Electrical Design Updates in Educational Environments

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Discussion Topics

01 Regulatory Updates

02 Door Hardware

03 Codes and Standards

04 Distributed Antenna Systems

05 Questions & Answers

Learning Objectives

Regulatory Updates: Gain knowledge on the State of Alaska requirements for schools and the status of updates from DEED and DEC.

Door Hardware: Identify common electrified door hardware types and how they interact with electronic access control and fire alarm systems.

Codes and Standards: Learn about electrical and fire alarm code requirements that may affect school design and operation.

Distributed Antenna Systems: Have awareness of distributed antenna systems and their potential need in a building.

Background

From Briefing Paper DEED ASHRAE Checklist

The department's November 30, 2018 briefing paper provided background, discussion, and recommendations regarding the enforcement the ASHRAE 90.1-2010 energy performance standard. This standard was recommended by the committee in 2012 and approved in regulation in 2013. Following committee discussion at the December 12, 2018 meeting, the department took steps to develop an ASHRAE 90.1-2010 compliance checklist specific to Alaska schools. The source document for the checklist, as proposed in the earlier paper, was the "Commercial Building Data Collection Checklist – ANSI/ASHRAE/IESNA Standard 90.1-2010" as provided by the United States Department of Energy. The checklist was modified by removing items not commonly associated with educational facilities or not applicable to climate zones 7 & 8.

Background

Since that initial checklist and adoption, ASHRAE-90.1 adoption was updated to 2013 and then 2016 versions, which is what is currently required per 4 AAC 31.014

4 AAC 31.014. Codes and regulations for school facilities.

(a) The chief school administrator shall assure that a new school facility, addition, or major renovation complies with applicable facility codes and regulations of the state and with those of the municipality in which the facility is located. The chief school administrator may meet the obligation by providing documentation from the appropriate state or municipal official that the facility, addition, or renovation complies with an applicable code or regulation. For purposes of this subsection, the applicable codes and regulations of the state with which facilities, additions, or renovations must comply are the

(1) building code, adopted by 13 AAC 50.020;

(2) electrical code, adopted by 8 AAC 70.025;

(3) plumbing code, adopted by AS 18.60.705(a);

(4) mechanical code, adopted by 13 AAC 50.023;

(5) ASME Boiler and Pressure Vessel Code, adopted by 8 AAC 80.010;

(6) fire code, adopted by 13 AAC 50.025; and

(7) energy efficiency code, consisting of the American Association of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, (2016 Edition), and adopted by reference.

Background

NOTE THAT AAC SAYS ADOPTION BY REFERENCE WHICH WOULD TYPICALLY REQUIRE COMPLIANCE WITH ALL AREAS.

THE PRESENCE AND DISTRIBUTION OF THE DESIGN CHECKLIST IDENTIFIES AND NARROWS THE SCOPE OF THE DESIGN REQUIREMENTS, AND MODIFICATION OF THE CHECKLIST CAN BY EXTENSION CHANGE THE COMPLIANCE REQUIREMENTS

Checklist – Electrical Plan Review

System	90.1-2016 Section #	Description	Design Value	Complies? (Yes/No)	Comments
Electrical	4.2.2 8.7	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	8.4.1	The feeder conductors and branch circuits combined shall be sized for a maximum of 5% voltage drop. If contractor alters from design, contractor to provide voltage drop calculations.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	8.4.2	At least 50% of all 125 volt 15- and 20-Amp receptacles, as required by 8.4.2, and 25% of the circuits for modular furniture are controlled by an automatic control device.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	8.4.3	Power monitoring and reporting devices shall be provided to address loads in paragraphs a. through e.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	4.2.2, 9.7	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting systems and equipment and document where exceptions are claimed.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	9.4.1.1	Automatic lighting control to shut off all building lighting installed in buildings in compliance with 9.4.1.1.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	4.2.2, 9.7	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting systems and equipment and document where exceptions are claimed.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	9.4.1.4	Automatic lighting controls for exterior lighting installed.	NA		Enter a reference as to where this is covered in the project documents.
Electrical	9.4.3	Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer's installation instructions. When occupant sensors, time switches, programmable schedule controls, or photosensors are installed, at a minimum, the procedures in subsections a. - c. shall be performed.	NA		Enter a reference as to where this is covered in the project documents.

Checklist – Electrical Inspection

90.1-2016 Section #	Description	Complies? (Yes/No)	Comments
8.4.2	At least 50% of all 125 volt 15- and 20-Amp receptacles, as required by 8.4.2, and 25% of the circuits for modular furniture are controlled by an automatic control device. And tested.		
8.4.3.1 8.4.3.2	Energy monitoring is installed and being recorded in buildings 25,000 sq ft or larger		
9.4.1.1	Automatic lighting controls installed per plans.		
9.4.1.4	Automatic lighting controls for exterior lighting installed.		
9.6.2	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.		
8.4.1.1 8.4.1.2	Does installation path follow design? If not, contractor to perform voltage drop calculations.		

Checklist – Final Inspection

90.1-2016 Section #	Description	Complies? (Yes/No)	Comments
8.7.1	Furnished as-built drawings for electric power systems within 30 days of system acceptance.		
8.7.2	Furnished O&M manuals for electrical power systems and equipment.		
9.2.2.3	Installed lamps and fixtures are consistent with what is shown on the approved lighting plans, which demonstrate proposed watts are less than or equal to allowed watts.		
9.4.3	Exterior lighting power is consistent with what is shown on the approved lighting plans, which demonstrate proposed watts are less than or equal to allowed watts.		

LIGHTING POWER DENSITY

NOTE THAT COMPLIANCE WITH THE DESIGN CHECKLIST DOES NOT INCLUDE COMPLIANCE WITH OVERALL LIGHTING POWER

9.2.2.3: INTERIOR LIGHTING POWER

9.4.2: EXTERIOR LIGHTING POWER

Table 9.5.1 *Lighting Power Density* Allowances Using the *Building* Area Method

Building Area Type[a]	*LPD*, W/ft^2
School/university	0.81

LATER VERSIONS OF ASHRAE USE LOWER LIGHTING POWER DENSITY AS A SIGNIFICANT SOURCE OF ENERGY SAVINGS

UPDATE – ASHRAE 90.1/DEED

DECEMBER 2024: SUBMITTED SUGGESTED EDITS TO CHECKLIST TO DEED

SUMMER 2025: DEED REQUESTED A WHITE PAPER ON THE CHANGES TO BE ABLE TO DISTRIBUTE TO OTHER PARTIES FOR CONSIDERATION, SUBMITTED UPDATED PACKAGE WITH WHITE PAPER, LAST YEAR'S PRESENTATION AND RECOMMENDED CHECKLISTS IN OCTOBER

DECEMBER 2025: RECOMMENDATION IS TO SUBMIT FOR NEXT BRGR MEETING

UPDATE – ASHRAE 90.1/DEED

IN 2025, WE FINISHED NAPAKIAK AND ARE ALMOST DONE WITH INLET VIEW, BOTH OF WHICH WERE NEW CONSTRUCTION AND DESIGNED UNDER THE CHECKLIST SO HAVE CONTROLLED RECEPTACLES AND LOAD MONITORING, CONTRACTOR ON NAPAKIAK INDICATED 300K COST INCREASE FOR COMPLIANCE, INLET VIEW WE DON'T HAVE IT BROKEN OUT BUT ASSUME SIMILAR (BIGGER SCHOOL BUT LOWER COST/SQ FT)

AAC LIGHTING –

Department of Environmental Conservation

18 AAC 30.340. Lighting.

Lighting in a school must meet the following standards:

(1) general use classrooms and shops - 50 footcandles at task level;

(2) drafting rooms and sewing rooms - 100 footcandles at task level;

(3) corridors, stairways, and locker rooms - 20 footcandles, measured 30 inches from the floor.

