

**N (B) Replacements.** Where emergency system(s) OCPDs are replaced, they shall be reevaluated to ensure selective coordination is maintained with all supply-side and load-side OCPDs.

**N (C) Modifications.** If modifications, additions, or deletions to the emergency system(s) occur, selective coordination of the emergency system(s) OCPDs with all supply-side and load-side OCPDs shall be reevaluated.

*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.*

The exception to 700.32(C) recognizes a series-rated system in which the device immediately upstream is designed to open before the downstream device under short-circuit conditions.

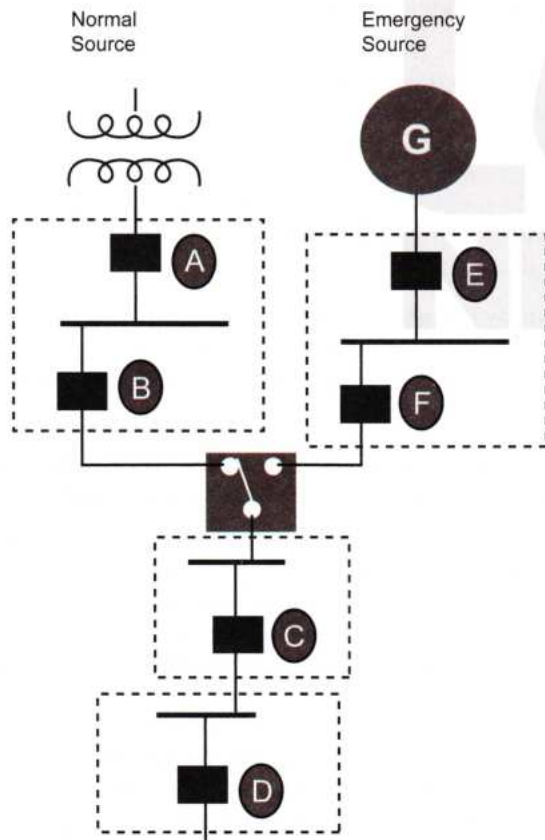
Informational Note: See Informational Note Figure 700.32(C) for an example of how emergency system OCPDs selectively coordinate with all supply-side OCPDs.

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.



**N INFORMATIONAL NOTE FIGURE 700.32(C)** Emergency System Selective Coordination.

## 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: See NFPA 99-2018, *Health Care Facilities Code*, for further information.

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

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

Informational Note No. 4: 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 systems, lighting systems, and industrial processes that, when stopped during any interruption of the normal electrical supply, could create hazards or hamper rescue or firefighting operations.

Informational Note No. 5: Legally required standby systems are considered level one systems when failure to perform could result in loss of human life or serious injuries and level two systems when failure of legally required standby systems to perform is less critical to human life and safety when applying NFPA 110-2019, *Standard for Emergency Standby Power Systems*.

Legally required standby systems provide electric power to aid in firefighting, rescue operations, control of health hazards, and similar operations that are code or AHJ mandated. In comparison, emergency systems (see Article 700) are those systems essential for safety to life. Optional standby systems (see Article 702) are those in which failure can cause, for example, physical discomfort, interruption of an industrial process, damage to process equipment, or disruption of business.

The requirements for legally required standby systems are similar to those for emergency systems, including the need for a transfer switch listed for emergency use. However, there are a few differences. When normal power is lost, legally required systems must be able to supply standby power in 60 seconds or less, instead of the 10 seconds or less required of emergency systems. Wiring for legally required standby systems may occupy the same raceways, cables, boxes, and cabinets as other general wiring, whereas wiring for emergency systems must be kept entirely independent of other wiring.



Legally required standby systems take second priority to emergency systems if they are involved in sharing an alternate supply and/or load shedding or peak shaving schemes.

- **701.2 Reconditioned Equipment.** Reconditioned transfer switches shall not be permitted.

### 701.3 Commissioning and Maintenance.

(A) **Commissioning Witness Test.** The authority having jurisdiction shall conduct or witness the commissioning 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: See NFPA 110-2019, *Standard for Emergency and Standby Power Systems*, for information on testing and maintenance of emergency power supply systems (EPSSs).

### 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 Parts I through IV of Article 220 or by another approved method. The system capacity shall be sufficient for the rapid load changes and transient power and energy requirements associated with any expected loads.

