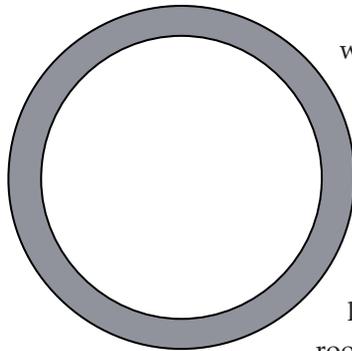


Requirements for a

Utilizing Magnetic Locks or Electronic Strikes



Owners and managers of secured facilities often request a card-to-exit system for select doors in an effort to prevent or monitor persons leaving the secured room. Current code

provisions indirectly permit use of card-to-exit systems for access-controlled egress doors. These doors control access for entering and exiting with magnetic locks, electronic dead bolts or other electronic locking devices, and these devices require special means to active the electronic locking devices. In addition, advancements with the strengths of electric strikes, coupled with the creative use of door contacts, provide new opportunities for card-to-exit systems.

This article offers concept level requirements for card-to-exit systems utilizing magnetic locks or electronic strikes. This paper focuses on Business occupancy type facilities as defined by the National Fire Protection Association "NFPA 101". The requirements

for access-controlled egress doors for other types of facilities, such as Institutional, or Assembly type facilities, are similar, but may have additional restrictions as defined within applicable codes, such as *NFPA 101*.

Code Requirements:

NFPA 101, dated 2006, Section 7.2.1.6.2, permits entrance (entering) and egress (exiting) electronic access-controlled system (hereafter referred to as mag-locks) for doors in the means of egress, if equipped with the following provisions:

1. A sensor shall be provided on the egress (or exit) side, arranged to detect an occupant approaching doors that are arranged to unlock (the mag-lock) in the direction of egress upon detection of an approaching occupant or loss of power to the sensor.
2. Loss of (electrical) power to the access control system shall automatically unlock access control device (the mag-lock).
3. Manual release device (push-button), mounted (per code requirements) on egress side shall unlock access control device (the mag-lock).
4. Manual release device (push-button) shall indicate 'PUSH TO EXIT'.



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Card-to-exit System

5. Manual release device (push-button) shall keep access control (the mag-lock) unlocked for at least 30-seconds.
6. Activation of fire building fire-protective signaling system, if provided, shall unlock access control device (mag-lock) and the door shall remain unlocked until the fire-protective signaling system has been reset.
7. Activation of the manual fire alarm boxes that activate the building fire protective signaling system shall not be required to unlock the door.
8. Activation of the building automatic sprinkler system or fire detection system, if provided, shall automatically unlock the doors in the direction of egress, and the doors shall remain unlocked until the fire-protective signaling system has been manually reset.

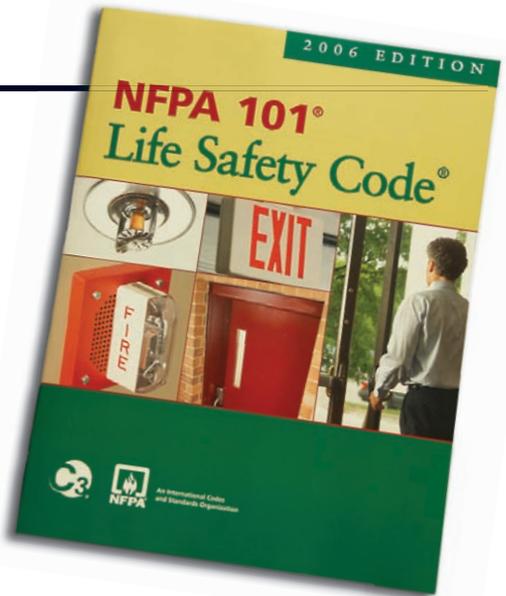
A "Means of Egress" door is defined by NFPA 101 as a door or doors required to serve as an exit from a room, area or building. NFPA 101 further defines characteristics for the doors, corridors and other exiting elements, which are beyond the scope of this article.

The NFPA 101 Handbook, further explains these provisions: "The

access-controlled egress doors addressed by 7.2.1.6.2 are intended to be locked against access from the outside of the building and require a magnetic card or similar instrument for authorized entry. However, such doors must be arranged for free egress use whenever the building is occupied."