NOTE THAT 20FC MEASURED 30 INCHES FROM THE FLOOR WILL BE APPROXIMATELY 12FC ON THE FLOOR

ILLUMINATING ENGINEERING SOCIETY

Established in 1906, the Illuminating Engineering Society is the recognized technical and educational authority on illumination. Our mission is to improve the lighted environment by bringing together those with lighting knowledge and by translating that knowledge into actions that benefit the public. We provide a variety of professional development, publications, networking and educational opportunities to our membership of engineers, architects, designers, educators, students, contractors, distributors, utility personnel, manufacturers and scientists in nearly 60 countries. Through our American National Standards Institute (ANSI) accredited process, we publish and maintain the Lighting Library®, with over 100 standards written by subject matter experts in our technical committees.

For more information, please visit: www.ies.org

01 Regulatory Updates

10 LUX = 1FC
50 LUX = 5FC
100 LUX = 10FC
300 LUX = 30FC
400 LUX = 40FC

COMMERCIAL, RESIDENTIAL, INDUSTRIAL
Recommended Maintained Illuminance Targets [a,b]

TS = Task Surface: Recommended Illuminances are at height of task surface above finished floor (AFF)

Application Task/Area	Task or Area	Veiling Reflection Risk: High Med Low	Horizontal (E_h): Target E_h @ Height AFF: CAT	Lux@m	Max Avg Min	Uniformity: Ratio	Ratio Basis	Vertical (E_v): Target E_v @ Height AFF: CAT	Lux@m	Max Avg Min	Uniformity: Ratio	Ratio Basis
EDUCATIONAL FACILITIES												
Classrooms | ANSI/IES RP-3-20 | Table A-1												
General Classrooms												
Learning, teaching (interactive)												
AV (dedicated AV viewing)	A	M	K	50@0.76	Avg			I	30@1.22	Avg	2:1	Avg:Min
Dedicated computer screens	A	M	N	150@0.76	Avg	2:1	Avg:Min	K	50@1.22	Avg	2:1	Avg:Min
Elementary school	A	L	P	300@0.76	Avg	2:1	Avg:Min	N	150@1.22	Avg	2:1	Avg:Min
Middle school, high school, higher ed	A	L	Q	400@0.76	Avg	2:1	Avg:Min	N	150@1.22	Avg	2:1	Avg:Min
Study halls	A	L	P	300@TS	Avg	2:1	Avg:Min	O	200@TS	Avg	2:1	Avg:Min
Shops												
Assembly (difficult process)	T	L	T	1,000@TS	Avg			R	500@TS	Avg		
Inspection (difficult process)	T	L	T	1,000@TS	Avg			R	500@TS	Avg		
Machining (medium benchwork)	T	L	T	1,000@TS	Avg			R	500@TS	Avg		
Woodworking (fine process)	T	L	T	1,000@TS	Avg			R	500@TS	Avg		

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Recommended Maintained Illuminance Targets [a,b]

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Veiling Reflection Risk			Horizontal (E_h)					Vertical (E_v)				
Light Level for Task or Area			Target E_h @ Height AFF		Uniformity			Target E_v @ Height AFF		Uniformity		
Application Task/Area	Task or Area	High Med Low	CAT	Lux@m	Max Avg Min	Ratio	Ratio Basis	CAT	Lux@m	Max Avg Min	Ratio	Ratio Basis
COMMON APPLICATIONS												
Transition Circulation Spaces | ANSI/IES RP-10-20 | Table A-1												
ATMs and service kiosks	T		O	200@0.91	Avg	3:1	Avg:Min	M	100@1.22	Avg	3:1	Avg:Min
Circulation corridors												
Adjacency (open) passageways[1,2]	A		-	#@0.00	Min	3:1	Avg:Min	-	#@1.52	Avg		
Enclosed passageways	A		K	50@0.00	Avg	3:1	Avg:Min	I	30@1.52	Avg	2:1	Avg:Min
Elevators, Escalators, Stairs[3]												
Freight												
Cab interior	T		K	50@0.00	Avg	2:1	Avg:Min	I	30@0.91	Avg	2:1	Avg:Min
Threshold	T		M	100@0.00	Avg	2:1	Avg:Min					
Passenger												
Cab interior	T		K	50@0.00	Avg	2:1	Avg:Min	H	20@1.52	Avg	2:1	Avg:Min
Threshold	T		M	100@0.00	Avg	2:1	Avg:Min					
Escalators, moving walkways	T		K	50@0.00	Avg	2:1	Avg:Min					
Stairs[4]												
High activity, internal	A		M	100@0.00	Avg	2:1	Avg:Min	K	50@1.52	Avg	2:1	Avg:Min

AAC LIGHTING - DEC

DEC REQUIREMENT FOR HIGHER LIGHT LEVELS IN CLASSROOMS AND CORRIDORS INCREASES LIGHTING LOAD BY 40% IN ELEMENTARY SCHOOL CLASSROOMS AND 20% IN MIDDLE/HIGH SCHOOL, 58% IN CORRIDORS, 16% IN STAIRS

RECOMMENDATION: ACTION NEEDED TO ADJUST THIS SECTION OF AAC TO ALLOW DESIGN TO BE PERFORMED IN ACCORDANCE WITH IES STANDARDS

UPDATE - AAC LIGHTING - DEC

MARCH 2025: SENT REQUEST TO DEC TO REQUEST A PATHWAY TO MODIFY OR REMOVE THIS REQUIREMENT

APRIL 2025: RESPONSE IS THAT :

At this time, the department does not anticipate making changes to 18 AAC 30.340. While the regulation has been in place for some time, program staff have reviewed recent lighting standards, including the November 2024 U.S. Department of Energy guidance, and found that the existing requirements remain consistent with current recommended ranges for classroom lighting (30–50 foot-candles).

UPDATE - AAC LIGHTING - DEC

AUGUST 2025: MICHAEL BUTIKOFER SENDS ME THE NOTICE OF THE GOVERNOR'S ADMINISTRATIVE ORDER TO REDUCE REGULATIONS (AO 360) AS A POTENTIAL PATHWAY TO ADJUST THIS

OCTOBER 2025: I EMAIL DEC ABOUT THE AO, WONDERING WHERE TO SUBMIT PUBLIC COMMENTS AND WAS TOLD THEY ALREADY OPENED AND CLOSED THE PUBLIC COMMENT PERIOD

NOVEMBER 2025: DEC SENDS OUT NOTICE OF AN EXTENSION TO THE PUBLIC COMMENT PERIOD WHICH ENDS DECEMBER 5TH.

