ARTICLE 110 REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

Introduction to Article 110—Requirements for Electrical Installations

Article 110 sets the stage for how the rest of the *NEC* is implemented. It is critical for you to completely understand all aspects of this article since it is the foundation for much of the *Code*. As you read and master Article 110, you are building your own essential foundation for correctly applying the *NEC*. The purpose of the *National Electrical Code* is to provide a safe installation, but this article is perhaps focused a little more on providing an installation that is safe for the installer and maintenance electrician, so time spent here is time well spent.

110.3 Examination, Identification, Installation, Use, and Product Listing (Certification) of Equipment

The revision clarifies that equipment that is listed, labeled, or both be installed in accordance with the instructions included in the listing or labeling. How the product might be used or installed is still ultimately at the discretion of the authority having jurisdiction (AHJ).

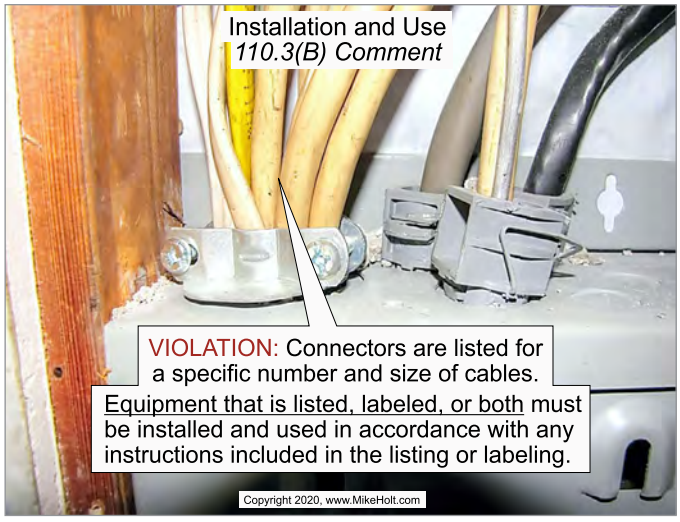
Analysis

CLARIFIED

Nationally recognized listing standards (UL and CSA for example) require a product to be listed and the product itself to be marked (labeled) to indicate it is listed. Listed products are often installed and used in applications that are outside of their listing. The information on the equipment label helps the installer and the authority having jurisdiction (AHJ) avoid potentially dangerous misuse of equipment.

110.3 Examination, Identification, Installation, Use, and Product Listing (Certification) of Equipment

(B) Installation and Use. Equipment that is listed and/or labeled must be installed and used in accordance with instructions included in the listing or labeling requirements. ▸Figure 110–1



▸Figure 110–1

Author's Comment:

- Connectors are listed for a specific number and size of cables. ▸Figure 110–2

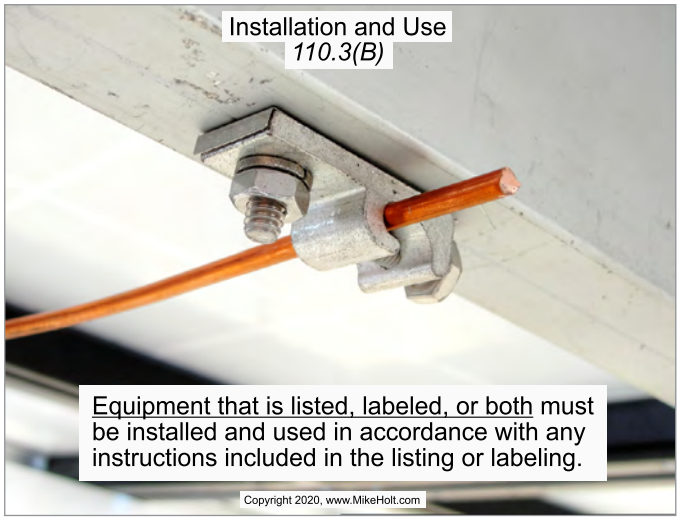


Figure 110–2

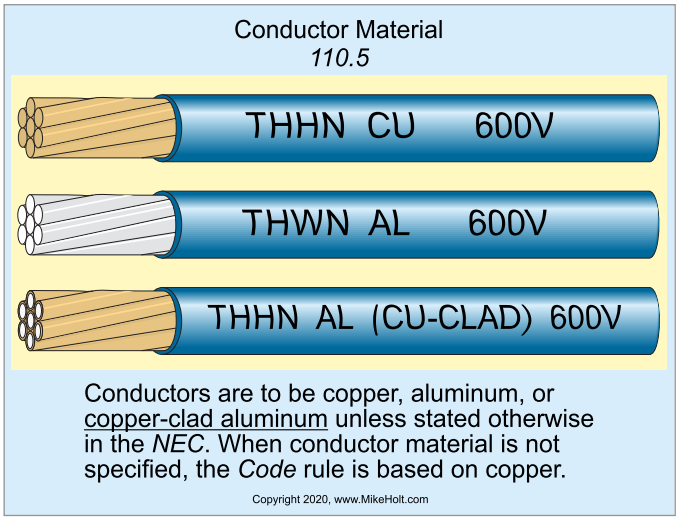


Figure 110–3

110.5 Conductor Material

Copper-clad aluminum conductors seem to have been neglected for a very long time and for no reason other than perhaps limited availability due to lack of demand. Since most of the electrical current travels on the outside of the conductor, copper-cladded aluminum is just as reliable as copper by itself. This section was revised to delete the Informational Note regarding a copper-clad aluminum conductor and place it into the rule text.

Analysis

CLARIFIED

The *NEC* permits the use of copper-clad aluminum conductors just as it does copper and aluminum conductors and there was no good reason not to include copper-clad aluminum in the main text. The ampacity tables include copper-clad aluminum in the same column as aluminum conductors.

110.12 Mechanical Execution of Work

This is perhaps one of the most contentious and practically unenforceable rules in the entire *NEC* because it is entirely subjective since there is no solid definition of "installed in a neat and workmanlike manner." This rule, that appeared in the "xxx.24" sections of some Chapter 7 and 8 articles, was relocated to Article 110 where it applies generally throughout the *Code*.

Analysis

NEW RELOCATED

110.12(C) Cables and Conductors. A new subsection (C) was added using text relocated from the "xxx.24" section of some Chapter 7 and 8 articles to apply generally throughout the *NEC*. It provides guidance for the installation of exposed alarm, communications and data cables, and conductors. While this rule was intended to only apply to Chapter 7 and 8 installations, its placement in Article 110 now makes it apply generally—except for Chapter 8 installations.

The overall scope of these changes still does not provide the guidance specific to distances between supports such as those found in the Chapter 3 cable articles.

110.5 Conductor Material

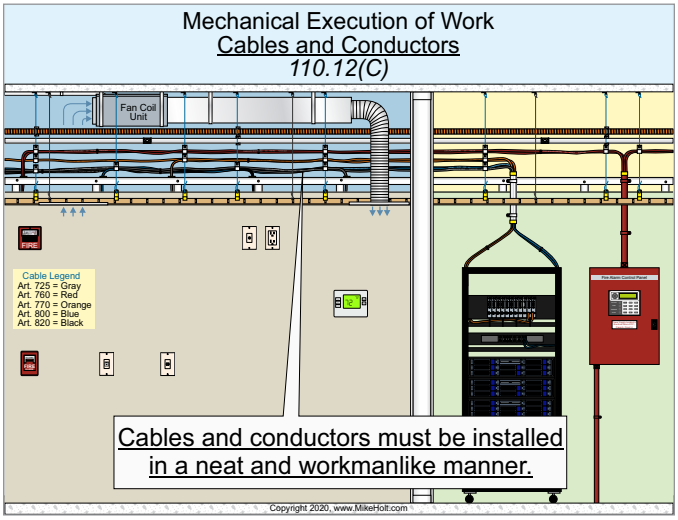
Conductors are to be copper, aluminum, or copper-clad aluminum unless otherwise provided in this *Code*; and when the conductor material isn't specified in a rule, the sizes given in the *NEC* are based on a copper conductor. Figure 110–3

NEW

Informational Notes are also a part of this new first level subsection. One refers to accepted industry practices and another advises that contaminants such as paint, plaster, abrasives, corrosive residues, or others may have an undetermined effect on the properties of optical fiber cables.

