the center of the door or near the edge of the door opposite the hinge side. The lock mechanism rotates a series of steel rods into the door frame at all sides. It can be found in commercial and residential applications. It is used where extremely high security is desired. This locking system is rare because of its expense. There is no way to force this door in the commercial application. The door must be sawn or the wall next to it must be breached. In residential applications, the hydraulic ram is effective if the door is wood but may have to be placed at more than one push point. If the door is metal, it must be sawn or the wall next to it must be breached. Evidence of these locks should be noted in "location of interest" information, which would be available at the time of dispatch.

8.12 Cypher Lock

8.12.1 A Cypher lock (brand name) is a lock where a combination is dialed in to operate the lock (like most fire station locks). There are several combinations and configurations. They may be mechanical or electrical.

8.12.2 One mechanical configuration uses a round face for the key pad (outside) with the locking mechanism mounted on the face of the door (inside). This lock is best overcome by striking the face of the lock so it drives the mechanism off of the door on the inside.



- 8.12.3 A second mechanical configuration uses a rectangular face for the key pad outside. The lock mechanism is a latch similar to a doorknob latch. This one is best overcome by shearing and prying the rectangular face and knob off of the outside of the door, then using a flat blade key tool to manipulate the latch.



- 8.12.4 The electrical configurations are too numerous to list all of them. However, a simple size-up of whether the locking mechanism is in the door frame or the door will assist greatly. In the case where the electric lock is in the frame, unlocking or removing the doorknob is the most effective. In cases where that is not possible, or the electric lock is in the door, some success may be achieved removing the combination face and jumping the two wires leaving the controller. Caution is due here as the controller may not be located behind the combination face. It may be located a couple of feet away. Prior knowledge of this is an obvious advantage.



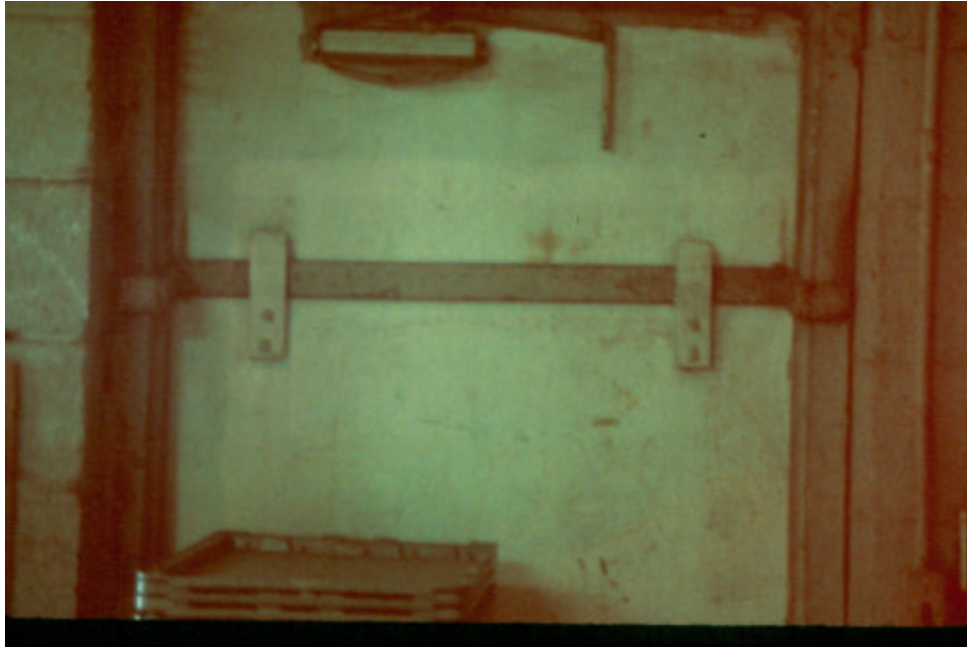
8.12.5 For the most part, these locks are 24 volt direct current (DC). The power may come from a converter or a battery.

8.13 Static Bars

8.13.1 The most basic static bar on an outward opening door consists of a set of "stirrups" on a door. When the door is closed, a long board or a piece of fabricated steel is placed in the stirrups.