IT'S WORTH NOTING THE FOLLOWING:

- Access-controlled egress doors, including doors serving occupant loads less than 50, shall swing in the direction of egress, although the AHJ may allow in-swing doors under special circumstances.
- Access control system (mag-lock) "fail-safe" or unlocks with the loss of electrical power or activation of the fire alarm system. Overcoming the vulnerability of the access control system (mag-lock) with the loss of electrical power may be achieved by connecting the access control system to the building's emergency electrical power system that is backed-up by a generator or "UPS" system, or by the use of battery back-up, and providing "line-signal supervision" that produces



an alarm when the system's wire current is disrupted or altered. However, the major weakness of the access control system utilizing mag-locks is the requirement to unlock with the activation of the fire alarm system. In addition, these mag-locks need to remain unlocked following a fire-alarm event, until reactivation of the fire alarm system by authorized fire protection personnel or as prescribed by local regulations.

- It's also worth noting that NFPA 2003 edition, Section 7.2.1.6.2 (1) (b) allowed "Listed panic hardware or fire exit hardware that, when operated, unlocks the door", in lieu of a sensor on the egress side. The use of panic or fire exit hardware is no longer acceptable as a means to activate the access-controlled egress door system.

CARD-TO-EXIT DESCRIPTION AND REQUIREMENTS WITH A MAGNETIC LOCK:

1. Card-to-exit systems cannot interfere with the occupants' right to safely exit a room that has a door with an access control system (mag-lock). Current codes favor life safety requirements over security. I believe the single most important life safety code requirement may be the ability to safely exit a room or building.
2. Card-to-exit system may be used to unlock (deactivate) the mag-lock from the exit side if combined with a motion sensor or panic-hardware, as well as the other code provisions as listed above.
3. A motion sensor will "defeat the purpose" of a card-to-exit system, as the occupant need only stand in front of the motion sensor to unlock the mag-lock.
4. Card-to-exit systems may be "encouraged" as the proper method to unlock the mag-lock with an alarm connected to the push-button.
5. Alarms may be interconnected with the push-button. Activation of the push-button to exit without use of the card-reader would activate the alarm. In other words, utilization of the card reader will unlock the mag-lock and shunt (turn off or not activate) the alarm, while utilization of the push-button will unlock the mag-lock and activate the alarm.
6. The alarms on the push-button may be silent, local, sent to an on-site or off-site Security Command Center, sent to guards' wireless hand held

devices, or sent to particular guard stations.

7. Activation of the push-button to exit without use of the card-reader may also activate a camera to record the unauthorized exiting event.
8. A sign should be placed near the push-button indicating that these devices are intended for emergency use only, these devices will activate an alarm (and camera) if utilized, and to utilize the card-reader to exit.
9. The push-button may have a cover device that freely swings open and further discourages its use.
10. Existing doors will likely need minor modifications to accommodate the mag-lock.
11. The card-readers on the inside face and outside face may also interface with the "head-end equipment" (security monitoring system) and provide an audit trail recording who entered when, assuming the cards and card reader system are equipped with preprogrammed user identification information.

