

- (4) Be located sufficiently remote from other building or other fire pump source disconnecting means such that inadvertent operation at the same time would be unlikely.

*Exception to 695.4(B)(3)(a): For a multibuilding campus-style complex(s) installed under the provisions of 695.3(C), only the requirements in 695.4(B)(3)(a)(2) shall apply for normal power source disconnects.*

(b) **Features and Location — On-Site Standby Generator.** The disconnecting means for an on-site standby generator(s) used as the alternate power source shall be installed in accordance with 700.10(B)(5) for emergency circuits and shall be lockable in the closed position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed.

(c) **Disconnect Marking.** The disconnecting means shall be marked “Fire Pump Disconnecting Means.” The letters shall be at least 25 mm (1 in.) in height, and they shall be visible without opening enclosure doors or covers. [20:9.2.3.1(5)]

(d) **Controller Marking.** A placard shall be placed adjacent to the fire pump controller, stating the location of this disconnecting means and the location of the key (if the disconnecting means is locked). [20:9.2.3.2]

(e) **Supervision.** The disconnecting means shall be supervised in the closed position by one of the following methods:

- (1) Central station, proprietary, or remote station signal device
- (2) Local signaling service that causes the sounding of an audible signal at a constantly attended point
- (3) Locking the disconnecting means in the closed position

(f) Sealing of disconnecting means and approved weekly recorded inspections when the disconnecting means are located within fenced enclosures or in buildings under the control of the owner [20:9.2.3.3]

**695.5 Transformers.** Where the service or system voltage is different from the utilization voltage of the fire pump motor, transformer(s) protected by disconnecting means and overcurrent protective devices shall be permitted to be installed between the system supply and the fire pump controller in accordance with 695.5(A) and (B), or with (C). Only transformers covered in 695.5(C) shall be permitted to supply loads not directly associated with the fire pump system.

**(A) Size.** Where a transformer supplies an electric motor driven fire pump, it shall be rated at a minimum of 125 percent of the sum of the fire pump motor(s) and pressure maintenance pump(s) motor loads, and 100 percent of the associated fire pump accessory equipment supplied by the transformer.

**(B) Overcurrent Protection.** The primary overcurrent protective device(s) shall be selected or set to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply. Secondary overcurrent protection shall not be permitted. The requirement to carry the locked-rotor currents indefinitely shall not apply to conductors or devices other than overcurrent devices in the fire pump motor circuit(s).

**(C) Feeder Source.** Where a feeder source is provided in accordance with 695.3(C), transformers supplying the fire pump system shall be permitted to supply other loads. All other

loads shall be calculated in accordance with Article 220, including demand factors as applicable.

**(1) Size.** Transformers shall be rated at a minimum of 125 percent of the sum of the fire pump motor(s) and pressure maintenance pump(s) motor loads, and 100 percent of the remaining load supplied by the transformer.

**(2) Overcurrent Protection.** The transformer size, the feeder size, and the overcurrent protective device(s) shall be coordinated such that overcurrent protection is provided for the transformer in accordance with 450.3 and for the feeder in accordance with 215.3, and such that the overcurrent protective device(s) is selected or set to carry indefinitely the sum of the locked-rotor current of the fire pump motor(s), the pressure maintenance pump motor(s), the full-load current of the associated fire pump accessory equipment, and 100 percent of the remaining loads supplied by the transformer. The requirement to carry the locked-rotor currents indefinitely shall not apply to conductors or devices other than overcurrent devices in the fire pump motor circuit(s).

**695.6 Power Wiring.** Power circuits and wiring methods shall comply with the requirements in 695.6(A) through (J), and as permitted in 230.90(A), Exception No. 4; 230.94, Exception No. 4; 240.13; 230.208; 240.4(A); and 430.31.

#### **(A) Supply Conductors.**

**(1) Services and On-Site Power Production Facilities.** Service conductors and conductors supplied by on-site power production facilities shall be physically routed outside a building(s) and shall be installed as service-entrance conductors in accordance with 230.6, 230.9, and Parts III and IV of Article 230. Where supply conductors cannot be physically routed outside of buildings, the conductors shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or (2).

*Exception: The supply conductors within the fire pump room shall not be required to meet 230.6(1) or (2).*

Informational Note: See 250.24(C) for routing the grounded conductor to the service equipment.

**(2) Feeders.** Fire pump supply conductors on the load side of the final disconnecting means and overcurrent device(s) permitted by 695.4(B), or conductors that connect directly to an on-site standby generator, shall comply with all of the following:

- (1) **Independent Routing.** The conductors shall be kept entirely independent of all other wiring.
- (2) **Associated Fire Pump Loads.** The conductors shall supply only loads that are directly associated with the fire pump system.
- (3) **Protection from Potential Damage.** The conductors shall be protected from potential damage by fire, structural failure, or operational accident.
- (4) **Inside of a Building.** Where routed through a building, the conductors shall be protected from fire for 2 hours using one of the following methods:
  - a. The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.

- b. The cable or raceway is a listed fire-resistive cable system.

Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, *Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables*.

Informational Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

- c. The cable or raceway is a listed electrical circuit protective system.

Informational Note No. 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, *Fire Tests for Electrical Circuit Protection Systems*.

Informational Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

*Exception to 695.6(A)(2)(4): The supply conductors located in the electrical equipment room where they originate and in the fire pump room shall not be required to have the minimum 2-hour fire separation or fire-resistance rating unless otherwise required by 700.10(D) of this Code.*

#### (B) Conductor Size.

**(1) Fire Pump Motors and Other Equipment.** Conductors supplying a fire pump motor(s), pressure maintenance pumps, and associated fire pump accessory equipment shall have a rating not less than 125 percent of the sum of the fire pump motor(s) and pressure maintenance motor(s) full-load current(s), and 100 percent of the associated fire pump accessory equipment.

**(2) Fire Pump Motors Only.** Conductors supplying only a fire pump motor shall have a minimum ampacity in accordance with 430.22 and shall comply with the voltage drop requirements in 695.7.

**(C) Overload Protection.** Power circuits shall not have automatic protection against overloads. Except for protection of transformer primaries provided in 695.5(C)(2), branch-circuit and feeder conductors shall be protected against short circuit only. Where a tap is made to supply a fire pump, the wiring shall be treated as service conductors in accordance with 230.6. The applicable distance and size restrictions in 240.21 shall not apply.