110.12 Mechanical Execution of Work

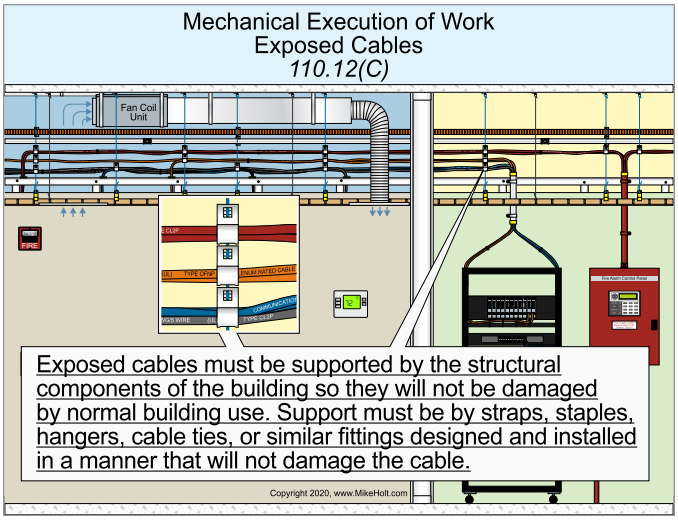
(C) Cables and Conductors. Equipment and cabling must be installed in a neat and workmanlike manner. ▸Figure 110–4



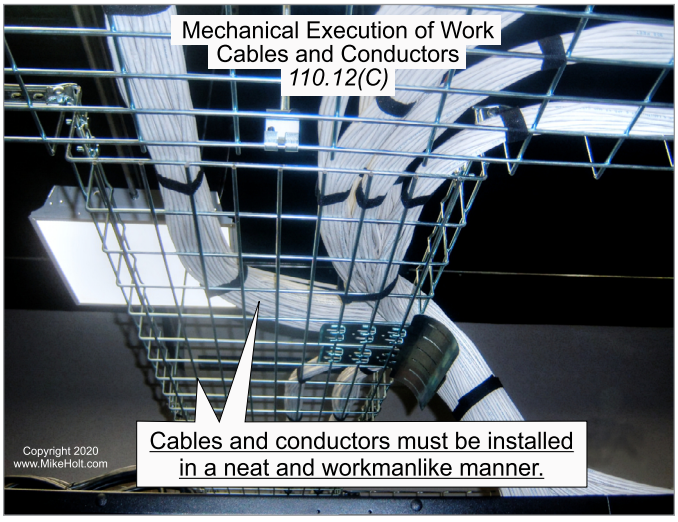
▸Figure 110–4

Exposed cables must be supported by the structural components of the building so the cable will not be damaged by normal building use. Support must be by straps, staples, hangers, cable ties, or similar fittings designed and installed in a manner that will not damage the cable. ▸Figure 110–5 and ▸Figure 110–6

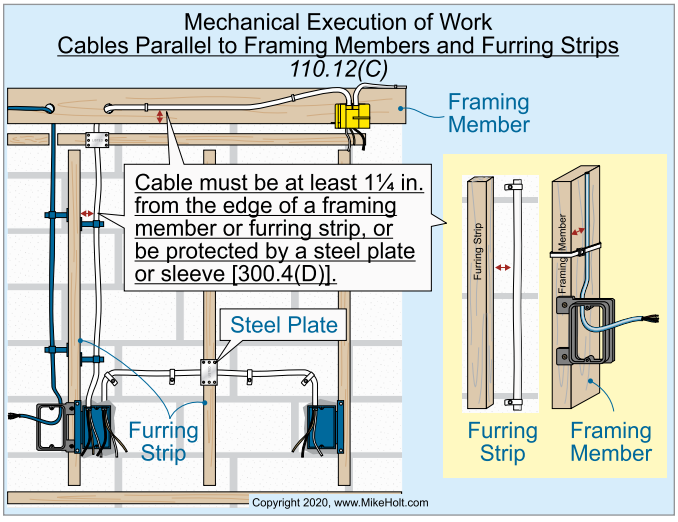
Cables installed through or parallel to framing members or furring strips must be protected, where they are likely to be penetrated by nails or screws, by installing the wiring method so it is not less than 1¼ in. from the nearest edge of the framing member or furring strips, or by protecting it with a 1/16 in. thick steel plate or equivalent [300.4(A)(1) and (D)]. ▸Figure 110–7



▸Figure 110–5



▸Figure 110–6



▸Figure 110–7

Note 1: Industry practices are described in ANSI/NECA/FOA 301, *Standard for Installing and Testing Fiber Optic Cables* and other ANSI-approved installation standards.

Note 3: Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants can result in an undetermined alteration of optical fiber cable properties.

110.14 Conductor Termination and Splicing

The importance of properly tightened electrical terminations cannot be stressed enough. Loose connections are the cause of far too many service calls, equipment damage, and (worse yet) electrical fires. This rule addressing the torqueing of connections first appeared in the 2017 *NEC*. It was revised to require the use of an approved means (not just a calibrated torque tool) to achieve the required torque value. Three new Informational Notes provide guidance for the *Code* user.

Analysis

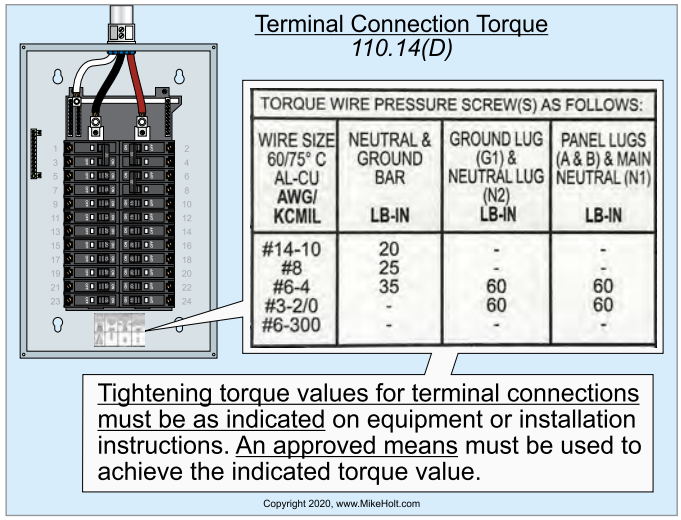
EDITED CLARIFIED

110.14(D) Terminal Connection Torque. The title of the subsection was changed to make the *NEC* easier to use. Finding termination torque requirements in a rule that is titled "Terminal Connection Torque" is easier than finding the same information in a rule called "Installation."

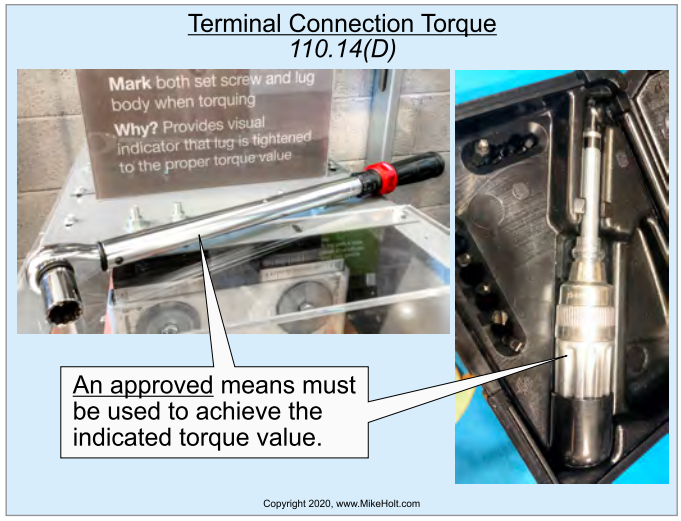
The previous requirement was for the use of a "calibrated torque tool," but an approved means could be a torque tool or a fastener with some type of torque indicator.

