

NEC 2011 Code Changes

Articles 100-110.74

CHANGES FROM 2008 CODE ARE IN RED.

Article 100 – Definitions

Ampacity: Ampacity is the maximum amount of current that a cable can carry continuously without exceeding its temperature rating as well as sustaining deterioration.

Arc – Fault Circuit Interrupter (AFCI): An AFCI is a circuit breaker designed to protect the professional from the effects of arc – faults. It operates by recognizing the arc – fault and working to disconnect the circuit the moment an arc – fault is detected.

Automatic: Functioning without the need for human action.

Bathroom: A room which includes one or more of the following pieces of equipment: tub/shower, toilet/urinal or bidet, or similar plumbing fixtures.

Bonding Jumper or Conductor: This is a reliable conductor used to ensure the required electrical conductivity between two metal parts used in the conductivity of electricity.

Bonding Jumper, System: The bonding jumper system is the connection between two or more portions of the equipment grounding conductor. The connection between the grounded circuit conductor and the equipment-grounding conductor at the service.

Explosion Proof Equipment: Equipment enclosed in a case that is capable of withstanding an explosion that may occur within it and is capable of preventing the

ignition of said explosive gas surrounding the enclosure. It must also operate at such and external temperature that the surrounding atmosphere will not be ignited.

Ground Fault: *A ground fault is An unintentional electricity conducting connection between an ungrounded conductor or circuit and a non-current carrying conductor such as, metal enclosures, raceways, equipment or earth.*

Interrupting Rating: The interrupting rating is the highest current that a fuse, circuit breaker, or other electrical apparatus is identified to interrupt under standard test conditions.

Intersystem Bonding Termination: A device that connects bonding conductors for communications systems such as telephone, CATV, radio or television, to the grounding electrode system.

Kitchen: A room with a sink, stove and permanent provisions for food preparation, storage and cooking.

Non-automatic: An action that requires human intervention to perform a function.

Overcurrent Protective Device, Branch-Circuit: *A fuse or circuit breaker capable of providing protection for service, feeder, and branch circuits. It must also protect equipment over the full range of overcurrents between its rated current and its interrupting rating.*

Overcurrent Protective Device, Supplementary: *A fuse or circuit breaker used to provide limited protection for specific applications such as lights and appliances*

Separately Derived System: A separately derived system is a power source with no direct electrical connection between circuit conductors and supply conductors. Its power is derived from a source of electric energy or equipment other than a service. These systems have no direct connection from circuit conductors of one system to circuit conductors of other systems.

Service Conductors, Overhead: The overhead cables between the service source and the point of connection to the cables at the building or other structure.

Service Conductors, Underground: The underground cables between the service source and the point of connection to the cables in a terminal box, or meter, which will be inside or outside of the building wall.

Further Information: Where there is no terminal box or meter, the point of connection is considered to be the point of entrance of the service cables into the building.

Service Drop: The service drop are the overhead electrical lines between the utility pole and the terminal box.

Service-Entrance Conductors, Overhead System: The service cables between the terminals of the service equipment and a point where they are joined to the service drop or overhead service conductors.

Service-Entrance Conductors, Underground System: The service cables between the terminals of the service equipment and a point of connection to the source, or underground service conductors.

Service Lateral: The service lateral is the underground conductor between the utility box and the service point or cables.

Service Point: The service point is the connection between the service equipment and the premises wiring.

Further Information: The service point can be described as the point of demarcation between where the service equipment ends and the building wiring begins. The serving utility generally specifies the location of the service point based on the conditions of service.

Uninterruptable Power Supply: The uninterruptable power supply is a power supply used to provide power to for some time after a power failure.

Further Information: In addition, it may provide a more constant voltage to the load, reducing the effects of voltage and frequency variations.

Article 110 – Requirements for Electrical Installations:

General (NEC 2008)

110.3 Examination, Identification, Installation, and Use of Equipment:

(A) Examination.

(1) Suitability for installation and use in conforming to the provisions of this Code.

Further Information: Suitability of equipment use may be identified by a description marked on a product to identify the suitability of the product for a specific use. Suitability of equipment may be confirmed by a listing or a label.

General (NEC 2011)

110.3 Examination, Identification, Installation, and Use of Equipment:

(A) Examination.

(1) Suitability for installation and use in conformity with the provisions of this Code.

Further Information: Suitability of equipment use may be identified by a description marked on a product to identify the suitability of the product for a specific use. *Special conditions of use or other limitations, and other necessary information may be labeled on the equipment, packaged with the product instructions, or provided with the appropriate listing and labeling information.* Suitability of equipment may be confirmed either by a listing or a label.