COMMENT: 18 AAC 30.340

"SEE JEREMY MAXIE'S COMMENT"

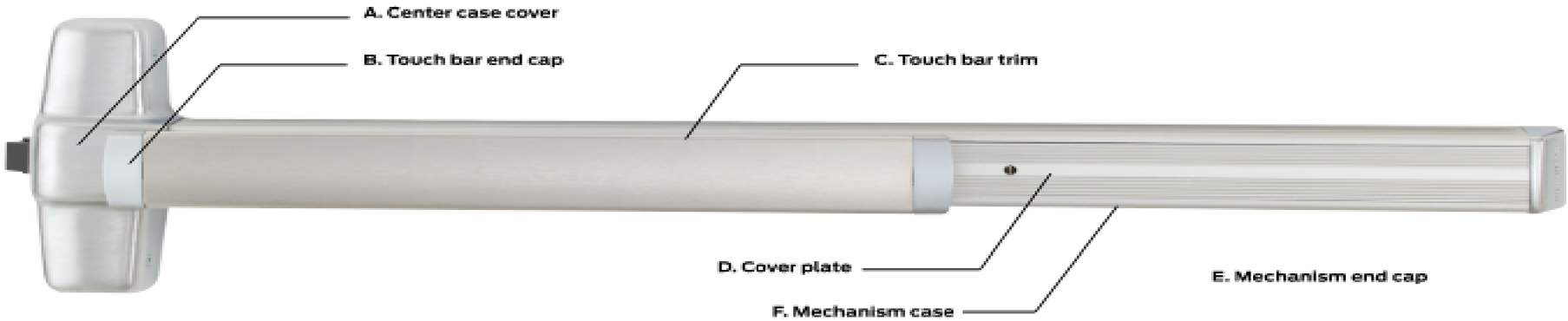
"LET'S FOLLOW THE IES"

"WHERE'S MY SEWING ROOM"

ELECTRIFIED DOOR HARDWARE

- ELECTRIFIED DOOR HARDWARE LIVES UNDER DIVISION 08 – ARCHITECTURAL
- ACCESS CONTROL SYSTEMS LIVE UNDER DIVISION 28 – ELECTRICAL/SPECIAL SYSTEMS
- THINGS TO COORDINATE ARE POWER SUPPLIES, TYPE OF MONITORING, DELAYED EGRESS
- DEPENDING ON THE TYPE OF HARDWARE, THERE ARE FIRE ALARM AND ADDITIONAL ELECTRICAL REQUIREMENTS

Device finish options



Finishes

Color	BHMA number	A, B, E	C	D and F
Bright brass	605	Bright brass	Bright brass, 605	Buffed anodized
Satin brass	606	Satin brass	Satin brass, 606	Anodized
Satin bronze	612	Plated	Satin bronze, 612	Anodized
Satin bronze, oil-rubbed	613	Oil rubbed bronze	Oil rubbed bronze, 613	Powder coat
Bright chrome	625	Plated	Bright stainless steel, 629	Buffed anodized
Satin chrome	626	Plated	Satin stainless steel, 630	Anodized
Satin stainless steel*	630	Stainless steel	Satin stainless steel, 630	Anodized
Aluminum, anodized	628	Powder coat	Satin stainless steel, 630	Anodized
Duranodic dark bronze	710	Powder coat	Powder coat	Powder coat
Black	622	Powder coat	Powder coat	Powder coat
Aged bronze	643e	Relieved aged bronze	Relieved aged bronze	Aged bronze, no relief

02 DOOR HARDWARE

Cylindrical: Sometimes called bored locks, cylindrical locks are sturdier and considered more secure than tubular locks. The latchbolt assembly interlocks with one side of the lock chassis, making it easier to install, replace and rekey. Cylindrical locks are also available in different formats that provide various levels of security, all of which use the same type of key. This allows like-keyed and master-keyed systems that use a wide variety of locks. Cylindrical locks are vulnerable to security threat that uses force to break them in two pieces—known as lock snapping or cylinder snapping.

Mortise: Mortise locks are considered even more secure than cylindrical locks. They require a pocket—the mortise—to be cut into the door where the lock is fitted. The mortise assembly includes the following:

- Lock body (the part installed inside the mortise cut-out in the door)
- Lock trim, which is typically available in various knob, lever, handle set and pull designs
- Strike plate
- Keyed cylinder to operate the locking/unlocking function of the lock body

An **electromagnetic lock** is an electromagnet that mounts on the frame, with a steel armature mounted on the door. When you apply power to the magnet, it bonds to the armature, securing the door. Electromagnetic locks are only available fail safe. When you remove power, the electromagnetic lock unlocks.

An exit device (also called a crash bar, panic bar, panic device, panic hardware or push bar) allows the exterior side of the door to be locked, while ensuring that people can always exit from the interior. Consisting of a spring-loaded metal bar or touchpad mechanism fixed horizontally to the inside of an outward-opening door, it activates a mechanism which unlatches the door, allowing occupants to leave quickly when the lever is either pushed or depressed. Panic hardware is required by code for Assembly and Educational occupancies with an occupant load of 50 people or more (100 people or more for some codes), and also for high hazard occupancies.

Types of electronic locks

An electronic lock is controlled by a reader, such as a keypad, card reader or biometric terminal. If the user has the right personal identification number (PIN), card or biometric the door unlocks. There are two main types of electronic locks: standalone and networked.

- **Standalone locks/readers:** Standalone electronic locks use the same credential (card, code, etc) as networked locks, however, they are not connected to access control software, so they require the user to physically go to each lock to administer access rights and retrieve tracking information.
- **Networked locks:** Networked electronic locks are connected to an access control system. They allow the system manager to easily change access rights and track movement throughout the facility from anywhere they are connected to the network.

Electronic locks from Schlage

AD Series

The AD Series was designed to be the right choice for today, and is ready to adapt to whatever the future holds.

There are a variety of options that allow you to select the AD Series electronic lock that's right for you, and a wide selection of features that can be configured in the field to further customize each opening. When your needs change in the future, the innovative modular design of the AD Series allows you to easily upgrade the credential reader or networking option, and adapt to emerging technologies using your existing chassis – all without taking the lock off the door. This means that you can be confident that your choice of the AD Series is right for today, and that your investment will be protected into the future.

Credential reader options

AD Series electronic locks are compatible with many different credential types.

- Multi-technology (reads 125 kHz prox and 13.56 MHz smart)
- Smart - iClass compatible
  + KEYPAD

- Magnetic stripe (swipe)
  + KEYPAD

- Keypad

CO Series

In the world of standalone electronic locks, CO Series offers simple solutions for access control. These easy-to-use, versatile locks can be applied anywhere there is a need to control access without distributing keys. The popular CO-100 is a simple lock that momentarily unlocks with a valid PIN code entry. It can be used indoors or out and allows administrators a variety of command options. The Series also includes CO-200. These computer programmable locks can provide audit trails and feature dual credential options (card+PIN) that provide an even greater level of security.

Compatibility

The CO Series offers a wide range of applications and can be used alongside other Schlage electronic locks. They feature expanded cylinder, exit device, and credential compatibility.

