

ELECTRICAL EMERGENCY SYSTEM PLAN REVIEW

What to Look for during Plan
Review

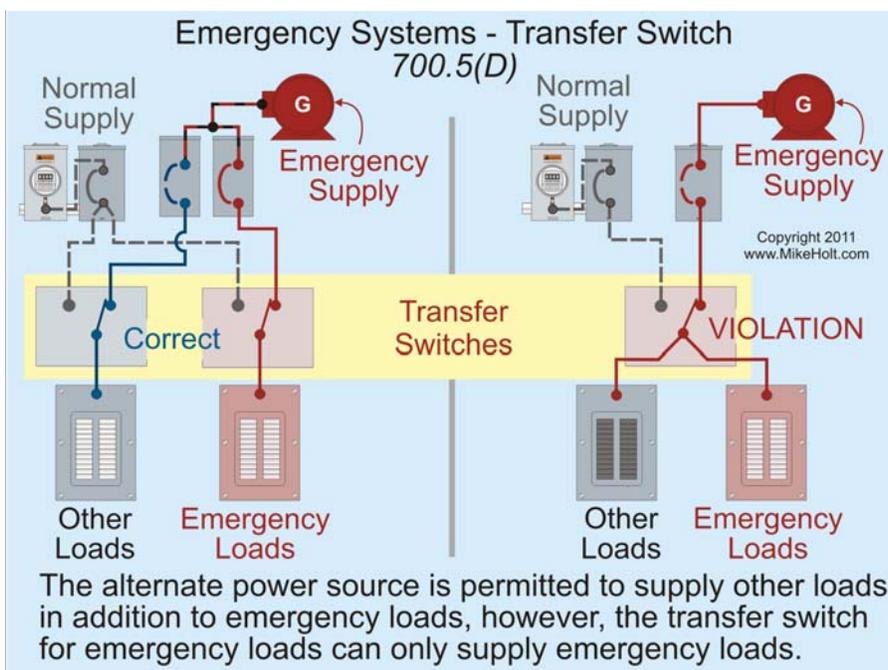
OVERVIEW OF CODE REQUIREMENTS

First determine the type of emergency power system; is the system designed for Emergency or Legally Required Standby System?

EMERGENCY VS. STANDBY POWER SYSTEMS

- What is the difference between these two systems?
- Emergency power systems are intended to provide electrical power for life safety systems. One of the key features is the required response time of 10 seconds or less.

- The wiring from an emergency source or emergency source distribution overcurrent protection device to emergency loads shall be kept entirely independent of all other wiring.
- The transfer equipment shall supply only emergency loads



Emergency Wiring Design and Location

- The Emergency wiring circuits shall be designed and located so as to minimize the hazards that might cause failure due to flooding, fire, icing, and vandalism
- Special protection methods of feeder-circuit wiring, feeder-circuit equipment and generator wiring is required for certain use groups that are in buildings that exceed 75 feet above grade or the occupancy is 1000 or more

Required Wiring Protection

- Spaces or areas are to be fully protected by an automatic fire suppression system or
- Be a listed electrical circuit protective system with a minimum 2-hour fire rating or
- Be protected by a listed thermal barrier system for electrical system components with a minimum 2-hour fire rating or

Required Wiring Protection

- Be protected by a listed fire-rated assembly that has a minimum fire rating of 2-hours and contains only emergency wiring circuits or
- Be encased in a minimum of 2 inches of concrete

Feeder-Circuit Equipment Protection

- The equipment shall be located either in spaces fully protected with an automatic fire suppression system or in spaces with a 2-hour fire resistance rating

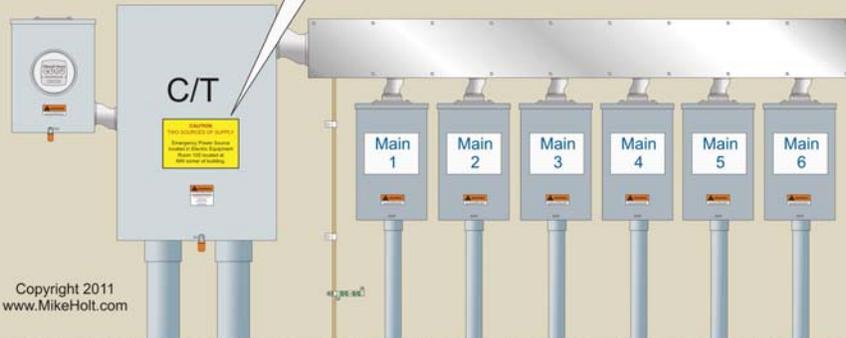
Generator Control Wiring

- The control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all wiring and shall be installed in spaces or areas that are fully protected by an automatic fire suppression system

Signs for Emergency Sources 700.7(A)

CAUTION
TWO SOURCES OF SUPPLY
Emergency Power Source
Located in Electric Equipment
Room 100 Located at
NW corner of building.

