

## Introduction

This fourth and final installment of the *NEC Essentials for Architects* white paper series aims to outline common technical requirements found in *NFPA 70-2020 (NEC)* for entrances to, egress from, and fire ratings of spaces containing the following pieces of low voltage (1,000 volts or less) electrical distribution equipment:

- Panelboards.
- Switchboards.
- Dry-type transformers.
- Enclosed switches (aka “safety switches”).

## Access to Working Space

Entrance(s) to electrical equipment areas are required to provide access to and egress from the electrical distribution equipment’s [working space](#). These requirements are in place to ensure workers can escape safely and quickly should the equipment catastrophically fail, such as an arc-flash incident.

## Quantity of Entrance(s)

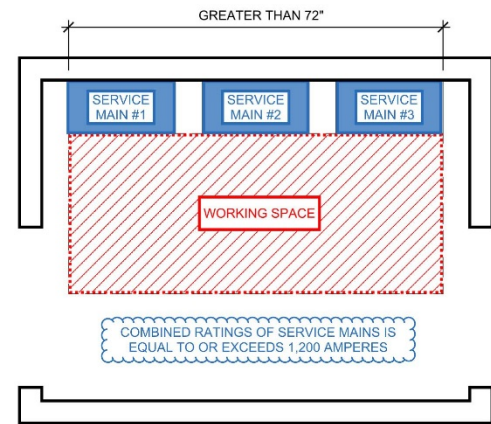
The quantity of entrances required is dependent upon the ampere rating and width of the equipment, however the code never requires more than two entrances.

Two entrances are required under either of the following scenarios:

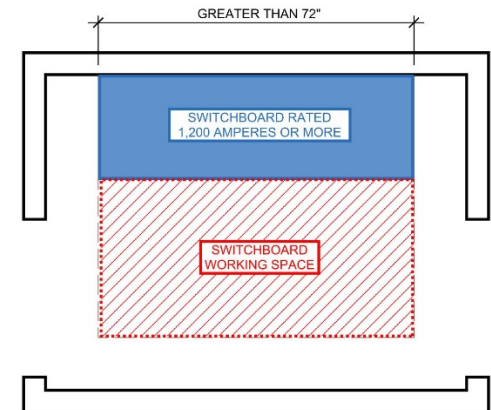
1. The equipment is service equipment consisting of more than one main disconnect in separate enclosures and the sum of the disconnect ratings is 1,200 amperes or more and the installation is over 6 feet wide.
2. The equipment is rated 1,200 amperes or more and the equipment is greater than 6 feet wide.

All other electrical installations only require one entrance.

The following images provide a graphical representation of the two scenarios in which two entrances are required.



Scenario 1



Scenario 2

### Installations Requiring Two Entrances

## Exceptions to the Two Entrances Rule

Under Scenarios 1 or 2, a single entrance is permitted under either of the following conditions:

1. A continuous and unobstructed path of egress travel is provided. Experience shows that Authorities Having Jurisdiction (AHJs) interpret this exception inconsistently. As such, this exception is typically difficult to obtain the AHJ’s acceptance. It is better to stick to two entrances unless it is clear that there are no obstructions.
2. The depth of the [working space](#) is doubled from that which would otherwise be required. The following

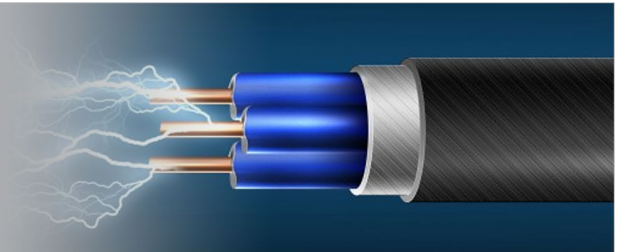


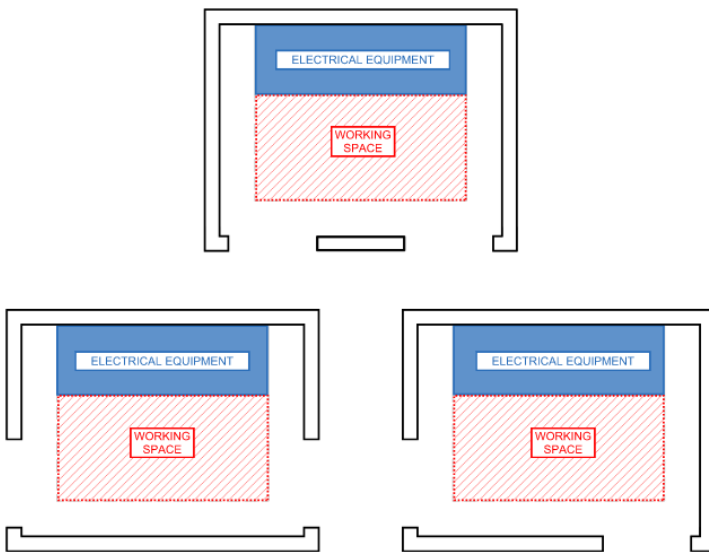
table outlines the doubled [working space](#) depths of voltage systems commonly found in buildings.

Voltage	Working Space Depth
120/208 volts	72 inches
120/240 volts	72 inches
277/480 volts	96 inches *
347/600 volts	96 inches *
* This depth may be reduced to 72 inches or 84 inches under certain circumstances. However, Schnackel Engineers does not recommend doing so because future flexibility of the electrical installation may be compromised.	

