



ALLEGION™

Article

Electromagnetically locked egress doors: Safe or unsafe?

By David Glorioso, AHC

Specifying door hardware is a complex process. Is everything compliant with all applicable codes? How do you balance safety and security with convenience and efficiency? With electronic to mechanical options, door hardware is not a one-size-fits-all solution. So it's important to understand when and where certain types of hardware should and shouldn't be used.

For example, when selecting an electrified locking device for a specific application, a consultant should exhaust all electromechanical options before specifying electromagnetic locks. Why? Because of the inherent nature of an electromagnetic lock. This is especially true with respect to assembly and educational occupancy groups. In my opinion, electromagnetic locks should never be specified on egress doors in these two occupancies — especially on doors requiring panic hardware.

Why? Let's take a look at how this product operates. An electromagnetic lock is essentially a large electromagnet in a rectangular housing that is mounted on the door frame and a steel armature mounted on the door. These products use electromagnetism to control the entire locking mechanism. When power is applied to the locking device, an electromagnetic force bonds the armature and lock together, securing the opening with more than 1,500 pounds of holding force. An electric switch is the only means by which access or egress is accomplished.

This seems secure, right? It is. It's very secure, in fact. But is it safe? In my opinion, not when it's installed as currently allowed by the model codes — with door-mounted hardware to release the lock, and without a secondary switch or connection to a fire alarm or sprinkler system. According to the International Building Code (IBC) and NFPA 101 — The Life Safety Code, if the electromagnetic lock is released by door-mounted hardware, the lock must be unlocked by a switch in the panic hardware, sensor bar or lever handle, and also by



loss of power. This could potentially put the building's occupants at risk should the switch fail during an emergency.

There is a separate section of the model codes that addresses electromagnetic locks released by a sensor detecting an approaching occupant instead of the door-mounted hardware. For this application, the model codes require two additional safety features. In addition to the sensor, the lock must also be released by activation of



ALLEGION™

the fire protection or detection system and by an emergency override button beside the door. I believe that these additional release methods should also be required for electromagnetic locks released by door-mounted hardware.

Evolution of changes

Prior to the 2009 editions of the IBC and NFPA 101, these codes only addressed the use of a sensor to unlock an electromagnetic lock, and did not include the section that applies to electromagnetic locks released by door-mounted hardware. The original section required a primary sensor switch that would detect a person as he or she approached and unlock the door to allow egress. The lock was required to unlock immediately upon loss of power, so battery backup was not allowed. It also had to connect to an approved fire alarm or sprinkler system and required a secondary switch mounted on the wall as a backup means to release the magnet. Specification of electromagnetic locks was more difficult than specifying other products, as the specifier had to coordinate with multiple systems to ensure that the door would allow code-compliant egress.

In the 2009 edition, the IBC and NFPA 101 introduced new sections which permit electromagnetic locks to be released by a switch in the door-mounted hardware, without some of the release methods required for electromagnetic locks released by a sensor. For the door-hardware-release application, the new model code language did not mandate the secondary switch, or require the device to be connected to a fire alarm or sprinkler system. These are my two biggest concerns with the 2009 changes. The IBC did, however, state that electromagnetic locks could not be used on assembly or educational occupancies where panic hardware or fire exit hardware was required. But this limitation was removed in the 2012 edition as long as the panic hardware would release the electromagnetic lock.

The reason I believe it was a mistake to omit the backup connections to a secondary switch and fire alarm system is because these devices are unlike other hardware components — electrified or mechanical. With an electromechanical device, there is always a mechanical means to release the latch. But with electromagnetic locks, there is no mechanical means to release the magnetic force

that is locking the door. I imagine this is why the model codes included such rigorous requirements in the past. So, I was alarmed to find that the 2012 and 2015 editions of the model codes not only continued with this language, but also permitted these systems to be used on openings in assembly and educational occupancies where panic or fire exit hardware is required.

