

HARDWARE REQUIREMENTS FOR ACCESS AND EGRESS

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PURPOSE

This guideline was developed by the Security and Life Safety Task Force, a group of public and private sector stakeholders working in cooperation with the Office of the Fire Commissioner. It is envisioned that this will be the first in a series of guidelines produced by the Task Force, in order to provide clarification and direction on security and life safety issues.

The purpose of this guideline is to clarify how to achieve compliance with the BC Fire Code and the BC Building Code when addressing requirements for locks, window bars, access, and the installation of electromechanical and electromagnetic hardware on doors.

The needs of building security and life safety are sometimes in conflict. Locked doors must allow unrestricted egress and exiting from a building. Access doors may be locked to prevent entry, but must allow egress for exiting. There are some exceptions allowed in the BC Building Code (BCBC), which will be explained in this guideline. Although the term "occupied" is not defined in the codes, there is an understanding that the building may be occupied at any time. This assumption reflects a concern for the safety of anyone unintentionally trapped in a building. For this reason, all exit doors must permit egress to the outside at any time.

DEFINITIONS

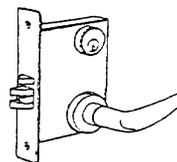
The following terminology is provided for clarification:

Captive Key Locks are double cylinder locks that have a removable thumb turn.

Double Cylinder Locks are devices that require a key to unlock the device from either the egress side or the access side. This includes lockable thumb turns and locks which have no method of release from the egress side.

Electric Bolt is an electromechanical dead bolt, latchbolt, pin or other similar device, which retracts and /or extends electro-magnetically to lock or unlock a door.

Electric Mortise Lock is a recessed lock that electromechanically disables or enables the levers/knobs from retracting the latchbolt.



Electric Mortise Lock

Electric Strike is an electromechanical strike plate in which one side can be released so that it does not retain the latch in the door frame.



Electric Strike

There are two types of electric strikes: fail-secure and fail-safe.

Fail-Secure:

If the door is pushed/pulled in the direction of swing against an electric strike that **is** energized (released), the keeper (or lip) part of the strike plate folds back and releases the latch, allowing the door to open. This device always provides positive latching when it is de-energized.

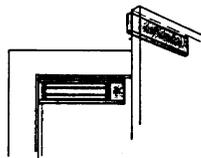
Fail-Safe:

If the door is pushed/pulled in the direction of swing against an electric strike that **is not** energized, the keeper (or lip) part of the strike plate folds back and releases the latch, allowing the door to open. This device does not provide positive latching when it is de-energized.

Both types of electric strikes are permitted where the door assembly is not in a fire separation. When a labeled electric strike is installed in a door assembly in a fire separation, the electric strike must fail-secure.

Electromagnetic Lock “Mag Lock,” has an electromagnet body and an armature plate held together by an electromagnetic force. There are no moving parts. (The armature plate is usually mounted on the door. A mag lock is not an electromechanical device).

Mag Lock



Electromechanical Devices incorporate latches or pins and use an Electro-magnetic field to move a mechanical component. Electric strikes, and electrified hardware including knob sets, lever sets, shear locks, mortise, and panic hardware are examples of Electro-mechanical locking devices. These devices are usually available fail-secure (locked) or fail-safe (unlocked) in the event of a power failure.

Electromechanical Releasing Devices use a mechanical action to release an electrically activated component which is integrated into the mechanical portion of the device. Pressure sensitive pads, door paddles, touch bars, pushbuttons, and micro-switch

equipped panic hardware are examples of electromechanical releasing devices. These devices are

available in Normally-Closed (circuit opens on activation) or Normally-Open (circuit closes on activation) configuration, or they may be configured as a combination of both (one circuit opens and one circuit closes on activation).

Labeled means equipment or materials to which has been attached a label, symbol, or other identifying mark of a recognized testing facility that is responsible for product evaluation/testing in Canada.

Mortise means fully recessed. A mortised device is flush mounted or concealed.

Strike Plate is a plate on a door frame with a cut-out that receives the door latch when the door is closed.

Window Bars are fixed and or movable screens or partitions, such as grills, mesh, posts, lattice, sheeting and may be fabricated out of materials such as metal, wood, or plastic. Window bars create an obstruction of an opening when installed.