*Exception No. 1: Conductors between storage batteries and the engine shall not require overcurrent protection or disconnecting means.*

*Exception No. 2: For an on-site standby generator(s) rated to produce continuous current in excess of 225 percent of the full-load amperes of the fire pump motor, the conductors between the on-site generator(s) and the combination fire pump transfer switch controller or separately mounted transfer switch shall be installed in accordance with 695.6(A)(2).*

*The protection provided shall be in accordance with the short-circuit current rating of the combination fire pump transfer switch controller or separately mounted transfer switch.*

**(D) Pump Wiring.** All wiring from the controllers to the pump motors shall be in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit, listed Type MC cable with an impervious covering, or Type MI cable. Electrical connections at motor terminal boxes shall be made with a

listed means of connection. Twist-on, insulation-piercing-type, and soldered wire connectors shall not be permitted to be used for this purpose.

**(E) Loads Supplied by Controllers and Transfer Switches.** A fire pump controller and fire pump power transfer switch, if provided, shall not serve any load other than the fire pump for which it is intended.

**(F) Mechanical Protection.** All wiring from engine controllers and batteries shall be protected against physical damage and shall be installed in accordance with the controller and engine manufacturer's instructions.

**(G) Ground-Fault Protection of Equipment.** Ground-fault protection of equipment shall not be installed in any fire pump power circuit. [20:9.1.8.1]

**(H) Listed Electrical Circuit Protective System to Controller Wiring.** Electrical circuit protective system installation shall comply with any restrictions provided in the listing of the electrical circuit protective system used, and the following also shall apply:

- (1) A junction box shall be installed ahead of the fire pump controller a minimum of 300 mm (12 in.) beyond the fire-rated wall or floor bounding the fire zone.
- (2) Where required by the manufacturer of a listed electrical circuit protective system or by the listing, or as required elsewhere in this *Code*, the raceway between a junction box and the fire pump controller shall be sealed at the junction box end as required and in accordance with the instructions of the manufacturer. [20:9.8.2]
- (3) Standard wiring between the junction box and the controller shall be permitted. [20:9.8.3]

**(I) Junction Boxes.** Where fire pump wiring to or from a fire pump controller is routed through a junction box, the following requirements shall be met:

- (1) The junction box shall be securely mounted. [20:9.7(1)]
- (2) Mounting and installing of a junction box shall not violate the enclosure type rating of the fire pump controller(s). [20:9.7(2)]
- (3) Mounting and installing of a junction box shall not violate the integrity of the fire pump controller(s) and shall not affect the short-circuit current rating of the controller(s).
- (4) As a minimum, a Type 2, drip-proof enclosure (junction box) shall be used where installed in the fire pump room. The enclosure shall be listed to match the fire pump controller enclosure type rating. [20:9.7(4)]
- (5) Terminals, junction blocks, wire connectors, and splices, where used, shall be listed. [20:9.7(5)]
- (6) A fire pump controller or fire pump power transfer switch, where provided, shall not be used as a junction box to supply other equipment, including a pressure maintenance (jockey) pump(s).

**(J) Terminations.** Where raceways or cable are terminated at a fire pump controller, the following requirements shall be met:

- (1) Raceway or cable fittings listed and identified for use in wet locations shall be used.
- (2) The type rating of the raceway or cable fittings shall be at least equal to that of the fire pump controller.
- (3) The installation instructions of the manufacturer of the fire pump controller shall be followed.

- (4) Alterations to the fire pump controller, other than raceway or cable terminations as allowed elsewhere in this Code, shall be approved by the authority having jurisdiction.

#### 695.7 Voltage Drop.

**(A) Starting.** The voltage at the fire pump controller line terminals shall not drop more than 15 percent below normal (controller-rated voltage) under motor starting conditions.

*Exception: This limitation shall not apply for emergency run mechanical starting. [20:9.4.2]*

**(B) Running.** The voltage at the load terminals of the fire pump controller shall not drop more than 5 percent below the voltage rating of the motor connected to those terminals when the motor is operating at 115 percent of the full-load current rating of the motor.

**695.10 Listed Equipment.** Diesel engine fire pump controllers, electric fire pump controllers, electric motors, fire pump power transfer switches, foam pump controllers, and limited service controllers shall be listed for fire pump service. [20:9.5.1.1, 10.1.2.1, 12.1.3.1]

Fire pump controllers and transfer switches shall not be permitted to be reconditioned.

#### 695.12 Equipment Location.

**(A) Controllers and Transfer Switches.** Electric motor-driven fire pump controllers and power transfer switches shall be located as close as practicable to, and within sight of, the motors that they control.

**(B) Engine-Drive Controllers.** Engine-drive fire pump controllers shall be located as close as is practical to, and within sight of, the engines that they control.

**(C) Storage Batteries.** Storage batteries for fire pump engine drives shall be supported above the floor, secured against displacement, and located where they are not subject to physical damage, flooding with water, excessive temperature, or excessive vibration.

**(D) Energized Equipment.** All energized equipment parts shall be located at least 300 mm (12 in.) above the floor level.

**(E) Protection Against Pump Water.** Fire pump controller and power transfer switches shall be located or protected so that they are not damaged by water escaping from pumps or pump connections.

**(F) Mounting.** All fire pump control equipment shall be mounted in a substantial manner on noncombustible supporting structures.