### Locations of Entrance(s)

When only one entrance is required, the location is not dictated by the code, however common sense and accessibility for removal and replacement of the equipment should be considered.

When two entrances are required, those entrances are required to be located at opposite ends of the [working space](#). The image below shows three acceptable entrance configurations when two entrances are required.



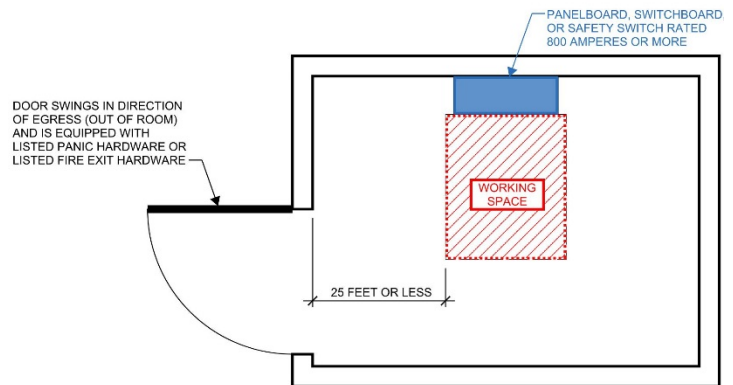
**Acceptable Locations of Entrances**

### Sizes of Entrance(s)

Whether one or two entrances are required, those entrances are required to be a minimum of 24 inches wide and 78 inches high. However, it is critical to ensure that entrances, whether it is a single entrance or two entrances, are sized to permit the equipment to be moved in and out of the room. As such, the width of the entrances should never be less than the smallest equipment dimension to ensure the equipment can be easily placed and/or removed. Typically, 30-36" wide doors are most common.

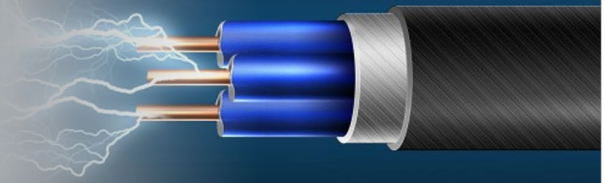
### Personnel Door Requirements

When personnel doors are installed on the access into areas containing equipment that is rated 800 amperes or more, the personnel doors are required to swing in the direction of egress (out of the room) and are required to be equipped with listed panic or fire exit hardware when those personnel door(s) are installed within 25 feet of the nearest point of the [working space](#) boundary.



**Personnel Door Requirements with Equipment Rated 800 Amps or More**

When personnel doors are installed into areas where the equipment is rated less than 800 amperes, the personnel doors are permitted to swing either into or out of the room and are not required to be fitted with any special egress hardware.



### Fire Ratings

Questions regarding NEC requirements for fire ratings of rooms housing electrical equipment are common.

#### Normal Power Systems

Normal power electrical equipment rated 1,000 volts or less is generally not required to be installed in rated enclosures. A few exceptions do exist. Sometimes local jurisdictions or local utility companies may require rated rooms for their electrical equipment.

#### Emergency Power Systems

Equipment that is part of an emergency power distribution system (generator or battery powered) is required to be installed in spaces with a 2-hour fire resistance rating in the following cases unless the electrical equipment space is fully protected by an automatic fire protection system:

- Assembly occupancies with an occupant load of 1,000 or more persons.
- Buildings over 75 feet in height.
- Educational occupancies with an occupant load greater than 300 persons.

For greater reliability of the emergency power system it may be better to fire rate the room and forgo the fire sprinklers.

#### Dry-Type Transformers

Dry-type transformers rated 112.5 kVA and smaller are permitted to be installed without any fire rated enclosure requirements in all occupancies.

Transformers rated over 112.5 kVA in all occupancies are required to be installed in a room with a minimum fire rating of 1 hour. However, transformers with a Class 155 or higher insulation system are exempt from this requirement. Nearly all low voltage dry-type transformers currently manufactured are provided with Class 220 insulation systems, meaning they are exempt from being required to be installed in a fire-rated room. With modern dry-type transformers, fire rated enclosures are rarely required.

### Oil-Filled and Utility Transformers

Sometimes, due to exterior space constraints or other reasons, utility transformers are placed inside buildings. When that occurs, the rules change significantly. In most cases, it will require a minimum of a 3-hour rated room. Stud-and-wallboard construction is not permitted to be used to achieve the 3-hour rating. Utility company requirements and local code amendments vary widely, so consultation with an experienced electrical engineer is essential for these situations.

### Summary

Schnackel Engineers can assist you with a thorough evaluation of your building to ensure space reserved for electrical equipment meets NEC requirements. Many local exceptions are made to the basic NEC requirements. Please give us a call at (800) 581-0963 or email us at [info@schnackel.com](mailto:info@schnackel.com) for a consultation.

### About Jason



Jason Rohe, P.E. has been involved in the design of electrical systems for malls, mixed-use developments, corporate offices, national retail rollouts, schools, hospitals, medical facilities, commercial and institutional buildings for over 24 years with Schnackel Engineers. Email Jason at [jrohe@schnackel.com](mailto:jrohe@schnackel.com).

### About Greg



Gregory Schnackel, P.E., LEED AP has been involved in the design of mechanical, electrical, plumbing, fire protections and information technology systems for malls, mixed-use developments, corporate offices, national retail rollouts, schools,

hospitals, medical facilities, commercial and institutional buildings for over 40 years with Schnackel Engineers. Email Greg at [gschnackel@schnackel.com](mailto:gschnackel@schnackel.com).