- 8.13.2 When an attempt is made to open the door from the outside, the walls assist in keeping the door closed. Static bars are fabricated differently for each door. There is no common brand name or manufacturer.



- 8.13.3 Static Bars on inward opening doors (residential) are virtually non-existent. They are almost impossible to identify from the outside because the stirrups may be in the wall. You can, however, sometimes identify the fasteners for the stirrups in the door frame.



Note the bolt pattern in the frame for the static bar on an inward opening door.

- 8.13.4 Should one come across a static bar on a residential structure (probably from a prior EMS call), the first concern would be why the occupant would require such high security. Extreme caution and safety of the crew would be warranted in that situation. Regardless of the type, presence of static bars should be noted in “location of interest” information, which would be available at the time of dispatch.
- 8.13.5 Static bars are found in various configurations and can be wood or metal. They are most predominantly found in strip shopping centers at the rear doors. The most effective method of identifying static bars is through pre-fire planning. Every strip shopping center in a truck company’s first due should be evaluated for forcible entry. At the incident scene, a static bar may be indicated by a distinctive bolt pattern on the outside of the door.



- 8.13.6 The bolt pattern is usually in the center of the door. Bolt patterns at the top or bottom usually indicate a sliding bolt. The absence of the bolt pattern does not mean the absence of a static bar. The stirrups on the inside of the door may have been welded instead of bolted.



Note welded stirrup for static bar. The bolt pattern on the outside is absent.

- 8.13.7 As mentioned in the **“Fires in Strip Shopping Centers”** book, it is imperative to get these rear doors open. These doors will be extremely difficult to open from the inside in poor visibility and could result in a firefighter being trapped.
- 8.13.8 Conventional forcible entry will not work. There may be no lock on the outside. If there is a lock, it may or may not be secured in conjunction with the static bar. For the most part, it is a waste of time to mess with the lock. There are many different ways to force through doors with static bars. The quickest and most effective method, when damage is not a concern, is to saw through the door containing the static bar. Start with one cut down through the center of the door from top to bottom. Ensure the cut is all the way through the door at the top and bottom near the frame. (This will be referred to as a “straight-line door cut”. This will be referred to in other operations as well). Attempt to pry the door open and lift the static bar out of place. If the bar is locked in place with a padlock from inside, continue to saw through the bar. At this point, you will have to size-up whatever is holding the door and then determine the best course of action to overcome it. As with any forcible entry size-up, consideration should be given to breaching a wall when difficulty is encountered in forcing through a door.



8.13.9 When damage is a concern, another option is to attack the bolt heads in the door. These may be sheared off using the adz or flathead placed on the bolt and striking it with a sledge. The sledge is more effective for striking because of its superior force over the flathead or Halligan. What is remaining may be forced using conventional methods. The procedure is most effective when crews have prior knowledge that the static bar is the only thing securing the door.

8.14 Sliding Bolts

8.14.1 A sliding bolt is a piece of rod that is mounted to a door and slides into a keeper or hole in the jamb. It may be fabricated or manufactured. It is found in both residential and commercial applications. If it is found locked in residential applications, it usually means the occupant is inside.



8.14.2 There is no indication of a bolt pattern on residential doors due to aesthetics. Therefore, since the screws do not go through the entire door and frame, they are easily overcome with conventional forcible entry.

- 8.14.3 On commercial occupancies, most notably strip shopping centers, there may be a bolt pattern visible on the outside (rear doors). Again, the absence of a bolt pattern does not necessarily mean the absence of a sliding bolt if it has been welded. The most effective method is to perform the “straight-line door cut” (see section under static bars).



An example of a pattern on the exterior of a door for a sliding bolt.