#### 695.14 Control Wiring.

**(A) Control Circuit Failures.** External control circuits that extend outside the fire pump room shall be arranged so that failure of any external circuit (open or short circuit) shall not prevent the operation of a pump(s) from all other internal or external means. Breakage, disconnecting, shorting of the wires, or loss of power to these circuits could cause continuous running of the fire pump but shall not prevent the controller(s) from starting the fire pump(s) due to causes other than these external control circuits. All control conductors within the fire pump room that are not fault tolerant shall be protected against physical damage. [20:10.5.2.6, 12.5.2.5]

**(B) Sensor Functioning.** No undervoltage, phase-loss, frequency-sensitive, or other sensor(s) shall be installed that automatically or manually prohibits actuation of the motor contactor. [20:10.4.5.6]

*Exception: A phase-loss sensor(s) shall be permitted only as a part of a listed fire pump controller.*

**(C) Remote Device(s).** No remote device(s) shall be installed that will prevent automatic operation of the transfer switch. [20:10.8.1.3]

**(D) Engine-Drive Control Wiring.** All wiring between the controller and the diesel engine shall be stranded and sized to continuously carry the charging or control currents as required by the controller manufacturer. Such wiring shall be protected against physical damage. Controller manufacturer's specifications for distance and wire size shall be followed. [20:12.3.5.1]

**(E) Electric Fire Pump Control Wiring Methods.** All electric motor-driven fire pump control wiring shall be in rigid metal conduit, intermediate metal conduit, liquidtight flexible metal conduit, electrical metallic tubing, liquidtight flexible nonmetallic conduit, listed Type MC cable with an impervious covering, or Type MI cable.

**(F) Generator Control Wiring Methods.** Control conductors installed between the fire pump power transfer switch and the standby generator supplying the fire pump during normal power loss shall be kept entirely independent of all other wiring. The integrity of the generator remote start circuit shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall start the generator(s).

*Informational Note: See NFPA 20-2019, Standard for the Installation of Stationary Pumps for Fire Protection, Section 3.3.7.2, for more information on fault-tolerant external control circuits.*

The control conductors shall be protected to resist potential damage by fire or structural failure. Where routed through a building, the conductors shall be protected from fire for 2 hours using one of the following methods:

- (1) The cable or raceway is encased in a minimum 50 mm (2 in.) of concrete.
- (2) The cable or raceway is a listed fire-resistive cable system.

*Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables.*

*Informational Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.*

- (3) The cable or raceway is protected by a listed electrical circuit protective system.

*Informational Note No. 1: Electrical circuit protective systems could include, but are not limited to, thermal barriers or a protective shaft and are tested in accordance with UL 1724, Fire Tests for Electrical Circuit Protection Systems.*

*Informational Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.*

**695.15 Surge Protection.** A listed surge protection device shall be installed in or on the fire pump controller.

## Chapter 7 Special Conditions

### ARTICLE 700 Emergency Systems

#### Part I. General

**700.1 Scope.** This article applies to the electrical safety of the installation, operation, and maintenance of emergency systems consisting of circuits and equipment intended to supply, distribute, and control electricity for illumination, power, or both, to required facilities when the normal electrical supply or system is interrupted.

Informational Note No. 1: For further information regarding wiring and installation of emergency systems in health care facilities, see Article 517.

Informational Note No. 2: For further information regarding performance and maintenance of emergency systems in health care facilities, see NFPA 99-2018, *Health Care Facilities Code*.

Informational Note No. 3: For specification of locations where emergency lighting is considered essential to life safety, see NFPA 101-2018, *Life Safety Code*.

Informational Note No. 4: For further information regarding performance of emergency and standby power systems, see NFPA 110-2019, *Standard for Emergency and Standby Power Systems*.

#### 700.2 Definitions.

**Branch-Circuit Emergency Lighting Transfer Switch.** This definition shall apply only within this article.

A device connected on the load side of a branch-circuit over-current protective device that transfers only emergency lighting loads from the normal supply to an emergency supply.

Informational Note: See ANSI/UL 1008, *Transfer Switch Equipment*, for information covering branch-circuit emergency lighting transfer switches.

**Emergency Luminaire, Directly Controlled.** An emergency luminaire that has a control input for an integral dimming or switching function that drives the luminaire to the required illumination level upon loss of normal power.

Informational Note: See ANSI/UL 924, *Emergency Lighting and Power Equipment*, for information covering directly controlled luminaires.

**Emergency Systems.** This definition shall apply within this article and throughout the *Code*.

Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination, power, or both, to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life.

Informational Note: Emergency systems are generally installed in places of assembly where artificial illumination is required for safe exiting and for panic control in buildings subject to occupancy by large numbers of persons, such as hotels, theaters,

sports arenas, health care facilities, and similar institutions. Emergency systems may also provide power for such functions as ventilation where essential to maintain life, fire detection and alarm systems, elevators, fire pumps, public safety communications systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions.

**Relay, Automatic Load Control.** A device used to set normally dimmed or normally-off switched emergency lighting equipment to full power illumination levels in the event of a loss of the normal supply by bypassing the dimming/switching controls, and to return the emergency lighting equipment to normal status when the device senses the normal supply has been restored.

Informational Note: See ANSI/UL 924, *Emergency Lighting and Power Equipment*, for the requirements covering automatic load control relays.

#### 700.3 Tests and Maintenance.

**(A) Conduct or Witness Test.** The authority having jurisdiction shall conduct or witness a test of the complete system upon installation and periodically afterward.

**(B) Tested Periodically.** Systems shall be tested periodically on a schedule approved by the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

**(C) Maintenance.** Emergency system equipment shall be maintained in accordance with manufacturer instructions and industry standards.

**(D) Written Record.** A written record shall be kept of such tests and maintenance.

**(E) Testing Under Load.** Means for testing all emergency lighting and power systems during maximum anticipated load conditions shall be provided.

Informational Note: For information on testing and maintenance of emergency power supply systems (EPSSs), see NFPA 110-2019, *Standard for Emergency and Standby Power Systems*.

**(F) Temporary Source of Power for Maintenance or Repair of the Alternate Source of Power.** If the emergency system relies on a single alternate source of power, which will be disabled for maintenance or repair, the emergency system shall include permanent switching means to connect a portable or temporary alternate source of power, which shall be available for the duration of the maintenance or repair. The permanent switching means to connect a portable or temporary alternate source of power shall comply with the following:

- (1) Connection to the portable or temporary alternate source of power shall not require modification of the permanent system wiring.
- (2) Transfer of power between the normal power source and the emergency power source shall be in accordance with 700.12.
- (3) The connection point for the portable or temporary alternate source shall be marked with the phase rotation and system bonding requirements.

- (4) Mechanical or electrical interlocking shall prevent inadvertent interconnection of power sources.
- (5) The switching means shall include a contact point that shall annunciate at a location remote from the generator or at another facility monitoring system to indicate that the permanent emergency source is disconnected from the emergency system.

