

Introduction

This third installment of the **NEC Essentials for Architects** white paper series seeks to outline “clearance” requirements found in *NFPA 70-2020 (NEC)* for the installation of the following pieces of low voltage (1,000 volts or less) electrical distribution equipment:

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

Equipment “Clearances”

The term “clearance” is commonly used throughout design and construction circles to refer to free space around electrical equipment. However, it is important to understand that “clearance” is comprised of three separate and distinct components – working space, dedicated equipment space, and manufacturer-required clearance.

Working Space

Working space is the component of the “clearance” that is directly in front of the accessible sides of electrical equipment. All electrical equipment requires some degree of working space to allow access and safe operation and maintenance of the equipment.

Very specific minimum working space dimensions are required when the equipment requires examination, adjustment, servicing, or maintenance while energized, such as panelboards, switchboards, and safety switches. This working space can be represented as a rectangular prism where the bottom sits on the floor and the back side sits against the front of the electrical equipment.

The required width of the working space is the greater of 30 inches or the width of the equipment. The working space width can be centered on the electrical equipment or offset such that the left or right edges are aligned with the sides of the equipment.

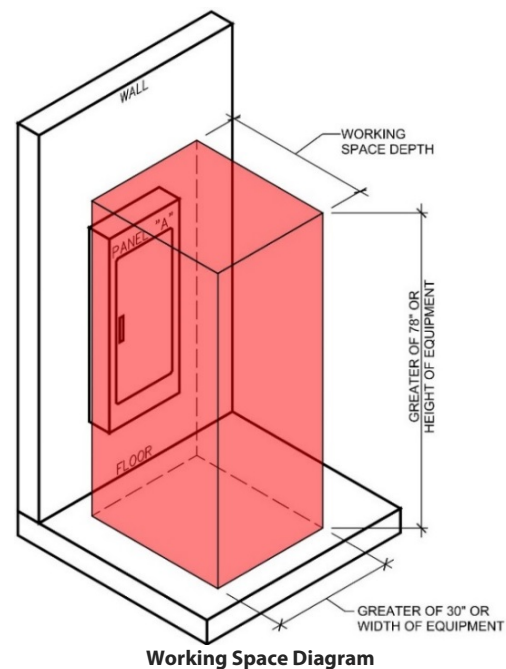
The required height of the working space is the greater of 78 inches or the height of the equipment. Regardless of the installed height of the top of the electrical equipment, this requirement inherently requires equipment to be installed in spaces that provide a minimum of 78 inches of headroom.

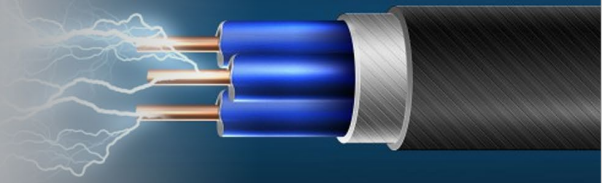
The required depth of the working space is dependent on the installation conditions and the operating voltage of the equipment. The following table outlines the minimum depths of voltage systems commonly found in buildings.

Voltage	Working Space Depth
120/208 volts	36 inches
120/240 volts	36 inches
277/480 volts	48 inches *
347/600 volts	48 inches *

* This depth may be reduced to 36 inches or 42 inches under certain circumstances. However, Schnackel Engineers does not recommend doing so because future flexibility of the electrical installation may be compromised.

The following figure provides a graphical representation of working space requirements.





WORKING SPACE FOR TRANSFORMERS

Whether transformers require specific working space dimensions is a great debate throughout the industry. Because the specific working space dimensions are triggered when the equipment requires examination, adjustment, servicing, or maintenance while energized, transformers fit into a grey area when it comes to working space.

An informal interpretation obtained from the National Fire Protection Association (NFPA), the authors of the *National Electrical Code (NEC)*, states that whether a transformer is likely to require examination, adjustment, servicing, or maintenance while energized is based on whether an employer will permit an employee or contractor to work on the transformer while it is energized.

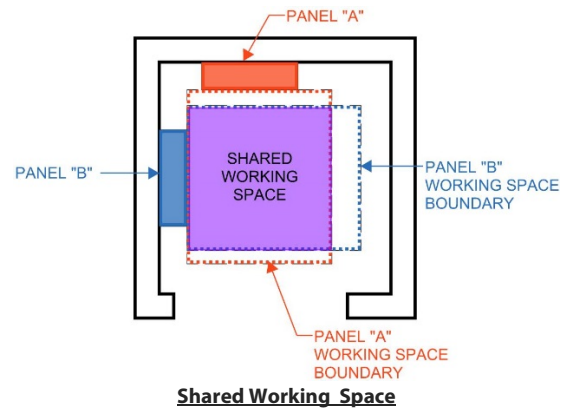
The informal interpretation further states that permission to waive working space requirements for transformers must be obtained from the Authority Having Jurisdiction (AHJ). Many AHJs will not base a safe installation on an employer's electrical safety program, which could change over time. Therefore, most AHJs will require working space for transformers.

