SPECWORK

CSI®
LITTLE ROCK CHAPTER

Little Rock Chapter - Chartered November 1965 January 2024

In This Issue

LITTLE ROCK CHAPTER
CONSTRUCTION SPECIFICATIONS INSTITUTE

President's Message

January 2024

Here we are starting 2024 with our New Years' Resolutions, our Goals, and our Hopes and Dreams for a wonderful new year. I know many of you are wondering where we are headed in 2024. As I said in December, One Goal is to increase our active membership and to get younger people involved.

I am 67 years old and have been a member of CSI since 1998. I have witnessed many changes and challenges overcome, but the one thing we need most of all is new blood at the helm. While we seasoned members do our best to understand this world of internet, social media, and all things electronic, we come from a much different world and cannot always grasp the ins and outs of the electronic age.

That is where you come in. We need you to usher us into your would. We need to know how to connect to the younger generations and we especially need the younger generation to step up and take over the reins of the Chapter, Region and Institute.

How about joining in on the fun, give us old timers some lessons in how things are done.

I am looking forward to the upcoming year and I hope that I will see a great deal more of the younger generations getting involved.

Billy J. Mathis, FCSI, CDT
Newsletter Editor and Secretary of the Little Rock Chapter.

"Diversity is a fact. Equity is a choice.

Inclusion is an action.

Belonging is an outcome."

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CALENDAR OF EVENTS

Wednesday, November 8, 2023	Event Cancelled	Rescheduled to January
DECEMBER	Closed for the Holidays	
Wednesday, January 10, 2024	**Barry Hillyer, Hillyer Sales**	**Introduction to Pultruded FRP Façade Attachment Systems (1 AIA LU/HSW)**
Wednesday, February 14, 2024		

If you have a Program that you feel would be interesting to the Membership and Guests, please contact Melissa at mjaguiar@garverusa.com or me at bjmathis@taggarch.com

Introduction to Pultruded FRP Façade Attachment Systems (1 AIA LU/HSW / GBCI / 1 IIBEC CEH)

Presenter: Barry Hillyer / Hillyer Sales

CSI LITTLE ROCK CHAPTER

STRONGWELL

In this session, Architects, Engineers, and Designers who work with exterior cladding systems will receive an introduction to pultruded fiber-reinforced polymer (FRP) composites and their characteristics as structural building materials. Using this information, session participants will be able to demonstrate how FRP girts can be used for a cladding support structure and simultaneously create a thermally efficient wall. Participants will be able to define continuous insulation (CI) systems per ASHRAE 90.1 and differentiate FRP CI systems vs. traditional steel girt systems. Finally, participants will be able to obtain the necessary design resources to integrate FRP CI systems in future projects.

Learning Objectives:

- describe the beneficial characteristics of pultruded fiber-reinforced polymer (FRP) composites used as building materials, including how this will impact the user's experience living/working in the building.
- identify the relevant codes and standards that apply when using FRP as a building material and discuss their application in common architectural designs.
- demonstrate how FRP girts can be used for a cladding support structure and simultaneously create a thermally efficient wall, and specifically address how this benefits occupants of the building.
- obtain and utilize the necessary design resources to integrate FRP CI systems in future projects to foster increased efficiency and longevity of structures for building owners and occupants.

Wednesday - January 10, 2024 / 12:00 – 1:00 pm

Location - Garver Engineering Office, Third Floor Academy Room
4701 Northshore Drive, North Little Rock, Arkansas 72118

PLEASE JOIN US AT THE GARVER OFFICE FOR A PRESENTATION. WE WILL PROVIDE LUNCH TO ALL ATTENDEES DURING THE PRESENTATION.

PLEASE RSVP ASAP AS TO WHETHER YOU WILL BE ATTENDING.

Thinking about taking the Certification Test
for the
Construction Document Technologist (CDT) this Spring.

The Nashville Chapter of CSI will hold CDT Classes again in 2024. The “CDT 2024 class Information & Agenda / Calendar” is posted on our Nashville CSI Chapter website:

https://csinashville.org/ click on Certification. Please forward this invitation to anyone that may be interested.

If you would like to attend the on-line classes, register by downloading and completing the registration form on the Nashville CSI web-site. Send to: **CManka@comcast.net**

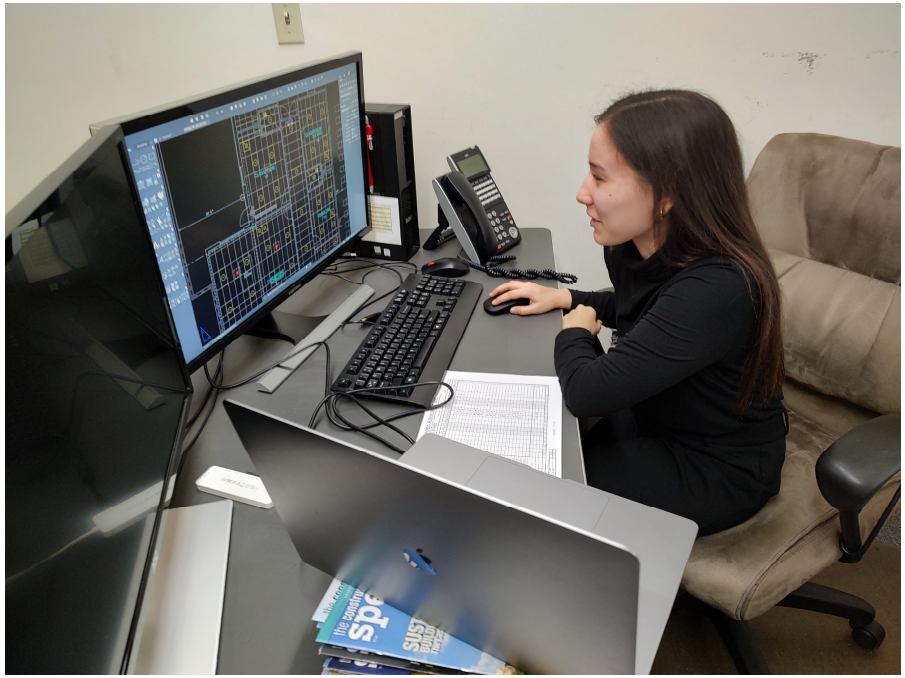
Thank you for your interest and let me or Lynn Jolley **LJolley@comcast.net** know if you need more information.

What I Learned From CSI - Architecture Student Shadows Local CSI Members at Work:

By: Gary Bergeron, CSI, CCS, GSR Technical Chair

CSI friends, I'd like to introduce you to Karina Kane who is a third year architecture student at the University of Tennessee College of Architecture and Design. (CoAD)

It all started with a text message from our chapter president who asked if I knew of an opportunity for a student to do some job shadowing in the local AECO industry. Karina was originally supposed to shadow at a local combined A/E firm but the schedules didn't work out. Luckily for our firm, Kelso-Regen, she called and asked if there was an opportunity to shadow at our firm over her Christmas break.



