II. 600 Volts, Nominal, or Less

110.26 Spaces About Electrical Equipment.

Sufficient access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment.

Key to understanding 110.26 is the division of requirements for spaces about electrical equipment in two separate and distinct categories: working space and dedicated equipment space. The term working space generally applies to the protection of the worker, and dedicated equipment space applies to the space reserved for future access to electrical equipment and to protection of the equipment from intrusion by nonelectrical equipment. The performance requirements for all spaces about electrical equipment are set forth in this section. Storage of material that blocks access or prevents safe work practices must be avoided at all times.

(A) Working Space. Working space for equipment operating at 600 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized shall comply with the dimensions of 110.26(A)(1), (A)(2), and (A)(3) or as required or permitted elsewhere in this Code.

The intent of 110.26(A) is to provide enough space for personnel to perform any of the operations listed without jeopardizing worker safety. These operations include examination, adjustment, servicing, and maintenance of equipment. Examples of such equipment include panelboards, switches, circuit breakers, controllers, and controls on heating and air-conditioning equipment. It is important to understand that the word examination, as used in 110.26(A), includes such tasks as checking for the presence of voltage using a portable voltmeter.

Minimum working clearances are not required if the equipment is such that it is not likely to require examination, adjustment, servicing, or maintenance while energized. However, “sufficient” access and working space are still required by the opening paragraph of 110.26.

(1) Depth of Working Space. The depth of the working space in the direction of live parts shall not be less than that specified in Table 110.26(A)(1) unless the requirements of 110.26(A)(1)(a), (A)(1)(b), or (A)(1)(c) are met. Distances shall be measured from the exposed live parts or from the enclosure or opening if the live parts are enclosed.

For the 2008 Code, the minimum clear distances were revised to reflect an accurate metric conversion (also known as a soft conversion).

Condition 1 — Exposed live parts on one side of the working space and no live or grounded parts on the other side of the working space, or exposed live parts on both sides of the working space that are effectively guarded by insulating materials.
Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space. Concrete, brick, or tile walls shall be considered as grounded.

Condition 3 — Exposed live parts on both sides of the working space.

Included in these clearance requirements is the step-back distance from the face of the equipment. Table 110.26(A)(1) provides requirements for clearances away from the equipment, based on the circuit voltage to ground and whether there are grounded or ungrounded objects in the step-back space or exposed live parts across from each other.

The voltages to ground consist of two groups: 0 to 150, inclusive, and 151 to 600, inclusive. Examples of common electrical supply systems covered in the 0 to 150 volts to ground group include 120/240-volt, single-phase, 3-wire and 208Y/120-volt, 3-phase, 4-wire. Examples of common electrical supply systems covered in the 151 to 600 volts to ground group include 240-volt, 3-phase, 3-wire; 480Y/277-volt, 3-phase, 4-wire; and 480-volt, 3-phase, 3-wire (ungrounded and corner grounded). Remember, where an ungrounded system is utilized, the voltage to ground (by definition) is the greatest voltage between the given conductor and any other conductor of the circuit. For example, the voltage to ground for a 480-volt ungrounded delta system is 480 volts. See Exhibit 110.9 for the general working clearance requirements for each of the three conditions listed in Table 110.26(A)(1).

(a) Dead-Front Assemblies. Working space shall not be required in the back or sides of assemblies, such as dead-front switchboards or motor control centers, where all connections and all renewable or adjustable parts, such as fuses or switches, are accessible from locations other than the back or sides. Where rear access is required to work on nonelectrical parts on the back of enclosed equipment, a minimum horizontal working space of 762 mm (30 in.) shall be provided.