How to order

Nomenclature – how to order

Prefix	Device series/type		Trim/ rating		Suffix/ finish		Door width	Handing	Less bottom rod/cable	Trim options/ finish	Optional strike/finish	Accessories	Other information
1	2	3	4	5	6	7	8	9	10	11	12	13	14
QEL	- 98	- 27	- L	- F	- —	- 626	- 3'	- RHR	- LBR	- 996-06/626	- 499F	- SNB	- HM

Detail

1 Prefixes

None	Standard
AX	Accessible device
CD	Cylinder dogging - panic only
CDSI	Cylinder dogging with security indicator
CI	Cylinder dogging indicator
CD-CX	Chexit cylinder dogging
CX	Chexit
DI	Dogging indicator
E	Electric locking mortise/lever
ESL	Emergency secure lockdown
FER	Fortified exit rim
HDSI	Hex dogging with security indicator
HH	Wind and impact
HW	Hurricane, wind only
LD	Less dogging
L-KC	Lever- key capture
LX	Latch bolt monitoring
LX-LC	Latch bolt monitoring, low current
LX-RX	Latch bolt monitoring, request to exit
LX-RX-LC	Latch bolt monitoring, request to exit low current
OUT	Outdoor defense
PL	Pullman latch
PN	Pneumatic latch retraction
QEL	Quiet electric latch retraction
QM	Quiet mechanical
RX	Request to exit
RX2	Double request to exit
RX-AUX	Request to exit, auxiliary
RX-LC	Request to exit, low current
SD	Special dogging -panic only
SS	Signal switch
WP-RX	Waterproof request to exit
WS-T	Windstorm (FEMA rated)
XP	Heavy protection - rim

2 Device series

98	Series 98-smooth
99	Series 99-grooved

3 Device type

None	Rim device
27	Surface mounted vertical rod device
47	Concealed vertical rod device
47WDC	Concealed vertical rod wood door device
48	Concealed vertical rod device
49	Concealed vertical cable device
50WDC	Concealed vertical cable wood door device
52	Rim device with remote trim input (pool exit hardware)
57	Three-point latch device
75	Mortise lock device

4 Trim functions

EO	For AD or CO locks, order the panic as Exit Only (EO)
DT	Dummy trim
EO	Exit only
HL	Hospital pull trim
K	Knob
K-BE	Knob - blank escutcheon
K-DT	Knob, rigid - dummy trim
K-NL	Knob, rigid - night latch
L	Lever (classroom)
L-BE	Lever - blank escutcheon
L-DT	Lever, rigid - dummy trim
L-KC	Lever - key capture
L-NL	Lever, rigid - night latch
NL	Night latch
NL-OP	Night latch cylinder assembly, optional pull
TL	Turn lever
TL-BE	Turn lever - blank escutcheon
TL-KC	Turn Lever - key capture
TP	Thumbpiece
TP-BE	Thumbpiece - blank escutcheon

5 Rating

F	Fire exit hardware
Blank	Panic exit hardware

6 Suffix

-2	Double cylinder (rim and mortise only)
-2SI	Double cylinder with security indicator (rim only)
CON	Connectors
WH	Weep holes

7 Finish

605	Bright brass
606	Satin brass
612	Satin bronze
619	Satin nickel
622/711	Matte black/Matte black, anodized
625	Bright chrome
626	Satin chrome
626AM	Satin chrome, antimicrobial
628	Aluminum, anodized
630	Satin stainless
630AM	Satin stainless, antimicrobial
643e	Aged bronze
693	Black paint
710	Dark brown, anodized

8 Door width / Door thickness

3'	Standard default	1 3/4"	Standard
4'		2 1/4"	Optional
2'	Vertical only		

9 Handing

LHR	Left hand reverse
RHR	Right hand reverse

10 Less bottom rod/cable

LBR	Less bottom rod
LBL	Less bottom latch
LBR-AFL	LBR with fire pin
LBL-AFL	LBL with fire pin

11 Trim options/finish

06	Standard default (optional levers available)

12 Optional strike/finish

See optional strikes/finish for each device type

13 Accessories

CYL	Cylinder
GBK	Glass bead kit
SEC	Security screws
SLM	SLM blocking
SNB	Sex bolts

14 Other information

Touchbar options

BRAILLE	Vision impaired touchpad, raised letter, and braille
PUSH	Touchbar trim embossed 'PUSH'
RSS	Red silk-screened lettered touchbar trim
KN	Knurled touchbar
SG	Safety glow

Miscellaneous

CE	CE labeled
LCP	Less cover plate
IOWDA	#IOWDA cover plate

Door material

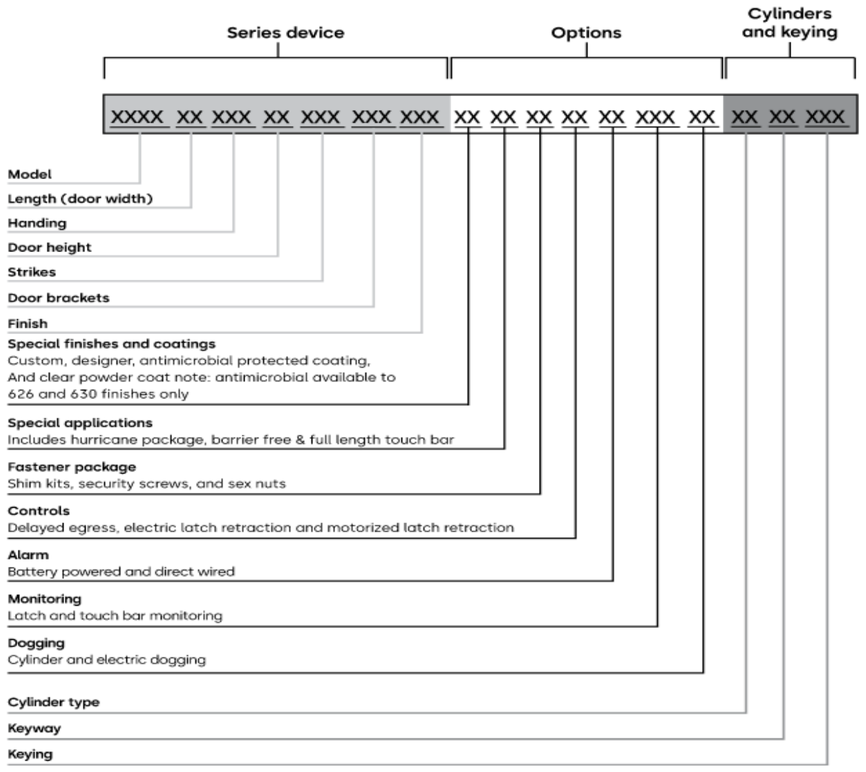
AL	Aluminum door
HM	Hollow metal
WD	Wood door
CP	Composite door
INS2	Insulclad - 1/2"
INS4	Insulclad - 1/4"

Door application

D	Double egress
P	Pair of doors
S	Single door

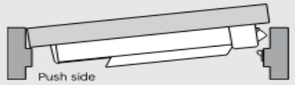
Note: Not all options are listed. See the specific device type pages for complete options available.

How to order 9000 Series exit devices

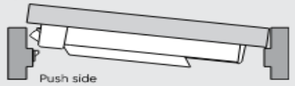


Handing

Right-Hand Reverse Bevel (RHR)
Outside



Left-Hand Reverse Bevel (LHR)
Outside



Patented key control
D100 is the keyway for our patented SC serialized key control system. SC is internet based and provides added layers of security. For more information, contact your local sales representative or Technical Service at 800-523-8488.