110.14 Conductor Termination and Splicing

(D) Terminal Connection Torque. Tightening torque values for terminal connections must be as indicated on equipment or installation instructions. An approved means, (torque tool), must be used to achieve the indicated torque value. ▸Figure 110–8 and ▸Figure 110–9



▸Figure 110–8



▸Figure 110–9

Author's Comment:

- Conductors must terminate in devices that have been properly tightened in accordance with the manufacturer's torque specifications included with equipment instructions. Failure to torque terminals properly can result in excessive heating of terminals or splicing devices due to a loose connection. A loose connection can also lead to arcing which increases the heating effect and may also lead to a short circuit or ground fault. Any of these can result in a fire or other failure, including an arc flash event. In addition, this is a violation of 110.3(B), which requires all equipment to be installed in accordance with listing or labeling instructions.

Note 1: Examples of approved means of achieving the indicated torque values include torque tools or devices such as shear bolts or breakaway-style devices with visual indicators that demonstrate the proper torque has been applied.

Note 2: The equipment manufacturer can be contacted if numeric torque values are not indicated on the equipment or if the installation instructions are not available. Annex I of UL Standard 486A-486B, *Standard for Safety-Wire Connectors*, provides torque values in the absence of manufacturer's recommendations.

Note 3: Additional information for torqueing threaded connections and terminations can be found in Section 8.11 of NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance.*

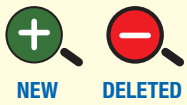
Author's Comment:

- Connections are arguably one of the most common points of electrical failure and properly making those connections properly is critical in preventing connection failures. Either too tight or too loose can result in connection failures and it is difficult to manually find the optimal intersect of mechanical strength and the most desirable performance.
- There is still no guidance as to how often a torqueing tool must be calibrated or who is to do so. The revised rule just requires an approved means to achieve the required torque value. This approved means could be a torque tool or a fastener with some type of torque indicator. One such indicator is a double head bolt found on some electrical equipment, where the outer head snaps off at the required torque.
- This rule is still difficult from an enforcement point of view. You may need to try to verify what the AHJ requires. Some may want to be present to watch the torqueing of the connection, others may just want to see the tool, and some want to see a "sign off" sheet with the equipment location, the torque value, the date, and the name of the person who torqued the connection. New Informational Notes provide some additional guidance. (See Notes: 1, 2, and 3.)

110.21 Markings

Reconditioning, and when it is permitted, was addressed globally throughout the *Code* during this 2020 revision cycle. This section was clarified to require that, in addition to the equipment being identified as "reconditioned," the original listing marking must be removed.

Analysis



110.21(A)(2) Reconditioned Equipment. This change requires the original listing mark to be removed because it no longer applies to the reconditioned equipment. Even if it was reconditioned to meet (or even exceed) current safety and other standards, it is not the same as the original listing. A new Informational Note 3 was added to indicate that only the original listing mark, and not the entire label, is to be removed. The original manufacturer's label often includes information that needs to be retained.

110.21 Markings

(A) Equipment Markings

(1) General. The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified must be placed on all electrical equipment. Other markings that indicate voltage, current, wattage, or other ratings must be provided as specified elsewhere in this *Code*. The marking or label must be of sufficient durability to withstand the environment involved.

(2) Reconditioned Equipment

Reconditioned equipment must be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

Reconditioned equipment must be identified as "reconditioned" and the original listing mark removed. Approval of the reconditioned equipment must not be based solely on the equipment's original listing.

Ex.: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) are not required for equipment that is reconditioned by the owner or operator as part of a regular equipment maintenance program.

Note 1: Industry standards are available for the application of reconditioned and refurbished equipment.

Note 2: The term "reconditioned" may be interchangeable with terms such as "rebuilt," "refurbished," or "remanufactured."

Note No. 3: The original listing mark may include the mark of the certifying body and not the entire equipment label.

Author's Comment:

- One might assume that removing the original listing mark is to be completed during the reconditioning process, but the *Code* provides no guidance on just who is responsible for its removal, the removal criteria, or verification that it was done!

110.22 Identification of Disconnecting Means

All electrical circuits large or small require a means to turn off the power and those means are required to be clearly identified. Turning off the wrong circuit(s) can sometimes create havoc! The requirement to identify the disconnecting means in this rule was expanded to include a requirement to identify the source of the circuit that supplies the disconnecting means.

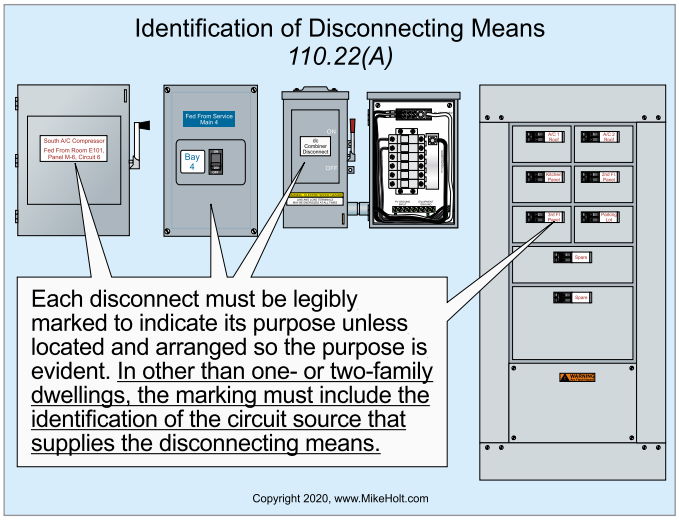
Analysis

EXPANDED

This rule was expanded to require that the power source, as well as the equipment served, be marked on the disconnect that is being served. This requirement doesn't apply to one- or two-family dwellings.

110.22 Identification of Disconnecting Means

(A) General. Each disconnect must be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking must include the identification of the circuit source that supplies the disconnecting means. The marking must be of sufficient durability to withstand the environment involved. ▸Figure 110–10



▸Figure 110–10

Author's Comment:

- See 408.4 for additional requirements for identification markings on circuit directories for switchboards and panelboards.
- These rules are intended to make it safer to work on electrical equipment. The premise is that if the worker knows the location of the power source, he or she is much more likely than not to lockout and tagout the power source.

110.24 Available Fault Current

Fault current far exceeds that of rated current and as such is far more dangerous. The sheer power behind an electrical fault can vaporize metal and justifies the critical attention it receives. The word "maximum" that preceded "available fault current" was deleted because the new definition of "Fault Current, Available (Available Fault Current)" specifies that current is the largest amount that can be delivered into a short circuit at that point on the system. A new Informational Note was also added.

Analysis

EDITED CLARIFIED

110.24(A) Field Marking. The change here is an example of revisions made throughout the *NEC* as a result of the new "Fault Current, Available (Available Fault Current)" definition in Article 100. The definition says that the available fault current is the maximum current available at that location, and the word "maximum" is being removed from *Code* sections where it was applied to the term "Fault Current."

A second Informational Note was added to say that values of available fault current for use in determining the appropriate minimum short-circuit current and interrupting ratings of service equipment are available from the electric utilities. This information, which is required to be provided, aids a worker in the ability to recognize hazards and identify safety-related work practices located in NFPA 70E, *Standard for Electrical Safety in the Workplace*.

