

National Electrical Code: 2014 Code Changes

A quick reference guide



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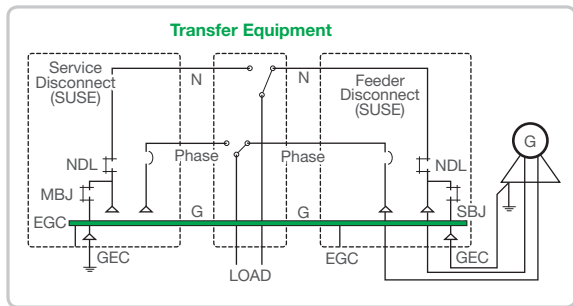
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Definition of Separately Derived System

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An electrical source, other than a service, having no direct connection(s) to circuit conductors of any other electrical source other than those established by grounding and bonding connections.

Impact on engineers, contractors, inspectors:

Revision of the definition for separately derived systems adds clarity that the determination of system type is based on the connection of sources into the system and not how loads are connected. The revised definition also recognizes that interconnection of the sources through the grounding and bonding of the system equipment does not impact this determination of system type.



Definition of Readily Accessible

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Capable of being reached quickly for operation, renewal, or inspections. Installations which require the use of tools or present obstacles to access are not permitted.

Impact on engineers, contractors, inspectors:

The NEC requires many devices such as AFCIs and GFCIs to be readily accessible. Providing this ability is usually straight forward for protection located in the electrical panel but other locations need to consider the room use and layout. Any obstacles in front of these devices renders the installation non-compliant such as a behind a refrigerator or a washing machine where the GFCI cannot be regularly tested in accordance with its instructions.



NEC 110 – Requirements for Electrical Installations

Dedicated Equipment Space

- Outdoor installations to meet dedicated equipment space requirements
- Space equal to width and depth of equipment and extending from grade to a height of 6 ft above the equipment
- No equipment outside of the electrical installation allowed in this space

Impact on engineers, contractors, inspectors:

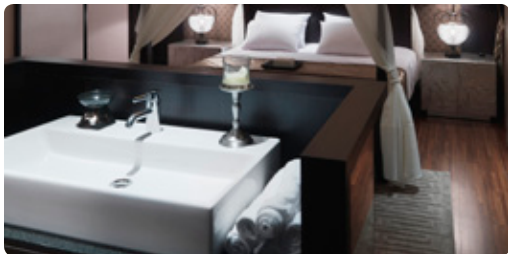
Dedicated equipment space requirements were added for outdoor installations where items such as gas piping, water piping, mechanical refrigeration lines, irrigation equipment, phone equipment, air lines, and other non-electrical equipment often impede access to the electrical equipment. Existing requirements covered indoor installations and this revision recognizes that outdoor installations also need space to permit the installation of conduit and other electrical equipment above the equipment.





GFCI (Dwellings) – Bathtubs and Shower Stalls

- 125 V, single-phase, 15 and 20 A receptacles within 6ft of a bathtub or shower stall must be GFCI protected
- Requirements cover installations where the bathtub or shower location is not a bathroom based on the definition in Article 100



Impact on engineers, contractors, inspectors:

The NEC definition for a bathroom requires a sink and one or more fixtures. Many interior designs place the sink in an area separate from the bathtub or shower. Without the area having a sink near the shower or tub, the GFCI protection requirement for receptacles near a shower can be called into question as not being a bathroom. Although most installers provide GFCI protection, this code change will ensure these areas have GFCI protection identical to bathrooms.



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GFCI (Dwellings) – Laundry

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All 125 V, single-phase, 15 and 20 A receptacles installed in the locations specified in 210.8(A)(1) through (10), including laundry areas, shall have ground-fault circuit-interrupter protection for personnel.



Impact on engineers, contractors, inspectors:

GFCI requirements for dwellings have positively impacted the incidents of electrical shocks in the home and the expansion to laundry areas is a rational step to further enhance this protection. The GFCI protection applies to all 125 V, 15 and 20 A receptacles in the laundry area and must be installed in a readily accessible location. Where the laundry connections are not located in a “laundry room,” a determination will need to be made as to which receptacles serve the laundry area. The area may include a closet, location in a basement or garage, or connected adjacent to the kitchen.



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GFCI (Dwellings) – Kitchen Dishwasher Branch Circuit

GFCI protection shall be provided for outlets that supply dishwashers.

Note: This is not a GFCI receptacle requirement.