Concerns

The 2015 editions of the IBC and NFPA 101 are the most current version available, so these practices are acceptable by the code. But I advise architects, specification consultants and others in our industry to consider the concerns before choosing an electromagnetic lock to secure an egress door.

Electromagnetic locks are fail-safe in that the door will be unlocked if there is a loss of power. But what happens if the switch fails, unrelated to a power outage? Electromagnetic locks are designed to be incredibly secure and strong, using 1,500 pounds or more of holding force between the magnet and armature. However, it's that same force that could impede egress in the event a switch fails, which can happen.

If there is an emergency in an assembly or educational facility, the occupants rely on panic hardware on egress doors to allow them an easy way out of the building. What happens if the switch in the panic hardware fails to release the electromagnetic lock in a panic situation? There is now nearly a ton of holding force keeping that door closed with no mechanical means to override the magnetic holding force. Pushing on the panic hardware will release the latchbolt, but the switch inside has failed, leaving it unable to release the holding power of the magnet. And it's not connected to a fire alarm or sprinkler system because the code doesn't require it. In addition to that, there is no secondary switch because, again, the code doesn't require one.

I wouldn't want to be in a building where safety was reliant upon a single switch controlling an opening with an electromagnetic lock on it. While Allegion rigorously tests the switches that are used inside its panic hardware and latchsets to release the magnetic force, that's not



ALLEGION™

mandated across the industry. The cycle requirements for these locking systems are set forth by UL 294 and other industry standards, which do not require the same rigorous testing as the standards for panic hardware. So why would we let the safety of future building occupants rely on a switch without a backup means of unlocking the door? And why would we allow it in assembly and educational facilities?

Solutions that go above and beyond for safety

The best practices are what many architects are already doing on a daily basis. If a project has an opening where panic hardware is required on the push side and the client wants a card reader on the pull side, there are other solutions that can deliver the same functionality.

Electric latch retraction panic hardware. On the pull side, you present a credential and it sends power to the panic hardware, which retracts the latchbolt so you can open the door. From the push side, you don't have to worry about the holding force of an electromagnetic lock, you don't have to worry about whether the switch fails. You just use the push pad to open the door, which should require no more than 15 pounds of force.

Panic hardware with electrified trim. When you present your credential on the pull side it unlocks the lever handle, allowing you to operate the lever handle and open the door. Again, on the push side there is no need to worry about any electronics; simply push on the panic hardware and go.

Electric strike. An electric strike can also be used in conjunction with panic hardware. The swipe of a credential energizes the electric strike, allowing you to pull the door open. If you're leaving, it's as easy as pushing on the panic hardware. Electric strikes are also a viable option for openings on which panic hardware is not required. In these instances, a storeroom function lock is usually specified to ensure that the electric strike is the primary means of unlocking the door. Once again, the lever-handle on the inside is always unlocked to allow free egress at all times. It's a mere mechanical operation performed by an occupant and is not reliant upon any internal switch.

Electrified lock. Another electromechanical option available for openings that are not required to have panic hardware is an electrified lock. Available in both cylindrical and mortise lock platforms, the electrified lock provides the same functionality one would get from an electric strike. The only difference being that the lever-handle on the locked side of the opening is the part which is electrically controlled. When a signal is received to unlock the opening, the lever handle is unlocked to allow the authorized individual to enter. Yet, as with the other electromechanical options, the lever on the inside of the opening is always unlocked to allow building occupants to freely egress at all times.

I believe that electromagnetic locks can be beneficial in some applications as a last resort — when all other means have been exhausted. For example, an all-glass door with no metal vertical stiles in a commercial office building would prevent the use of an electrified lockset or electric strike. In these instances, I may recommend electromagnetic locks if panic hardware is not required, but only if the electromagnetic locks are released by primary and secondary switches and are released by the fire alarm or sprinkler system. Ultimately, I follow the pre-2009 model code requirements.