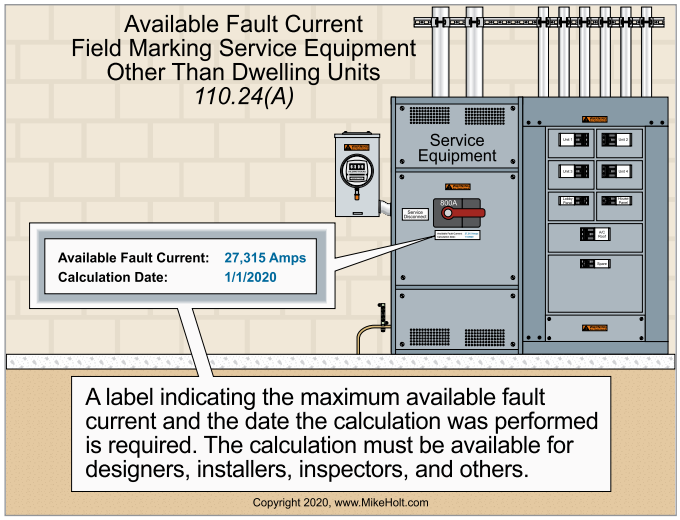
110.24 Available Fault Current

(A) Field Marking. In other than dwelling units, service disconnects must be field marked with the available fault current on the line side of the service disconnect, the date the fault current calculation was performed, and the marking must be of sufficient durability to withstand the environment present.

The available fault current calculation must be documented and be available to those who are authorized to design, install, inspect, maintain, or operate the system. ▸Figure 110–11

Note 1: The available fault current markings required by this section are related to the short-circuit current and interrupting ratings of equipment required by 110.9 and 110.10. They are not intended to be used for arc flash analysis. Arc flash hazard information is available in NFPA 70E, *Standard for Electrical Safety in the Workplace*.

Note 2: Values of available fault current for use in determining short-circuit current and interrupting ratings of service equipment are available from electric utilities in published or other forms.



▸Figure 110–11

110.26 Spaces About Electrical Equipment

There just cannot be enough emphasis placed upon the importance of clear and accessible working space around electrical equipment. The *NEC* goes to great lengths to help ensure the safety of electrical workers. It is sad, but sometimes a change to this section is the result of an unforeseeable incident that results in injury, property damage, and even fatalities. This is not the case for all changes to the *Code*, but some changes and clarifications during the 2020 revision cycle were made to require even safer workspaces. When equipment is installed on concrete pads it affects the equipment, but the pad itself is not equipment so it could extend out past the 6 in. permitted for electrical equipment. This change clarifies this. Clarifications were also made to entrances and egresses to and from working spaces (C) as well as the illumination (D) of these areas.

Analysis

CLARIFIED

110.26(A)(3) Height of Working Space. Large electrical equipment is often installed on a raised concrete pad that extends a few inches in front of the face of the equipment. The use of such pads was unclear in the 2017 *Code* language which permitted "other equipment" associated with the electrical installation to project not more than 6 in. in front of the equipment.

Public Comment (PC) indicated that it would be a real stretch of the Article 100 definition of "Equipment" to see the "housekeeping pad" as equipment. The revision permits "other equipment or support structures, such as concrete pads, associated with the electrical equipment to extend not more than 6 in. beyond the front of the electrical equipment." The revised wording now very clearly permits this commonly used installation method.

EDITED

110.26(C)(2) Large Equipment. This section was revised to prevent a worker from being trapped because an open equipment door protrudes into the means of egress thereby impeding or even blocking the worker's escape from the area in the event of an emergency.

CLARIFIED

110.26(C)(3) Personnel Doors. This is another large equipment rule; however, the current must be 800A or more for the rule to apply. This rule requires the exit doors from the working space to swing in the direction of egress and have listed panic hardware or listed fire exit hardware. Permitting listed fire exit hardware was added because it is required where the electrical equipment is in a room with fire-rated walls.

CLARIFIED

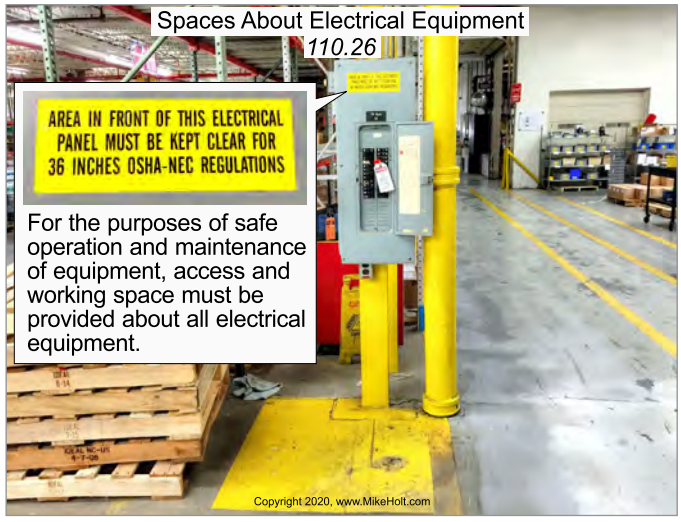
110.26(D) Illumination. Having the working space go completely dark because an automatic control turns off the lights creates a serious safety hazard to someone who may be working on energized equipment. This change requires that at least some of the working space lighting be controlled only by manual means.

110.26 Spaces About Electrical Equipment

For the purpose of safe operation and maintenance of equipment, access and working space must be provided about all electrical equipment. ▸Figure 110–12

Author's Comment:

- Spaces about electrical equipment (width, depth, and height) consist of working space for worker protection [110.26(A)] and dedicated space to provide access to, and protection of, equipment [110.26(E)].



▸Figure 110–12

(A) Working Space. Equipment that may need examination, adjustment, servicing, or maintenance while energized must have a working space provided in accordance with 110.26(A)(1), (2), (3), and (4).

Author's Comment:

- The phrase "while energized" is the root of many debates. As always, check with the authority having jurisdiction to see what equipment he or she believes needs a clear working space.

Note: NFPA 70E, *Standard for Electrical Safety in the Workplace*, provides guidance in determining the severity of potential exposure, planning safe work practices including establishing an electrically safe work condition, arc flash labeling, and selecting personal protective equipment.

(1) Depth of Working Space. The depth of working space, which is measured from the enclosure front, is not permitted to be less than the distances contained in Table 110.26(A)(1), which is dependent on voltage and three different conditions. ▸Figure 110–13

Author's Comment:

- Depth of working space must be measured from the enclosure front, not the live parts. ▸Figure 110–14

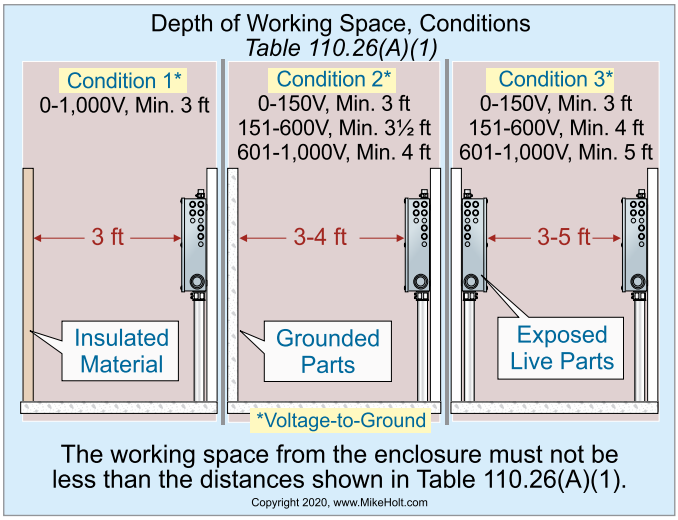


Figure 110–13

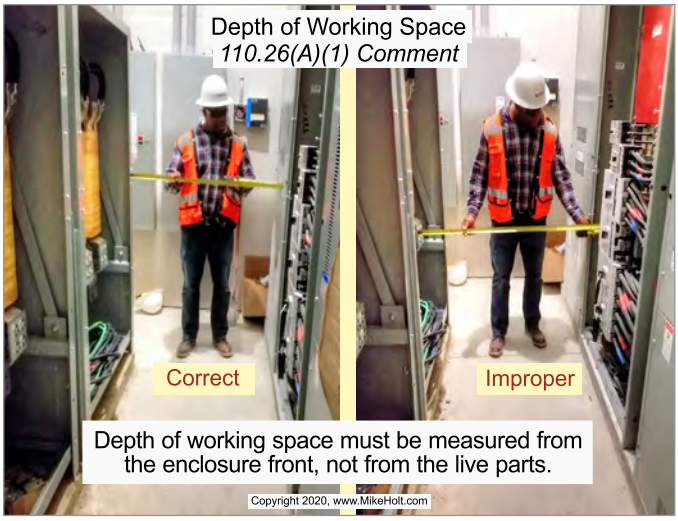


Figure 110–14

Table 110.26(A)(1) Working Space			
Voltage–to–Ground	Condition 1	Condition 2	Condition 3
0–150V	3 ft	3 ft	3 ft
151–600V	3 ft	3½ft	4 ft
601–1,000V	3 ft	4 ft	5 ft