It shall be permissible to utilize manual switching to switch from the permanent source of power to the portable or temporary alternate source of power and to utilize the switching means for connection of a load bank.

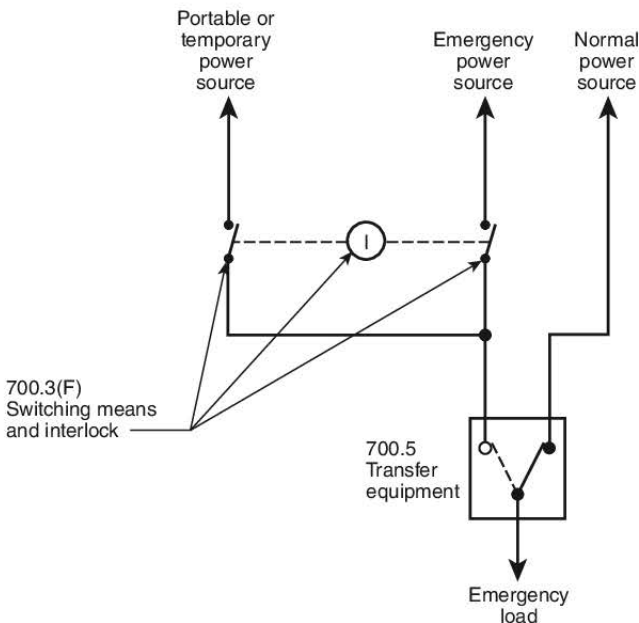
Informational Note: There are many possible methods to achieve the requirements of 700.3(F). See Informational Note Figure 700.3(F) for one example.

*Exception: The permanent switching means to connect a portable or temporary alternate source of power, for the duration of the maintenance or repair, shall not be required where any of the following conditions exists:*

- (1) All processes that rely on the emergency system source are capable of being disabled during maintenance or repair of the emergency source of power.
- (2) The building or structure is unoccupied and fire protection systems are fully functional and do not require an alternate power source.
- (3) Other temporary means can be substituted for the emergency system.
- (4) A permanent alternate emergency source, such as, but not limited to, a second on-site standby generator or separate electric utility service connection, capable of supporting the emergency system, exists.

#### 700.4 Capacity and Rating.

(A) **Rating.** The emergency system equipment shall be suitable for the available fault current at its terminals.



Informational Note Figure 700.3(F)

(B) **Capacity.** An emergency system shall have adequate capacity in accordance with Article 220 or by another approved method.

(C) **Selective Load Pickup, Load Shedding, and Peak Load Shaving.** The alternate power source shall be permitted to supply emergency, legally required standby, and optional standby system loads where the source has adequate capacity or where automatic selective load pickup and load shedding is provided as needed to ensure adequate power to (1) the emergency circuits, (2) the legally required standby circuits, and (3) the optional standby circuits, in that order of priority. The alternate power source shall be permitted to be used for peak load shaving, provided these conditions are met.

Peak load shaving operation shall be permitted for satisfying the test requirement of 700.3(B), provided all other conditions of 700.3 are met.

#### 700.5 Transfer Equipment.

(A) **General.** Transfer equipment shall be automatic, listed, and marked for emergency use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and emergency sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705. Meter-mounted transfer switches shall not be permitted for emergency system use.

(B) **Bypass Isolation Switches.** Means shall be permitted to bypass and isolate the transfer equipment. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

(C) **Automatic Transfer Switches.** Automatic transfer switches shall be electrically operated and mechanically held. Automatic transfer switches shall not be permitted to be reconditioned.

(D) **Use.** Transfer equipment shall supply only emergency loads.

(E) **Documentation.** The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

**700.6 Signals.** Audible and visual signal devices shall be provided, where practicable, for the purpose described in 700.6(A) through (D).

(A) **Malfunction.** To indicate malfunction of the emergency source.

(B) **Carrying Load.** To indicate that the emergency source is carrying load.

(C) **Not Functioning.** To indicate that the battery charger is not functioning.

(D) **Ground Fault.** To indicate a ground fault in solidly grounded wye emergency systems of more than 150 volts to ground and circuit-protective devices rated 1000 amperes or more. The sensor for the ground-fault signal devices shall be located at, or ahead of, the main system disconnecting means for the emergency source, and the maximum setting of the signal devices shall be for a ground-fault current of 1200 amperes. Instruc-

tions on the course of action to be taken in the event of indicated ground fault shall be located at or near the sensor location.

For systems with multiple emergency sources connected to a paralleling bus, the ground fault sensor and the system bonding jumper shall be permitted to be at an alternative location.

#### 700.7 Signs.

**(A) Emergency Sources.** A sign shall be placed at the service-entrance equipment, indicating type and location of each on-site emergency power source.

*Exception: A sign shall not be required for individual unit equipment as specified in 700.12(I).*

**(B) Grounding.** Where removal of a grounding or bonding connection in normal power source equipment interrupts the grounding electrode conductor connection to the alternate power source(s) grounded conductor, a warning sign shall be installed at the normal power source equipment stating:

WARNING  
SHOCK HAZARD EXISTS IF GROUNDING  
ELECTRODE CONDUCTOR OR BONDING JUMPER  
CONNECTION IN THIS EQUIPMENT IS REMOVED  
WHILE ALTERNATE SOURCE(S) IS ENERGIZED.

The warning sign(s) or label(s) shall comply with 110.21(B).

**700.8 Surge Protection.** A listed SPD shall be installed in or on all emergency systems switchboards and panelboards.

## Part II. Circuit Wiring

### 700.10 Wiring, Emergency System.

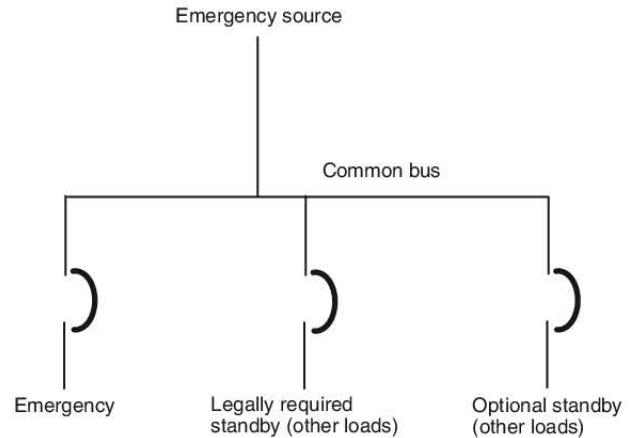
**(A) Identification.** Emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system by the following methods:

- (1) All boxes and enclosures (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked as a component of an emergency circuit or system.
- (2) Where boxes or enclosures are not encountered, exposed cable or raceway systems shall be permanently marked to be identified as a component of an emergency circuit or system, at intervals not to exceed 7.6 m (25 ft).