We started the morning with some samples of fire sprinkler heads that are used in several different types of buildings. Karina was shown a church floor plan that our office was currently working on and we showed how the sprinkler heads for light hazard occupancy where located in both acoustical tile ceilings and exposed structure. She was a quick study and offered to finish the sprinkler design intent drawing showing the all the sprinkler heads in the church. After a review of her work, we corrected a few discrepancies.
Karina attended a progress meeting on the church with the architect, owner, electrical engineer, civil engineer, and myself on the following day. It was at the progress meeting that Karina observed that the architect is like the conductor of the orchestra of engineers, contractors, and owner. After the progress meeting we visited three architectural firms and one electrical engineering firm that have several female team members. Karina was able to observe the offices and obtained several business cards for future contacts. Later in the day, we also performed a site visit with another architect, contractor, and engineers to evaluate the existing conditions of a building. This was at a halfway house that was being renovated and doubled in size with new construction.

We believe that Karina learned several things in the two days she shadowed us at our engineering firm and will be welcomed back at any time. If an architectural firm is interested in Karina's abilities we can provide stellar references.

UPDATE: Karina has returned to our office this week to work on several other projects including a wedding event center, a veterinary clinic, and a warehouse. Karina will also be going on a site visit to a major expansion and renovation of a Kroger grocery store. We are considering offering Karina a part time position while she completes her architecture degree.

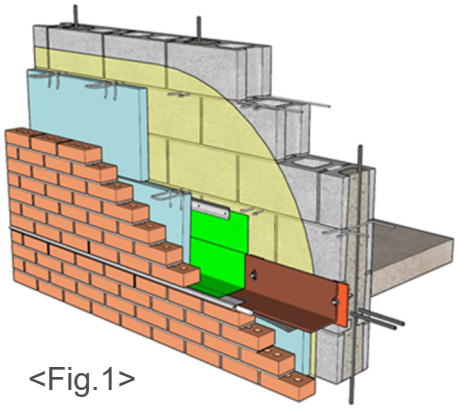
Shelf Angles in Masonry Veneer Walls

By: Scott Conwell, FAIA, FCSI, CDT, LEED AP

Shelf angles in masonry veneer walls add cost and are not always necessary. So why use them? The truth is, there are ways to design around the masonry code's prescriptive requirements for shelf angles allowing us to minimize, or in some cases, eliminate shelf angles altogether.

Perhaps the biggest myth is that shelf angles serve a structural function. They do not. Their purpose is to provide a continuous horizontal expansion to accommodate vertical movement of the veneer below the angle. This video clip shows a classic example of a steel shelf angle, protected with flashing of course, with a horizontal expansion joint below.

Depending on the height of the wall, the locations and pattern of openings, and whether all the movement can be taken at the top of the wall, alternative movement strategies can sometimes be employed that help minimize the use of shelf angles.

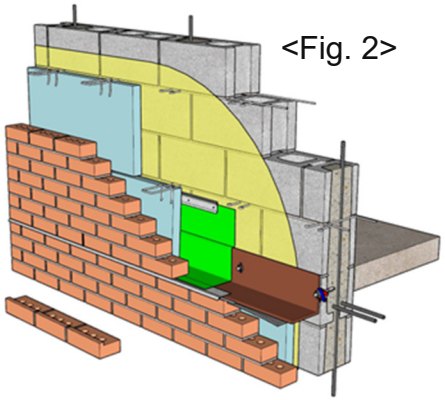


<Fig.1>

Some designers have concerns about the wide horizontal expansion joint resulting from the thickness of the angle's leg added to the width of the expansion joint when a conventional non-lipped brick is used.

First of all, this condition is most likely 30 feet or more above ground level, so a horizontal joint that is 5/8" or 3/4" instead of 3/8" will probably be imperceptible. Secondly, any good union bricklayer can compensate for that wide joint in the coursing above and below and still hit their required elevations.

In special circumstances, if the joint is at eye level and requires the more typical 3/8" width, a lipped or notched brick may be used. These units are typically fabricated at the manufacturing plant, but they could be field-cut. This video clip shows that it's a simpler flashing installation to install the lipped brick below the angle rather than above it.

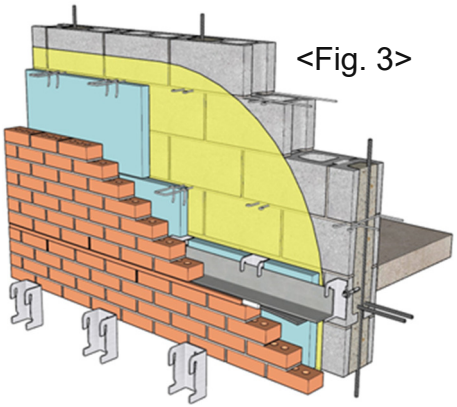


<Fig. 2>

While the strategic use of shelf angles in a masonry veneer wall can effectively manage vertical movement of the veneer, continuous direct contact between the angles and the backing wall can compromise the wall's thermal performance.

Masonry's thermal mass makes it inherently good for heat storage, and the ability to place continuous insulation (CI) in the cavity of a multi-wythe wall even further enhances thermal performance. However, heat loss can occur when a thermal bridge like a continuous steel angle interrupts the CI. Fortunately, there are many ways to avoid this condition.

"Standoff" devices serve to separate the shelf angle from the backing wall and allow for CI to pass behind the angle uninterrupted. These mechanisms can take many forms, from off-the-shelf clip angles to proprietary brackets. A good standoff device will be adjustable, allowing the shelf angle to be installed level and the veneer to be installed plumb. This video clip shows some examples of standoffs.



<Fig. 3>

Whether you love or hate them, you shouldn't be using shelf angles when you don't need to, and when you do, please be smart about it. Here are a few key points to take away:

Shelf angles solve a movement problem, not a structural problem.

Use shelf angles sparingly.

Protect shelf angles with flashing.

Simpler details tend to be better.

Project the shelf angle from the backing wall to maintain continuity of insulation.

For downloadable details on shelf angles and other common masonry conditions, visit International Masonry Institute's Masonry Detailing Series (MDS) web page at https://imiweb.org/detailing-series/.

Video 1: Conventional shelf angle design: https://www.linkedin.com/feed/update/urn:li:activity:7125443873648115712/

Video 2: Shelf angle with lipped brick: https://www.linkedin.com/feed/update/urn:li:activity:7130532407362940928/

Video 3: Shelf angle with standoffs: https://www.linkedin.com/feed/update/urn:li:activity:7134888636138881024/

Decoded: NFPA 80 Requirements for Hinges, Pivots, and Continuous Hinges

By: Lori Greene - I Dig Hardware Blog

With the continued focus on fire door assemblies, it's important to be familiar with the basic requirements as well as what has changed in the more recent codes and standards. This article focuses on hinge requirements for fire doors, as mandated by NFPA 80 – Standard for Fire Doors and Other Opening Protectives.