110.9 Interrupting Rating: (NEC 2008)

Equipment intended to interrupt current at fault levels shall have an interrupting rating high enough for the stated circuit voltage and the current that's available at the line terminals of the equipment. Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at stated circuit voltage enough for the current that has to be interrupted.

110.9 Interrupting Rating: (NEC 2011)

Equipment intended to interrupt current at fault levels shall have an interrupting rating *no less than* the stated circuit voltage and the current that is available at the line terminals of the equipment. Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at stated circuit voltage *no less than* the current that has to be interrupted.

110.10 Circuit Impedance and Other Characteristics: (NEC 2008)

The overcurrent protective devices, circuit breakers, fuses, etc., the total burden, the component short-circuit current ratings, and other characteristics of the circuit to be protected, will be sealed and organized to permit the circuit-protective devices used to prevent a fault to do so without extensive damage to the electrical components of the circuit itself. This fault will be assumed to be either between two or more of the circuit cables or between any circuit cable and the grounding cable or enclosing metal raceway. Listed products applied in accordance with their listing will be considered in order to meet the requirements of this section.

110.10 Circuit Impedance; *Short-Circuit Current Ratings* and Other Characteristics: (NEC 2011)

The overcurrent protective devices, circuit breakers, fuses, etc., the total burden, the *equipment* short-circuit current ratings, and other characteristics of the circuit to be protected will be selected and organized to allow the *circuit protective* devices used to prevent a fault to perform that function without extensive damage to the electrical *equipment* of the circuit itself. This fault is assumed to be either between two or more of the circuit cables, or between any circuit cable and the *equipment* grounding cable(s)

allowed according to section 250.118, or an enclosing metal raceway. Listed *equipment* applied in according to their listing will be considered in order to meet the requirements of this section.

110.11 Deteriorating Agents: (NEC 2008) Equipment that is not intended for outdoor use and equipment identified only for indoor use, such as “indoor use only,” or enclosure types 1, 2, 5, 12, 12K, and/or 13, shall be protected against permanent damage from the weather during building construction.

Further Information: See Table 110.20 for appropriate enclosure-type classifications.

110.11 Deteriorating Agents: (NEC 2011) Equipment that is not intended for outdoor use and equipment identified only for indoor use, or enclosure types 1, 2, 5, 12, 12K, and/or 13, must be protected *against damage* from the weather *during construction*.

Further Information: See Table *110.28* for appropriate enclosure-type classifications.

110.14 Electrical Connections: (NEC2008) No change to first paragraph. Second paragraph is not in the 2008 edition.

(1) Equipment Provisions: The decision of termination provisions of the equipment will be based on section 110.14(C)(1)(a) or section 110.14(C)(1)(b). Unless the equipment is listed and marked as otherwise, conductor ampacities used in determining equipment termination provisions will be based on Table 310.16 as modified by section 310.15(B)(6).

110.14 Electrical Connections: (NEC 2011) Connectors and terminals for cable strands smaller than Class B and Class C stranding, as shown in Chapter 9 Table 10, shall be identified for the specific cable class or classes.

(1) Equipment Provisions. The decision of termination provisions of equipment will be based on section 110.14(C)(1)(a) or section 110.14(C)(1)(b). Unless the equipment is marked otherwise, conductor ampacities used in determining equipment termination provisions will be based on Table 310.15(B)(16) as modified by section 310.15(B)(6).

110.16 Flash Protection: (NEC 2008) Electrical equipment in other than dwellings, and likely to require examination, adjustment, servicing, or maintenance while powered will be field marked to warn of potential electric arc flash hazards. The marking will be clearly visible before examination, adjustment, servicing, or maintenance.

110.16 Arc-Flash Hazard Warning: (NEC 2011) Electrical equipment in structures other than dwelling units, likely to be examined, adjusted, serviced, or maintained while powered will be field marked to warn of potential electric arc-flash hazards. The marking will be clearly visible before examination, adjustment, servicing or maintenance.