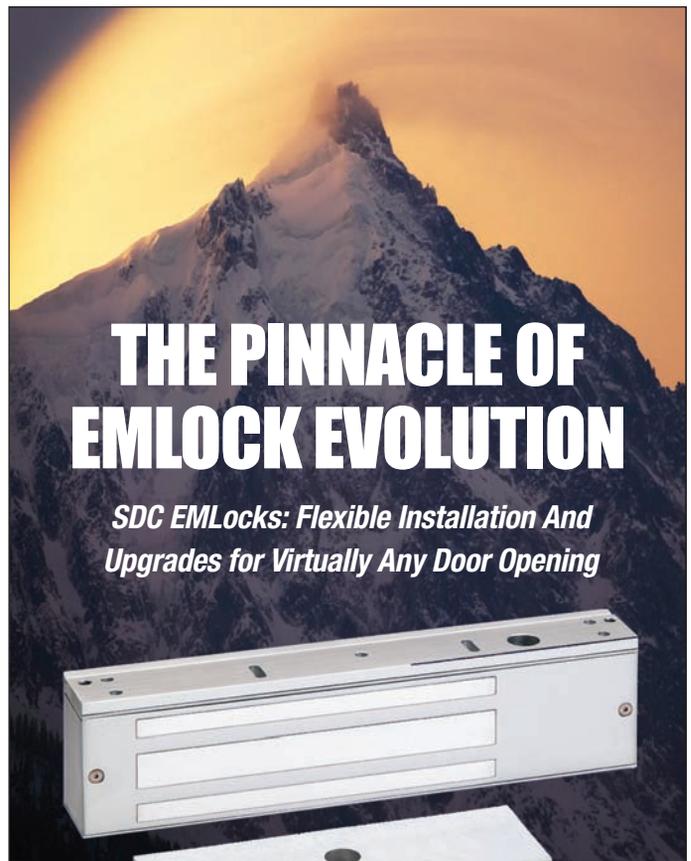
MAG-LOCK VULNERABILITY AND OPPORTUNITIES OF ELECTRONIC STRIKES:

1. Mag-locks, and other electronic locking devices that provide electronic access control for entering and exiting through a door, must meet the referenced code requirements indicated above. However, electronic strikes need not meet the referenced code requirements if the occupant can exit (or leave the room) by manually turning the latch/lever set. In other words, electronic strikes are often used as part of an electronic access

control system for entering a room without providing electronic access control for exiting a room, and thereby eliminating the need for the push-button and motion sensor to deactivate the electronic strike.

2. Mag-locks must unlock with activation of the fire alarm as prescribed by code. As a safeguard however, a door contact may be placed with the mag-lock that activates a camera to record the door in the event of entry or exit during a fire alarm.
3. A possible alternative to mag-locks is the use of electronic strikes with card-reader on outside wall face.
4. A door contact may be provided to signal an alarm of unauthorized entry or exiting.
5. The outside card-reader may retract (or unlock) the electronic strike, as well as shunt the door contact, thus allowing entry without alarm.
6. A second card-reader may be provided on the inside wall face to shunt the door contact upon exiting. Leaving the room without use of the card-reader activates an alarm.
7. The interior card-reader need not control the electric strike. Exiting the room need only require manually turning the lock/lever set.
8. The card-readers on the inside face and on the outside face may interface with the "head-end equipment" and provide an audit trail (recording who entered when).
9. The door contact may also activate a camera to record the event when the interior card-reader is not utilized to exit.

10. Electronic strikes are becoming more powerful and are available with holding power equal to or greater than mag-locks. Prior to "9/11", most Grade 1 electronic strikes had a holding force of less than 1000 pounds, thus creating the weakest point of a typical commercial-grade, metal door, frame and hardware assembly. However, current electronic strikes are available with holding power near 3000 pounds. It's interesting to note that mag-locks, once provided to strengthen the door assemblies, are manufactured by fewer and fewer sources, probably as a result of their vulnerabilities related to fire alarm activations.
11. Doors may swing in or out with this option, unless the occupant load exceeds 500, in which case they must swing out and there must be two exit doors per code requirements. If two doors are required by code, they are both considered 'means of egress' and must comply with the access control requirements. A sign should be placed on the inside door face indicating that exiting without use of card-reader will activate an alarm (and camera).
12. Electronic strikes utilized with existing door-frames must be selected to properly interface with all existing lock/lever sets' latches and frame profiles. It is not uncommon to retrofit existing doorframes with a variety of electric strike sizes as a result of the variety of existing latch configurations or variety of unusual frame profiles. If retrofit work is needed, proper surveys are required to verify existing latch configurations and frame profiles. Or, existing lock/lever sets may be replaced with lock/lever sets with latches that properly fit the new electronic strikes. If this is done, proper surveys are required to verify existing door cutout characteristics.
13. Existing latch/lever sets may also need replacement with new sets that have the ability and function to allow free exiting without use of keys or special requirements. Again, proper surveys are required to verify adequacy of existing latch/sets to allow free exiting with electronic strikes. Should electronic methods be required to retract the electric strike from the inside to allow exiting, then this situation is considered access control for both entering and egress and all the provisions listed above must be met. In other words, motion sensors and push-buttons are required and the system must interface with



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the building's electrical power system and fire alarm system to "fail safe" as described above.