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Impact on engineers, contractors, inspectors:

Expansion of GFCI requirements to dishwashers installed in dwelling kitchens provides needed safety enhancements where product end of life failure can result in a shock hazard. The revision applies to both cord and plug and “hard wired” dishwasher installations. In order to protect the outlet for the dishwasher, the GFCI must be installed in a readily accessible location ahead of the receptacle or outlet serving the dishwasher. Since kitchen branch circuits are now required to be AFCI protected, this may be accomplished with either an AFCI circuit breaker feeding a GFCI ahead of the dishwasher outlet or a dual function circuit breaker that includes both AFCI and GFCI protection.



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AFCI – Dwelling Units



AFCI protection is required for all 120 V, 15 and 20 A branch circuits that supply outlets or devices in dwelling units. This includes **kitchens**, family rooms, living rooms, parlors,

libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, **laundry areas**, or similar rooms.

Impact on contractors, inspectors:

The inclusion of AFCI protection in the kitchen includes the small appliance branch circuits, lighting and all individual appliance circuits such as the garbage disposal, dishwasher, microwave, refrigerator, and range hood. AFCI protection in the laundry area may include the washer circuit, lighting, or other outlets. The laundry area may be a well-defined laundry room or an area where laundry equipment is installed.

AFCI circuit breaker protection is compatible with GFCI receptacle protection in these areas, or protection may be provided by a dual function AFCI/GFCI circuit breaker.



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AFCIs

The 2014 NEC has introduced multiple methods to provide AFCI protection:

- 1) Combination type AFCI circuit breaker
- 2) Branch/feeder type AFCI circuit breaker + outlet branch-circuit type AFCI
- 3) Supplemental arc protection circuit breaker + outlet branch-circuit type AFCI with restrictions
- 4) Circuit breaker + outlet branch-circuit type AFCI listed as a “combination-type AFCI” with restrictions
- 5) Home run in a steel wiring method + outlet branch-circuit type AFCI installed in first outlet
- 6) Home run encased in 2" of concrete + outlet branch-circuit type AFCI installed in first outlet

Impact on engineers, contractors, inspectors:

Method 1 is the most common and simplest choice for new construction.

Methods 3 and 4 are currently not viable solutions at this time. Standard thermal magnetic circuit breakers are not acceptable for use in either method.

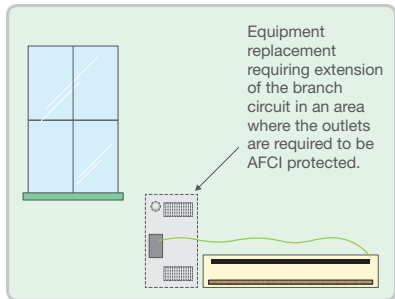
Methods 5 and 6 are used when the installation utilizes a conduit system.

Branch Circuit Extensions or Modifications – Dwelling Units

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AFCI is not required where:

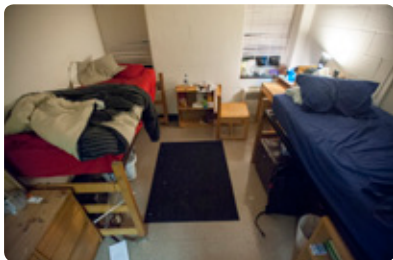
- Extension does not exceed 6 ft
- No additional outlets or devices installed



Impact on engineers, contractors, inspectors:

Renovation or modification of existing wiring in dwellings often includes replacing the electrical panel or extending one or more branch circuits to accommodate equipment or appliance replacement. This exception prohibits additional outlets and sets limits on the extension length in order to not trigger the AFCI protection required in this section. New service panels are often larger than the older ones that are being replaced so this provides the permission necessary to extend existing circuits within the panel to reach the new circuit breaker.

AFCI – Dormitory Units



AFCI protection is required for all 120 V, 15 and 20 A branch circuits that supply outlets in dormitory unit bedrooms, living rooms, hallways, closets, and similar rooms.

Impact on engineers, contractors, inspectors:

The code panel has recognized that student dorms are a living space similar to dwelling units and protecting those living spaces from an electrical arc hazard is very similar to a dwelling unit. A number of campuses across the country have recognized the safety aspect and have included arc fault protection as a standard specification for new dormitory construction. Although this is a new requirement in the 2014 NEC, arc-fault protection has been protecting circuits in dorms for a number of years where college campuses recognized the enhanced protection it provides.



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Electric Vehicle Branch Circuit

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Outlet(s) installed for the purpose of charging electric vehicles shall be supplied by a separate branch circuit. This circuit shall have no other outlets.

Impact on engineers, contractors, inspectors:

In recognition of the recent growth in electrical vehicle use, the NEC addressed how this additional load should be connected to the electrical system when electric vehicle supply equipment is installed.