PERMIT APPLICATION/ INSTALLATION REQUIREMENTS

A specific/separate building permit, and/or an electrical permit, may be required prior to any installation/replacement of exit door hardware. Consult your local Building Official for clarification.

Installation, replacement or alteration of hardware on new and existing exit doors must comply with the BC Fire and Building Codes. [Refer to Building Code Appeal Board Ruling #1498].

The following is a summary of the requirements:

For all locking devices:

- Locks shall not restrict egress but may restrict access at all times.
- All fire rated door assemblies and hardware shall be labeled.

Electric Strikes - there are restrictions for the use of electric strikes, and if used with hardware for a door located in a fire separation, the electric strike must be

labeled.

Mag Locks - may temporarily delay egress when installed in complete conformance with sentence 3.4.6.15.(4)(BCBC). Mag locks, which do not delay egress, need not comply with sentence 3.4.6.15.(4). (See attached BCAB decision # 1483). Mag locks are intended for use as auxiliary locks. The combined use of a fail-secure electromechanical device and a mag lock would be required where there is a need for automatic locking security, such as in the event of a power failure and single motion egress. The use of a push-button switch is considered “specialized knowledge” and is not permitted to be the primary release of a mag lock.

In installations that delay egress, a push-button can be used by security personnel for operating a mag lock. In installations that do not delay egress, and where acceptable to the authority having jurisdiction, the use of other devices such as motion sensors or pressure sensitive pads maybe incorporated to facilitate unimpeded egress. However, they must be certified to a ULC standard or equivalent to ensure reliability because they are not controlled by a fire alarm system. (Examples of other certified releasing devices are listed under ULC 25L9). In a fire separation, a latch and strike are required on a closure to facilitate automatic positive latching. Labeling of all hardware and electronic components used in a fire separation is required.

Electric Mortise Locks - and other electromechanical devices that only affect the access side door handle and that use only mechanical means to control the latchbolt (there is no deadbolt) are permitted. The latchbolt and the egress side handle shall **not** be controlled by electromechanical means. Labeling of all hardware and electronic components used in a fire separation is required in fire separations requiring a fire protection rating.

Electric Bolts - and other devices that restrict egress when they fail are **not** permitted.

FUNDAMENTAL REQUIREMENTS

There are three underlying requirements, all of which

must be satisfied, for the acceptance of locking devices.

Examples are listed after each requirement:

1. Unrestricted Exiting.
2. Latching Maintained (in fire separations).
3. Door, Frame and Hardware labeling Maintained (in fire separations).

1. UNRESTRICTED EXITING

- Doors with double cylinder and/or captive key locks are **not permitted**.
- If a door divides a floor area, and egress is required in both directions through the door, “unrestricted exiting” is required in both directions.
- Electromechanical devices which affect only the access side door handle (unrestricted egress) and maintain a positive latch even when unlocked (such as some electric mortise locks), are acceptable.
- Electric operated strikes used to restrict access are considered to not restrict egress, provided a mechanical release for the door is installed on the egress side.
- An electric operated bolt engaging a fixed receptacle (strike plate) is **not** permitted under any circumstance, since it may fail locked in a position which prevents egress.

Exceptions to Unrestricted Exiting: (BCBC 1998)

- (i) 3.3.1.12(6), (7), (8) and (9)
These sentences address remote or locally released locking devices in a contained use area or impeded egress zone. In these circumstances, specialized knowledge or devices may be permitted because the building will be occupied by security personnel with the training to operate these specialized devices.
- (ii) 3.4.6.15
This Article addresses the requirements for mag lock installations.

- (iii) 3.4.6.16
This Article applies to unrestricted egress doors in buildings that are fully **sprinklered throughout**, and identifies the criteria necessary in banks and mercantile occupancies for locked exit doors. Full compliance to all applicable sentences, as well as an active and approved Fire Safety Plan, with exiting procedures, and requirements specified for bank and mercantile occupancies with locked doors, is required (BCFC 2.8.2).

2. LATCHING MAINTAINED

- In fire separations, a positive latch is required to hold the door in the closed position after each use. (Access control systems must not affect latching).
- Labeled doors and frames equipped with closers help identify fire separations in existing situations.