Occasionally hospitals have pairs of double egress doors that need to be locked. Because they are double egress and require panic hardware, securing the opening requires an electromagnetic lock. A card reader is usually what controls the locking and unlocking of such openings. Unfortunately, you cannot use a secondary switch for these applications, but I still make sure that it's tied to the fire alarm system. In addition, a hospital is a 24/7 facility with trained personnel available at all times. Hospitals are also considered "defend-in-place" facilities, since many of the occupants are incapable of self-preservation. This fact mitigates much of my concern normally associated with electromagnetic lock applications.

The goal is to provide the safest possible environment for the building owner and future occupants, while maintaining the appropriate level of security and convenience. I sincerely hope it doesn't happen, but I could see an instance where

there could be a loss of life because of the way the language is written in the current codes. I hope others will join me in going beyond the current code requirements to ensure safe and secure environments — ones that leave no room for doubt in the event of an emergency.

David S. Glorioso, AHC, is a thirty-three year veteran of the door and hardware industry. He is an architectural consultant at Allegion, previously Ingersoll Rand Architectural Hardware. During his tenure, David has worked in various markets for the company, including Florida, Michigan, Indiana and Ohio. While he has fulfilled various roles within the company over the years, most of his time has been spent developing relationships with the architectural community and assisting the various firms in developing the hardware specifications for their respective projects.

Code call out

Electromagnetically locked egress doors (2015: 1010.1.9.9; 2012: 1008.1.9.9; 2009: 1008.1.9.8; 2006, 2003: n/a)

- Egress doors in Group A, B, E, I-1, I-2, I-4, M, R-1 or R-2 occupancies may have electromagnetic locks in addition to listed hardware that has a built-in switch and meets the following requirements:
 - The listed hardware which releases the electromagnetic lock is mounted on the door leaf
 - The operation of the listed hardware is simple and obvious
- The listed hardware can be operated with one hand in all lighting conditions
- When the listed hardware is operated, the power to the lock is directly interrupted, and the electromagnetic lock releases, unlocking the door
- Loss of power to the locking system automatically releases the electromagnetic lock, unlocking the door
- When panic hardware is installed on a door with an electromagnetic lock, operation of the panic hardware releases the electromagnetic lock, unlocking the door (Note: The 2009 edition of the IBC states that this section may be used for doors that are not required to have panic hardware, but this was not the intent and the code has since been changed.)
- Door locking system must be listed in accordance with UL 294.

Sensor release of electrically locked egress doors (2015: 1010.1.9.8; 2012: 1008.1.9.8; 2009: 1008.1.4.4; 2006, 2003: 1008.1.3.4)

- Entrance doors and entrance doors to tenant spaces in groups A, B, E, I-1, I-2, I-4, M, R-1 or R-2 may be equipped with an approved entrance and egress access control system installed in accordance with all of the following:
- Sensor on egress side must detect an occupant approaching the door and door must unlock by a signal from or loss of power to the sensor
- Loss of power to locking device must unlock the door
- Door shall unlock by a readily-accessible manual unlocking device (push button) marked “Push to exit”, located 40 inches (1016 mm) to 48 inches (1219 mm) above the floor within 5 feet (1524 mm) of the door
- Manual unlocking device must interrupt power to the lock, independent of the access control system, door must unlock for 30 seconds
- Fire alarm and/or sprinkler system must unlock the door until system is reset
- Entrance doors in groups A, B, E and M must not be secured from the egress side when the building is open to the general public
- System must be listed per UL 294

About Allegion

Allegion (NYSE: ALLE) is a global pioneer in safety and security, with leading brands like CISA®, Interflex®, LCN®, Schlage®, SimonsVoss® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion produces a range of solutions for homes, businesses, schools and other institutions. Allegion is a \$2 billion company, with products sold in almost 130 countries. For more, visit www.allegion.com.

KRYPTONITE ■ LCN ■  ■ STEELCRAFT ■ VON DUPRIN



© 2017 Allegion
011955, Rev. 10/17
www.allegion.com/us