110.22 Identification of Disconnecting Means: (NEC 2008)

(B) Engineered Series Combination Systems. Where circuit breakers or fuses are used in compliance with series combination ratings selected under engineering supervision and marked on the equipment as directed by the engineer the equipment enclosure(s) must be clearly marked in the field to indicate that the equipment has been fit with a series combination rating. The marking must be easily visible and read as follows:

CAUTION – ENGINEERED SERIES COMBINATION SYSTEM RATED -
___ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED

(C) Tested Series Combination Systems. Where circuit breakers or fuses are applied in compliance with the series combination ratings marked on the equipment by manufacturer, the equipment enclosure(s) must be clearly marked in the field to show that the equipment has been marked with a series combination rating. The marking must be readily visible and read as follows:

CAUTION – SERIES COMBINATION SYSTEM RATED ___ AMPERES.
IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.

110.22 Identification of Disconnecting Means: (NEC 2011)

(B) Engineered Series Combination Systems. *Equipment enclosures for* circuit breakers or *fuses applied* in compliance with series combination ratings selected under engineering supervision *in according to section 240.86(A)* must be clearly marked in the field *as directed by the engineer* to show that the equipment has been marked with a series combination rating. The marking will be easily visible and read as follows:

CAUTION – ENGINEERED SERIES COMBINATION SYSTEM RATED -
___ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED

(C) Tested Series Combination Systems. *Equipment enclosures for* circuit breakers or *fuses applied* in compliance with the series combination ratings marked on the equipment by manufacturer *in according to* section 240.86(B) must be clearly marked in the field to

show that the equipment has been marked with a series combination rating. The marking must be easily visible and read as follows:

CAUTION – SERIES COMBINATION SYSTEM RATED ___ AMPERES
IDENTIFIED REPLACEMENT COMPONENTS REQUIRED.

110.24 Available Fault Current: (NEC 2008)

No listing in 2008

110.24 Available Fault Current: (NEC 2011)

(A) Field Marking. *Service equipment, other than in dwellings, must be marked in the field with the maximum fault current. Markings must be easily read. The field marking(s) must include the date that the fault current calculation was completed and it will be durable enough to withstand the environmental hazards associated with the climate.*

(B) Modifications. *When modifications to the electrical installation occur that affect the maximum available fault current at the service site, the maximum available fault current will be recalculated to ensure that the service equipment ratings are large enough for the maximum available fault current at the line terminals. The required field marking(s) in section 110.24(A) must be adjusted to show the new level of maximum available fault current.*

Exception: *The field marking requirements in sections 110.24(a) and 110.24(b) will not be required in industrial installations where conditions of maintenance and supervision ensure that only qualified persons will service the equipment in question.*

110.26 Spaces around Electrical Equipment: (NEC 2008)

Sufficient access, and working space, must be provided and maintained around all electrical equipment in order to permit easy and safe operation and maintenance of said equipment.

(A) Working Space

(3) Height of Working Space

The work space will be clear and it will extend from the grade, floor, or platform to the height required by section 110.26(E). Within the height requirements of this section other equipment associated with the electrical installation and located above or below the electrical equipment will be allowed to extend no more than 150 mm (6 in.) beyond the front of the equipment.

(D) Illumination

Illumination will be provided for all working spaces around the equipment installed indoors. Additional lighting outlets will not be required where the workspace is illuminated by an adjacent light source or as allowed by section 210.70(A)(1), Exception No. 1. In electrical equipment rooms, the illumination will not be allowed to be controlled by only automatic sources.

(E) Headroom

The minimum headroom of working spaces around service equipment will be 2.0m (6 1/2 ft). If the electrical equipment is more than 2.0 m (6 1/2 ft) in height, the minimum headroom will be no less than the height of the equipment.

Exception: In existing dwellings, service equipment or panel boards that are not more than 200 amperes will be permitted in spaces where the headroom is less than 2.0 m (6 ½ ft).

(F) Dedicated Equipment Space

All Switchboards, panel boards, distribution boards, and motor control centers must be installed in dedicated spaces and must be protected from damage.

Exception: control equipment that is, by its very nature, or because of other rules of the Code must be adjacent to or within sight of its operating machinery, will be allowed to be located near equipment.

(1) Indoor

Indoor installations will adhere to sections 110.26(F)(1)(a) through section 110.26(F)(1)(d)

(a) Dedicated Electrical Space

The space equal to the width of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment or to the structural ceiling, whichever is lower, will be dedicated to the installation. No piping, ducts, leak protection devices, or other equipment foreign to the installation will be allowed in this space.

Exception: suspended ceilings with removable panels will be permitted within the 1.8 m (6 ft) zone due to the nature of the structure.

(b) Foreign Systems

The area above the dedicated space required by section 110.26(F)(1)(a) will be allowed to contain foreign systems provided protection is in place in order to avoid damage to the

electrical equipment from environmental hazards such as, condensation, leaks, or breaks in the foreign systems.