Incorrect or missing fasteners can impact the performance of a fire door – both functionally on a day-to-day basis, and during a fire.

Each edition of NFPA 80 refers to several ANSI/BHMA standards for hinges, including A156.1 (Butts & Hinges), A156.4 (Door Controls – contains pivot requirements), A156.17 (Self-Closing Hinges and Pivots), and A156.26 (Continuous Hinges). These standards contain detailed requirements about hinges, spring hinges, pivots, and continuous hinges. The edition of a referenced standard may vary from one edition of NFPA 80 to the next, so refer to the applicable edition of NFPA 80 to verify the effective date of the referenced standard.

Standard hinges are not typically required to bear a label indicating that they are listed for use on a fire door, but they must comply with the applicable referenced standard. Spring hinges must be labeled, as well as meeting the Grade 1 standards of A156.17. All hanging devices – hinges, spring hinges, continuous hinges, and pivots, must be provided as specified in the door and hardware manufacturer's published listings or in accordance with NFPA 80. Various types of hinges are referenced in Annex A of NFPA 80, including 5-, 3-, and 2-knuckle hinges, full-mortise, half-mortise, full-surface, and half-surface hinges, and spring hinges, wide-throw, raised-barrel, and swing-clear designs.

A table within NFPA 80 includes a lot of important information about hinges for fire door assemblies. In recent editions of the standard, it is Table 6.4.3.1 – Builders Hardware: Hinges, Spring Hinges, and Pivots. The table specifies the minimum hinge size, type, and thickness, based on the door rating, width, and height. This table should be consulted to determine the correct hinge for each fire door assembly. For example, a steel hinge, mortise or surface-mounted, on a fire door that is 3 feet wide and 7 feet high must be at least 4 1/2 inches high and 0.134 inches thick. The maximum door size shown on this table for spring hinges is 3 feet wide and 7 feet high, so spring hinges installed on larger fire doors must be listed by the manufacturer for the appropriate door size.

Spring hinges are defined by NFPA 80 as, "A closing device in the form of a hinge with a built-in spring used to hang and close the door." When spring hinges are installed on a fire door, NFPA 80 requires at least 2 spring hinges to be used, but does not specify which hinge locations the spring hinges must be installed in (top, center, or bottom hinge positions). Annex A suggests that spring hinges should be adjusted so that the door will latch properly when allowed to close freely from an open position of 30 degrees. This may be difficult to achieve long-term, and door closers are often used on fire doors because they provide greater control of the door and more reliable operation.

Using foam insulation to fill an existing hinge prep on a fire door assembly is not a method that is allowed by the manufacturers' listings.

Fire door assemblies are required to have an adequate quantity of hinges as specified in the standard. A door up to 60 inches in height must have two hinges. Doors over 60 inches tall are required to have one additional hinge for each additional 30 inches of door height (or fraction thereof). For example, a 90-inch door would have 3 hinges, and a 100-inch door would have 4. Annex F – Door Hardware Locations, includes diagrams showing hinge locations for different types of swinging fire doors, but it's acceptable for a manufacturer's listings to allow hinges in alternate locations. NFPA 80 states that the distance between hinges may be greater than 30 inches.

NFPA 80 requires all hinges and pivots to be ball-bearing type, except for spring hinges, but other antifriction bearing surfaces are allowed if they meet the requirements of ANSI/BHMA A156.1 – Standard for Butts and Hinges. For hinges that are not of the ball bearing type, or are of lighter weight than what is allowed by Table 6.4.3.1, the hinges may be used if they are part of a listed assembly, and meet the test requirements of A156.1, and they have been tested to a minimum of 350,000 cycles. Pivot sets which are smaller or lighter weight than the minimums shown in Table 6.4.3.1 must meet the requirements of A156.4 – the standard for door controls (which also includes pivot requirements), and must be in accordance with the manufacturer's label service procedures.

New requirements for pivots were added to NFPA 80 in the 2013 edition. The standard now mandates the quantity of pivots required for fire doors – a pivot set consisting of a top and bottom pivot and one intermediate pivot for doors up to 90 inches in height. For door heights greater than 90 inches, an additional intermediate pivot is required for each additional 30 inches of door height, or fraction thereof. NFPA 80 also allows the use of only intermediate pivots rather than a top and bottom pivot set. In some cases, this application is preferred for aesthetic reasons or because of the design of the frame. If only intermediate pivots are used, the quantities are the same as the requirements for hinges – two intermediate pivots for doors up to 60 inches in height, and an additional intermediate pivot for each additional 30 inches of door height or fraction thereof.

When hinge reinforcements become damaged, creative modifications like this one can result in a non-code-compliant fire door assembly.

Requirements for continuous hinges were also added to NFPA 80 in the 2013 edition. Continuous hinges must be labeled and are required to comply with ANSI/BHMA A156.26, the standard for continuous hinges. The standard states that the length of continuous hinges must be within 1 inch of the height of the door leaves. Continuous hinges manufactured from steel, stainless steel, and aluminum are available for use on fire door assemblies, but only labeled continuous hinges may be used. When a continuous hinge is installed on a fire door assembly, labels that would be covered on the door and/or frame should be attached in an alternate location so they are visible for the life of the assembly. If a door or frame was prepped for standard hinges, and a continuous hinge is installed, the existing hinge preps need to be addressed in a manner that is acceptable per the manufacturer's published listings.

One of the common problems regarding hinges on fire doors is related to the failure of the fastening method. Hinges are required to be secured as described in the manufacturer's installation instructions and published listings. The standard specifies the type of fasteners that must be used – steel machine screws to secure mortise hinges to reinforcements in a door, and steel wood screws (No. 12 x 1 1/4 inch flat, threaded-to-the-head) for mortise hinges attached to wood and composite doors. Pilot holes must be drilled for these fasteners (5/32-inch in diameter). Steel through-bolts are required for surface-mounted hinges. For attachment to the frame, hinges must be secured with steel screws, but the type of screw will vary depending on the frame material.

Hinges on fire doors may be shimmed, but steel shims must be used. Shims of cardboard, wood, plastic, or other materials do not meet the requirements of NFPA

In some cases, hinges must be shimmed during or after installation to properly align the door in the frame and bring clearances into compliance with NFPA 80. Shimming is allowed, but steel shims must be used. If correct clearances cannot be achieved by shimming the hinges, the NFPA 80 Handbook suggests adjusting compression anchors and/or repositioning sill anchors on slip-on drywall frames, or removing and reinstalling the frame. It's much less disruptive to shim the hinges if possible, but shims of cardboard, wood, or other materials are not allowed for use on a fire door assembly.