Because of the ambiguity of the NFPA's informal interpretation and the overriding need to ensure the safety of electrical workers, providing transformers with the standard working space dimensions is recommended to ensure a fully compliant installation. If an installation *cannot* provide the required working space, AHJ approval to waive the working space requirements must be obtained before the installation is undertaken.

SHARING WORKING SPACE

When electrical distribution equipment, whether switchboards, panelboards, safety switches or transformers, is located on two adjacent walls or directly across from one another, the working spaces are permitted to overlap or be shared. However, the equipment itself (dedicated equipment space) is not allowed to overlap or be shared, except in the case of

stacked panelboards or transformers wall mounted above panelboards.



Dedicated Equipment Space

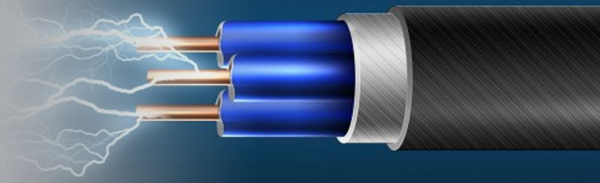
Dedicated equipment space is the component of the "clearance" that is directly above and below electrical equipment. The requirements for dedicated equipment space applies to only switchboards, switchgear, panelboards, and motor control centers. As such, transformers and safety switches are not subject to dedicated equipment space requirements.

The dedicated equipment space is required to be dedicated to the electrical installation. Foreign systems, except for suspended ceilings with removable panels, are strictly prohibited from being located within the dedicated equipment space. However, foreign systems are permitted in the area above the dedicated equipment space when those foreign systems are provided with protection to prevent leaks, condensation, or breaks in the foreign system to prevent damage to the electrical equipment below.

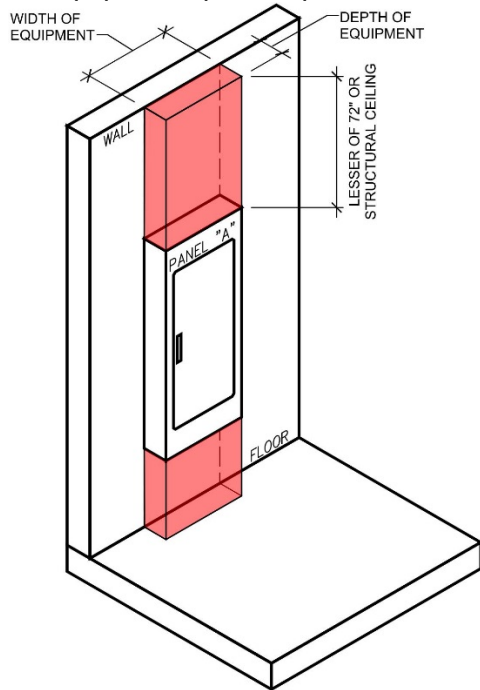
The required width of the dedicated equipment space is the equal to the width of the equipment.

The required height of the dedicated working space starts at the floor and extends to 6 feet above the top of the equipment or to the structural ceiling, whichever is lower. A suspended ceiling is not considered a structural ceiling.

The required depth of the dedicated equipment space is the equal to the depth of the equipment.



The following figure provides a graphical representation of dedicated equipment space requirements.



Dedicated Equipment Space Diagram

Manufacturer-Required Clearances

Manufacturer-required clearances are not typically specified for panelboards, switchboards, or safety switches. However, some manufacturers require specific clearances around transformers. This clearance is typically 6 inches and is required around all sides of a transformer for ventilation. Other special purpose electrical equipment often has manufacturer required clearances.

All manufacturer-required clearance must be strictly observed and are enforceable by the AHJ.

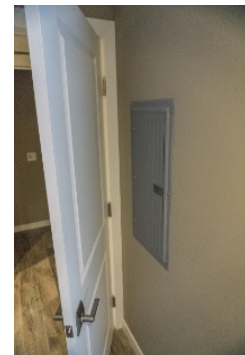
Panelboards Behind Door Swings

A common question that relates to “clearance” is whether a panelboard is permitted to be installed on a wall behind a door.

This scenario is not directly addressed by the *NEC*. However, the letter of the code does not prohibit this installation and many AHJs prefer this installation because it ensures that nothing will be stored in front of the

panelboard and working space will always be maintained.

Nevertheless, some AHJs have adopted local amendments that prohibit this installation. It is best to check with the local plan reviewers or inspectors prior to locating panelboards behind door swings.



Summary

Schnackel Engineers can assist you with a thorough evaluation of your building to ensure that adequate space has been reserved for electrical equipment that meets all NEC and local requirements. Please give us a call at (800) 581-0963 or email us at 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.

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