Electric vehicle supply equipment is considered a continuous building load and a dedicated branch circuit is needed to prevent circuit overload and nuisance tripping of the supply overcurrent protective device.



Outdoor Outlets (Dwellings)

15

- Outdoor receptacle outlets must be **readily accessible** from grade level
- Installed no higher than 6-1/2 ft above grade level
- At least one receptacle outlet at the front and rear of dwelling

Impact on engineers, contractors, inspectors:

Installations intending to utilize a porch or deck receptacle outlet to meet the outdoor receptacle requirements of this section must ensure that the placement of the receptacle permits ready access from grade and is within the specified height limitation. A deck can preclude such accessibility and drive the need for another outdoor receptacle outlet beneath the deck accessible at grade level.



Garages (one family dwellings)

- A receptacle outlet is required to be installed for each car space in an attached or detached garage with electric power
- The branch circuit supplying the receptacle(s) can only serve outlets in the garage

Impact on engineers, contractors, inspectors:

The single garage receptacle permitted in existing requirements creates a safety issue by fostering the permanent use of extension cords where the receptacle was not conveniently located or in multi-car garages where distance to the receptacle was too far. The new requirements address this concern by specifying the intended area the receptacle serves and including one for each space.

The garage branch circuit must only serve garage outlets. Flood lights and other luminaires mounted on the exterior of the garage will need to be supplied from a separate branch circuit.





Electrical Service Areas

- New section requires at least one 125 V, single-phase, 15 or 20 A rated receptacle outlet within 15 m (50 ft) of the electrical service equipment
- Exception for one- and two-family dwellings

Impact on engineers, contractors, inspectors:

Aside from one- and two-family dwellings, the new requirements for a receptacle outlet for maintenance and servicing of electrical service areas apply to all service equipment regardless of the application.

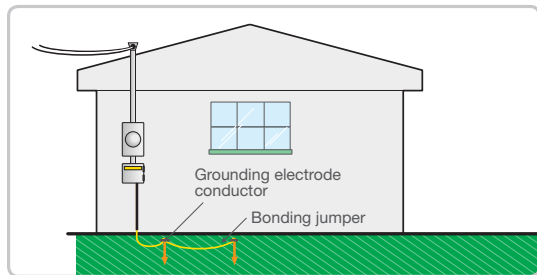
Small services for signs, community irrigation, and 240 V loads are examples where this requirement will impact the installation to supply the required 125 V receptacle.



Grounding Electrode Installation – Securing and Protection Against Physical Damage

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- Table 300.5 sets the minimum cover requirements
- Grounding electrode conductors and bonding jumpers **do not** have to meet the burial depth requirements for direct-buried conductors



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Impact on engineers, contractors, inspectors:

Grounding electrode conductors and grounding electrode bonding jumpers are required to be installed with protection where exposed to physical damage. This revision clarifies that the portions of these conductors which are direct buried are considered protected and the burial depth requirements normally associated with underground wiring do not apply.

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Grounding Electrode Connections – Concrete-encased Electrode Extension

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- Allows extension of the electrode to area above the concrete
- Must be accessible to allow for inspection of the connection
- Applies to conductor, reinforcing rod, and bar types



Impact on engineers, contractors, inspectors:

The connection to a concrete-encased electrode can be disruptive to the normal construction schedule since concrete is usually installed early in the building process. The allowance to use an extension provides a convenient method of connection and inspection during the normal electrical installation and verification phases of construction.

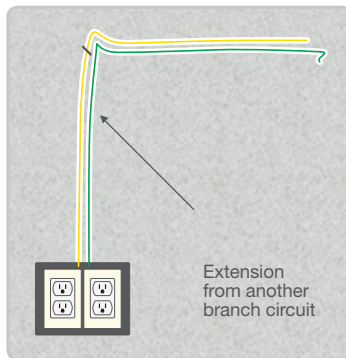


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Equipment Grounding Connections – Non-grounding Receptacle Replacement or Branch Circuit Extensions

20

- Allows extension of a grounding electrode conductor from another branch circuit
- Branch circuits must originate in the same panelboard



Impact on engineers, contractors, inspectors:

Replacing non-grounding receptacles or extending a branch circuit without an equipment grounding conductor (EGC) can be a challenge in many existing installations. This allowance provides relief from installing a separate EGC from the panelboard while addressing the safety aspects of the installation.