Figure 110–15, Figure 110–16, and Figure 110–17

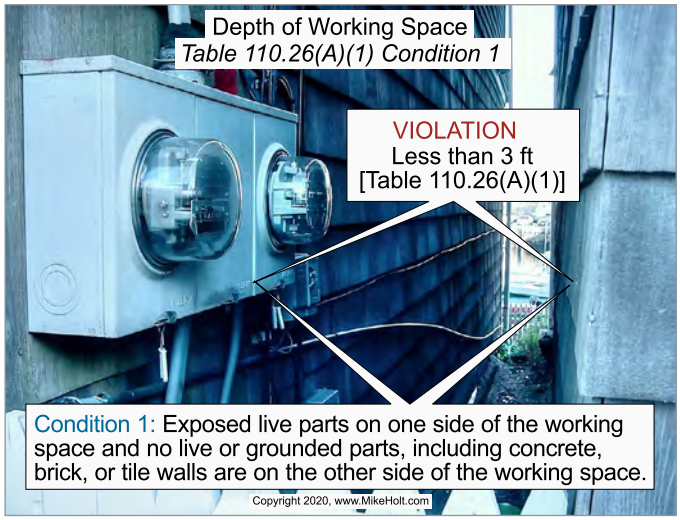


Figure 110–15

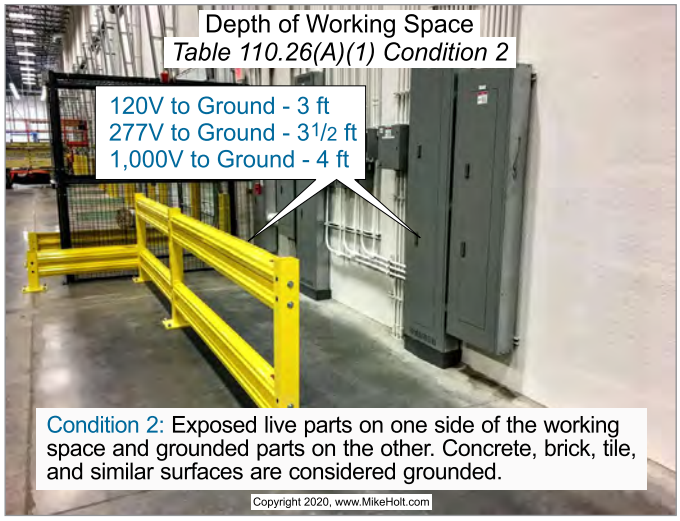


Figure 110–16

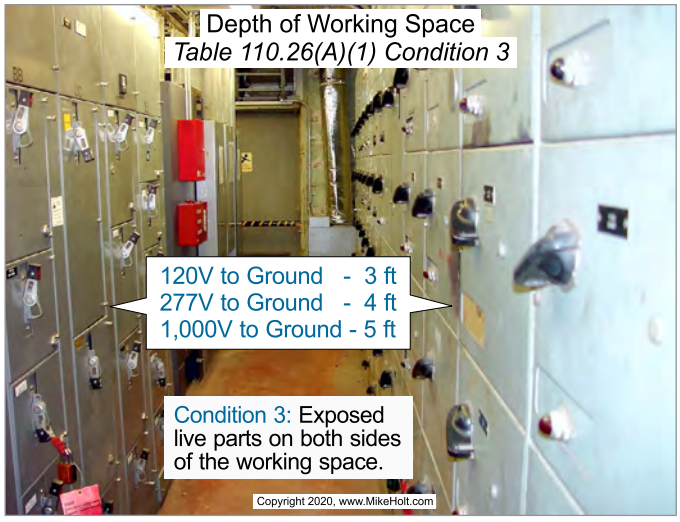
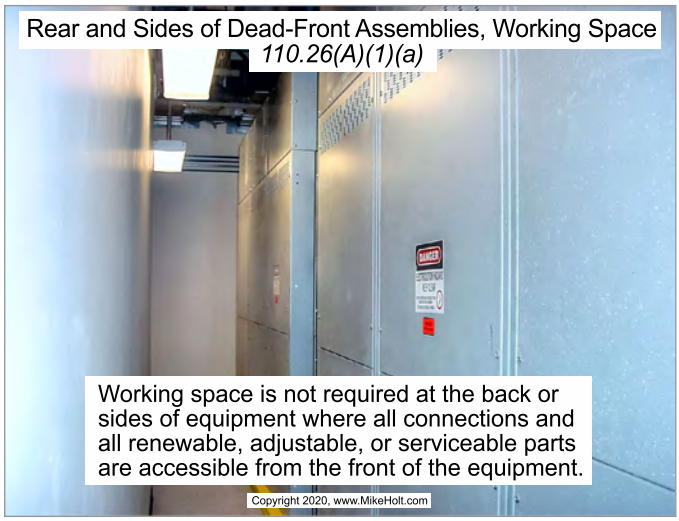


Figure 110–17

(a) Rear and Sides of Dead-Front Equipment. Working space is not required at the back or sides of equipment where all connections and all renewable, adjustable, or serviceable parts are accessible from the front of the equipment. ▸Figure 110–18



▸Figure 110–18

Author's Comment:

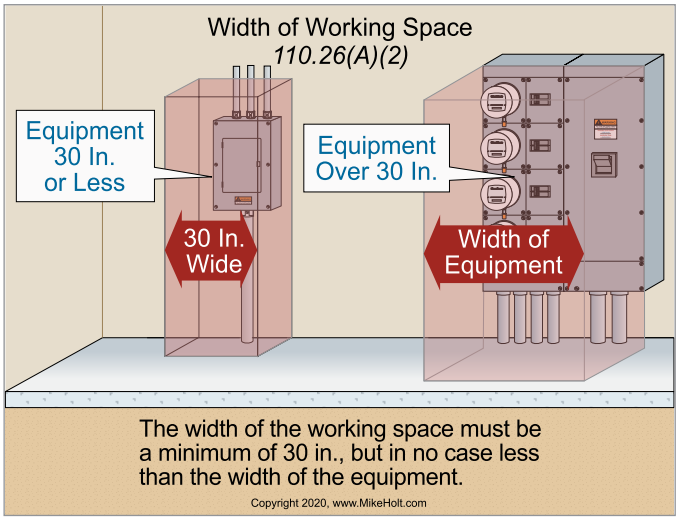
- Sections of equipment that require rear or side access to make field connections are to be marked by the manufacturer on the front of the equipment, see 408.8(C).

(c) Existing Buildings. If electrical equipment is being replaced, Condition 2 working space is permitted between dead-front switchboards, switchgear, panelboards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time, and only authorized, qualified persons will service the installation.