3. DOOR, FRAME AND HARDWARE LABELING MAINTAINED

- In fire separations which have a fire-resistance rating, all parts of a closure must be labeled and must maintain their listings. This includes door, door frame, and hardware. Closures cannot be modified.
- The door, frame and hardware must be listed for use with each other and be installed in conformance with their listing.
- A manufacturer's stamp on a door or frame does not confirm fire rating under the Building Code. A label from a recognized product testing and certification agency is required on the door and frame AFTER they are machined for the hardware (ie: "prepared" for the hardware).
- Defective door assemblies shall be repaired/ replaced in conformance with the BC Fire Code. (For preparation of **new** fire rated assemblies, the labeling occurs prior to the door and frame arriving on site).

- For preparation of **existing** fire rated doors and frames, the existing assembly shall be replaced with a new assembly (which is prepared and labeled before coming to the site); **OR** written confirmation shall be provided to the authority having jurisdiction from the fire door manufacturer, stating that the specifically named hardware installed per the manufacturer's instructions will not void the door and/or frame label; **OR** the assembly may be re-labeled by a recognized product testing and certification agency.
- When shipping the existing assembly offsite to a location that is under the label's service for preparation, (such as the manufacturer's location or a machinists' or prehanger's shop which is licensed to apply labels), the existing fire separation must be maintained.

Exceptions:

- i) If the new hardware does not require any alteration (drilling, cutting) to the existing frame or door, the respective frame or door is not required to be re-labeled. Of course, the hardware must be listed for use in the door assembly: for example, listed for wood doors if used on wood doors and have the specific required fire rating.
 - ii) If the preparations are within those permitted as "job site preparation" in NFPA 80¹ and written confirmation from the fire door manufacturer is provided to the authority having jurisdiction, stating that the specifically named hardware installed per the manufacturer's instructions will not void the label, the assembly is not required to be re-labeled.
- (iii) Preparation that is permitted on-site for fire

¹ NFPA 80 states that job site preparation is permitted for surface-applied hardware, function holes for mortise locks (for the door handles and key receptacle), holes for labeled viewers, undercutting of wood and composite doors and installation of protection plates (NFPA 80 specifies measurements). Preparation means round holes drilled through one or both faces of the door. The holes must not exceed a maximum of 2.5 cm.

rated door assemblies is only for assemblies intended to receive this preparation (hence the requirement for confirmation from the door manufacturer for existing doors and frames) and is as permitted in NFPA 80:

This means that, with written confirmation from the door manufacturer, surface-applied mag locks may be installed on-site without re-labeling, but recessed mag locks (or any other recessed hardware) shall have their preparation work done at a location which is under the label's service.

- **Access to and through Cross-over Floors (and into Areas of Refuge)**
Consult your local Building Official for modifications in cross-over floors.
- **Fire Department Access**
Access panels or windows (as required by Building and Fire Codes) provided to facilitate access for fire fighting operations shall be maintained free of obstructions.
- To provide Fire Department access into high-rise buildings without providing keys, one may install a wired glass panel within 300 mm of the door opening hardware (as per current Codes.) Note: if the glass panel is installed in a required fire rated door, the panel must be installed in accordance with NFPA 80 (ie: the panel may not be installed on-site).
- Required access panels or windows are not permitted to be obstructed by window bars. An alternative is to allow window bars that are removable with the use of a key. A tagged copy of that key shall be kept in a lock box in a location approved by the Authority Having Jurisdiction.

Window Bars

Although there is no standard for window bars, the current BCBC identifies certain windows to be used for egress in times of emergency. For example, in unsprinklered buildings, bedroom

windows must release from the inside without the use of tools (keys), or specialized knowledge. If window bars are put over these windows, the bars must open from the inside as easily as the window hardware.

OTHER HARDWARE CONSIDERATIONS

The BCBC addresses exit requirements. Other things to consider when designing the door hardware are:

- (a) panic hardware requirements. Note that panic hardware in rated fire separations is required to be labelled as fire exit hardware and not just labelled as panic hardware.
- (b) head room clearance, amount of force to open and the required direction of the door swing.
- (c) no automatic locking devices on doors between residential suites and public corridors.
- (d) accessibility of the door opening hardware for persons with disabilities. For example, door opening hardware must be operable without tight grasping, pinching, or twisting of the wrist.
- (e) turn pieces which release a locking bolt on a building main entrance door or on exit doors should release the bolt with not more than a 90 degree turn.