The hanging components – hinges, pivots, and continuous hinges – are just one part of a fire door assembly, but they play an important role. If the hinges are specified, supplied, or installed incorrectly, the door will not swing freely. Incorrect fasteners may cause the door to sag or even come loose from the frame. Clearances can be affected by this misalignment, and the door may not close and latch properly, impacting the ability of the assembly to deter the spread of smoke and flames during a fire. The inspection requirements of NFPA 80 include verification that all components of a fire door assembly, including the hinges, *"are secured, aligned, and in working order with no visible signs of damage;"* Annex A indicates that hinges are one of the items that are especially subject to wear.

Quick Question: Product Certification to Codes and Standards

By: Lori Greene, I Dig Hardware Blog

This Quick Question has come up quite often over the years – I was shocked to find that I had not yet answered it here:

Is XYZ product certified as compliant with NFPA 101 (or any other model code)?

No matter which piece of hardware or model code we're talking about, the short answer is no. Products are not certified to NFPA 101 – Life Safety Code, the International Building Code (IBC), or the International Fire Code (IFC). The same goes for many referenced standards, like NFPA 80 – Standard for Fire Doors and Other Opening Protectives, and ICC A117.1 – Accessible and Usable Buildings and Facilities. These are not test standards. Doors, frames, and hardware are not tested or certified to these publications.

Here's an example: I was recently asked whether a particular electric strike was certified to NFPA 101. Let's not get hung up on the word "certified" (as I said before, the answer is no) – I can't say whether the strike is compliant with NFPA 101 either. The answer depends on the application:

- What kind of lockset is being used along with the electric strike? Is it a function that allows free egress without the use of a key, tool, special knowledge or effort?
- Is the strike being installed as part of a fire door assembly? If so, is it fail secure and listed to UL 10C?
- Is it a fire door that needs to allow for stairwell reentry and also remain positively latched?
- Does the opening require panic hardware, and if yes, is the strike of the correct type?
- Does the door unlatch with one releasing motion, and without tight grasping, pinching, or twisting of the wrist?
- Is the releasing hardware mounted between 34 inches and 48 inches above the floor?

The list of questions goes on and on, and it's up to the hardware consultant or other professional responsible for product selection to determine whether a particular application meets the requirements of the adopted code or reference standard. There is no simple answer or certification to verify this – if it was easy, it would be called easyware!

Note that some standards referenced in the model codes ARE test standards – products may be certified to these standards. For example, NFPA 101 requires panic hardware to comply with ANSI/BHMA A156.3 – Exit Devices. To determine whether a particular panic device is compliant, you can refer to the BHMA Certified Products Directory (https://buildershardware.com/Certification-Program/Certified-Products-Directory). The same applies to test standards like UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies. The list of products certified to this standard can be found in UL's Product iQ database. (https://productiq.ulprospector.com/en).

Quick Code Q&A: Delayed Egress in Mercantile Occupancies

By: Lori Greene, I Dig Hardware Blog

Delayed egress hardware is often used on emergency exits in retail stores to deter unauthorized egress and/or theft.

With the holidays approaching, we may spend more time in mercantile occupancies looking for the perfect gifts for friends and family. So, I wanted to focus on delayed egress hardware for this Quick Code Q+A. This type of hardware is often used on emergency exits in retail stores to deter unauthorized egress and/or theft.

This special locking arrangement is designed to keep a door locked in the direction of egress for 15 seconds or 30 seconds as allowed by the Authority Having Jurisdiction (AHJ). The timer is actuated by an attempt to exit when a force of not more than 15 pounds is applied for up to three seconds. The actualization of the hardware triggers an audible alarm at the door.

It is important to note that delayed egress hardware is not allowed in all occupancies, and the model codes include several requirements to ensure a balance of life safety and security. Since being introduced in 1981, the codes around delayed egress hardware have evolved. Because there are differences between the International Codes (I-Codes) and the National Fire Protection Association (NFPA) codes, it is recommended to verify which codes (and editions) have been adopted in the project's location and if there are amendments or additional requirements to consider. The following answer will focus on requirements listed in the I-Codes; for NFPA requirements, refer to NFPA 101-2021: 7.2.1.6.1 – Delayed Egress Electrical Locking Systems.

Question: What is required for code-compliant delayed egress hardware?

As delayed egress locks are not permitted in all occupancy types, it is important to check the applicable sections of the adopted codes to determine whether this hardware can be installed in a particular facility. The I-Codes allow delayed egress locks in the following use groups:

B (business)

F (factory and industrial)

I (institutional)

M (mercantile)

R (residential)

S (storage)

U (utility)

E (educational)—limited to doors serving classrooms with an occupant load of less than 50 people

A (assembly)—limited to secondary exits for courtrooms, and the building must be equipped throughout with an automatic sprinkler system.

If a building falls under one of the approved occupancy types, delayed egress hardware can be used if provided:

- The building has an automatic sprinkler or approved automatic smoke or heat detection system;
- Emergency lighting is installed on the egress side of the door;
- The hardware activation begins when a force of 15 pounds is applied for no more than three seconds (less than three seconds is permitted);
- The lock releases in the direction of egress after 15 seconds (an AHJ may approve a delay for up to 30 seconds), and the locking system must be manually rearmed;
- An audible alarm sounds when the hardware is activated;
- The hardware must comply with the referenced standards, including UL 294. Delayed egress locks must comply with UL 10C or NFPA 252 when installed on fire doors. Panic hardware with the delayed egress function must comply with UL 305 and, in some cases, BHMA A156.3;
- There is signage mounted above and within 12 inches of the door exit hardware (with one exception) that reads, “PUSH [PULL] UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 [30] SECONDS.” This signage must comply with the visual character requirements of ICC A117.1 – Accessible and Usable Buildings and Facilities;
- When the fire alarm or sprinkler system is activated, or power fails, the delayed egress locks must automatically allow immediate egress; and
- Delayed egress locks are able to be deactivated by a switch at the fire command center and/or other approved locations.

FAQs About Electromagnetic Locks

By: Lori Greene, I Dig Hardware Blog

Electromagnetic locks are often used in access control systems because of the relative ease of installation in comparison to other types of electrified hardware – especially when compared with electromechanical locks. In part, this is because electromechanical locks and electrified trim for panic hardware typically require power transfers and often wire raceways through the door, while mag-locks only require power to the frame head. The electromagnet in a housing is attached to the frame, with a steel armature secured to the door. When the magnet is energized, it bonds to the armature and locks the door.

While the installation can be relatively simple, the code requirements that apply to mag-locks are somewhat complicated and can be confusing. These answers to frequently asked questions should help.

How are mag-locks released to allow egress?

One release method addressed in the model codes applies to electrified locks that are released by a switch in the door-mounted hardware.