(c) Sprinkler Protection

Sprinkler protection will be allowed for the dedicated space where the piping complies with section 110.26(E)(1)(c).

(d) Suspended Ceilings

A dropped, suspended or similar ceiling that does not add support to the building structure will not be considered a structural ceiling.

(2) Outdoor

Outdoor electrical equipment will be installed in acceptable enclosures and will be protected from accidental contact by unauthorized personnel, traffic, or accidental leakage from piping systems. The working space will include the area described in section 110.26(A). No architectural additions or other equipment may be located in this area.

110.26 Spaces around Electrical Equipment: (NEC 2011)

Access and working space will be provided and maintained around all electrical equipment in order to allow easy and safe operations and maintenance of equipment.

(A) Working Space

(3) Height of Working Space. The work space will be clear and will extended from the grade, floor, or platform *to a height of 2.0 m (6 ½ ft) or the height of the equipment, whichever is greater.* Within the height requirements of section 110.26, other equipment

that is associated with the installation, and is located above or below the equipment, will be allowed to extend no more than 150 mm (6in.) beyond the front of the equipment.

Exception No. 1: In existing dwellings, service equipment that does not exceed 200 amperes will be allowed in spaces where the height of the working space is less than 2.0m (6 1/2 ft).

Exception No. 2: Meters that are installed in meter sockets will be allowed to extend beyond the other equipment. The meter socket will be required to follow the rules of section 110.26.

(D) Illumination

Illumination will be provided for all work spaces around service equipment installed indoors *and must not be controlled by only automatic means.* Additional lighting outlets will not be required where the workspace is illuminated by an nearby light source or as allowed by section 210.70(A)(1), Exception No. 1, for the switched receptacles. In electrical equipment rooms, the illumination must not be controlled only by automatic means.

(E) Dedicated Equipment Space. All Switchboards, panelboards, distribution boards, and motor control centers will be located in dedicated spaces and will be protected from damage.

Exception: control equipment that is by its nature, or because of other rules of the Code, necessarily adjacent to, or within sight of, operating machinery will be permitted near electrical equipment.

(1) Indoor

Indoor installations will adhere to sections 110.26(E)(1)(a) through section

110.26(E)(1)(d)

(a) Dedicated Electrical Space

The space equal to the width of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment or to the structural ceiling, whichever is lower, will be dedicated to the electrical installation. No equipment foreign to the installation will be located in this area.

Exception: suspended ceilings with removable panels will be allowed within the 1.8 m (6 ft) area.

(b) Foreign Systems

The area above the dedicated space required by section 110.26(E)(1)(a) will be allowed to contain foreign systems, provided protection is installed in order to avoid damage to the electrical equipment from environmental hazards such as, condensation, leaks, or breaks in these foreign systems.

(c) Sprinkler Protection

Sprinkler protection will be allowed for the dedicated space where the piping adheres to this section 110.26.

(d) Suspended Ceilings

A dropped suspended or similar ceiling that does not add strength to the building structure will not be considered a structural ceiling due to the nature of its construction.

(2) Outdoor

Outdoor electrical equipment will be installed in acceptable enclosures and will be protected from accidental contact by unauthorized personnel, vehicular traffic, or accidental leakage from piping systems. The working clearance space will include the area described in section 110.26(A). No architectural additions or other equipment will be allowed in this area.

(F) Locked Electrical Equipment Rooms or Enclosures

Electrical equipment rooms or enclosures holding electrical devices that are protected by a lock or locks must be accessible only to qualified persons.

110.28 Enclosure Types: (NEC 2008)

No Listing in 2008

110.28 Enclosure Types: (NEC 2011)

Enclosures of switchboards, panel boards, industrial control panels, motor control centers, meter sockets, enclosed switches, transfer switches, power outlets, circuit breakers adjustable-speed drive systems, pullout switches, portable power distribution, equipment, termination boxes, general-purpose transformers, fire pump controllers, fire pump motors, and motor controllers, rated not over 600 volts nominal and intended for such locations, will be marked with an enclosure-type number as shown in Table 110.28.

Table 110.28 will be used for selecting these enclosures for use in specific locations other than hazardous locations. The enclosures are not intended to protect against environmental conditions such as condensation, icing, corrosion, or contamination that may occur within the enclosure or enter via the conduit or unsealed openings.