**Referenced Building Code
excerpts and Appendix notes.**

Note: Code excerpts typed in bold text.
Appendix excerpts typed in regular text.

3.3.1.12. Doors and Door Hardware

4) An egress door from an individual dwelling unit or from a suite of residential occupancy is permitted to be provided with additional devices that require a releasing operation additional to the main door release hardware, provided the devices are readily operable from the inside without the use of keys, special devices or specialized knowledge. (See Appendix A.)

A-3.3.1.12.(4) Door Hardware

The permission to have additional door releasing devices is intended to allow the use of a security chain, night latch or dead bolt to supplement the normal door latching device. These are permitted for dwelling units and locations where guests in a hotel or motel require additional security. The height of these items is also governed by the maximum height stipulated in Sentence 3.3.1.12.(5) to ensure that they can be operated by persons with physical disabilities. This additional hardware should not require appreciable dexterity by the user and the general requirements on the ability to operate the device without the use of keys, special tools or specialized knowledge still apply.

Note: “Although Sentence 3.3.1.12.(4) allows another releasing device in addition to the main door release hardware of a dwelling unit, the requirements of Article 3.3.4.2., Sentences 3.1.8.4.(1), 3.1.8.5.(2), 3.3.4.5.(1) and 3.3.4.7.(1) regulate the device. Therefore, a deadbolt lock, with a fire resistance rating, conforming to the ULC standard or equivalent, is the only recognized device allowed in addition to the main door release hardware.”

5) Door release hardware shall be installed not more than 1 200 mm above the finished floor.

6) An egress door in an access to exit serving a contained use area or an impeded egress zone is permitted to be equipped with locking devices

that

can be released either locally or remotely in conformance with Sentence (7) or Sentence (8). (See Appendix A.)

A-3.3.1.12.(6) Controlled Egress Doors

It is intended that Sentence 3.3.1.12.(6) apply to doors used at the perimeter of a contained use area or an impeded egress zone. If the contained use area consists of a single room, the requirements would apply to that room. In the case of individual cells within a contained use area, exterior keyed locks could be used on the cell doors consistent with the fire safety plan and continuous supervision by staff who can release the doors in an emergency.

7) Local locking devices permitted by Sentence (6) shall be operable by a key from both sides of the door.

8) Controls for the remote release of door locking devices permitted by Sentence (6) shall be located in an area readily available to security personnel.

9) Locking devices permitted by Sentence (6) that are electrically operated shall be:

- a) designed to operate on emergency power; and**
- b) capable of manual release by security personnel.**

3.4.6.15. Door Release Hardware

1) Except for devices on doors serving a contained use area or an impeded egress zone designed to be remotely released in conformance with Article 3.3.1.12., and except as permitted by Sentence (4) and Article 3.4.6.16., locking, latching and other fastening devices on a principal entrance door to a building as well as on every exit door shall permit the door to be readily opened from the inside with not more than one releasing operation and without requiring keys, special devices or specialized knowledge of the door opening mechanism. (See Appendix A.)

A-3.4.6.15.(1) Fastening Device

Turnpieces of a type which must be rotated through an angle of more than 90° before releasing a locking bolt are not considered to be readily openable. The release of a locking bolt should allow the door to open without having to operate other devices on the door.

2) If a door is equipped with a latching mechanism, a device that will release the latch and allow the door to swing wide open when a force of not more than 90 N is applied to the device in the direction of travel to the exit shall be installed on:

- a) every exit door from a floor area containing an assembly occupancy having an occupant load more than 100;**
- b) every door leading to an exit lobby from an exit stair shaft, and every exterior door leading from an exit stair shaft in a building having an occupant load more than 100; and**
- c) every exit door from a floor area containing a high hazard industrial occupancy.**

3) Except as required by sentence 3.8.3.3 (7) every exit door shall be designed and installed so that, when the latch is released, the door will open under a force of not more than 90 N, applied at the knob or other latch releasing device.