BA	Battery powered exit alarm
BAR	Battery powered exit alarm, (4) minute reset
DA	Direct wired exit alarm
CD	Cylinder dogging
MLR	Motorized latch retraction / electric dogging
ES	Latch retraction (9100, 9300, 9400, 9600, 9700, 9800)
ETR	Top rod extension (9100, 9400, 9600, 9800)
GK9000	Vision lite shim kit (wide stile)
GK9200	Vision lite shim kit (narrow stile)
LB	Less bottom rod (9100, 9400, 9600, 9800)
LM	Latch monitor
MS	Monitor switch
HC	Hurricane code rated (9300, 9400, 9500, 9700, 9800)
TP	Touchbar protector
LM/MS	Latch monitor/monitor switch
LM/MS BP	Latch monitor/monitor switch with bypass
DE	Delayed egress, 15 sec (9100, 9300, 9500, 9600, 9700)
D3	Delayed egress, 30 sec (9100, 9300, 9500, 9600, 9700) requires special approval from authority having jurisdiction)
[illegible]	[illegible]

CD-CX	Chexit cylinder dogging
CX	Chexit
DI	Dogging indicator
E	Electric locking mortise/lever
ESL	Emergency secure lockdown
FER	Fortified exit rim
HDSI	Hex dogging with security indicator
HH	Wind and impact
HW	Hurricane, wind only
LD	Less dogging
L-KC	Lever- key capture
LX	Latch bolt monitoring
LX-LC	Latch bolt monitoring, low current
LX-RX	Latch bolt monitoring, request to exit
LX-RX-LC	Latch bolt monitoring, request to exit low current
OUT	Outdoor defense
PL	Pullman latch
PN	Pneumatic latch retraction
QEL	Quiet electric latch retraction
QM	Quiet mechanical
RX	Request to exit
RX2	Double request to exit
RX-AUX	Request to exit, auxiliary
RX-LC	Request to exit, low current
SD	Special dogging -panic only

Schlage PS902	Schlage PS904	Schlage PS906
Up to 2 amps	Up to 4 amps	Up to 6 amps

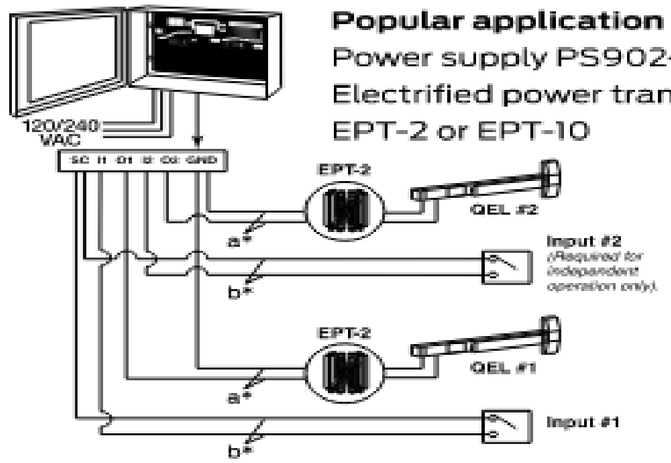
QEL electrical load

Voltage	24VDC
Current	1.0 A Inrush (0.5 sec.) / 0.14 A Holding

Minimum door opening widths*

Application	Surface vertical	Concealed vertical	Mortise	Rim
Min. door opening	28 1/4"	28 1/4"	28 3/4"	29 1/4"

* For 3' devices. For 4' devices, add 6".



Popular application
Power supply PS902-2RS
Electrified power transfer
EPT-2 or EPT-10

a*

Distance (one-way)	Wire gauge
200 '	18 AWG
320 '	16 AWG
500 '	14 AWG
800 '	12 AWG

b*

Wire selection	Switch wire size
1200 ft. Max.	18 gauge standard

Motorized latch bolt retraction

Specify **MLR**. A motor concealed in the touchbar assembly provides retraction of the latch bolt by drawing in the touch bar to allow access from the secure side of the door. MLR can also be used to electrically dog/hold the exit push bar in a retracted position during non-secure hours (latch bolt is retracted). Remote control can be accomplished with switching devices such as key switches and card readers that provide a normally open electrical contact. The motor is rated at 24 VDC, 1.5 AMP.

The motor draws approximately 215 milliamp during continuous operation. MLR can be powered by the RPSMLR Power Supply series. The RPSMLR Power Supply can power up to 2 MLR panic exit devices RPSMLR2 – Small enclosure, no battery storage RPSMLR2BB – Larger enclosure for battery storage (Batteries not included)

Electric latch bolt retraction

Specify **ES**. A solenoid concealed in the touchbar assembly provides instantaneous retraction of the latch bolt to allow access from the secure side of the door. Remote control can be accomplished with switching devices such as key switches and card readers that provide a normally open electrical contact. The solenoid is rated for 24 VDC, 14–18 AMP continuous duty, 24 VDC, 14–18 AMP inrush for 200 milliseconds, 1 AMP holding current.

Requires PS501 power supply.

02 DOOR HARDWARE

IBC 2021 Magnetic Locking Systems – Compliance Chart

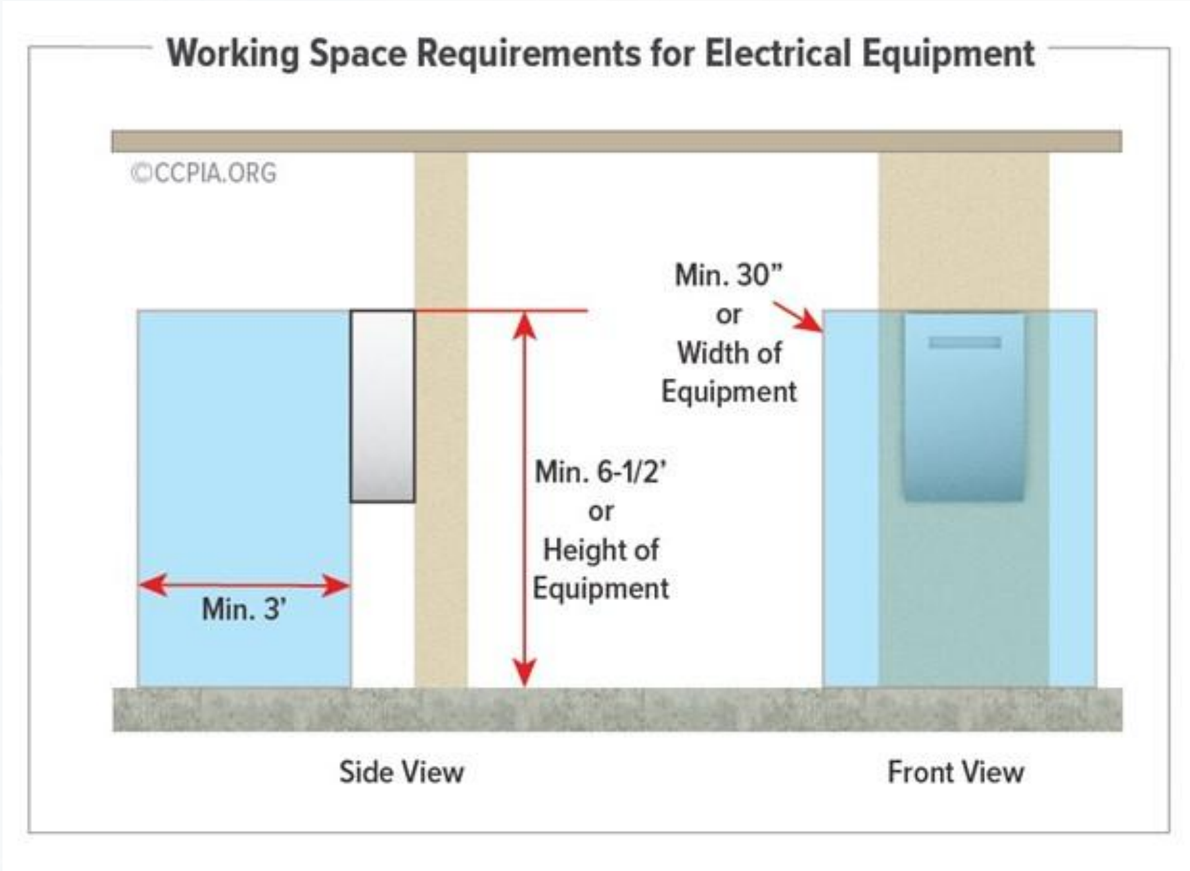
Sensor Release Maglocks (IBC 2021 §1010.1.9.9) vs Door Hardware Release Maglocks (IBC 2021 §1010.1.9.10)