(C) **Load Management.** 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 load management (that includes automatic selective load pickup and load shedding) is provided that will ensure adequate power to the legally required standby circuits.

- **(D) Parallel Operation.** Parallel operation shall comply with Part I or Part II of Article 705 where the legally required source capacity required to supply the legally required load is maintained at all times. Parallel operation of the legally required source(s) shall consist of the sources specified in 701.4(D)(1) and (D)(2).

- **(1) Normal Source.** The alternate power source shall be permitted to operate in parallel with the normal source in compliance with Part I or Part II of Article 705 where the capacity

required to supply the legally required standby load is maintained at all times. Any operating condition that results in less than the required source capacity shall initiate a legally required standby source malfunction signal in 701.6(A).

Parallel operation shall be permitted for satisfying the test requirements of 701.3(B), provided all other conditions of 701.3 are met.

Informational Note: Peak load shaving is one application for parallel source operation.

- **(2) Alternate Source.** Legally required standby sources shall be permitted to operate in parallel where the necessary equipment to establish and maintain a synchronous condition is provided.

### 701.5 Transfer Equipment.

- Δ **(A) General.** Transfer equipment shall be automatic, listed, and marked for emergency system or legally required standby use. 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.

Not all automatic transfer switches (ATS) permit parallel operation of generation equipment and the normal source; therefore, those transfer switches do not need to comply with Article 705. Some ATS equipment is designed to briefly allow (for a few cycles) parallel operation of the generation equipment with the normal source upon load transfer. This load transfer can occur with minimal disturbance or effect on the load. Transfer switches that employ paralleling must comply with Article 705.

**(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.

- Δ **(C) Automatic Transfer Switches.** Automatic transfer switches shall be electrically operated and mechanically held.

This requirement correlates with NFPA 110, *Standard for Emergency and Standby Power Systems*, and requires the relay contacts to be mechanically held in the event of coil failure.

When standby systems are tested, both the normal system and the standby system are energized. If the two sources are not synchronized, as much as twice the rated voltage could exist across the transfer switch contacts. Some listed transfer switches are designed and tested to be suitable for switching between out-of-phase power sources. Other protection methods can be employed, such as a mechanical interlock that prevents inadvertent interconnection or an electronic method that prevents both systems from being interconnected.

**(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.

In this requirement, the term *short-circuit current rating* (see Article 100) includes all the various options by which the product standard evaluates transfer switches for fault currents, such as short-circuit withstand and closing rating, short-time current rating, and the common industry term withstand/close-on rating.

Product standards require transfer equipment to be marked with the short-circuit withstand/closing or short-time current rating (short-circuit current rating). Some transfer switches are marked by the manufacturer with several options, each resulting in a different short-circuit current rating. Short-circuit current rating values can vary based upon the overcurrent protective device (OCPD) type, ampere rating, and setting. The field marking required by this section documents the specifics of the protection scheme and verifies compliance with 110.3(B) and 110.10.

**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.** Malfunction signals indicate a malfunction of the standby source.

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

**(C) Battery Charging Malfunction.** Battery charging malfunction signals indicate charging malfunction on a battery required for source readiness, including the prime mover starting battery.

Informational Note: See NFPA 110-2019, *Standard for Emergency and Standby Power Systems*, for signals for generator sets.

**(D) Ground Fault.** Ground-fault signals 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 the event of an 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 shall be permitted at an alternate location.

Informational Note: See NFPA 110-2019, *Standard for Emergency and Standby Power Systems*, for signals for generator sets.

Although 701.31 specifies that automatic ground-fault protection of equipment is not required to be provided on the alternate source, ground faults can occur on such systems, and they can result in equipment burndown. Because of the importance of legally required systems, automatic disconnection of power in

the event of a ground fault is inappropriate. Detection of such a fault, however, is required so that the condition can be corrected.

If multiple sources are connected to a paralleling bus, the ground-fault sensor can be located on feeders connected to the bus, rather than to each of the sources. With this arrangement, ground-fault protection can easily discriminate between more critical and less critical loads. The system would not be disabled for a downstream fault and critical loads such as fire pumps and emergency circuits can be alarmed, while less critical circuits can be tripped. This results in overall better protection for less critical systems and better reliability for critical circuits.