There are two applications addressed in the model codes that are typically applied to electromagnetic locks. One is for electrified locks that are released by a sensor detecting a building occupant approaching the door. The other covers electrified locks released by a switch in the door-mounted hardware – like a panic device, lever handle, or sensor bar with a request-to-exit (RX) switch. These sections of the codes are not limited to electromagnetic locks, but mag-locks are the most common product used in these applications.

Are back-up release methods required in case the sensor or RX switch does not release the mag-lock?

Yes, both types of systems require alternative release methods. Sensor-release locks must also be unlocked for egress by an auxiliary switch mounted beside the door (consult the adopted code for more details), and by fire alarm/sprinkler activation and upon power failure. Electrified locks released by a switch in the door-mounted hardware are not required by the model codes to have the auxiliary push button or fire alarm/sprinkler release, but they must allow free egress upon power failure. The model codes also require some components of these systems to be listed to UL 294 – Standard for Access Control System Units.

If electromagnetic locks must release upon loss of power, how is security maintained during a power failure? Is battery backup allowed?

Electromagnetic locks are fail safe – when power is cut, there is no magnetic bond, and the lock is unlocked. For example, if a mag-lock is installed on an exterior door with no other locking hardware, the building will not be secure during a power failure. And if the system is the type where the lock is released by a sensor detecting a building occupant approaching the door, the building will not be secure during a fire alarm or sprinkler activation.

When electrified locks are released for egress by a sensor above the door, the lock must also unlock via an auxiliary push button, fire alarm/ sprinkler activation, and upon loss of power.

The model building codes and fire codes do not define exactly what “loss of power” means, nor do they specifically address whether battery back-up is acceptable. One interpretation is that stand-by power of a mag-lock is allowed if the fire alarm system is powered by the same back-up power source. This helps to ensure that if the fire alarm is activated, the door will unlock for egress. The fire alarm/sprinkler release is only required for sensor-release systems and not door-hardware-release systems, which may affect the AHJ’s decision on battery back-up for these applications.

What about other types of access control systems that include mag-locks – locks that are not released by a sensor or by an RX switch?

The model codes do address other types of systems where mag-locks might be used, such as delayed egress locks, and the controlled egress locks allowed in health care facilities. There are separate code sections that include the requirements for these applications. Mag-locks are also used in interlocks (AKA control vestibules), but these are not currently addressed by the model codes. Because the codes do not include requirements for this type of system, each interlock/control vestibule must be submitted to the Authority Having Jurisdiction (AHJ) for approval.

As always, the adopted codes should be consulted for the detailed requirements that apply to electromagnetic locks. Some states and local jurisdictions have modified the model codes with regard to electrified hardware and access control, so local mandates may differ from the model code requirements. The AHJ is responsible for enforcing the adopted codes and has the final say.

Quick Code Q&A: Electromagnetic Locks Released by a Sensor

By: Lori Greene, I Dig Hardware Blog

Continuing our conversation around electrified hardware (refer to next article), this post will focus on electromagnetic locks, also called mag-locks. This hardware is common due to the ease of installation, especially in retrofit applications. However, there can be confusion about the codes governing the use of electrified locking systems.

Mag-locks are common due to the ease of installation, especially in retrofit applications.

Electromagnetic locks are allowed by the I-Codes in access control systems in occupancies other than Group H – High Hazard. This hardware has two main components: the electromagnet in the housing attached to the frame and a steel armature secured to the door. When energized, the magnet bonds to the armature and locks the door. Electromagnetic locks are typically de-energized by either a sensor release or a switch within the door-mounted hardware—both applications are required to allow free egress upon power failure. Further, model codes also require some components of these systems to be listed to UL 294 – Standard for Access Control System Units.

Separate sections included in the model codes detail requirements for each of the two application types. Only one set of requirements must be followed, depending on the method used for releasing the lock. These requirements vary by location, so verifying which model codes and editions have been adopted in a particular jurisdiction is important. The following will focus on the 2024 edition of the International Building Code (IBC), which no longer allows sensor-release mag-locks on doors required to have panic hardware. For these applications, the locks are required to be released by a switch in the panic hardware.

Question: What codes apply to doors with electromagnetic locks released by a sensor?

When an electromagnetic lock is released by a sensor (refer to article https://idighardware.com/sla/#:~:text=Type%203)%20Is%20the%20lock%20an%20electromagnetic%20lock%20released%20by%20a%20sensor%20above%20the%20door%3F%C2%A0) that detects an approaching occupant and de-energizes the lock, the sensor must be installed on the egress side of the door, typically located above the door.

Sensor-release locks must also be unlocked for egress by an auxiliary switch that is readily available, mounted within five feet of the door and between 40 and 48 inches above the floor. These switches (typically push buttons) must allow free egress for 30 seconds or more, independent of the access control system, and must be accompanied by signage that reads “PUSH TO EXIT.”

Electromagnetic locks released by a sensor must also unlock upon activation of a fire alarm or automatic sprinkler system (if present)—the door must remain unlocked until the system is reset. A loss of power to the sensor or the lock/locking system must also result in the system allowing free egress.

The model building codes and fire codes do not define exactly what “loss of power” means nor specifically address whether battery backup is acceptable (Refer to Article following) for electromagnetic locks released by a sensor. One interpretation is that the stand-by power of an electromagnetic lock is permissible if the same backup power source powers the fire alarm system.

Special Locking Arrangements

By: Lori Greene, I Dig Hardware Blog

The code requirements that apply to electrified hardware and access control can be difficult to interpret, although code changes approved through the last few editions of the model codes have helped to clarify the intent. This page includes questions to help identify which code section applies to a particular type of access control opening, a short summary of each of the electrified hardware applications, and links to additional information about each type.

Special Locking Arrangements are electrified locking systems that affect egress, such as delayed egress or controlled egress locks. Although there are quite a few code sections that apply to these applications, the majority of doors with access control readers are not considered special locking arrangements, because the hardware allows free and immediate egress – independent of the access control system. These systems that allow free egress via mechanical operation of the door hardware are considered "normal locking arrangements" and are subject to the same egress requirements as doors with standard mechanical hardware.

The model codes that we most often refer to for information related to access control systems are the International Building Code (IBC), International Fire Code (IFC), and NFPA 101 – Life Safety Code. The requirements of the I-Codes and the NFPA codes are similar, although they are not exactly the same. There may also be state-specific code modifications that apply to these systems. Detailed information about the requirements can be found by referring directly to the adopted codes.

The following questions will help to determine which model code section applies to your electrified hardware application:

Under normal operation, a delayed egress lock delays egress for 15 seconds after an attempt to exit is made.

Type 1) Does the electrified hardware delay egress for 15 seconds (or 30 seconds) to deter unauthorized use of the door?