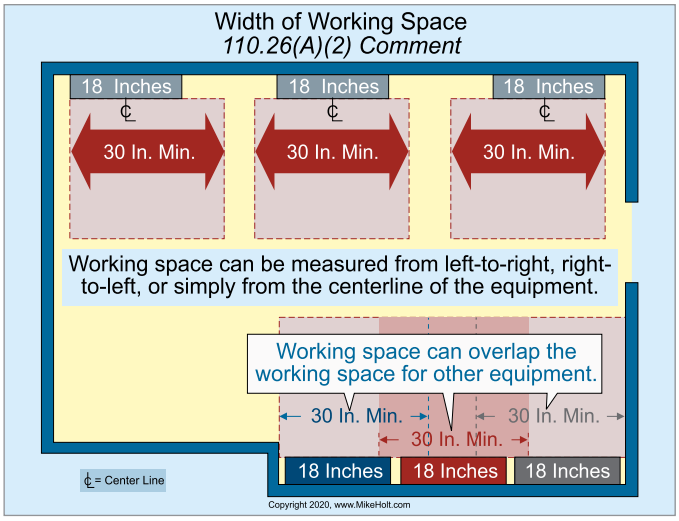
(2) Width of Working Space. The width of the working space must be a minimum of 30 in., but in no case less than the width of the equipment. ▸Figure 110–19

Author's Comment:

- The width of the working space can be measured from left-to-right, from right-to-left, or simply centered on the equipment, and can overlap the working space for other electrical equipment. ▸Figure 110–20 and ▸Figure 110–21



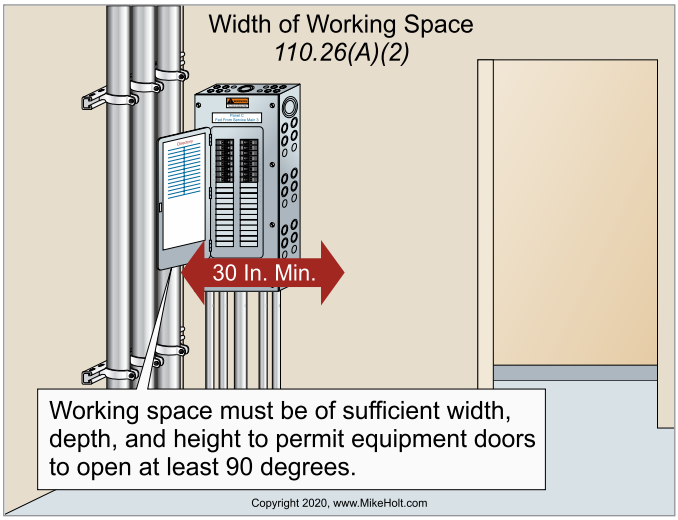
▸Figure 110–19



▸Figure 110–20

▸Figure 110–21

The working space must be of sufficient width, depth, and height to permit equipment doors to open at least 90 degrees. ▸Figure 110–22



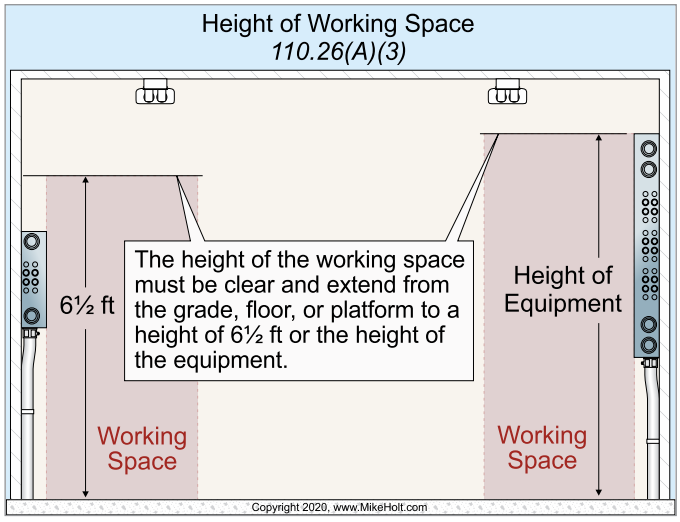
▸Figure 110–22

Author's Comment:

- If the working space is a platform, it must be sized to the working space requirement, in this example the working platform is not 30 in. deep. ▸Figure 110–23

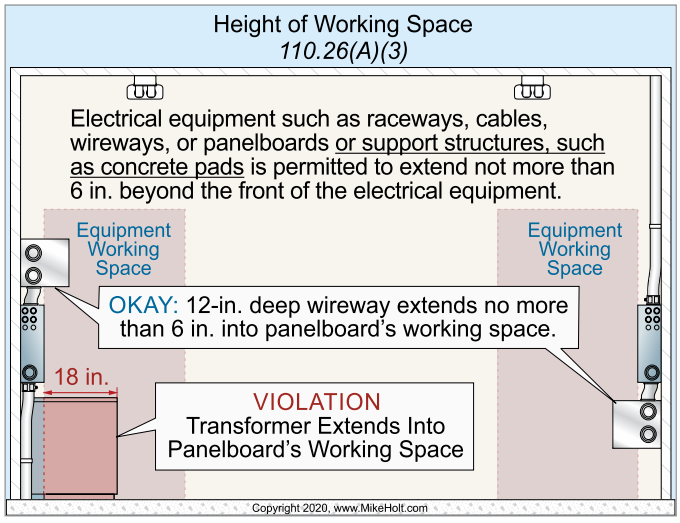
▸Figure 110–23

(3) Height of Working Space. The height of the working space must be clear and extend from the grade, floor, or platform to a height of 6½ ft or the height of the equipment. ▸Figure 110–24



▸Figure 110–24

Electrical equipment such as raceways, cables, wireways, or panelboards or support structures, such as concrete pads are permitted to extend not more than 6 in. beyond the front of the electrical equipment. ▸Figure 110–25



▸Figure 110–25

Ex. 1: The minimum height of working space does not apply to a service disconnect or panelboards rated 200A or less located in an existing dwelling unit.

Ex. 2: Meters are permitted in the working space.

Author's Comment:

- Unless the size of the housekeeping pad provides the necessary working space clearances about the equipment, care needs to be taken that the pad does not create a violation of 404.8(A) which specifies that the center of the operating handle of switches and circuit breakers used as switches be not more than 6 ft 7 in. above the floor or work surface and that the pad provides the necessary depth of working space. The workspace is the surface on which the worker stands to operate the switch or circuit breaker.

(4) Limited Access. Where equipment is likely to require examination, adjustment, servicing, or maintenance while energized is located above a suspended ceiling or crawl space, all of the following conditions apply:

(1) Equipment installed above a suspended ceiling must have an access opening not smaller than 22 in. × 22 in., and equipment installed in a crawl space must have an accessible opening not smaller than 22 in. × 30 in.

(2) The width of the working space must be a minimum of 30 in., but in no case less than the width of the equipment.

(3) The working space must permit equipment doors to open 90 degrees.

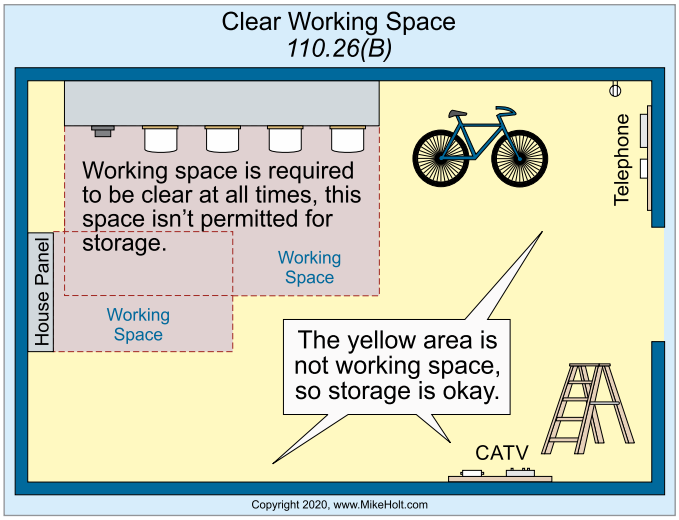
(4) The working space in front of the equipment must comply with the depth requirements of Table 110.26(A)(1), and horizontal ceiling structural members are permitted in this space.

(B) Clear Working Space. The working space required by this section must be clear at all times; therefore, this space is not permitted for storage. ▸Figure 110–26

Caution

It is very dangerous to service energized parts in the first place, and it is unacceptable to be subjected to additional dangers by working around bicycles, boxes, crates, appliances, and other impediments.