### 701.7 Signs.

**(A) Mandated Standby.** A sign shall be placed at the service entrance indicating type and location of each on-site legally required standby power source.

*Exception: A sign shall not be required for individual unit equipment as specified in 701.12(I).*

**Δ (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).

Legally required standby systems that have a solid (unswitched) neutral in the transfer equipment (nonseparately derived system) rely on the grounding and bonding connections in the normal source supply equipment to ensure that the ground-fault current path is completed from a ground fault to the alternate source. If a main or system bonding jumper is removed [e.g., to perform testing on ground-fault protection of equipment (GFPE) systems], service personnel could inadvertently become part of the current path if a ground fault occurs.

## Part II. Circuit Wiring

### Δ 701.10 Wiring Legally Required Standby Systems.

**N (A) General.** The legally required standby system wiring shall be permitted to occupy the same raceways, cables, boxes, and cabinets with other general wiring.

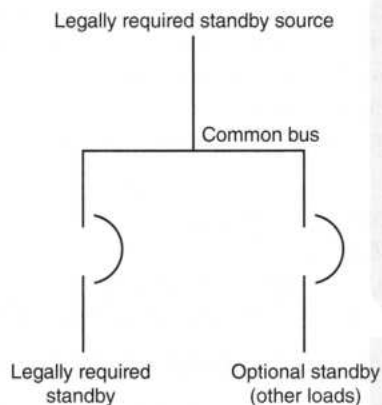
Unlike emergency system wiring, which must be kept entirely independent of other wiring to ensure reliability, the wiring for legally required standby systems may be installed with other general (normal) wiring because legally required standby system loads are not essential for life safety.



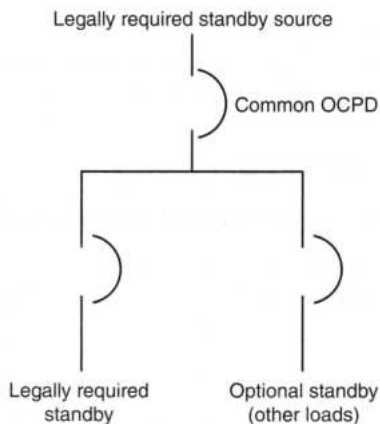
**(B) Wiring.** Wiring from a legally required source to supply legally required and other (nonlegally required) loads shall be in accordance with the following:

- (1) The common bus of switchgear, sections of a switchboard, or individual enclosures shall be either of the following:
  - a. Supplied by single or multiple feeders without overcurrent protection at the source
  - b. Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to a legally required system and any nonlegally required system(s) is selectively coordinated with the next downstream overcurrent protective device in the nonlegally required system(s)

Informational Note: See Informational Note Figure 701.10(B)(1) and Informational Note Figure 701.10(B)(2) for further information.



**INFORMATIONAL NOTE FIGURE 701.10(B)(1)** Single or Multiple Feeders Without Overcurrent Protection.



**INFORMATIONAL NOTE FIGURE 701.10(B)(2)** Single or Multiple Feeders with Overcurrent Protection.

### Part III. Sources of Power

**701.12 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, legally required standby power will be available within the time required for the application but not to exceed 60 seconds. The supply system for legally required standby purposes, in addition to the normal services to the building, shall be permitted to comprise one or more of the types of systems described in 701.12(A) through (I). Unit equipment in accordance with 701.12(I) shall satisfy the applicable requirements of this article.

**(A) Power Source Considerations.** In selecting a legally required standby source of power, consideration shall be given to the type of service to be rendered, whether of short-time duration or long duration.

**(B) Equipment Design and Location.** Consideration shall be given to the location or design, or both, of all equipment to minimize the hazards that might cause complete failure due to floods, fires, icing, and vandalism.

Informational Note: See ANSI/IEEE 493-2007, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*, for further information.

**Δ (C) Supply Duration.** The alternate power source shall be of suitable rating and capacity to supply and maintain the total load for the duration determined by the system design. In no case shall the duration be less than 2 hours of system operation. Additionally, the power source shall comply with 701.12(C)(1) through (C)(5) as applicable.

Informational Note: See NFPA 110-2022, *Standard for Emergency and Standby Power Systems*, for information on classification of emergency power supply systems (EPSS).