Receptacles supplied from the emergency system shall have a distinctive color or marking on the receptacle cover plates or the receptacles.

**(B) Wiring.** Wiring from an emergency source or emergency source distribution overcurrent protection to emergency loads shall be kept entirely independent of all other wiring and equipment unless otherwise permitted in 700.10(B)(1) through (B)(5):

- (1) Wiring from the normal power source located in transfer equipment enclosures
- (2) Wiring supplied from two sources in exit or emergency luminaires
- (3) Wiring from two sources in a listed load control relay supplying exit or emergency luminaires, or in a common junction box, attached to exit or emergency luminaires



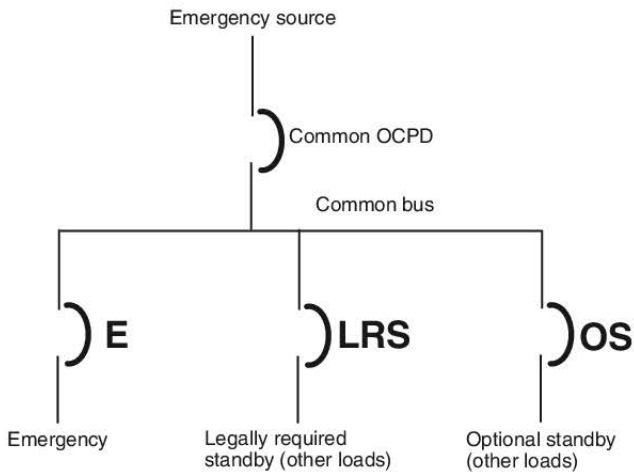
**Informational Note Figure 700.10(B)(a) Single or Multiple Feeders Without Overcurrent Protection.**

- (4) Wiring within a common junction box attached to unit equipment, containing only the branch circuit supplying the unit equipment and the emergency circuit supplied by the unit equipment
- (5) Wiring from an emergency source to supply emergency and other (nonemergency) loads in accordance with 700.10(B)(5)a., (B)(5)b., (B)(5)c., and (B)(5)d. as follows:
  - a. Separate vertical switchgear sections or separate vertical switchboard sections, with or without a common bus, or individual disconnects mounted in separate enclosures shall be used to separate emergency loads from all other loads.
  - b. The common bus of separate sections of the switchgear, separate sections of the switchboard, or the individual enclosures shall be either of the following:
    - (i) Supplied by single or multiple feeders without overcurrent protection at the source
    - (ii) Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to an emergency system and any nonemergency system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonemergency system(s)

*Informational Note: For further information, see Informational Note Figure 700.10(B)(a) and Informational Note Figure 700.10(B)(b).*

- c. Emergency circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as other circuits.
- d. It shall be permissible to utilize single or multiple feeders to supply distribution equipment between an emergency source and the point where the emergency loads are separated from all other loads.

Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet.



**Informational Note Figure 700.10(B)(b) Single or Multiple Feeders with Overcurrent Protection.**

**(C) Wiring Design and Location.** Emergency wiring circuits shall be designed and located so as to minimize the hazards that might cause failure due to flooding, fire, icing, vandalism, and other adverse conditions.

**(D) Fire Protection.**

**(1) Occupancies.** Emergency systems shall meet the additional requirements in 700.10(D)(2) through (D)(4) in the following occupancies:

- (1) Assembly occupancies for not less than 1000 persons
- (2) Buildings above 23 m (75 ft) in height
- (3) Educational occupancies with more than 300 occupants

**(2) Feeder-Circuit Wiring.** Feeder-circuit wiring shall meet one of the following conditions:

- (1) The cable or raceway is installed in spaces or areas that are fully protected by an approved automatic fire protection system.
- (2) The cable or raceway is protected by a listed electrical circuit protective system with a minimum 2-hour fire rating.

Informational Note No. 1: Electrical circuit protective systems could include but not be limited to thermal barriers or a protective shaft and are tested to UL 1724, *Fire Tests for Electrical Circuit Protection Systems*.

Informational Note No. 2: The listing organization provides information for electrical circuit protective systems on proper installation requirements to maintain the fire rating.

- (3) The cable or raceway is a listed fire-resistive cable system with a minimum 2-hour fire rating.

Informational Note No. 1: Fire-resistive cables are tested to ANSI/UL 2196-2017, *Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control and Data Cables*.

Informational Note No. 2: The listing organization provides information for fire-resistive cable systems on proper installation requirements to maintain the fire rating.

- (4) The cable or raceway is protected by a listed fire-rated assembly that has a minimum fire rating of 2 hours and contains only emergency circuits.

- (5) The cable or raceway is encased in a minimum of 50 mm (2 in.) of concrete.

**(3) Feeder-Circuit Equipment.** Equipment for feeder circuits (including transfer switches, transformers, and panelboards) shall be located either in spaces fully protected by an approved automatic fire protection system or in spaces with a 2-hour fire resistance rating.

**(4) Generator Control Wiring.** Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(2). The integrity of the generator remote start circuit shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall start the generator(s).

**Part III. Sources of Power**

**700.12 General Requirements.** Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12(C) through (H). Unit equipment in accordance with 700.12(I) shall satisfy the applicable requirements of this article.

**(A) Power Source Considerations.** In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

**(B) Equipment Design and Location.** Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.12(C) through (H) shall be installed either in spaces fully protected by approved automatic fire protection systems or in spaces with a 2-hour fire rating where located within the following:

- (1) Assembly occupancies for more than 1000 persons
- (2) Buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile
- (3) Educational occupancies with more than 300 occupants

Informational Note No. 1: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA 101-2018, *Life Safety Code*.