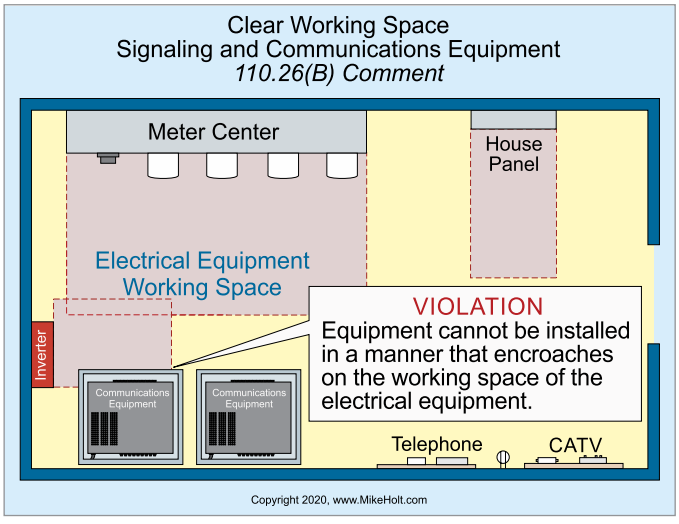
When live parts are exposed for inspection or servicing, the working space, if in a passageway or open space, must be suitably guarded.



▸Figure 110–26

Author's Comment:

- When working in a passageway, the working space should be guarded from use by occupants. When working on electrical equipment in a passageway one must be mindful of a fire alarm evacuation with many people congregating and moving through the area.
- Signaling and communications equipment are not permitted to be installed in a manner that encroaches on the working space of the electrical equipment. ▸Figure 110–27



▸Figure 110–27

(C) Access to and Egress from Working Space

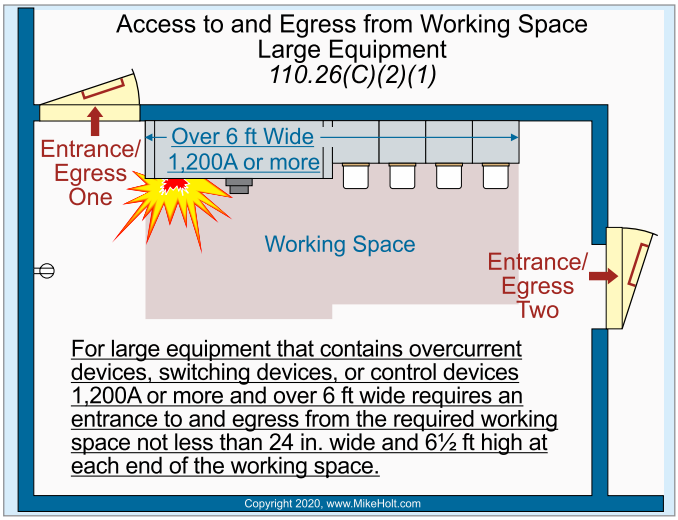
(1) Minimum Required. At least one entrance of sufficient area must provide access to and egress from the working space.

Author's Comment:

- Check to see what the authority having jurisdiction considers "sufficient area." Building codes contain minimum dimensions for doors and openings for personnel travel.

(2) Large Equipment. For large equipment that contains overcurrent devices, switching devices, or control devices, an entrance to and egress from the required working space not less than 24 in. wide and 6½ ft high is required at each end of the working space. This requirement applies for either of the following conditions:

(1) Where equipment is over 6 ft wide rated 1,200A or more ▸Figure 110–28



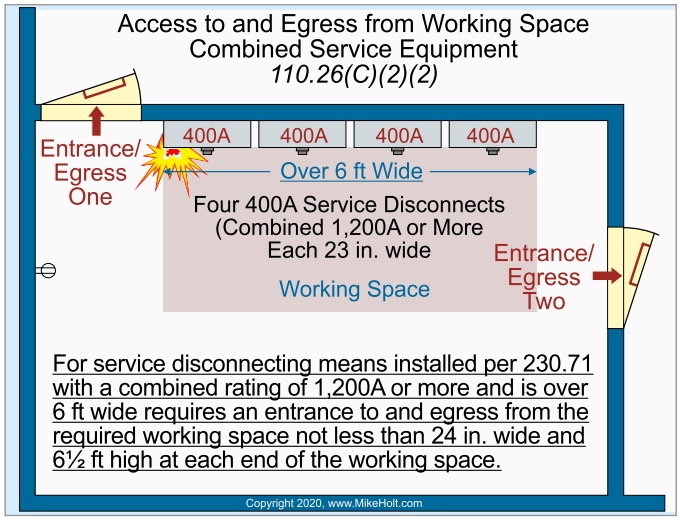
▸Figure 110–28

(2) Where the service disconnect is over 6 ft wide and where the combined ampere rating is 1,200A ▸Figure 110–29

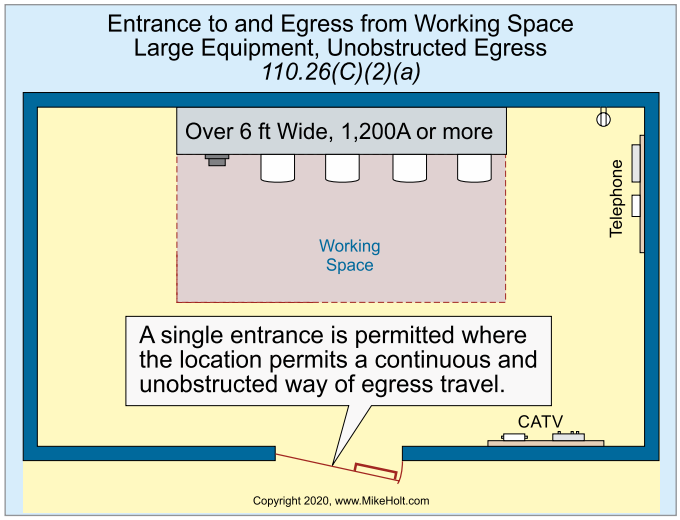
Open equipment doors must not impede the entry to or egress from the working space.

A single entrance for access to, and egress from, the required working space is permitted where either of the following conditions are met:

(a) Unobstructed Egress. Where the location permits a continuous and unobstructed way of egress travel. ▸Figure 110–30



▸Figure 110–29



▸Figure 110–30

(b) Double Working Space. Where the required working space depth is doubled, and the equipment is located so the edge of the entrance is no closer than the required working space distance. ▸Figure 110–31

Author's Comment:

- The requirement for a path of egress with the door open may require wider aisle space. The *Code* does not give specific guidance as to the required width of the egress path, but the egress door must be at least 24 in. wide. It would be reasonable to ensure the aisle has a width equal to the door plus 24 in. Doors that open more than 90 degrees would be ideal for providing more space for egress.

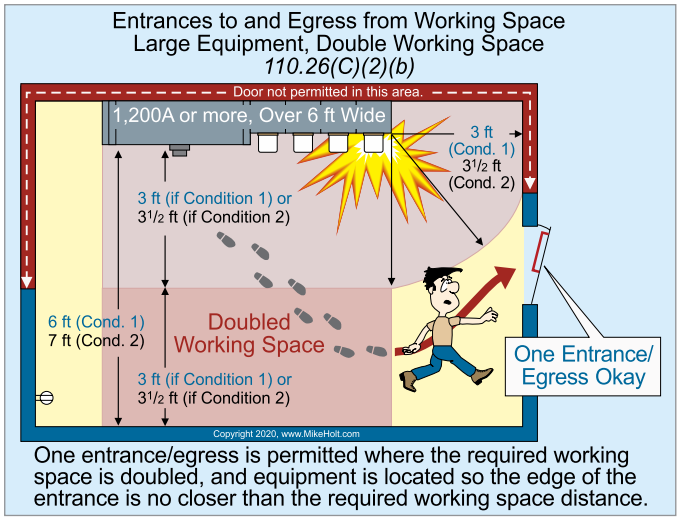


Figure 110–31

(3) Fire Exit Hardware on Personnel Doors. Where equipment rated 800A or more that contains overcurrent devices, switching devices, or control devices is installed and there is a personnel door(s) intended for entrance to and egress from the working space less than 25 ft from the nearest edge of the working space, the door(s) are required to open in the direction of egress and be equipped with listed panic or listed fire exit hardware on personnel door(s) for entrance to, and egress from, the working space. Such doors must open in the direction of egress. Figure 110–32