**N (1) On-Site Fuel Supply.** An on-site fuel supply shall be provided, sufficient for not less than 2 hours operation of the system.

**Δ (2) Fuel Transfer Pumps.** Where power is needed for the operation of the fuel transfer pumps to deliver fuel to the source, these pumps shall be connected to the legally required standby power system.

**Δ (3) Public Gas System, Municipal Water Supply.** Sources shall not be solely dependent on a public utility gas system for their fuel supply or on a 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. Where a public gas system is approved, the requirements of 701.12(C)(1) shall not apply.*

**N (4) Storage Batteries and UPS.** Storage batteries and UPS used to supply standby illumination 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 nominal voltage. Automotive-type batteries shall not be used. An automatic battery charging means shall be provided.

**N (5) Automatic Fuel Source Transfer.** Where dual fuel sources are used, means shall be provided for automatically transferring from one fuel source to another.

**(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 701.4, means shall be provided for automatically starting the prime mover upon failure of the normal power source and for automatic transfer and operation of all required electrical circuits. A time-delay feature permitting a 15-minute setting shall be provided to avoid retransfer in case of short-time reestablishment of the normal source.

**(2) Battery Power.** 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.

**(3) Outdoor Generator Sets.** If 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.

The disconnecting means on an outdoor generator set can be used as the disconnecting means required in 225.31, provided the disconnecting means, and not just the generator, is readily accessible and is within sight of the building. [See the definitions of the terms *accessible*, *readily (readily accessible)* and *in sight from (within sight from) (within sight)* in Article 100.]

**(E) Stored-Energy Power Supply Systems (SEPSS).** Stored energy power supply systems shall comply with 701.12(E)(1) and (E)(2).

**N (1) Types.** Systems shall consist of one or more of the following system types:

- a. Uninterruptible power supply (UPS)

Informational Note: See UL 1778, *Uninterruptible Power Systems*, and UL 924, *Emergency Lighting and Power Equipment*, for further information.

- b. Fuel cell system
- c. Energy storage system (ESS)
- d. Storage battery
- e. Other approved equivalent stored energy sources that comply with 701.12

**N (2) Fire Protection, Suppression, Ventilation, and Separation.**

The systems in 701.12(E)(1) shall be installed with the fire protection, suppression, ventilation, and separation requirements specified in the manufacturer's instructions or equipment listing.

Informational Note: See NFPA 853-2020, *Standard for the Installation of Stationary Fuel Cell Power Systems*, and NFPA 855-2020, *Standard for the Installation of Stationary Energy Storage Systems*, for additional information on fire protection installation requirements.

**(F) Separate Service.** Where approved, by the authority having jurisdiction as suitable for use as a legally required source of power, an additional service shall be permitted. This service shall be in accordance with 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) Connection Ahead of Service Disconnecting Means.**

Where approved by the authority having jurisdiction, connections located ahead of and not within the same cabinet, enclosure, vertical switchgear section, or vertical switchboard section as the service disconnecting means shall be permitted. The legally required standby service shall be sufficiently separated from the normal main service disconnecting means to minimize simultaneous interruption of supply through an occurrence within the building or groups of buildings served.

Informational Note: See 230.82 for equipment permitted on the supply side of a service disconnecting means.

If a legally required standby system is supplied by a connection on the line side of the normal service disconnecting means, 230.82 requires that the tapped conductors be installed in accordance with all the requirements for service-entrance conductors and that the conductors terminate in equipment suitable for use as service equipment. Those requirements help ensure that the legally required standby system disconnecting means is rated for the fault current available from the utility.

**Δ (H) Microgrid Systems.** On-site sources, designated as legally required standby sources, shall be permitted to be connected to a microgrid system.

The system shall isolate the legally required standby system from all nonlegally required loads when the normal electric supply is interrupted or shall meet the requirements of 701.4(C). Interruption or partial or complete failure of the normal source(s) shall not impact the availability, capacity, and duration provided by the designated legally required standby sources.

The designated stored-energy legally required standby power source(s) of a microgrid system shall be permitted to



remain interconnected to any available power production source during operation of the legally required standby source(s) where the lack of, or failure of, the interconnected power production source(s), or related controls, does not impact system operation. Interconnected power production sources, other than the designated SEPSS, shall not be required to meet the requirements of this article.