8.15 OVERHEAD DOORS

- 8.15.1 Overhead doors can be found in three basic configurations:

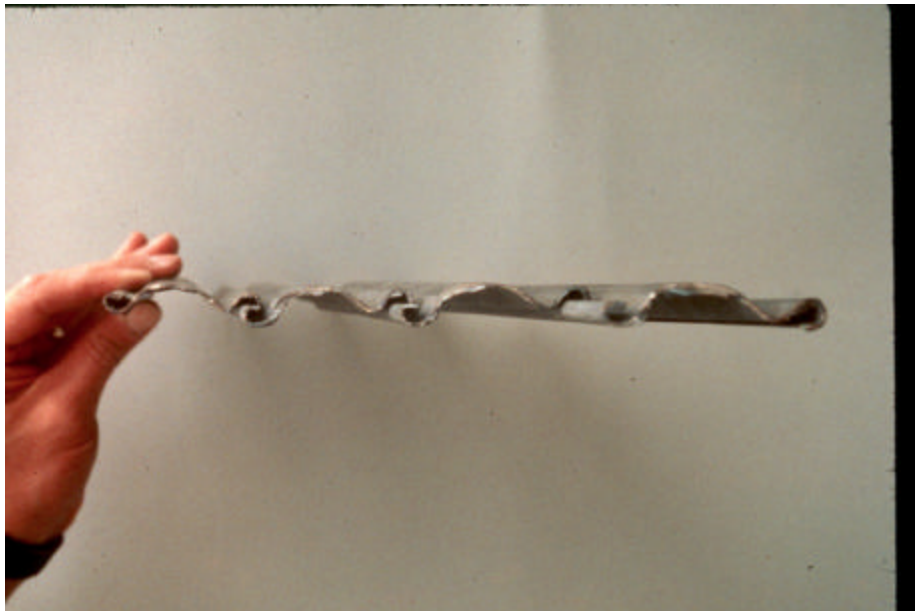
- Folding
- Slab
- Roll-up.

8.15.2 Slab and Folding Doors

8.15.2.1 Overhead slab and folding doors are composed of metal, fiberglass, or wood framed sections that can contain glass panels. Wood and fiberglass framed doors can also have wood panels. They are usually operated manually or electrically. During size-up, look for bolt heads at the top of the door in the center. This is where the arm attaches to the door raising mechanism on the inside. The mechanism is operated by an electric motor, which raises the door. Break the panel adjacent to the bolt heads at the top. Activate the pull cord which will release the mechanism and allow the door to be raised manually. If the door is manually operated, and is locked (checked during size-up), the panel next to and above the door handle should be broken. Reach in and unlock the door. Then manually raise it. When these methods are ineffective, an inverted V cut will create an opening (see below).

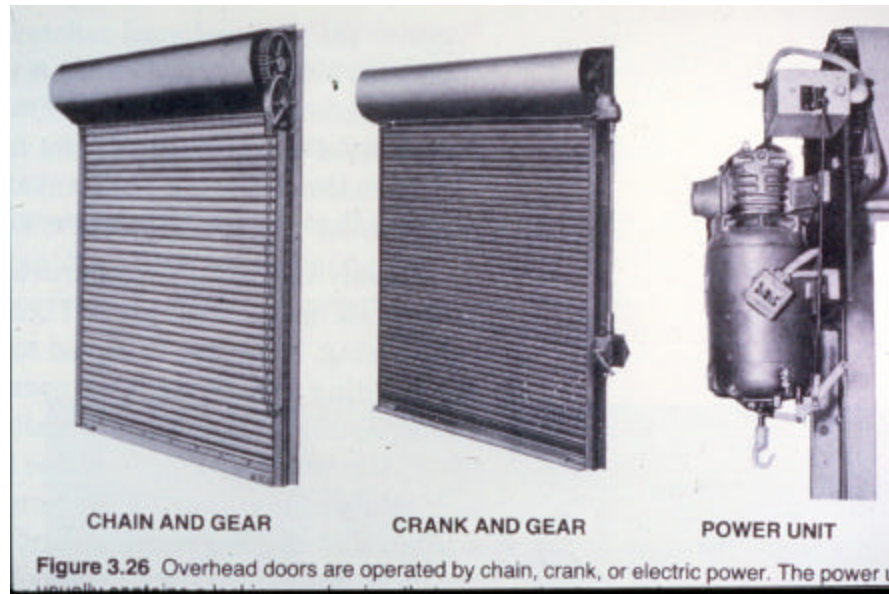
8.15.3 Roll-up Doors

8.15.3.1 A roll-up door is a commercial type of door that has several pieces of interlocking steel that allow it to roll up like a piece of carpet.