4) Electromagnetic locks that do not incorporate latches, pins or other similar devices to keep the door in the closed position are permitted to be installed on exit doors other than doors leading directly from a high hazard industrial occupancy, provided:

- a) the building is equipped with a fire alarm system;**
- b) the locking device, and all similar devices in the access to exit leading to the exit door, release upon actuation of the fire alarm**

signal;

c) the locking device releases immediately upon loss of power controlling the electromagnetic locking mechanism and its associated auxiliary controls;

d) the locking device releases immediately upon actuation of a manually operated switch readily accessible only to authorized personnel;

e) a force of not more than 90 N applied to the door opening hardware initiates an irreversible process that will release the locking device within 15 s and not relock until the door has been opened;

f) upon release, the locking device must be reset manually by the actuation of the switch referred to in Clause (d); and

g) a legible sign is permanently mounted on the exit door to indicate that the locking device will release within 15 s of applying pressure to the door-opening hardware.

(See Appendix A.)

A-3.4.6.15.(4) Electromagnetic Lock

Electromagnetic locks are intended for use where there is a need for security additional to that provided by traditional exit hardware. They are not intended for indiscriminate use as alternative locking devices. The design of these devices requires evaluation to ensure that their operation will be fail-safe in allowing exiting in the event of foreseeable emergencies. If more than one locking device is used in a building, it is expected that one switch will release and reset all devices simultaneously.

5) Door hardware for the operation of the doors referred to in this Section shall be installed at a height not more than 1 200 mm above the finished floor.

3.4.6.16. Security for Banks and Mercantile Floor Areas

1) If a building is sprinklered throughout,

the requirements of Sentence 3.4.6.15.(1) are permitted to be waived for exit and egress doors complying with Sentences (2) to (9) that serve a floor area or part of a floor area used exclusively for

- a) a bank, or
 - b) the sale of retail merchandise.
- (See Appendix A.)

A-3.4.6.16.(1) **Special Security for Doors**

The need for security in banks and in mercantile occupancies requires the ability to use positive locking devices on doors that may not readily be opened from inside the building. In a fully sprinklered building, the risk to persons inside the building is substantially reduced. The provisions of Sentences 3.4.6.16.(2) to (9) assume that the area is illuminated and that a means of communication is available to any occupant during times that the doors are locked.

2) Exit and egress doors referred to in Sentence (1) shall be designed to prevent locking at any time that the part of the floor area that they serve is open to the public.

3) A sign with the words "This door shall not be locked at any time that the public is present" in letters not less than 50 mm high shall be permanently affixed to both sides of doors referred to in Sentence (1).

4) Exit and egress facilities complying with Sentences (5) to (9) shall be incorporated for egress by persons other than the public from a floor area or a part of a floor area referred to in Sentence (1) during times when the public is neither present nor being admitted to the area that they serve.

5) In exit and egress facilities referred to in Sentence (4), at least one door at each exit and egress location shall

- a) be operable in conformance with Sentence 3.4.6.15.(1), or
- b) be equipped with locks conforming to Sentence 3.4.6.15.(4) that release immediately

- i) if an alert signal or alarm signal is initiated in the fire alarm system, or
- ii) the sprinkler system is actuated.

6) A door referred to in Sentence (5) shall be permanently and distinctly marked to indicate that it is an emergency exit.

7) Exit and egress facilities required for evacuation of persons other than the public from a floor area or a part of a floor area referred to in Sentence (1) shall have an aggregate width based on the maximum number of persons other than the public and determined in accordance with Articles 3.4.3.2. to 3.4.3.5.

8) Travel distance to an exit referred to in Sentence (7) shall not exceed the travel distance determined in accordance with Subsection 3.4.2.

9) Exit and egress doors serving a floor area or part of a floor area referred to in Sentence (1) are permitted to be equipped with locks that require keys, special devices or specialized knowledge of the door opening mechanism provided:

- a) the doors do not lead into exit stairs;
- b) the doors do not lead from exit stairs to the exterior of the building;
- c) the doors do not serve any other occupancy;
- d) the area served contains at least one telephone;
- i) that is accessible and in operation at all times;
- ii) that is not coin or card operated; and
- iii) marked to indicate that it is for emergency use,
- e) the area served is illuminated by normal power or by emergency power when the doors are locked,
- f) there are provisions that enable an announcement to be made throughout the area served before the locks are fastened, and
- g) the locks are designed for use during times that the building is not occupied.

BC Fire Code excerpts

2.7.2.1. Exit Doors

1) Except as provided in Sentences (2), (3) and (4), all doors forming part of a means of egress shall be tested at intervals not greater than one month to ensure that they are operable.