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120/240 V, Single-phase, Services and Main Power Feeders (Dwellings)

- **Table 310.15(B)(7) removed**
- Service or Feeder ratings 100 A through 400 A, **an adjustment factor of 0.83** of the service or feeder ampere rating can be used to determine the size of the ungrounded conductors where supplying the entire load
- **Other correction or adjustment factors** applicable to the conductor installation apply



Impact on engineers, contractors, inspectors:

The existing service conductor size table has been replaced with an 0.83 adjustment factor which results in the same base conductor size as the original table value. Conductor correction or adjustment factors may now apply to the installation.



Boxes at Luminaire or Lampholder Outlets – Ceiling Outlets

22

- Standard ceiling outlet boxes for luminaire or lampholder use must support 50 lbs
- Luminaires exceeding 50 lbs and supported from the ceiling box must use a box which is **marked with the maximum weight allowed**



Impact on engineers, contractors, inspectors:

Large luminaires can exceed the rated weight support of standard ceiling outlet boxes. Many installations utilize independent support for such luminaires, but this code revision recognizes that special boxes marked with the support rating are suitable for this application.



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NEC 334 – NM Cable: Types NM, NMC, and NMS



Section 334.40(B)

[Revision]

Devices of Insulating Material

- Removes the requirement for a box when installing self-contained switches, self-contained receptacles, or NM interconnectors
- Applies to exposed cable wiring and concealed repair wiring
- Devices must be listed



Impact on engineers, contractors, inspectors:

Modifying or repairing an existing wiring installation can be a difficult installation and code compliance challenge. The devices added to this section provide a permanent installation method for exposed and concealed modifications to the wiring system. The listing requirement ensures evaluation for the intended use and safety aspects of installing without a box.

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NEC 386 – Surface Metal Raceway

Surface Metal Raceway Marking

- New marking requirement for each length of raceway
- Manufacturer's name or unique identification
- Similar revision for non-metallic surface raceways in 388.120



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Impact on engineers, contractors, inspectors:

Surface raceways must be installed as a complete system with the appropriate components as intended by the product manufacturer. The marking requirement added in this section will assist in verifying that the system is installed as intended.

NEC 400 – Flexible Cords and Cables

Flexible Cords and Cables

- Permits flexible cord connection between a receptacle outlet and an inlet
- Inlet is permanently wired using a standard wiring method to a single receptacle outlet
- Wall mounting of flat screen televisions or monitors is a common application



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DataComm Electronics

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Impact on engineers, contractors, inspectors:

Flexible cords and cables are not permitted to be concealed or as a substitute for the fixed wiring of a structure. This presents a challenge when wall mounting a television, monitor, or device where the existing wiring system did not place a receptacle in the desired location. In utilizing a listed assembly, this revision provides a compliant method for addressing common applications where the use of flexible cords and cables is desired.

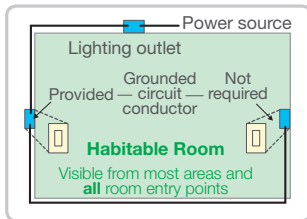


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Switches Controlling Lighting Loads

A grounded circuit conductor must be provided at the switch location unless one of the follow apply:

- Raceway sized to accommodate a grounded conductor
- Box enclosing the switch is accessible without removing finish materials
- Snap switches with integral enclosures
- Switch does not serve a habitable room or bathroom
- Multiple switch locations control the same lighting load and the entire floor area is visible from one or more switches
- Area lighting is automatically controlled
- Switch controls a receptacle load



Impact on engineers, contractors, inspectors:

The requirement to provide a grounded circuit conductor at each switch location has been revised to provide needed relief. Where multiple switches are installed in the same area, the addition of a grounded conductor is no longer required at all locations. Permission to install the grounded conductor at a future date is allowed where access is available to the switch.



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NEC 406 – Receptacles, Cord Connectors, and Attachment Plugs (Caps)



Section 406.9(B)(1)

[Revision]

15 and 20 A Receptacles in a Wet Location

27

- Expands the “extra duty” cover requirement to all wet location receptacle locations, **not just those supported from grade**
- Similar revision to 590.4(D)(2) – clarifies the “extra duty” requirements apply to all wet location temporary installations, **including dwellings**



Impact on engineers, contractors, inspectors:

Revisions to this section recognize the added safety benefit for “extra duty” covers for wet location receptacles. Extra duty covers provide enhanced mechanical strength and “in-use” protection for outdoor and other wet location receptacles.