14. Providing electronic strikes in existing doorframes is done frequently with wiring concealed within "hollow" stud walls. Unfortunately, grouted frames that abut mason and even stud walls will require additional work to modify the frame. With this situation, exposed wiring is usually required and is placed in conduit on the protected side along the doorframe. It is important to verify and indicate doorframe construction characteristics, including grouted and non-grouted frames, in the Contract Documents, as this may be a

source of additional costs for the Contractor.

15. Double doors present more complicated issues for electronic strikes. Efforts are required to match the electronic strike with the various latch points that may include top and side locations. Often the electronic strike is placed at the secondary "inactive" door and therefore requires internal wiring path and electrified center hinge. Further considerations for double doors are beyond the scope of this paper.

ADDITIONAL CONSIDERATIONS:

1. I have experienced owners' employee unions or employee representation organizations objecting to the concept of

card-to-exit systems in several organizations. The owner should consider the implications of card-to-exit systems with employee unions or employee representation organizations before commitment to this system.

2. Building code officials and fire department officials have numerous and conflicting opinions with regard to a card-to-exit systems and should be part of the planning team prior to implementation.
3. Card-to-exit systems may not be appropriate for areas with unusual or special circumstances. This may include secured rooms where occupants are required to comply with higher levels of standard, such as



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“evidence” storage rooms, where “custody trail” legal considerations play an important aspect in the overall security planning. Unfortunately, the state of current technology, coupled with possible deviant behavior, such as the piggy-back opportunities for entry and exiting, may be considered to violate the custody trail considerations. In such cases, the old fashion deadlock with the key held by restricted personnel, or one-person turnstiles, appears to work best. However, door contacts that activate camera recording when the door is opened may enhance the security aspects of these types of rooms.

4. A card-reader system may have an “anti-pass back com-

ponent” that will not allow the same card to be read twice to enter or exit. However, this system does not prevent “piggy-back” occupants that exit with someone else who provides a valid card read. An anti-piggy-back type of system requires a turnstile with arms or sensor “electric-eyes” that respond to the number of occupants passing with valid card read, or a system with doors placed in a series, thus creating a “man-trap”.

5. Intrusion detection systems (IDS) that use motion sensors to detect motion or heat (change) within a room and that are interfaced with the exterior card-reader and alarm system may be considered. Activation of the IDS triggers

an alarm. This system offers a second line of defense in the event of a breach or by-pass of the door security system. Activation of the outside card-reader may shunt the interior IDS system in addition to deactivating the access control devices. A card-to-exit system may also interface with the IDS to reactivate the system upon exiting. However, if the card-to-exit system is not utilized then manual activation is required. I know of no IDS “hands-free” system that automatically reactivates an IDS system when an occupant leaves a secured room. (And I’ve tried to create such systems without success). In this case, a sign is necessary to advise the occupants to reactivate the IDS system prior to leaving.



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- Architectural hardware to enhance and interface with the electronic devices should be considered. Hardware includes door closers for all doors with access control or door contacts, coordinators for double doors with access control or door contacts, and latch guard plates for out-swing single doors with electronic strikes. Latch guard plates must be coordinated with the particular size of the electronic strike.
- Architectural elements such as hardened walls with metal mesh, full height walls, and louver and wall opening protection should also be considered.
- Regardless of the systems used, the owner should develop and provide written procedures, protocols and expectations for the access control systems to their staff and visitors.

This article touches on the basis code requirements and planning principles for card-to-exit systems. Every security situation, whether within new buildings or existing buildings, presents unique circumstances and conditions that will likely arise during the planning and application of the work. These challenges may differ from the concept level information presented in this paper. The reader is urged to obtain additional consultation, advice and opinions from professionals for their specific projects. 

About the Author: *Scott Detienne, RA, CPP, CCS, BSCP, AHC, is a senior project architect with the URS Corporation and has been involved in renovation, rehabilitation and design issues for government facilities, with focus on security integration and building hardware upgrades, for the past 25 years. He can be contacted at Scott Detienne/WashingtonDC/URSCorp.*