The intent of this section is to point out that work space is required only from the side(s) of the enclosure that requires access. The general rule still applies: Equipment that requires front, rear, or side access for the electrical activities described in 110.26(A) must meet the requirements of Table 110.26(A)(1). In many cases, equipment of “dead-front” assemblies requires only front access. For equipment that requires rear access for nonelectrical activity, however, a reduced working space of at least 30 in. must be provided. Exhibit 110.10 shows a reduced working space of 30 in. at the rear of equipment to allow work on nonelectrical parts.
Exhibit 110.9 Distances measured from the live parts if the live parts are exposed or from the enclosure front if the live parts are enclosed. If any assemblies, such as switchboards or motor-control centers, are accessible from the back and expose live parts, the working clearance dimensions would be required at the rear of the equipment, as illustrated. Note that for Condition 3, where there is an enclosure on opposite sides of the working space, the clearance for only one working space is required.
Exhibit 110.10 Example of the 30-in. minimum working space at the rear of equipment to allow work on nonelectrical parts, such as the replacement of an air filter.

(b) Low Voltage. By special permission, smaller working spaces shall be permitted where all exposed live parts operate at not greater than 30 volts rms, 42 volts peak, or 60 volts dc.

(c) Existing Buildings. In existing buildings where electrical equipment is being replaced, Condition 2 working clearance shall be permitted between dead-front switchboards, 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 qualified persons who are authorized will service the installation.

This section permits some relief for installations that are being upgraded. When assemblies such as dead-front switchboards, panelboards, or motor-control centers are replaced in an existing building, the working clearance allowed is that required by Table 110.26(A)(1), Condition 2. The reduction from a Condition 3 to a Condition 2 clearance is allowed only where a written procedure prohibits facing doors of equipment from being open at the same time and where only authorized and qualified persons service the installation. Exhibit 110.11 illustrates this relief for existing buildings.

(2) Width of Working Space. The width of the working space in front of the electrical equipment shall be the width of the equipment or 762 mm (30 in.), whichever is greater. In all cases, the work space shall permit at least a 90 degree opening of equipment doors or hinged panels.

Regardless of the width of the electrical equipment, the working space cannot be less than 30 in. wide. This space allows an individual to have at least shoulder-width space in front of the equipment. The 30-in. measurement can be made from either the left or the right edge of the equipment and can overlap other electrical equipment, provided the other equipment does not extend beyond the clearance required by Table 110.26(A)(1). If
the equipment is wider than 30 in., the left-to-right space must be equal to the width of the equipment. See Exhibit 110.12 for an explanation of the 30-in. width requirement.

Exhibit 110.11 Permitted reduction from a Condition 3 to a Condition 2 clearance according to 110.26(A)(1)(c).

Exhibit 110.12 The 30-in. wide front working space, which is not required to be directly centered on the electrical equipment if space is sufficient for safe operation and maintenance of such equipment.

Sufficient depth in the working space also must be provided to allow a panel or a door to open at least 90 degrees. If doors or hinged panels are wider than 3 ft, more than a 3-ft deep working space must be provided to allow a full 90 degree opening. (See Exhibit 110.13.)
Exhibit 110.13 Illustration of requirement that working space must be sufficient to allow a full 90 degree opening of equipment doors in order to ensure a safe working approach.

(3) Height of Working Space. The work space shall be clear and extend from the grade, floor, or platform to the height required by 110.26(E). Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment.

In addition to requiring a working space to be clear from the floor to a height of 61/2 ft or to the height of the equipment, whichever is greater, 110.26(A)(3) permits electrical equipment located above or below other electrical equipment to extend into the working space not more than 6 in. This requirement allows the placement of a 12 in. × 12 in. wireway on the wall directly above or below a 6 in.-deep panelboard without impinging on the working space or compromising practical working clearances. The requirement continues to prohibit large differences in depth of equipment below or above other equipment that specifically requires working space. To minimize the amount of space required for electrical equipment, it was not uncommon to find installations of large free-standing, dry-type transformers within the required work space for a wall-mounted panelboard. Clear access to the panelboard is compromised by the location of the transformer with its grounded enclosure and this type of installation and is clearly not permitted by this section. Electrical equipment that produces heat or that otherwise requires ventilation also must comply with 110.3(B) and 110.13.