Informational Note No. 2: For information regarding power system reliability, see IEEE 3006.5-2014, *Recommended Practice for the Use of Probability Methods for Conducting a Reliability Analysis of Industrial and Commercial Power Systems*.

**(C) Storage Battery.** Storage batteries shall be of suitable rating and capacity to supply and maintain the total load for a minimum period of 1½ hours, without the voltage applied to the load falling below 87½ percent of normal. Automotive-type batteries shall not be used.

An automatic battery charging means shall be provided.

**(D) Generator Set.**

**(1) Prime Mover-Driven.** For a generator set driven by a prime mover approved by the authority having jurisdiction and sized in accordance with 700.4, means shall be provided for automatically starting the prime mover on failure of the normal service and for automatic transfer and operation of all required electrical circuits. A time-delay feature shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.

**(2) Internal Combustion Engines as Prime Movers.**

(a) *On-Site Fuel Supply.* Where internal combustion engines are used as the prime mover, an on-site fuel supply shall be provided with an on-premises fuel supply sufficient for not less than 2 hours' operation of the system.

(b) *Fuel Transfer Pumps.* Where power is needed for the operation of the fuel transfer pumps to deliver fuel to a generator set day tank, this pump shall be connected to the emergency power system.

(c) *Public Gas System, Municipal Water Supply.* Prime movers shall not be solely dependent on a public utility gas system for their fuel supply or municipal water supply for their cooling systems.

*Exception: Where approved by the authority having jurisdiction, the use of other than on-site fuels shall be permitted where there is a low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company.*

(d) *Automatic Fuel Transfer.* Where dual fuel supplies are used, means shall be provided for automatically transferring from one fuel supply to another.

**(3) Battery Power and Dampers.** Where a storage battery is used for control or signal power or as the means of starting the prime mover, it shall be suitable for the purpose and shall be equipped with an automatic charging means independent of the generator set. Where the battery charger is required for the operation of the generator set, it shall be connected to the emergency system. Where power is required for the operation of dampers used to ventilate the generator set, the dampers shall be connected to the emergency system.

**(4) Auxiliary Power Supply.** Generator sets that require more than 10 seconds to develop power shall be permitted if an auxiliary power supply energizes the emergency system until the generator can pick up the load.

**(5) Outdoor Generator Sets.** Where an outdoor-housed generator set is equipped with a readily accessible disconnecting means in accordance with 445.18, and the disconnecting means is located within sight of the building or structure supplied, an additional disconnecting means shall not be required where ungrounded conductors serve or pass through the building or structure. Where the generator supply conductors terminate at a disconnecting means in or on a building or structure, the disconnecting means shall meet the requirements of 225.36.

*Exception: For installations under single management, where conditions of maintenance and supervision ensure that only qualified persons will monitor and service the installation and where documented safe switching procedures are established and maintained for disconnection, the generator set disconnecting means shall not be required to be located within sight of the building or structure served.*

**(E) Uninterruptible Power Supplies.** Uninterruptible power supplies used to provide power for emergency systems shall comply with the applicable provisions of 700.12(B) and (C).

**(F) Separate Service.** Where approved by the authority having jurisdiction as suitable for use as an emergency source of power, an additional service shall be permitted. This service shall be in accordance with the applicable provisions of Article 230 and the following additional requirements:

- (1) Separate overhead service conductors, service drops, underground service conductors, or service laterals shall be installed.
- (2) The service conductors for the separate service shall be installed sufficiently remote electrically and physically from any other service conductors to minimize the possibility of simultaneous interruption of supply.

**(G) Fuel Cell System.** Fuel cell systems used as a source of power for emergency systems shall be of suitable rating and capacity to supply and maintain the total load for not less than 2 hours of full-demand operation.

Installation of a fuel cell system shall meet the requirements of Parts II through VIII of Article 692.

Where a single fuel cell system serves as the normal supply for the building or group of buildings concerned, it shall not serve as the sole source of power for the emergency standby system.

**(H) DC Microgrid Systems.** Sources connected to a dc microgrid system shall be permitted where the system is capable of being isolated from all non-emergency sources.

DC microgrid systems used as a source of power for emergency systems shall be of suitable rating and capacity to supply and maintain the total emergency load for not less than 2 hours of full-demand operation.

Where a dc microgrid system source serves as the normal supply for the building or group of buildings concerned, it shall not serve as the sole source of power for the emergency standby system.

**(I) Unit Equipment.**

**(1) Components of Unit Equipment.** Individual unit equipment for emergency illumination shall consist of the following:

- (1) A rechargeable battery
- (2) A battery charging means
- (3) Provisions for one or more lamps mounted on the equipment, or shall be permitted to have terminals for remote lamps, or both
- (4) A relaying device arranged to energize the lamps automatically upon failure of the supply to the unit equipment

**(2) Installation of Unit Equipment.** Unit equipment shall be installed in accordance with the following:



- (1) The batteries shall be of suitable rating and capacity to supply and maintain the total lamp load associated with the unit in accordance with the following:
  - a. For a period of at least 1½ hours without the voltage falling below 87½ percent of normal battery voltage.
  - b. The unit equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 1½ hours.
- (2) Unit equipment shall be permanently fixed (i.e., not portable) in place and shall have all wiring to each unit installed in accordance with the requirements of any of the wiring methods in Chapter 3. Flexible cord-and-plug connection shall be permitted, provided that the cord does not exceed 900 mm (3 ft) in length.
- (3) The branch circuit feeding the unit equipment shall be one of the following:
  - a. The same branch circuit as that serving the normal lighting in the area and connected ahead of any local switches
  - b. Where the normal lighting circuit is served by one or more branch circuits, a separate branch circuit, provided with a lock-on feature, that originates from the same panelboard as the normal lighting circuits. The branch circuit disconnecting means for this branch circuit shall be provided with a lock-on feature.
- (4) The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.
- (5) Emergency luminaires that obtain power from a unit equipment and are not part of the unit equipment shall be wired to the unit equipment as required by 700.10 and by one of the wiring methods of Chapter 3.
- (6) Remote heads providing lighting for the exterior of an exit door shall be permitted to be supplied by the unit equipment serving the area immediately inside the exit door.