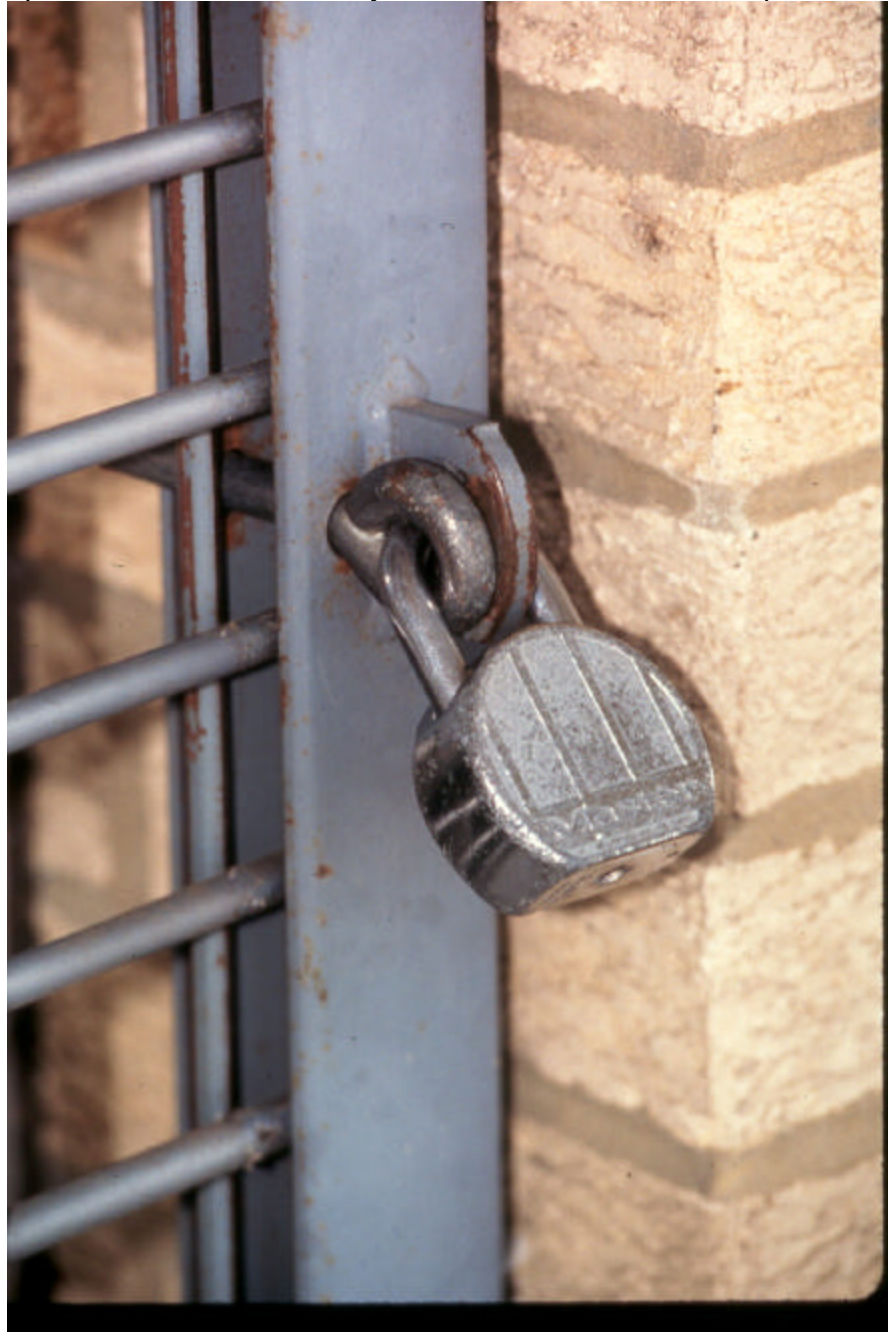


8.15.3.2 The actual mechanism raising the door can be done in one of four ways:

- Manually
- Chain and Gear
- Crank and Gear
- Electric Power and Gear



8.15.3.3 These doors may be secured from the inside or out. The manually operated doors are usually secured with one or more padlocks.