If yes, this is a delayed egress locking system. Under normal operation, this hardware delays egress for 15 seconds, or 30 seconds where approved by the Authority Having Jurisdiction (AHJ). This hardware is most commonly used to deter unauthorized use of an exit, helping to prevent theft or elopement. The 15-second timer is actuated by an attempt to exit, when a force of not more than 15 pounds is applied for up to 3 seconds. Immediate egress is required (no delay) upon activation of the fire alarm or sprinkler system, and upon power failure.

For detailed requirements on hardware that delays egress for 15 seconds (or 30 seconds where approved by the AHJ), refer to IBC/IFC-2021: 1010.2.13 – Delayed Egress / NFPA 101-2021: 7.2.1.6.1 – Delayed Egress Electrical Locking Systems.

Type 2) Is the electrified hardware used to control egress indefinitely in a memory care facility or other health care unit where patients require containment for their security or safety?

This application is called a controlled egress lock, which is only allowed in health care units where the clinical needs of patients require their containment to prevent them from leaving the facility unaccompanied; it is not allowed by the model codes in other types of occupancies. In health care units where controlled egress locks are installed, all clinical staff must carry the keys, codes, or other cred

credentials required to operate the locks, and the unlocking procedures must be part of the facility's emergency plan. The model codes include automatic release requirements that apply to some occupancy types.

For detailed requirements on electrified hardware that prevents egress from a health care facility until evacuation is needed, refer to IBC/IFC-2021: 1010.2.14 Controlled Egress Doors in Groups I-1 and I-2 / NFPA 101-2021: 18/19.2.2.2.5 (New and Existing Health Care), also refer to 20/21.1.3.6 (New and Existing Ambulatory Health Care).

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Other types of electrified locks may be released by a sensor above the door, but the most common lock used in this application is an

Type 3) Is the lock an electromagnetic lock released by a sensor above the door?

There are two code sections that typically apply to electromagnetic locks, depending on the type of release devices installed (see also Type 4). An electromagnetic lock consists of an electromagnet in a housing mounted on the door frame, and a steel armature mounted on the door. When power is applied, the magnet bonds to the armature and locks the door. Without the release devices mandated by the model codes, these locks would not allow egress when they are powered, so it's crucial to understand what is required by each of the two applicable code sections.

One method of releasing a mag-lock is with a sensor above the door on the egress side that detects an approaching occupant and unlocks the lock. In past editions of the model codes, the section addressing this application was called Access Controlled Egress Doors, leading some to believe that this section was applicable to every door equipped with an access control reader. That was not the intent of the codes, so the section titles were changed to indicate that the sections apply only to locks released by a sensor – not to every door with access control. Note that some sensors mounted above the door are used by the security system to signal that someone has exited and may have nothing to do with the locking or unlocking of the door (this code section does not apply to those sensors).

For detailed requirements on electromagnetic locks released by a sensor, refer to IBC/IFC-2021: 1010.2.12 Sensor Release of Electrically Locked Egress Doors / NFPA 101-2021: 7.2.1.6.2 – Sensor-Release of Electrical Locking Systems.

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Type 4) Is the lock an electromagnetic lock released by a switch in the door-mounted hardware?

Another method for releasing an electromagnetic lock is via a switch in the door-mounted hardware. Instead of a sensor above the door, these systems use an electronic switch in the lever handle, panic hardware, or electronic touch-sensor bar to release the mag-lock for egress. This switch is often called a request-to-exit switch or RX/REX switch.

Other types of electrified locks may be released by a sensor above the door, but the most common lock used in this application is an electromagnetic lock.

This section would not apply to a door with an access control reader where the mechanical lockset or panic hardware allows free egress. It is only applicable to systems where a switch in the door-mounted hardware releases an electrified lock – typically a mag-lock.

For detailed requirements on electromagnetic locks released by a switch in the door-mounted hardware, refer to IBC/IFC-2021: 1010.2.11 – Door Hardware Release of Electrically Locked Egress Doors / NFPA 101-2021: 7.2.1.6.3 – Door Hardware Release of Electrically Locked Egress Door Assemblies.

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The IBC does not currently allow fail safe locks to be used on elevator lobby doors, but there is a change to the 2024 edition that will address this application.

Type 5) Does the door serve an elevator lobby that does not have direct access to an exit stairwell?

The Life Safety Code permits electrified locking of elevator lobby doors if all of the criteria stated in the code are met. The lock must unlock automatically upon actuation of the sprinkler system or fire alarm system (except when the system is initiated by a manual fire alarm box) and upon loss of power to the lock. A two-way communication system must be installed in the elevator lobby to allow a building occupant to call for help.

The IBC and IFC require elevator lobbies to have at least one door that leads to an exit. These codes do not currently include sections which would allow elevator lobby egress doors to be locked, although some states and cities have modified the I-Codes to allow an application similar to what is described in NFPA 101. A change has been approved for the 2024 edition of the IBC, which will include a section similar to the one found in the Life Safety Code.

For detailed requirements on egress doors serving elevator lobbies, refer to IBC-2021: 3006.4 – Means of Egress / NFPA 101-2021: 7.2.1.6.4 – Elevator Lobby Exit Access Door Assemblies Locking.

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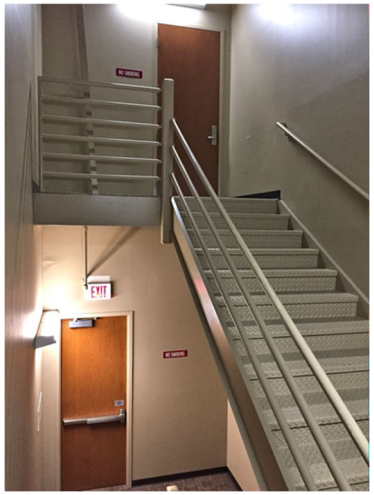

If an interior stair door is locked on the stair side, preventing access from the stairwell to a tenant floor, the IBC requires remote unlocking capability regardless of the number of floors served by the stairwell.

Type 6) Is the door an interior fire door assembly leading to a stairwell, where the lever handle on the stair side of the door is typically locked?

In buildings where stairwell doors are locked (or lockable) on the stair side, the stairwell reentry requirements address the means of allowing reentry back into the building if the stairwell becomes compromised during a fire. This ensures that building occupants can leave the stairwell and find another exit, or shelter in place and wait for rescue. The unlocked stair doors also allow firefighters to access each floor. NFPA 101 and the I-Codes differ in how stairwell reentry is addressed. While the Life Safety Code allows some stairwell doors to be mechanically locked on the stair side with other doors allowing reentry, the IBC and IFC require all interior stairwell doors to be capable of remote unlocking from a switch at the fire command center or other approved location.

Note that some stairwell doors may have hardware providing reentry on the stair side, in combination with another type of electrified hardware, such as delayed egress or controlled egress, on the egress side. These doors must meet the requirements of all applicable sections. Revisions clarifying the requirements for stairwell doors have been approved for the 2024 IBC.