- Δ (I) **Battery-Equipped Emergency Luminaires, Used for Legally Required Standby Systems.** Battery-equipped emergency luminaires used for legally required standby systems shall comply with 701.12(H).

#### Part IV. Overcurrent Protection

**701.30 Accessibility.** The branch-circuit overcurrent devices in legally required standby circuits shall be accessible to authorized persons only.

**701.31 Ground-Fault Protection of Equipment.** The alternate source for legally required standby systems shall not be required to provide ground-fault protection of equipment with automatic disconnecting means. Ground-fault indication at the legally required standby source shall be provided in accordance with 701.6(D) if ground-fault protection of equipment with automatic disconnecting means is not provided.

#### Δ 701.32 Selective Coordination.

*Coordination, selective (selective coordination),* as defined in Article 100, is a protection method in which the operation of the overcurrent protective scheme localizes an overcurrent condition to the circuit conductors or equipment in which an overload or fault (short circuit or ground fault) has occurred. This selective operation prevents power loss to unaffected loads.

Continuity of operation of lighting and life-safety equipment is necessary for safe occupant evacuation. This requirement minimizes the possibility that an overload, short circuit, or ground fault in a 20-ampere branch circuit would cause the feeder protective device supplying the branch-circuit panelboard to open. Coordination must be carried through each level of distribution that supplies power to the emergency system.

Design and verification of electrical system coordination can be achieved only through a coordination study. A coordination study entails detailed analysis of electrical supply system fault-current characteristics. Modifications to the electrical system after the initial design and installation can affect the original implementation of the coordinated system. For examples of overcurrent protection with and without coordinated protection, see Exhibit 700.11 within Article 700.

- N (A) **General.** Legally required standby system(s) overcurrent protective devices (OCPDs) shall be selectively coordinated with all supply-side and load-side OCPDs.

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.

- N (B) **Replacements.** Where legally required standby OCPDs are replaced, they shall be reevaluated to ensure selective coordination is maintained with all supply-side and load-side OCPDs.

- N (C) **Modifications.** If modifications, additions, or deletions to the legally required standby system(s) occur, selective coordination of the legally required system(s) OCPDs with all supply-side and load-side OCPDs shall be reevaluated.

*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.*

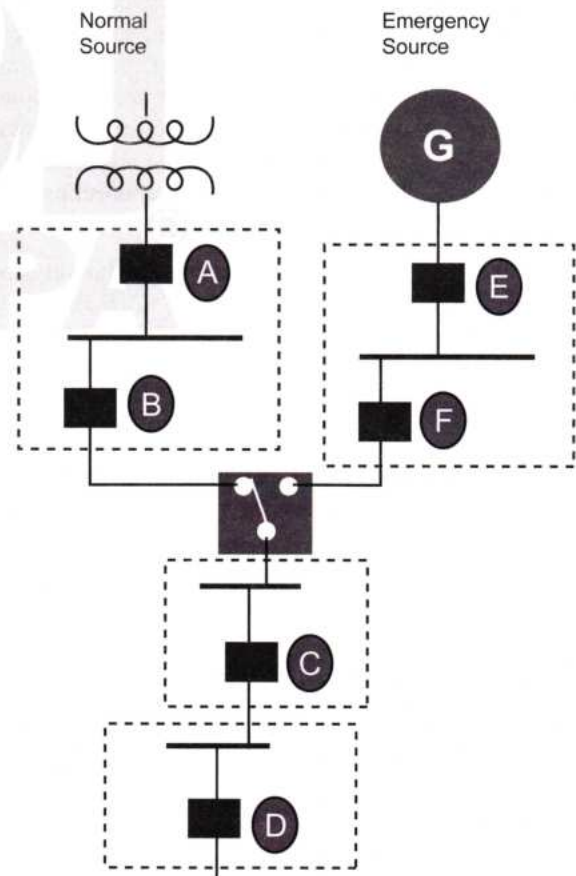
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OCPD D selectively coordinates with OCPDs C, F, E, B, and A.

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 a legally required standby system OCPD.



**INFORMATIONAL NOTE FIGURE 701.32(C)** Legally Required Standby System Selective Coordination.