8.15.3.4 These locks can be locked at the floor level, an intermediate level, or a series of locks from the floor level upward. If that is the case, remove them as you would any other padlock (see section under padlocks). Once the door is raised, it should be blocked open using a hook or preferably a set of vise-grips (trade name) clamped to the track. This is imperative as heat exiting from the opening may cause the spring holding the door open to fail. The remaining three doors are secured by the gear mechanism itself preventing the door from being raised manually. In addition, the chain or crank can be padlocked as an added measure of security. In situations where access cannot be gained to the interior (because of fire) to operate the gear mechanism (chain, crank or switch), the door should be opened using either the rectangular “three-cut” method or the inverted V cut. (Some texts refer to the inverted V cut as the Apex cut).



Roll-up door that has been cut with the "three-cut" method.

- 8.15.3.5 The three-cut method is effective only on roll-up doors. The three-cut method is accomplished by making three vertical cuts in the door. The first cut should be made as close to the edge of the door as possible from the maximum height down to the floor. The second cut is made the same way on the other end of the door. The third cut is then made in the center downward about two feet. The resulting slats will then be short enough to be pulled out before hitting the sidewalls. At times, especially on wide doors, the weight of the hanging sections below can bind the slats that support them, making it difficult to remove them. This can be avoided by making additional two-foot cuts every five to six feet. The shorter sections are then easier to pull out. The key point to remember is that all the cuts must be made through the same slat. Once the first slat has been pulled out a little, the operation can be assisted by a member with a flathead axe tapping slightly on the back of the slat. This method requires more cutting than the inverted V, but it does guarantee clearing a larger area for access, rapid egress, and ventilation. (Norman, 2nd Edition).
- 8.15.3.6 The inverted "V" is a cut that is started at the center of a roll-up door. The saw is held at head level in the middle of the door and then moved through the material down to a corner (at an approximate 45 degree angle if the door was perfectly square). The process is repeated again going down to the opposite corner. Another member with a long handled tool (pike pole or trash hook) pushes the cut material into the building as the second cut is being made. If the door is extremely wide, it is not necessary to take the cut all the way to the corner. The objective is for the door to be wide as possible.



- 8.15.3.7 The inverted V cut is not the only type of cut that can be made in this type of door but it might be the quickest.
- 8.15.3.8 If a hoseline is going to be deployed through the opening in the door, consideration should be given to leaving a member at the opening to prevent the hoseline from being cut by the sharp metal edges.

8.15.4 Scissor Gates

- 8.15.4.1 Scissor gates come in various configurations. They can be attached to the face of a wall or supported on rollers. Scissor gates are secured with a mortise lock or a padlock. One should note which side (interior or exterior) the gate is secured from. The easiest method to get through scissor gates is to attack the lock. That is usually all that is holding it. There may be multiple locks securing it. It is still easiest to attack the locks. Cutting into the gate itself will be complicated and time consuming. One advantage the scissor gate offers is ventilation. It is not solid like a roll up door.



8.15.5 Shopping Malls

- 8.15.5.1 Shopping malls present their own unique forcible entry problems. Every mall has a pre-fire plan. This preplan needs to include the forcible entry problems unique to each mall. The best time to study forcible entry problems in malls is when the mall proper opens, but the individual stores have not. This will enable you to see up close how they are secured.
- 8.15.5.2 Anchor stores usually have some form of solid roll up or sliding door to provide fire separation from the anchor store and the mall proper. They may also have an open mesh type of door. Roll up or sliding doors are secured from the inside.

8.15.5.3 The linking stores have no fire separation. They usually have some type of open mesh door (e.g. scissor gates) between the link store and the mall common area. Some doors are secured from inside the store, others may be secured outside the door. The doors may have an electric motor that raises and lowers them. They may also be raised manually and secured with padlocks or mortise locks. The method in which these doors open and close (inside or outside) will determine the type of forcible entry to be performed. The first step is to size-up the door, walls and lock(s) to determine how it is secured. Obviously, if smoke is pouring out of the open mesh opening, this will create some difficulty. This is where some pre-fire knowledge will pay large dividends.