Requirement	Sensor Release Maglocks	Door Hardware Release Maglocks
Method of Release	Motion sensor detects occupant approaching door	Door hardware (lever, push bar) directly interrupts power
Unlock on Sensor Activation	✅Required	❌Not applicable
Manual Release (Push-to-Exit Button)	✅Required within 5 feet of door, labeled "PUSH TO EXIT"	❌Not required
Unlock Duration After Button Press	✅Minimum 30 seconds	❌Not applicable
Unlock on Fire Alarm / Sprinkler Activation	✅Required if system is present	❌Not required
Unlock on Power Loss	✅Required	✅Required
Listed & Approved Components	✅Sensor and button must be listed	✅Hardware must be listed
Unlock via Door Hardware	❌Not applicable	✅Required (must release lock without delay)
One-Handed Operation	✅Required	✅Required
Special Occupancy Limitations	❌Allowed in most occupancies with approval	✅Restricted to Groups A, B, E, I, M, R-1, R-2
AHJ Approval Required	✅Yes	✅Yes

Additional Notes: - All maglocks must fail safe. - Components must be code-compliant, listed, and labeled. - Must maintain required fire rating if installed on fire doors. - Installation must not obstruct egress and must comply with ADA/ICC A117.1 standards.

03 CODES AND STANDARDS

- Electrical Rooms – Code Requirements
- NEC 110 – Working Clearance
  - 36-48” Depth
  - 30” Width
  - 78” Height
  - 6’ Clear Space Above



- Electrical Rooms – Code Requirements
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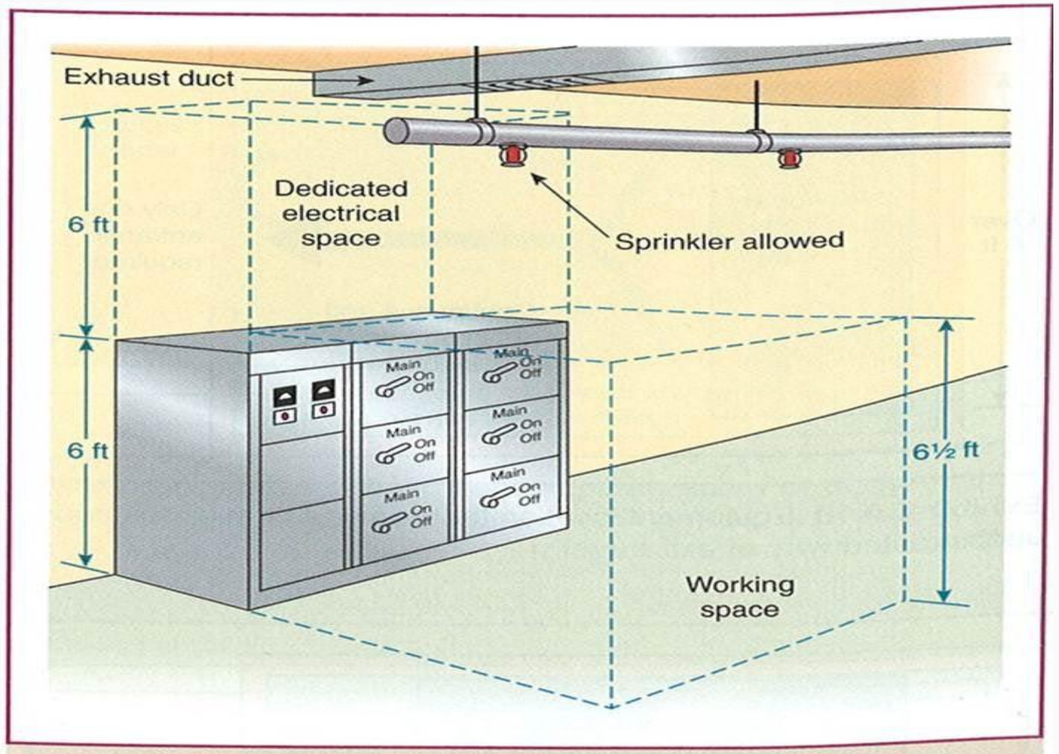
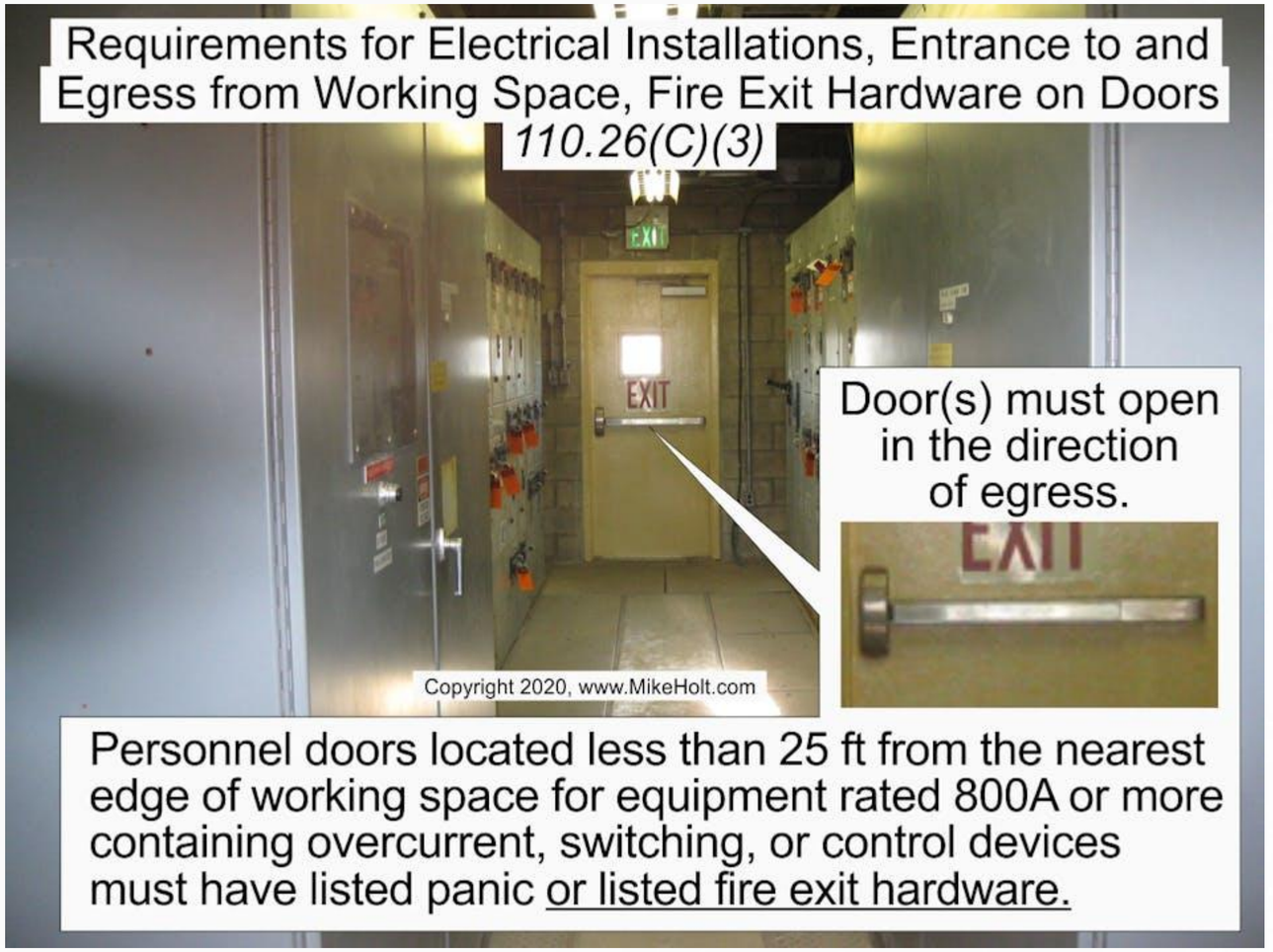