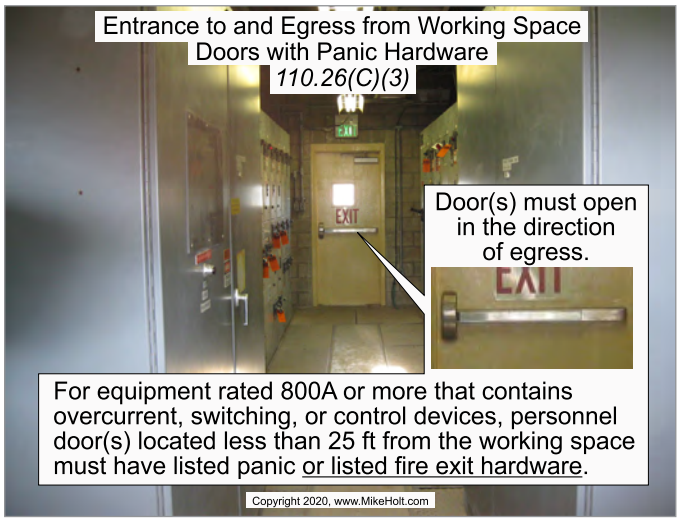


Figure 110–32

Author's Comment:

- History has shown that electricians who suffer burns on their hands in electrical arc flash or arc blast events often cannot open doors equipped with knobs that must be turned or those that must be pulled open.
- Since this requirement is in the *NEC*, the electrical contractor is responsible for ensuring that panic hardware is installed where required. Some are offended at being held liable for nonelectrical responsibilities, but this rule is designed to save the lives of electricians. For this and other reasons, many construction professionals routinely hold "pre-construction" or "pre-con" meetings to review potential opportunities for miscommunication–before the work begins.
- The minimum requirement to provide listed panic hardware at or above 800A shouldn't overshadow the importance to perform a risk assessment to incorporate specific room design, equipment layout, and egress accessibility.

(D) Illumination. Illumination is required for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor control centers installed indoors. Control by automatic means is not permitted to control illumination within the working space. Figure 110–33 and Figure 110–34

Figure 110–33

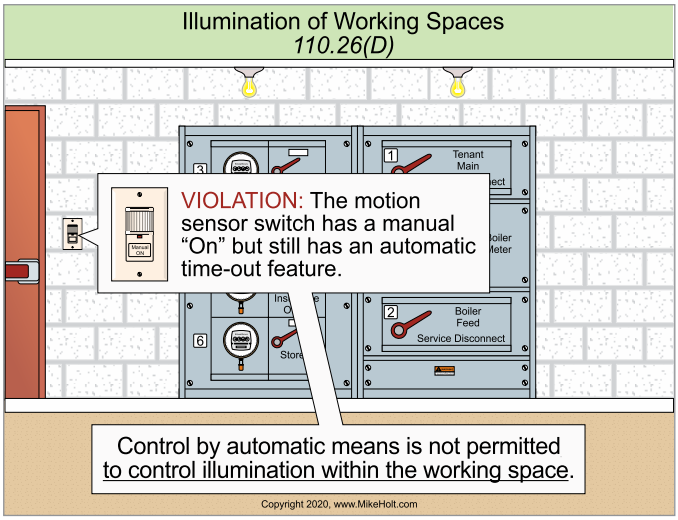


Figure 110–34

Additional lighting outlets are not required where the working space is illuminated by an adjacent light source or as permitted by 210.70(A)(1) Ex 1, for switched receptacles.

Author's Comment:

- The *Code* does not identify the minimum foot-candles required to provide proper illumination even though proper illumination of electrical equipment rooms is essential for the safety of those qualified to work on such equipment.

110.28 Enclosure Types

Two new Informational Notes were added to the enclosure selection rule to advise the reader that dusttight-rated enclosures are suitable for use in Class II, Division 2 dust hazard areas.

Analysis

NEW CLARIFIED

The two new Informational Notes were added and tell us that dusttight enclosures are suitable for use in Class II, Division 2; Class III; and Zone 22 locations as well as per the permissions in 502.10(B)(4), 503.10(A)(2), and 506.15(C)(8). Before these notes, some AHJs may have been inclined to reject dusttight enclosures in hazardous areas where ignitible dust or ignitible fibers/flyings were present.

110.28 Enclosure Types

Enclosures must be marked with an enclosure-type number and be suitable for the location in accordance with Table 110.28. Enclosures are not intended to protect against condensation, icing, corrosion, or contamination that might occur within the enclosure or that enters via a raceway or unsealed openings. Figure 110–35 and Figure 110–36

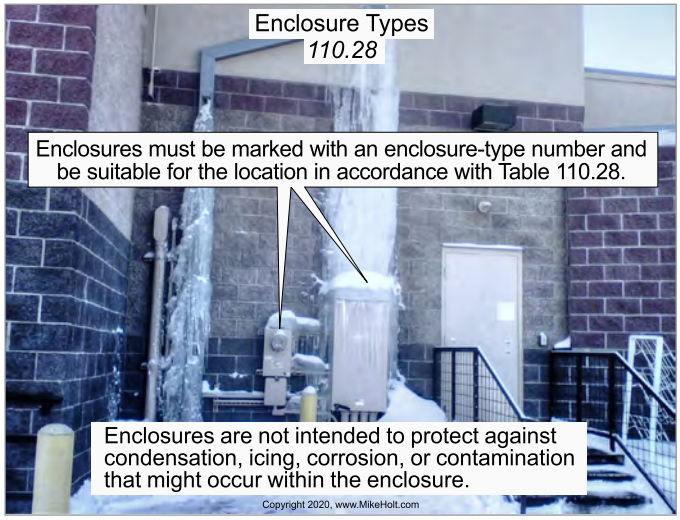


Figure 110–35

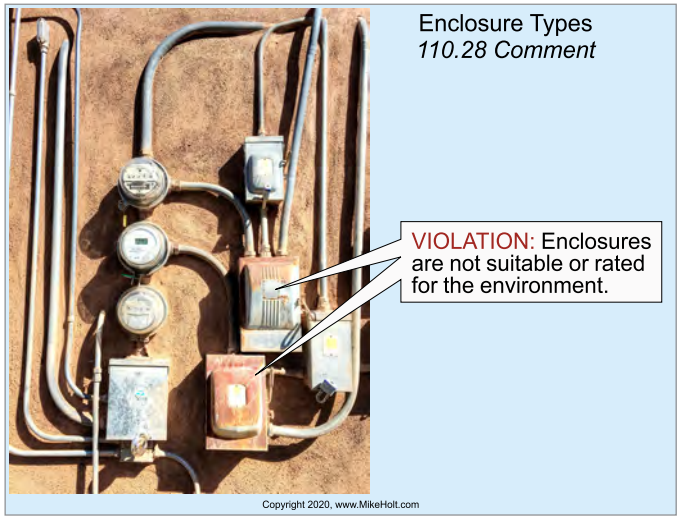


Figure 110–36

Note: Raintight enclosures include Types 3, 3S, 3SX, 3X, 4, 4X, 6, and 6P; rainproof enclosures are Types 3R and 3RX; watertight enclosures are Types 4, 4X, 6, and 6P; driptight enclosures are Types 2, 5, 12, 12K, and 13; and dusttight enclosures are Types 3, 3S, 3SX, 3X, 5, 12, 12K, and 13.

Note 3: Dusttight enclosures are suitable for use in hazardous locations in accordance with 502.10(B)(4), 503.10(A)(2), and 506.15()9).

Note 4: Dusttight enclosures are suitable for use in unclassified locations and in Class II, Division 2; Class III; and Zone 22 hazardous (classified) locations.

Author's Comment:

- Remember that with these hazards, we are only trying to keep the ignitable materials out of the electrical equipment as opposed to Class I locations where the enclosures may be called on to physically contain an explosion within the enclosure.