#### Part IV. Emergency System Circuits for Lighting and Power

**700.15 Loads on Emergency Branch Circuits.** No appliances and no lamps, other than those specified as required for emergency use, shall be supplied by emergency lighting circuits.

#### 700.16 Emergency Illumination.

**(A) General.** Emergency illumination shall include means of egress lighting, illuminated exit signs, and all other luminaires specified as necessary to provide required illumination.

**(B) System Reliability.** Emergency lighting systems shall be designed and installed so that the failure of any illumination source cannot leave in total darkness any space that requires emergency illumination. Control devices in the emergency lighting system shall be listed for use in emergency systems. Listed unit equipment in accordance with 700.12(F) shall be considered as meeting the provisions of this section.

Informational Note: 700.23 through 700.26 provide requirements for applications of emergency system control devices.

**(C) Discharge Lighting.** Where high-intensity discharge lighting such as high- and low-pressure sodium, mercury vapor, and metal halide is used as the sole source of normal illumination, the emergency lighting system shall be required to operate until normal illumination has been restored.

**(D) Disconnecting Means.** Where an emergency system is installed, emergency illumination shall be provided in the area of the disconnecting means required by 225.31 and 230.70, as applicable, where the disconnecting means are installed indoors.

*Exception: Alternative means that ensure that the emergency lighting illumination level is maintained shall be permitted.*

**700.17 Branch Circuits for Emergency Lighting.** Branch circuits that supply emergency lighting shall be installed to provide service from a source complying with 700.12 when the normal supply for lighting is interrupted. Such installations shall provide either of the following:

- (1) An emergency lighting supply, independent of the normal lighting supply, with provisions for automatically transferring the emergency lights upon the event of failure of the normal lighting branch circuit
  - (2) Two or more branch circuits supplied from separate and complete systems with independent power sources. One of the two power sources and systems shall be part of the emergency system, and the other shall be permitted to be part of the normal power source and system. Each system shall provide sufficient power for emergency lighting purposes.
- Unless both systems are used for regular lighting purposes and are both kept lighted, means shall be provided for automatically energizing either system upon failure of the other. Either or both systems shall be permitted to be a part of the general lighting of the protected occupancy if circuits supplying lights for emergency illumination are installed in accordance with other sections of this article.

**700.18 Circuits for Emergency Power.** For branch circuits that supply equipment classed as emergency, there shall be an emergency supply source to which the load will be transferred automatically upon the failure of the normal supply.

**700.19 Multiwire Branch Circuits.** The branch circuit serving emergency lighting and power circuits shall not be part of a multiwire branch circuit.

#### Part V. Control — Emergency Lighting Circuits

**700.20 Switch Requirements.** The switch or switches installed in emergency lighting circuits shall be arranged so that only authorized persons have control of emergency lighting.

*Exception No. 1: Where two or more single-throw switches are connected in parallel to control a single circuit, at least one of these switches shall be accessible only to authorized persons.*

*Exception No. 2: Additional switches that act only to put emergency lights into operation but not disconnect them shall be permissible.*

Switches connected in series or 3- and 4-way switches shall not be used.

**700.21 Switch Location.** All manual switches for controlling emergency circuits shall be in locations convenient to authorized persons responsible for their actuation. In facilities covered by Articles 518 and 520, a switch for controlling emergency lighting systems shall be located in the lobby or at a place conveniently accessible thereto.

In no case shall a control switch for emergency lighting be placed in a motion-picture projection booth or on a stage or platform.

*Exception: Where multiple switches are provided, one such switch shall be permitted in such locations where arranged so that it can only energize the circuit but cannot de-energize the circuit.*

**700.22 Exterior Lights.** Those lights on the exterior of a building that are not required for illumination when there is sufficient daylight shall be permitted to be controlled by an automatic light-actuated device.

**700.23 Dimmer and Relay Systems.** A dimmer or relay system containing more than one dimmer or relay and listed for use in emergency systems shall be permitted to be used as a control device for energizing emergency lighting circuits. Upon failure of normal power, the dimmer or relay system shall be permitted to selectively energize only those branch circuits required to provide minimum emergency illumination using a control bypass function. Where the dimmer or relay system is fed by a normal/emergency source from an upstream transfer switch, normal power sensing for this function shall be permitted to be from a normal-only power source upstream of the transfer switch. All branch circuits supplied by the dimmer or relay system cabinet shall comply with the wiring methods of Article 700.

**700.24 Directly Controlled Emergency Luminaires.** Where emergency illumination is provided by one or more directly controlled emergency luminaires that respond to an external control input, or loss thereof, to bypass normal control upon loss of normal power, such luminaires and external bypass controls shall be individually listed for use in emergency systems.

**700.25 Branch Circuit Emergency Lighting Transfer Switch.** Emergency lighting loads supplied by branch circuits rated at not greater than 20 amperes shall be permitted to be transferred from the normal branch circuit to an emergency branch circuit using a listed branch circuit emergency lighting transfer switch. The mechanically held requirement of 700.5(C) shall not apply to listed branch circuit emergency lighting transfer switches.

**700.26 Automatic Load Control Relay.** If an emergency lighting load is automatically energized upon loss of the normal supply, a listed automatic load control relay shall be permitted to energize the load. The load control relay shall not be used as transfer equipment.

**Part VI. Overcurrent Protection**

**700.30 Accessibility.** The branch-circuit overcurrent devices in emergency circuits shall be accessible to authorized persons only.

**700.31 Ground-Fault Protection of Equipment.** The alternate source for emergency systems shall not be required to provide ground-fault protection of equipment with automatic disconnecting means. Ground-fault indication at the emergency source shall be provided in accordance with 700.6(D) if ground-fault protection of equipment with automatic disconnecting means is not provided.