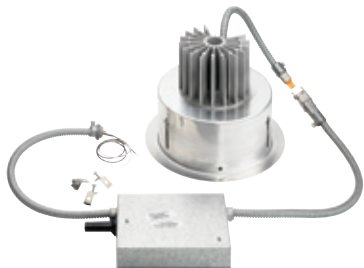
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Luminaires, Lampholders, and Lamps – Listing Required

28

- Expands the listing requirements to retrofit kits for lampholders and luminaires
- Retrofit kit definition added to Article 100 which provides clarity and distinguishes retrofit kits from re-lamping activities (no field conversion of the utilization equipment)



Impact on engineers, contractors, inspectors:

Improving the energy efficiency of installed lighting systems can be a challenge when the existing luminaires require field conversion to support the efficiency upgrade. Listed retrofit kits ensure that the safety aspects of the conversion have been considered and are in compliance with the product safety standard.



Marking



Impact on contractors, inspectors:

Generators will now include a marking indicating if it is bonded. If the generator is not bonded, markings such as “floating” or “ungrounded” may be included. This marking is important when generators are used in home standby applications and must be coordinated with the system transfer equipment.

Revision requires marking when the neutral of a generator is bonded to the generator frame.



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GFCI Protection for Receptacles on Portable Generators (< 15 kW)

30

- All 125 V, single-phase, 15 and 20 A receptacle outlets shall.....
 - » Have GFCI integral to the generator or receptacle **or**
 - » Be arranged so that these receptacles are not be available for use when the 125/250 V locking receptacle is in use
- Generators without a 125/250 V locking-type receptacle are **exempt**
- Listed cord sets or devices incorporating listed GFCI protection are permitted for installations of generators manufactured or re-manufactured prior to January 1, 2015



Impact on engineers, contractors, inspectors:

Portable generator installations which utilize a 125/250 V locking-type receptacle in home back-up applications will be impacted by this change. Such use requires connection as a separately derived system and transfer equipment which switches the neutral unless the generator configuration prevents use of the 125 V, 15 and 20 A receptacle outlets.

Electric Vehicle (EV) Supply Equipment System

A system of components that provides an AC output that is supplied to the vehicle for the purpose of providing input power to an on-board charger.

- 625.17 cords and cables added to cover the power supply cords and output cable to the EV
- 625.41 permits an energy management system to establish calculated load
- 625.44 sets requirements for cord and plug connected EV supply equipment



Impact on engineers, contractors, inspectors:

EV supply equipment installations must comply with the appropriate ratings to demonstrate suitability for the environment where it is located, intended use and access, and exposure to physical damage. The EV charging station branch circuit breaker and wire must also be sized at 125 percent of its rated load, unless an energy management feature is associated with the EV charging infrastructure.



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NEC 625 – Electric Vehicle Charging System

Electric Vehicle (EV) Supply Equipment Connections to 125 V, Single-phase, 15 A, and 20 A Receptacle Outlets

32

- Supplied from 125 V receptacle outlets where rated 15 or 20 A, non-locking, 2-pole, 3-wire, grounding type

or

- Supplied at less than 50 V DC



Impact on engineers, contractors, inspectors:

Cord and plug connection requirements of EV supply equipment are divided into separate sections based on the rated voltage of the supply. The 125 V receptacle outlets must be non-locking to provide physical protection should the vehicle move while connected. Section 210.17 requires a dedicated branch circuit for outlets intended for this use.



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Electric Vehicle Supply Equipment (EVSE) – Connections to Other Receptacle Outlets

Receptacle outlets must comply with all of the following:

- Rated 250 V maximum
- 50 A or less
- Non-locking, 2-pole, 3-wire, and 3-pole, 4-wire, grounding type
- EVSE fastened in place
- Supply cord limited to 6 ft length
- Located to avoid physical damage to the supply cord



All other EVSE (over 250 V) must be permanently wired and fastened in place

Impact on engineers, contractors, inspectors:

EVSE rated 250 V or greater must be fastened in place and located based on the rated environmental conditions. The supply cord to the EVSE presents a challenge in ensuring physical damage exposure does not create a hazard. This is especially difficult when the EVSE is intended for public use. The installer may consider using a hard-wired connection for the EVSE to eliminate any concerns with damage to the supply cord of the EVSE.



Outdoor Generator Sets – Portable Generators (< 15 kW)

34

- Flanged inlet or other cord- and plug-type connections of small portable generators can serve as the building or structure disconnect
- Power inlet installations must include the 702.7(C) sign requirements indicating if the system is separately derived or non-separately derived



Impact on engineers, contractors, inspectors:

Small portable generators used in optional standby systems are frequently connected using cord- and plug-type connections. This revision allows this connection to serve as the building disconnect for the generator supply. The cord and plug and associated flanged inlet must be rated for the conditions of use and outdoor installation location.



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