For detailed requirements on the reentry requirements for locks on the stair side of stairwell doors, refer to IBC/IFC-2021: 1010.2.7 – Stairway Doors and 403.5.3 – Stairway Door Operation / NFPA 101-2021: 7.2.1.5.7 – Stair Enclosure Re-entry.

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If a door with electrified hardware allows free egress via mechanical use of the door hardware, it is not considered a special locking arrangement.

Type 7) Is there an access control reader on the outside, that controls access while the door hardware provides free egress at all times?

If yes, it's likely that the doors in question are not considered one of the "special locking arrangements." The most common type of access control system includes a reader that controls access only – and does not impede egress in any way. The lever handle or panic hardware on the egress side allows egress the same way a door with standard mechanical hardware would.

Currently, there is not a separate section in the model codes that is specific to access control systems which control access but do not affect egress (a change is coming in the 2024 editions). Because these systems are not considered special locking arrangements, they must comply with the code requirements for "normal locking arrangements" – the same sections that would apply to doors with mechanical hardware.

These doors must be operable for egress with no key, tool, special knowledge or effort, and with no tight grasping, pinching, or twisting of the wrist. Operable hardware must be mounted between 34 and 48 inches above the floor (some state codes are more restrictive on this), and one releasing operation must unlatch the door (with a few exceptions). Hardware for these systems is not required by the model codes to be listed to UL 294 – Standard for Access Control System Units.

The IBC/IFC Commentaries and the NFPA 101 Handbook include information which clarifies that the sections on special locking arrangements do not apply to electrified hardware that allows free egress at all times – independent of the access control system.

For detailed requirements on egress through doors with "normal locking arrangements", refer to IBC/IFC-2021: 1010.2 – Door Operations / NFPA 101-2021: 7.2.1 – Door Openings.

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Conclusion

When considering which code requirements must be followed, first identify which category the hardware falls into, and then refer to the applicable code section(s). This summary is not intended to provide complete information about the types of electrified hardware referenced. More detailed information can be found in the code sections listed with each application. Keep in mind that state or local requirements may differ from those of the IBC/IFC or NFPA 101, so it's important to be aware of the codes in your project's jurisdiction. Refer to the adopted codes for the detailed code requirements, and contact the AHJ if you need assistance.

No matter how hard the past, you can always begin again.

Buddha

With the new day comes new strength and new thoughts.

Eleanor Roosevelt

Happy new year, happy new year. May we all have a vision now and then of a world where every neighbor is a friend.

Abba, "New Year's Day"

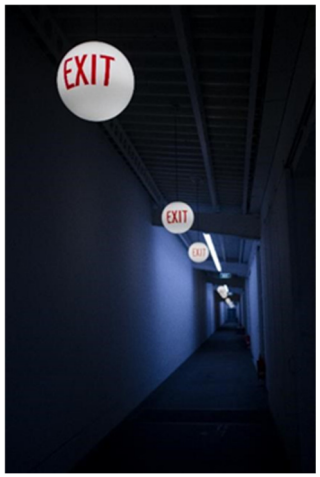
You don't have to see the whole staircase, just take the first step.

Martin Luther King, Jr.

Model Code Update on Swinging Door Openings

By Lori Greene, I Dig Hardware Blog

Author's Note: At the 2023 DHI conNextions Conference in Boston, I taught an interactive code update class in a game show format for an enthusiastic and competitive group of attendees. I am sharing some of the information from that session in this article, so everyone can benefit from what was covered in the presentation.



When learning about the code requirements related to swinging door openings, there are several basic concepts to understand first:

- Adopted Codes – The model codes are updated every 3 years, but these codes may not be adopted in a particular jurisdiction right away. Most states and cities make local modifications to the model codes, so it's important to check the adopted codes in a project's jurisdiction for specific requirements. The updates presented here are changes to the model codes and may not apply in all locations.
- Changes vs. Clarifications – When a code or standard is modified, changes do not technically apply until they are adopted in the project's jurisdiction. However, some code changes are actually clarifications that help to establish the intent of the codes. Learning about new requirements proactively can be very helpful when interpreting the codes.
- Use Groups – The use group or occupancy classification for a particular building (or portion of a building) will affect the code requirements for the space. For example, the egress requirements for an assembly occupancy such as a theater, will differ from those of a residential occupancy like a multifamily apartment building.
- Layered Requirements – Each door opening may be subject to one or more sets of code requirements. If a door is required for egress or provided for egress purposes, it must comply with the egress mandates of the adopted codes. Some openings will also be fire door assemblies, with prescriptive criteria that must be met. Most doors must also comply with the accessibility standards.

What's new?

The 2024 editions of the International Building Code (IBC), the International Fire Code (IFC), and NFPA 101 – Life Safety Code are now complete, and the following topics are just a few of the most important changes that have been made with regard to swinging doors in recent editions of the model codes.

Existing classroom doors in existing schools are allowed by NFPA 101 to have two releasing motions for egress, but the I-Codes continue to require one releasing motion to unlatch all locks and latches simultaneously.

Classroom Security

After the 2018 code change cycle was complete, a Tentative Interim Amendment (TIA 1436) to NFPA 101 was approved, which modified the number of releasing motions allowed to unlatch an existing classroom door for egress. While the IBC and IFC continue to require one motion to unlatch all latching and locking devices simultaneously, NFPA 101 allows a second, non-simultaneous releasing motion for existing classroom doors in existing schools. The intent was to allow a separate deadbolt to be installed along with the latching

This change has been carried forward into the 2021 and 2024 editions of the Life Safety Code, but it's important to remember that the second motion is only allowed in jurisdictions where NFPA 101 is the adopted code and the IBC and IFC do not apply. Some states and local jurisdictions have made code modifications that may also allow a second releasing motion. In addition to the unlatching requirements, the hardware must comply with the other mandates of the applicable codes and standards related to mounting height of the releasing mechanism, egress without the use of a key, tool, special knowledge or effort, and operation without tight grasping, pinching, or twisting of the wrist. Beginning with the 2018 model codes, classroom doors must also allow an authorized person to enter from the outside with a key, credential, or other approved means.

Operable Force for Door Hardware

In the 2010 edition of the ADA Standards for Accessible Design, an editorial change was made which affected the allowable operable force for door hardware. These standards require hardware to operate with 5 pounds of force, maximum. Prior to this change, operable force for hardware was not addressed in the accessibility standards.

The 2017 edition of ICC A117.1 – Accessible and Usable Buildings and Facilities includes a limitation on operable force that differs from the 5-pound limit in the ADA standards. A117.1 states that the operational force for door hardware is limited to 15 pounds of pushing or pulling motion (ex. panic hardware), and 28 inch-pounds of rotational motion (ex. lever handle). The same requirements were included in the 2021 edition of the IBC and IFC, which creates a conflict with the 5-pound limit in the ADA standards. This conflict will exist until the ADA standards are updated, so it's important to consider how to manage this inconsistency on current and upcoming projects.