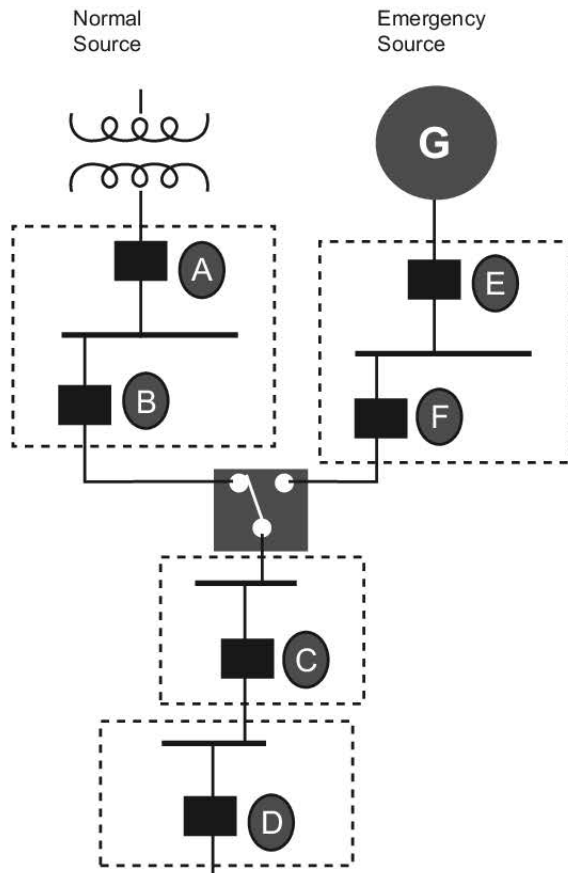
**700.32 Selective Coordination.** Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

*Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.*

Informational Note: See Informational Note Figure 700.32 for an example of how emergency system overcurrent protective devices (OCPDs) selectively coordinate with all supply-side OCPDs.

- OCPD D selectively coordinates with OCPDs C, F, E, B, and A.
- OCPD C selectively coordinates with OCPDs F, E, B, and A.
- OCPD F selectively coordinates with OCPD E.
- OCPD B is not required to selectively coordinate with OCPD A because OCPD B is not an emergency system OCPD.



**Informational Note Figure 700.32 Emergency System Selective Coordination.**

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## ARTICLE 701 Legally Required Standby Systems

### Part I. General

**701.1 Scope.** This article applies to the electrical safety of the installation, operation, and maintenance of legally required standby systems consisting of circuits and equipment intended to supply, distribute, and control electricity to required facilities for illumination or power, or both, when the normal electrical supply or system is interrupted.

The systems covered by this article consist only of those that are permanently installed in their entirety, including the power source.

Informational Note No. 1: For further information, see NFPA 99-2018, *Health Care Facilities Code*.

Informational Note No. 2: For further information regarding performance of emergency and standby power systems, see NFPA 110-2019, *Standard for Emergency and Standby Power Systems*.

Informational Note No. 3: For further information, see ANSI/IEEE 446-1995, *Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*.

**701.2 Definition.** The definition in this section shall apply within this article and throughout the *Code*.

**Legally Required Standby Systems.** Those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classed as emergency systems) in the event of failure of the normal source.

Informational Note: Legally required standby systems are typically installed to serve loads, such as heating and refrigeration systems, communications systems, ventilation and smoke removal systems, sewage disposal, lighting systems, and industrial processes, that, when stopped during any interruption of the normal electrical supply, could create hazards or hamper rescue or fire-fighting operations.

### 701.3 Tests and Maintenance.

**(A) Conduct or Witness Test.** The authority having jurisdiction shall conduct or witness a test of the complete system upon installation.

**(B) Tested Periodically.** Systems shall be tested periodically on a schedule and in a manner approved by the authority having jurisdiction to ensure the systems are maintained in proper operating condition.

**(C) Maintenance.** Legally required standby system equipment shall be maintained in accordance with manufacturer instructions and industry standards.

**(D) Written Record.** A written record shall be kept on such tests and maintenance.

**(E) Testing Under Load.** Means for testing legally required standby systems under load shall be provided.

Informational Note: For information on testing and maintenance of emergency power supply systems (EPSSs), see NFPA 110-2019, *Standard for Emergency and Standby Power Systems*.

### 701.4 Capacity and Rating.

**(A) Rating.** Legally required standby system equipment shall be suitable for the available fault current at its terminals.

**(B) Capacity.** A legally required standby system shall have adequate capacity in accordance with Article 220 or by another approved method.

**(C) Load Pickup, Load Shedding, and Peak Load Shaving.** The alternate power source shall be permitted to supply legally required standby and optional standby system loads where the alternate source has adequate capacity or where automatic selective load pickup and load shedding are provided that will ensure adequate power to the legally required standby circuits.

### 701.5 Transfer Equipment.

**(A) General.** Transfer equipment shall be automatic, listed, and marked for emergency system or legally required standby use, and approved by the authority having jurisdiction. Transfer equipment shall be designed and installed to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705. Meter-mounted transfer switches shall not be permitted for legally required system use.

**(B) Bypass Isolation Switches.** Means to bypass and isolate the transfer switch equipment shall be permitted. Where bypass isolation switches are used, inadvertent parallel operation shall be avoided.

**(C) Automatic Transfer Switches.** Automatic transfer switches shall be electrically operated and mechanically held. Automatic transfer switches shall not be permitted to be reconditioned.

**(D) Documentation.** The short-circuit current rating of the transfer equipment, based on the specific overcurrent protective device type and settings protecting the transfer equipment, shall be field marked on the exterior of the transfer equipment.

**701.6 Signals.** Audible and visual signal devices shall be provided, where practicable, for the purposes described in 701.6(A), (B), (C), and (D).

**(A) Malfunction.** To indicate malfunction of the standby source.

**(B) Carrying Load.** To indicate that the standby source is carrying load.

**(C) Not Functioning.** To indicate that the battery charger is not functioning.

Informational Note: For signals for generator sets, see NFPA 110-2016, *Standard for Emergency and Standby Power Systems*.

**(D) Ground Fault.** To indicate a ground fault in solidly grounded wye, legally required standby systems of more than 150 volts to ground and circuit-protective devices rated 1000 amperes or more. The sensor for the ground-fault signal devices shall be located at, or ahead of, the main system disconnecting means for the legally required standby source, and the maximum setting of the signal devices shall be for a ground-fault current of 1200 amperes. Instructions on the course of action to be taken in event of indicated ground fault shall be located at or near the sensor location.