- If it is secured with a mortise lock with a pivoting deadbolt into the floor, use through-the-lock entry methods.
- If a lock cylinder is found on the wall next to the door and there is nothing securing the door to the floor, it is an electric motor lock. Remove the lock cylinder and jump the wires to open the door electrically.
- There is a lock unique to malls called a Phelps lock. A Phelps lock is a timed-release lock powered by electricity. The proprietor must unlock each lock (usually three) at the correct time and in the correct sequence. For example, lock #1 (they are not numbered, you have to have knowledge of this) is unlocked. The proprietor must then wait exactly five minutes to unlock #2. Then they may have to wait another three minutes to unlock #3 before the roll-up mesh door can be raised manually. If the timing or the sequence is incorrect, the locks will relock. Pulling the lock cylinders will not unlock them unless you know the correct sequence and timing. These locks should have the sliding bolt cut with a power saw.



Size-up this door to determine what is locking it. If you could get close to this, you would note that it is not secured to the floor. Note the trap door in the wall on the lower right.



Pull this lock cylinder and trip the wires to raise the door. You may also remove the screws to accomplish the same thing.



Phelps lock with the key in lock #1.



Once the sequence is met, the door will unlock which will allow it to be raised manually.

8.15.5.4 The most common type of open mesh roll up door is the horizontal rod, roll up gate. It consists of horizontal rods attached with flat plate aluminum. If a saw is used to attempt a vertical cut, the horizontal rods are carbon or case hardened and will spin as fast as the saw blade, thereby negating its affect. The best method of cutting through a horizontal rod gate is to cut where it is being secured at the floor level. If that is not possible, cut the vertical flat plates as low as possible on the door. Once the cuts are made all the way across, the section below the cut will fall in the track. This will allow the remaining part of the door above the cut to be raised. If the cut is made too high, the door will drop down in the track and stack making it difficult for members to enter or exit the store.



An example of a roll-up mesh door. Note the lock cylinder in the wall. In this case, removing the screws and jumping the wires opened the door.



- 8.15.5.5 Another variation of the horizontal rod gate uses lexan between the rods to fill in the open mesh. Obviously, fire would melt and possibly ignite the lexan.
- 8.15.5.6 The doors to the rear of linking stores and doors to the exterior of anchors stores are many and varied. Size up of those doors, jambs, walls, and locks will provide answers to gaining entry through them.

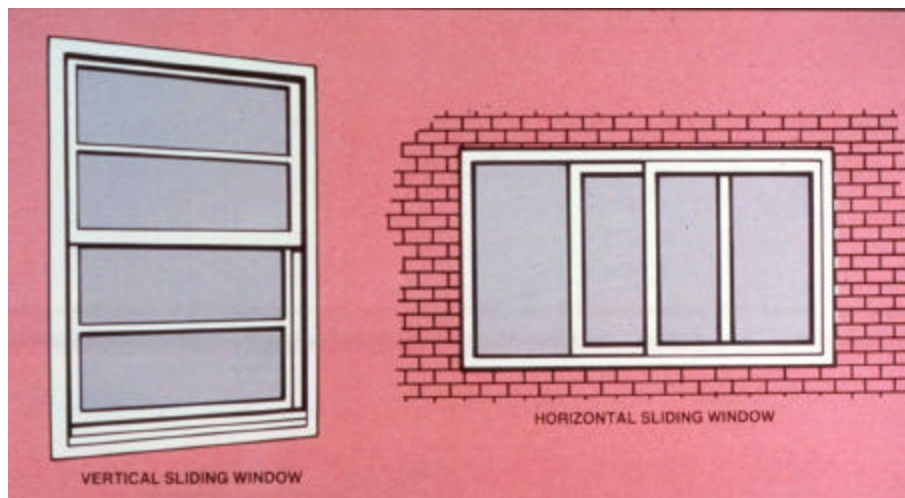
8.16 WINDOWS

8.16.1 Types of windows include:

- Double-hung
- Casement
- Projected or factory
- Awning or jalousie

8.16.2 Double-hung windows consist of a wood or metal frame surrounding the glass. It may be secured with a latch between the two sliding portions or a latch between the frame and the sash. Breaking glass is effective for both egress and ventilation. The window may also be forced by prying at the bottom (vertical sliding) or on the side (horizontal sliding). Double hung windows come in two basic configurations:

- Vertical sliding
- Horizontal sliding (sometimes called checkrail)



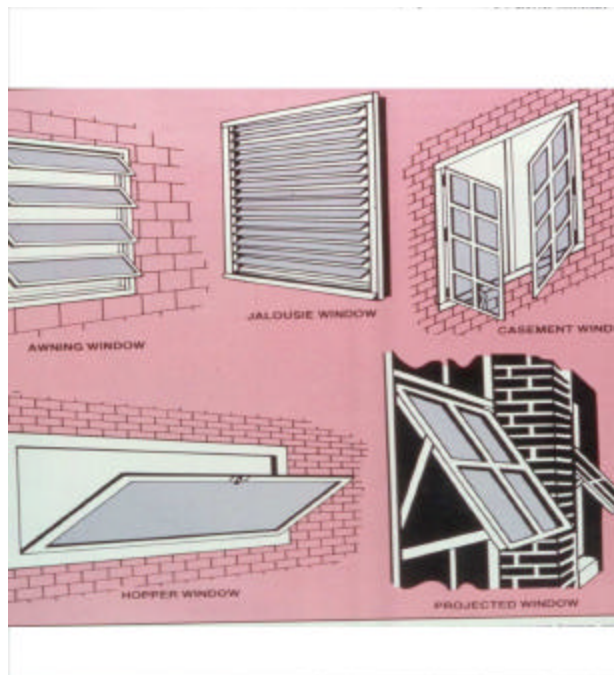
8.16.3 Casement windows consist of two rectangular sections that are hinged at the sides and secured in the middle with a latch. Opening requires unlatching and then operating a crank to hinge open. Most modern casement windows have a single pane of glass in the rectangle with wood or light aluminum framing. With this type, breaking glass is effective for both egress and ventilation. The center piece should be removed after the window is open or broken. On older casement windows, the framing is solid steel with criss-crossing pieces. The window panes are smaller (usually six inches square). The framing is solid steel and set securely in masonry. Breaking the glass will provide ventilation but with casement windows, each individual pane must be broken. **However, egress will be blocked.** The only way to ensure egress is to physically open the hinged rectangular portions. Even that won't provide a very large opening, as there will still be a steel frame piece in the center. This will not only negate rapid egress, but will make rescue (unless it is a small child) virtually impossible. **When this type of window is discovered, all companies should take note and consider alternative means of egress or rescue.** Another option is to use the battery operated reciprocating saw to remove the center piece.

NOTE: Casement windows should NOT be vented using the tip of any aerial device. The glass must be removed using hand tools.



Note the narrow casement windows on the second floor. These pose a significant safety hazard to firefighters searching upstairs.

- 8.16.4 Projected or Factory windows consist of a large square metal frame (steel in older, aluminum in newer) that is hinged at the top, bottom, or both. The factory type is typically found in basements within a window well. A lever is operated to unlatch the window and then it is pushed out (projected) if it is hinged at the top, or pulled in (factory) if it is hinged at the bottom. Breaking glass is effective for ventilation. However, the size of the panes of glass will depend on its effectiveness for egress. Unlatching and opening the window will assist egress in projected windows. Unlatching and opening of factory windows will afford no means of egress.
- 8.16.5 Awning windows are hinged at the sides near the top of each section. Awning windows have wide horizontal sections. Breaking glass will effect ventilation in awning windows, however, the cross pieces will have to be removed to effect egress and rescue. With awning windows, if the crosspieces are constructed of steel, this will be difficult and time consuming.
- 8.16.6 Jalousie windows are almost exclusively found in breezeways and finished porches in this area of the country. Jalousie windows have very narrow (3-4 inch) sections. They will not normally be found covering heated spaces because they afford no seal for insulating purposes. If a porch or breezeway needs to be vented, try to attempt means other than breaking glass as the jalousie window is one of the most expensive windows to replace. Breaking glass is effective for ventilation and egress with jalousie windows.



8.16.7 Types of Glass

- Clear
- Plate
- Laminated
- Tempered
- Thermoplastic
- Bullet-resistant

8.16.7.1 Clear glass is also simply called window glass. Clear glass is lightweight. When broken, it forms knife-like shards. It may come in single, double or triple pane configurations.