Automatic Door Operators

Automatic operators are sometimes installed to resolve accessibility issues related to manually operated doors. For example, if a door opening does not have the maneuvering clearance that is required by the accessibility standards for a manual door, adding an auto operator may bring the door into compliance, as the automatic door section of the standards does not require the same clearance.

In the past, automatic doors were not specifically required by the model codes or the accessibility standards, but a change to the 2021 IBC mandates auto operators in certain locations. In buildings of particular use groups and occupant loads, at least one automatic door or set of automatic doors (exterior and vestibule) must be provided at each accessible public entrance. This applies to assembly occupancies (with the exception of Use Group A-5) that have a calculated occupant load of more than 300 people, and to business, mercantile, and residential Group R-1 occupancies with a load of more than 500 people.

Doors Serving Roofs and Other Exterior Spaces

The model codes have been clarified over the last few editions regarding security for doors serving roofs that are not intended to be occupied, such as roofs that contain mechanical equipment. Generally, the IBC and IFC allow doors serving unoccupied roofs to be locked, preventing access from the stairwell to the roof and from the roof to the stairwell. NFPA 101 allows the door to be locked on the roof side if it is also locked on the stair side.

The 2021 IBC and IFC include additional requirements that apply to exterior spaces where the egress route passes through the building, for example, a roof top restaurant or an enclosed courtyard. The need for egress from these spaces often creates a security problem by allowing unauthorized people to access the exterior space and enter the building. Prior to the 2021 editions, the codes did not include prescriptive information for securing these doors.

The I-Codes now allow the doors serving these exterior areas to be locked when the space is not occupied, if certain criteria are met. The maximum occupant load of the space must not be more than 300 people, and signage must be posted stating that the door is to remain unlocked when the outdoor area is occupied. The locking device must be key-operated and readily distinguishable as locked – such as a double-cylinder deadbolt with an indicator. Each exit access door serving the exterior space must have a clear vision panel that measures at least 5 square feet, and at least one of these openings must have a weatherproof telephone or two-way communication system mounted nearby on the exterior side. The codes include additional detailed requirements for the communication system.

Electrified Hardware

For more than 20 years, the Builders Hardware Manufacturers Association (BHMA) has been working in code development, including many proposals related to electrified hardware. Several important changes have been made to the 2024 model codes:

- Elevator Lobby Egress Doors – In many buildings, the elevator lobby does not have direct access to a stairwell/exit; building occupants must leave the elevator lobby to access a means of egress. This can create a security issue by allowing unauthorized access to tenant spaces. Beginning with the 2009 edition of NFPA 101, the code has included a section specific to locking these doors electrically, but the I-Codes did not include a comparable set of requirements. The 2024 IBC and IFC will include a section similar to the requirements of NFPA 101, which allows elevator lobby doors to be locked with fail safe electrified locks if the other criteria in the code are met. This includes a two-way communication system in the elevator lobby and hardware that unlocks immediately upon activation of the fire alarm or sprinkler system, along with other mandates. Refer to the adopted code(s) for detailed information.
- Stairwell Reentry – Although the industry typically specifies and supplies fail safe locking devices on stairwell doors to allow building occupants to leave the stairwell during a fire, the codes did not mandate a specific hardware type. The 2024 I-Codes will clarify that the locking hardware must unlock on the stair side via a signal from the fire command center or a location inside the building's main entrance, upon activation of the fire alarm signal, and/or power failure to the electrified lock. The power failure requirement means that a fail safe lock must be used.
- Electromagnetic Locks – Currently, the model codes allow electromagnetic locks to be released for egress in one of two ways:
    - Option A is for the lock to be released by the activation of a sensor detecting a building occupant approaching the door on the egress side. This type of system also requires the lock to be released by an auxiliary push button beside the door, by activation of the fire alarm or sprinkler system (if present), and upon power failure.
    - Option B is for the lock to be released by a switch in the door-mounted hardware (ex. RX switch in panic hardware, lever handle, or sensor bar). With this type of system, the lock must also release for egress upon power failure, but the auxiliary switch and fire alarm release mentioned in Option A are not required by the model codes for Option B.

- A change proposed by a code official and approved by the technical committee states that if the door is required to have panic hardware and is also equipped with an electromagnetic lock, Option B must be used. Option A – the mag-lock released by a sensor – will no longer be allowed on doors with panic hardware. The panic hardware will have to incorporate a switch the releases the mag-lock as described in Option B above.

- Listings for Electrified Hardware – The model codes currently require some electrified hardware to be listed to UL 294 – Standard for Safety for Access Control System Units. This requirement typically applies when the hardware is part of a special locking arrangement. Beginning with the 2024 model codes, this hardware may be listed to either UL 294, or UL 1034 – Standard for Safety for Burglary-Resistant Electric Locking Mechanisms.

A revision to the 2024 I-Codes clarifies that a door with access control hardware is not considered a special locking arrangement if it is readily openable from the egress side without a key or special

The 2024 I-Codes include another very important clarification related to electrified hardware. One of the issues that causes the most confusion with the codes related to door openings is the concept of special locking arrangements vs. normal locking arrangements. The electrified hardware used in the various types of special locking arrangements is addressed in specific code sections that ensure a balance of security and life safety.

However, the most common electrified hardware applications are not special locking arrangements – they are normal locking arrangements. This hardware allows free egress the same way standard mechanical hardware does and complies with the codes that address standard locking or latching hardware. Because this was not completely clear in the model codes, code officials and others would often try to apply one of the special locking arrangements sections to a door with a normal locking arrangement, just because the hardware was electrified. There was no specific section in the codes that applied to electrified hardware that allowed free egress.

This will change in the 2024 I-Codes, with a clarification stating that electrified hardware used in an access control system must either comply with one of the sections addressing special locking arrangements, OR it shall be readily openable from the egress side without the use of a key or special knowledge or effort. Stated another way, access control hardware that is readily openable from the egress side is not required to comply with the sections on special locking arrangements.

Here is the revised IBC section for reference:

Monitored or recorded egress, and access control systems. Where electrical systems that monitor or record egress activity are incorporated, or where the door has an access control system, the locking system on the egress side of the door shall comply with Section 1010.2.11, 1010.2.12, 1010.2.13, 1010.2.14 or 1010.2.15 or shall be readily openable from the egress side without the use of a key or special knowledge or effort.

For more information about the life safety, fire protection, and accessibility requirements that apply to door openings, refer to the codes and standards that have been adopted in the project's jurisdiction. The Authority Having Jurisdiction (AHJ) will make the final determination on matters of code compliance.

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