2) The safety features of revolving doors shall be tested at intervals not greater than 12 months.

3) Sliding doors that are required to swing on their vertical axes in the direction of egress when pressure is applied shall be tested at intervals not greater than 12 months.

4) When doors are equipped with electromagnetic locks, these locks shall be tested at intervals not greater than 12 months.

2.8.2. Fire Safety Plan

2.8.2.1. Measures in a Fire Safety Plan

1) In buildings or areas described in Article 2.8.1.1., a fire safety plan conforming to this Section shall be prepared in cooperation with the fire department and other applicable regulatory authorities and shall include:

a) the emergency procedures to be used in case of fire, including:

- i) sounding the fire alarm (see Appendix A),
- ii) notifying the fire department,
- iii) instructing occupants on procedures to be followed when the fire alarm sounds,
- iv) evacuating occupants, including special provisions for persons requiring assistance (see Appendix A),
- v) confining, controlling and extinguishing the fire,

b) the appointment and organization of designated supervisory staff to carry out fire safety duties,

- c) the training of supervisory staff and other occupants in their responsibilities for fire safety,
- d) documents, including diagrams, showing the type, location and operation of the building fire emergency systems,
- e) the holding of fire drills,
- f) the control of fire hazards in the building,
- g) the inspection and maintenance of building facilities provided for the safety of occupants, and
- h) a copy of the records of inspections, maintenance procedures or tests as required by Article 1.1.1.6.(See Appendix A.)

2) The fire safety plan shall be reviewed at intervals not greater than 12 months to ensure that it takes account of changes in the use and other characteristics of the building.

BCAB #1483

June 28, 1999

**Re: Electromagnetic Locks, Sentence 3.4.6.15.(4)
(1998 BCBC)**

Project Description

Although there is no specific project related to this appeal the issue concerns the use of electromagnetic locks (mag locks) on exit doors in mercantile occupancies.

Reason for Appeal

Sentence 3.4.6.15.(4) permits electromagnetic locks that do not incorporate latches, pins or other similar devices to keep the door closed provided a number of conditions are met. Two of the conditions are that the building be equipped with a fire alarm system and that the door will open within 15 seconds of pressure being applied to the door opening hardware.

Appellant's Position

The appellant asks if Sentence 3.4.6.15.(4) prohibits the use of electromagnetic locking devices which do not delay egress in buildings which are not equipped with a fire alarm system?

Building Official's Position

The building official is reluctant to approve such an installation due to the way the code is worded but questions why such an installation should pose any safety hazard.

Appeal Board Decision #1483

It is the determination of the Board that providing the electromagnetic lock does not delay egress as permitted by the exception referenced in Sentence (4) and is installed in full compliance with Sentence 3.4.6.15.(1) it does not have to comply with the installation requirements of Sentence 3.4.6.15.(4).

George R. Humphrey, Chair

BCAB #1498

November 17, 1999

**Re: Door Hardware, Clause 1.1.2.1.(1)(k),
Sentence 3.3.1.12.(3)**

Project Description

This appeal involves the installation of additional hardware, for security reasons, on access to exit doors in an existing building of Group D occupancy.

Reason for Appeal

Clause 1.1.2.1.(1)(k) states that the code applies to "... the installation of ... equipment regulated by this Code." Sentence 3.3.1.12.(3) requires that door hardware "shall be operable by one hand and the door shall be openable with not more than one releasing operation."

Appellant's Position

The appellant contends that the additional hardware requested by the client must comply with the current code (1998 BC Building Code). The thumb latch deadbolts with which the client wishes to install on three office doors would be in addition to the existing lever handle passage sets and would not comply with Sentence 3.3.1.12.(3). An interconnected single motion lock set should be installed to replace the existing passage set.

Building Official's Position

The building official maintains that the installation of a thumb latch deadbolt is a relatively minor alteration and permits are not required. The building official is prepared to allow hardware that contravenes the current code in an existing building, provided it does not lessen the existing level of safety and it seems "reasonable."

Appeal Board Decision #1498

It is the determination of the Board that new hardware installed in addition to or to replace existing door hardware must comply with the current code. Alternate installations must meet the requirements of Section 2.5, Equivalents.

George R. Humphrey, Chair