8.16.7.2 Plate Glass is found where large sections of glazing are required, such as in large windows and sliding glass doors, and is single pane. Plate glass is extremely heavy. While it is relatively easy to break with standard fire dept. tools, it is the most dangerous glass encountered. This is because it can break into large sections that are extremely heavy (can weigh upwards of 60 pounds). The broken edges are very sharp and angled, much like a guillotine. These heavy broken pieces easily cut through standard PPE and flesh very easily (not to mention hoselines). Extreme caution should be exercised in breaking plate glass. It is imperative that members stand to the side and not underneath to break plate glass. Extra effort should be made to ensure the pathway below (such as a common entrance to an apartment building) is clear of members and equipment prior to breaking. If the entire frame cannot be cleared of glass, the area beneath the partially broken window shall be posted off limits. During the breaking operation, a member should standby out of the way to ensure no one walks beneath the falling glass.

- 8.16.7.3 Laminated glass is two or more sections of clear or plate glass with plastic sandwiched in the middle. In some cases the laminate may be found on the outside of the glass. The most common place laminated glass is found is in vehicle windshields. However, some sliding glass doors contained laminated glass prior to the use of tempered glass. Some reflective glass is laminated. A variation of laminated glass is wire glass. With wire glass, a mesh of light gauge steel wire is sandwiched with the plastic in the middle. The most effective method of breaking laminated or wire glass is to chop (with an axe) on the glass at the edge where it meets the frame. The entire perimeter of the glazing should be cut as close to the frame as possible. It is almost impossible to remove or cut the glass without the rigidity the framing provides. Members should ensure they can reach all areas of the framing prior to beginning the cut. Another option is cut the glass with a reciprocating saw.
- 8.16.7.4 Tempered glass is used where large areas of glazing are required and there is the possibility of people coming into contact with the glass such as glass doors and windows next to doors. This is used to replace plate glass because of the hazards associated with plate glass. Tempered glass is extremely expensive and is used sparingly in buildings. For example, in the same apartment stairwell mentioned above, the bottom windows and door would be tempered while the upper windows would be plate. Tempered glass goes through a patented heat treatment process (tempering) which strengthens the glass as much as four times greater than plate glass. It is several times more resistant to impact and can withstand a temperature of 650 degrees F on one side without breaking. When it is broken, the sheet of glass suddenly disintegrates into relatively small pieces. The small pieces cannot penetrate standard PPE and weigh ounces. Tempered glass is strongest in the middle or center and weakest at its edges. The preferred method of breaking tempered glass is with a sharp object such as the pick-head axe or pick of the halligan bar. The glass should be struck with the sharp point at a corner.
- 8.16.7.5 One common practice in vehicle extrication is to use a spring-loaded center punch in the lower corner of the automobile window. While this practice would be effective if tempered glass is found in buildings, caution is warranted. A spring-loaded center punch should be used in an upper corner of a building window or door. No one should crouch to reach a lower corner. If the glass being broken turned out to be plate instead of tempered (a center punch will break plate glass as well), the member would be in a dangerous path of the falling plate glass.

- 8.16.7.6 Thermoplastic glass is a polycarbonate, acrylic, or cellulose acetate butyrate that has seen wide application as a glass substitute. It has trade names such as Plexiglas (acrylic), Lexan (polycarbonate), and Uvex (butyrate). Some thermoplastic glass is 250 times stronger and 50% lighter than tempered glass. It can be found in thickness ranging from 1/8 inch to 4 inches. The best way to force through thermoplastic glass is to attack the frame. Removing the molding around the glass and cutting or removing the gasket does this. Another option would be to cut it with a carbide-tipped blade. If the cut melts together, a tool should be used to push on the glass as it is being cut.
- 8.16.7.7 Bullet Resistant glass is a security glass made by bonding layers of glass under heat and pressure into $\frac{3}{4}$ to 3 inch laminated sheets. Although not totally impenetrable, it is resistant to standard fire dept. hand tools. Sawing the glass creates flying particles of glass that can be hazardous to eyes and may be retained in folds of PPE. For the most part, bullet resistant glass should be avoided. Most of the time, another means of entry is readily available.