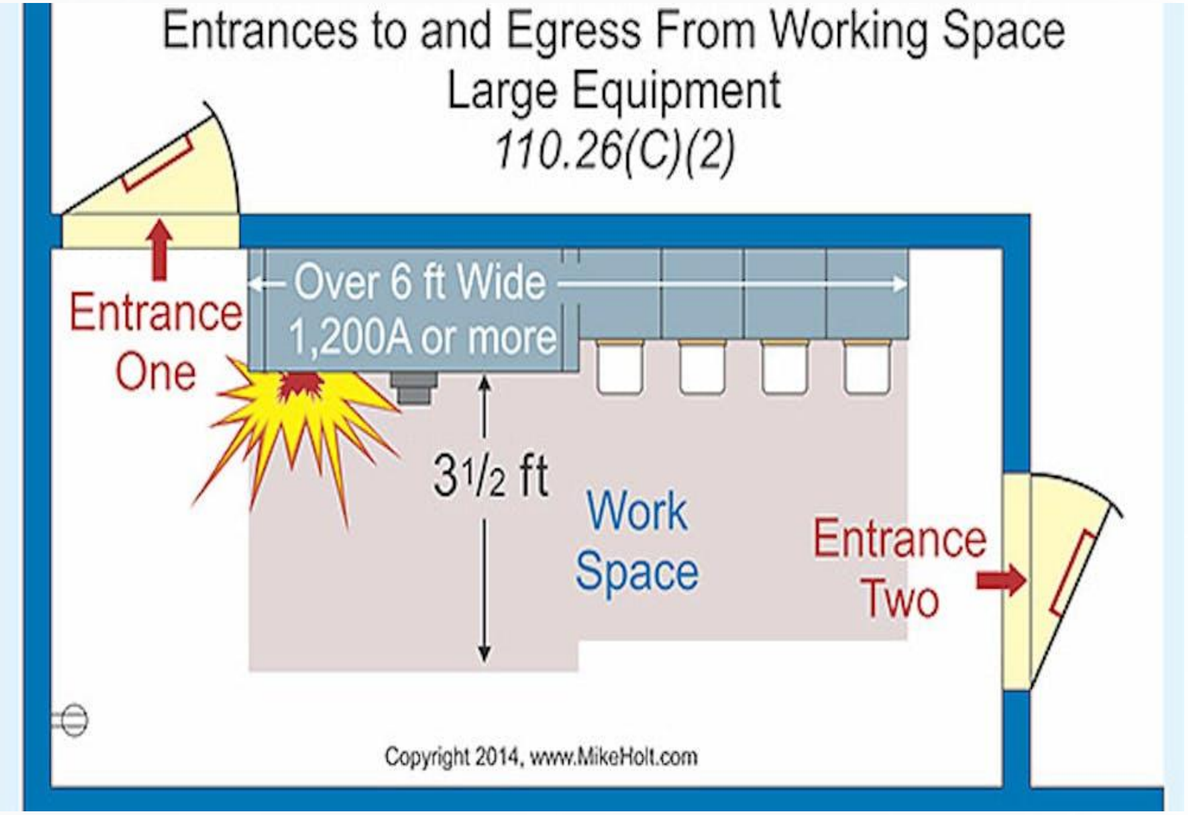
Exhibit 110.21 The two distinct indoor installation spaces required by 110.26(A) and 110.26(F): the working space and the dedicated electrical space.

03 CODES AND STANDARDS

- Electrical Rooms – Code Requirements
- NEC 110 – Egress
  - Rooms with 800A Equipment or More
    - Panic Hardware and Outward Swing
    - Applies to Doors <25’ from Equipment



- Electrical Rooms – Code Requirements
- NEC 110 – Egress
  - Rooms with 1200A Equipment and Over 6’ Wide
    - Two Exits Required – One at Each End
    - Can Be Reduced to One If:
      - Unobstructed Egress Path or
      - Depth of Working Space is Doubled



- Telecom Rooms – Standards

Telecommunications Room (TR) Guidelines

Floor Space Served

There shall be at least one TR or ER per floor.

Multiple rooms are required if the cable length between the HC (FD) and the telecommunications outlet location, including slack, exceeds ≈90 m (295 ft). If the usable floor space to be served exceeds ≈929 m^2 (10,000 ft^2), consider additional TRs.

For TRs that serve areas with an office density of less than one work area per ≈9.3 m^2 (100 ft^2) of usable floor space, a TR may serve larger areas, provided the horizontal cable length requirements are met.