110.31 Enclosure for Electrical Installations: (NEC 2008)

(A) Fire Resistance of Electrical Vaults

The walls, roof, floors, and doorways of vaults containing conductors and equipment over 600 volts nominal, must be constructed of materials that have enough structural strength for the conditions to which they are subjected, and it must have a minimum fire rating of no less than 3 hours. The floors of vaults that are in contact with the earth will be constructed of concrete and must have a vacant space or other stories below it. The floor will have enough structural strength for the load imposed upon it and a minimum fire resistance of no less than 3 hours. For the purpose of this section, studs and wallboards will not be considered acceptable.

110.31 Enclosure for Electrical Installations: (NEC 2011)

(A) Electrical Vaults

If an electrical vault is required for conductors and equipment operating at over 600 volts nominal, the following must apply:

(1) Walls and Roof

The walls and roof will be constructed of materials that have enough structural strength for the conditions and also have a minimum fire rating of no less than 3 hours. For the purpose of this section, studs and wallboard construction will not be allowed.

(2) Floors

The floors of vaults in contact with the earth must be constructed of concrete that is no less than 102 mm (4 in.) thick, but where the vault is constructed with a vacant space or

other stories below it, the floor must have enough structural strength for the load imposed on it and it must have a minimum fire resistance of not less than 3 hours.

(3) Doors

Each doorway leading into a vault from the building interior will be constructed with a tight-fitting door that has a minimum fire rating of no less than 3 hours. The authority with jurisdiction will be allowed to require such a door for an exterior wall opening where conditions allow.

Exception to (1), (2), and (3): Where the vault is protected with an automatic sprinkler, water spray, carbon dioxide, or halon, construction with at least a 1 hour rating will be allowed.

(4) Locks

Doors must be equipped with locks and must be kept locked, access allowed only to qualified persons. Personnel doors must swing out and must be equipped with panic bars, pressure plates, or other devices that are normally latched but that open under simple pressure.

(5) Transformers

If a transformer is installed in a vault as required by article 450, the vault will be constructed according to the requirements of Part III of Article 450.0

Further Information No. 1: For additional information, see ANSI/ASTM E119-1995, Method for Fire Tests of Building Construction and Materials, NFPA 251-2006, Standard Methods of Tests of Fire Resistance of Building Construction and Materials, and NFPA 80-2010, Standard for Fire Doors and Other Opening Protective's.

Further Information No. 2: A typical 3 hour construction is 150 mm (6in.) thick reinforced concrete.

110.34 Work Space and Guarding: (NEC 2008)

(A) Working Space

Exception: Working space will not be required in the rear of equipment such as dead front switchboards or control assemblies where there are no renewable or adjustable parts on the rear and where all connections are assessable from locations other than the rear.

Where rear access is required to work on de-energized parts, a minimum working space of 762 mm (30 in.) horizontally must be provided.

110.34 Work Space and Guarding: (NEC 2011)

(A) Working Space

Exception: Working space will not be required in the rear of equipment such as dead front switchboards or control assemblies where there are no renewable or adjustable parts on the rear and where all connections are accessible from locations other than the rear.

Where rear access is required to work on *nonelectrical* parts on the rear of enclosed equipment, a minimum working space of 762 mm (30 in.) horizontally must be provided.

110.40 Temperature Limitations at Terminations: (NEC 2008)

Conductors will be allowed to be terminated based on the 90°C (119°F) temperature rating and ampacity as shown in Table 310.67 through Table 310.86.

110.40 Temperature Limitations at Terminations: (NEC 2011)

Conductors shall be permitted to be terminated based on the 90°C (119°F) temperature rating and ampacity as shown in Table *310.60(C)(67) through 310.60(C)(86)*.

110.74 Bending Space for Conductors: (NEC 2008)

Bending space for conductors operating at 600 volts or below will be provided according to the requirements of section 314.28. Conductors operating at over 600 volts will be provided with bending space according to section 314.71(A) and section 314.71(B). All conductors will be cabled, racked up, or arranged in a manner that provides easy and safe access for persons to enter for installation and maintenance.

110.74 Conductor Installation: (NEC 2011)

Conductors installed in manholes and other enclosures intended for personnel entry must be cabled, racked up, or arraigned in a manner that provides easy and safe access for persons to enter for installation and maintenance. The installation will adhere to section 110.74(A) or section 110.74(B).

(A) 600 Volts, Nominal, or Less

Wire bending space for conductors at 600 volts or less will be provided according to the requirements of section 314.28.

(B) Over 600 Volts, Nominal

Conductors operating at over 600 volts will be provided with bending space in according to section 314.71(A) and section (B).