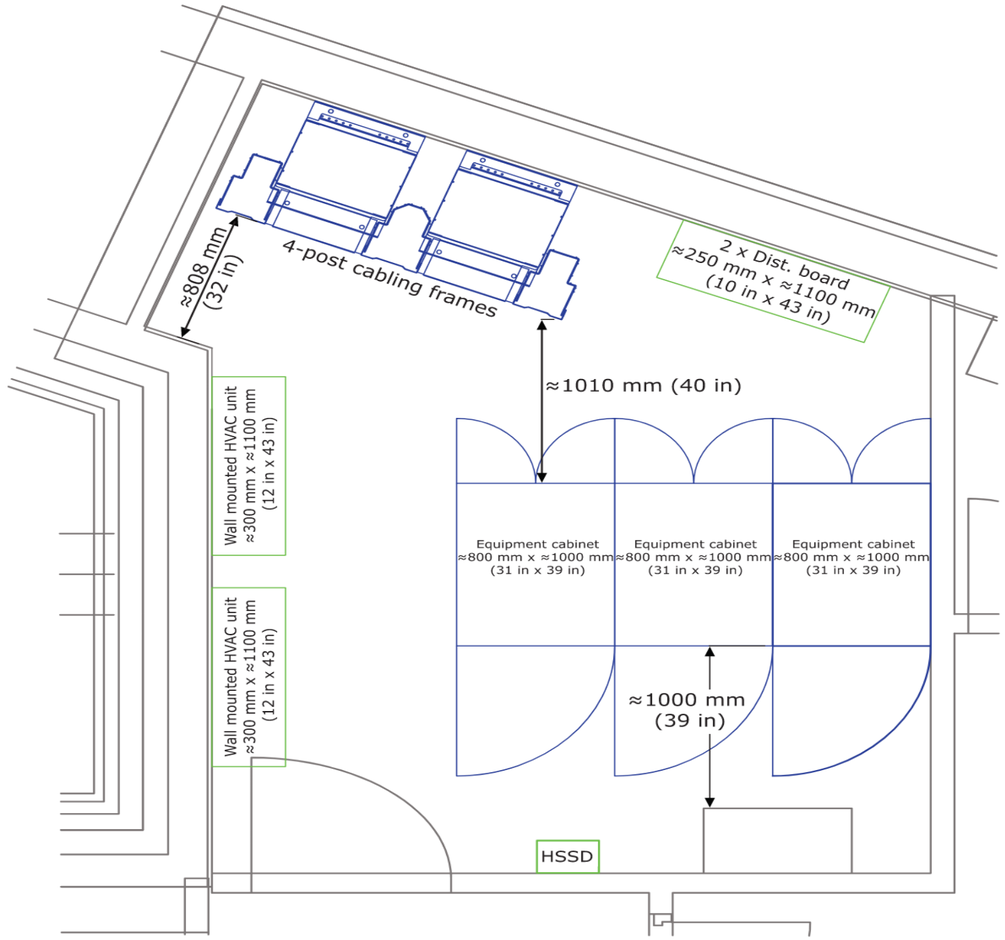
- Telecom Rooms – Standards

Table 4.1
Size guidelines for telecommunications spaces

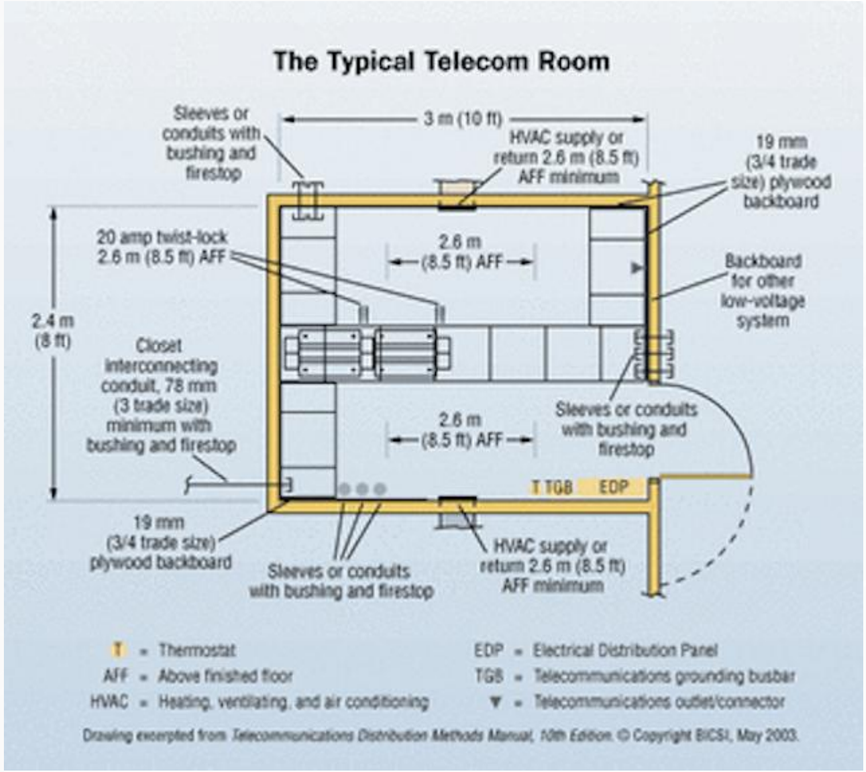
If the Serving Area Is…	Then the Interior Dimensions of the Room Shall Be at Least…
≈465 m^2 (5000 ft^2) or less	≈3 m (10 ft) by ≈2.4 m (8 ft). (See note below.)
Larger than ≈465 m^2 and less than or equal to ≈743 m^2 (>5000 ft^2 to 8000 ft^2)	≈3 m (10 ft) by ≈2.74 m (9 ft).
Larger than ≈743 m^2 and less than or equal to ≈929 m^2 (>8000 ft^2 to 10,000 ft^2)	≈3 m (10 ft) by ≈3.4 m (11 ft).

NOTE: The size of ≈3 m (10 ft) by ≈2.4 m (8 ft) is specified here to allow a center rack, cabinet, or enclosure configuration.

03 CODES AND STANDARDS



HSSD = High sensitivity smoke detection
HVAC = Heating, ventilation, and air-conditioning



- NEC Changes
  - NEC 406.12 – Tamper-Resistant Receptacles
    - 2014 NEC: 3 Locations – Dwelling Units, Guest Rooms/Suites, Child Care Facilities
      - Child Care Facility Definition: More than 4 children ages 7 and below
    - 2017 NEC: Added 4 locations including preschools and elementary education, medical office public areas, some assembly areas, dormitories
    - 2020 NEC: Removed the word elementary and added assisted living facilities
      - MOA interpretation – TR receptacles in every educational space (which is not defined in the NEC), including post-secondary

03 CODES AND STANDARDS

- NEC Changes
  - NEC 210.8(B) – GFCI Receptacles in Locations other than Dwelling Units
    - 2017 NEC: Added requirement for GFCI protection on all single phase 120V receptacles up to 50A, and all 3-phase receptacles, 120/208/240V up to 100A (MOA local amendment reduced 3-phase size limit to 30A)
    - 2020 NEC: Added Laundry Areas and receptacles within 6’ of the outside edge of a bathtub or shower stall
  - NEC 406.9 – Receptacles in Damp/Wet Locations
    - 2017 NEC: No Receptacles in or above bathtub or shower stall
    - 2020 NEC: No receptacles within a zone 3’ horizontally and 8’ vertically from the top of the bathtub rim or shower stall threshold including the space over the tub/shower

- NEC Changes
  - NEC 210.63 – Receptacles for Equipment Requiring Servicing
    - Within 25’ of heating/air conditioning/refrigeration equipment, on the same level, and not connected to the load side of the branch circuit disconnecting means
    - Within the same room as indoor service equipment
    - Within the same room or area as equipment requiring dedicated equipment space per 110.26(E) and not connected to the load side of the branch circuit disconnecting means
    - 210.8(E): GFCI for Equipment Requiring Servicing
    - MOA local amendment removed the non-load side requirement for the indoor equipment requiring dedicated equipment space

03 CODES AND STANDARDS

- IBC/IFC/NFPA 72
  - 2012 IBC/IFC – requirement for voice evacuation in educational facilities
  - 2018 IBC/IFC – requirement for addressable systems and transmitting contact ID
  - 2016 NFPA 72 – moving away from telephone lines to other means of transmission for 24-hour monitoring
    - IP – allowed by SoA, not allowed by MOA unless all equipment is fire-rated
    - Cellular – dual-carrier communicators using AT&T/Verizon in use, GCI not yet
    - Radio – Guardian is most common, typically requires a minimum of 3 sites for redundancy/mesh configuration
  - Note that NFPA 72 requires factory certification for any panel reprogramming, but any NICET fire alarm technician can do annual inspections

Distributed Antenna Systems

- IBC 510 dictates requirements with 90% to 95% coverage requirements
- Typical Size/Type of Building – not necessarily big buildings only, as things like the reflectiveness of the glass, location of the towers, building materials all affect coverage
- Can do site surveys beforehand, and use FCC data to determine likelihood of need
- For existing buildings, best to confirm with fire department at start of design
- For new construction, use probability data, plan for pathways, can do signal strength testing once enclosed and floors are in place
- Cost per square foot installed: Start at $50k baseline for equipment and add $.50-$1.00/sq ft

Distributed Antenna Systems

- Most common design is antenna on roof, coax trunk to active equipment in protected room (typically next to fire alarm control panel), coax riser to each floor, cabling to individual antennas
- Combination cellular boost and emergency radio not really practical
  - Too many different carrier types and bandwidths
  - Carriers are higher frequency requiring 3-5 times as many antennas
  - Carrier boosters don't meet fire code, but using fire-rated equipment for carrier boosting is expensive

Questions and Answers...

RSA Engineering

Thank You