A sign must be placed at the service-entrance equipment indicating the type and location of on-site emergency power sources.



Emergency system

- Emergency power is required where the loss of normal power would endanger the occupants.



What are the Sources of Emergency Power?

- Storage Batteries 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% of the normal voltage.



Sources of Power

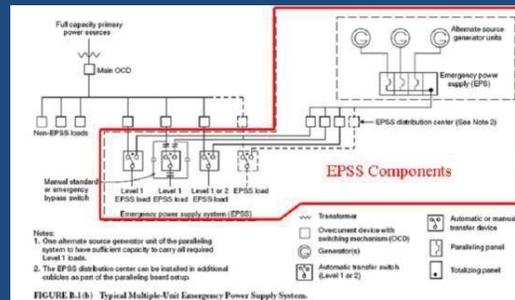
- A Generator Set that is driven by a prime mover and is sized to have the adequate capacity and rating for all loads to be operated simultaneously.





Emergency Power Supply Systems are Crucial to a Health Care Electrical Power Supply System

Outdoor Generator Sets may need additional disconnects located within sight of the building



Health Care Facility

A Typical Multiple-Unit Emergency Power Supply System

Sources of Power

- Uninterruptible Power Supplies must meet all the applicable provisions of a Central Battery Storage System and the provisions for a Generator Set



Sources of Power

- A Separate Electrical Service shall be permitted if the AHJ approves the service as suitable for use as an emergency source of power. These conductors are to be sufficiently remote electrically and physically from any other service conductors

Sources of Power

- A Fuel Cell System 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



UNIT EQUIPMENT

- The unit equipment shall be permanently fixed in place (not portable) and shall have all wiring to each unit installed per the wiring methods of chapter 3 of the NEC.
- The branch circuit that feeds unit equipment shall be clearly identified at the distribution panel.

Unit Equipment Continued

In a separate and uninterrupted area supplied by a minimum of three normal lighting circuits, a separate branch circuit for unit equipment shall be permitted if it originates from the same panelboard as that of the normal lighting circuits and is provided with a lock feature





Standby System

- Intended to provide electrical power for loads not as critical as those requiring emergency power. Standby power systems must provide power within 60 seconds of failure of primary power.

Standby System

- These systems are typically installed to serve loads, such as heating and refrigeration systems, communication systems, ventilation and smoke removal systems, sewage disposal, lighting systems and industrial processes that if stopped could create hazards and hamper rescue or fire-fighting operations

Standby Systems Continued

It is important to determine during the plan review stage whether the system is designed for emergency purposes or standby purposes; although there are similarities in these two systems there are also major differences. The current referenced standard for emergency and standby systems is NFPA 110, 2002 edition

NFPA 110, 2002 EDITION

This referenced document does not identify the standby system as a Legally Required Standby System (See NEC Art.701) but refers to the Emergency Power Supply System (EPSS) in a Class, Type and Level (Refer to Chapter 4 of NFPA 110)

NFPA 110 CONTINUED

For example a class 2 EPSS would provide power for a minimum of 2 hours. A class 6 would provide power for a minimum of 6 hours.

The type of EPSS could be designated type U for a UPS system which basically is uninterruptable, type 10 is to restore power within 10 seconds or less, type 60 will restore power within 60 seconds or less

NFPA 110 CONTINUED

There are two levels of equipment installations and performance

1. Level 1 system shall be installed when failure of the equipment to perform could result in loss of human life or serious injuries
2. Level 2 systems shall be installed when failure of the EPSS to perform is less critical to human life and safety

Which Level?

The designed Level system shall ensure that all loads served by the alternating power to the EPSS shall maintain the quality of the operating limits of the load as well as the duration specified by the Class and within the time specified for the Type of EPSS

Installation and Environmental Considerations

During the Plan review stage it is important to note the following:

1. Seismic consideration
2. Type of Building Construction
3. The Classification of the Building
4. The Hazard Contents

Location

- The EPSS shall be installed in a separate room
- The room shall have a minimum 2-hour fire rating
- No other equipment except those that serve the space shall be permitted in this room
- EPSS equipment shall not be installed in the same room where the normal electrical equipment is installed

Lighting

- Level 1 and 2 EPS equipment shall be supplied with battery-powered emergency lighting
- The intensity of illumination in the room housing the EPS equipment for a Level 1 shall be 30 foot candles

Heating and Cooling

Design of the HVAC system for the EPS equipment room shall include provisions for factors including:

1. Heat
2. Cold
3. Dust
4. Humidity
5. Snow and Ice
6. Louvers
7. Remote radiator fans
8. Prevailing Winds

Fuel System

The fuel supply for gas-fueled and liquid fueled prime movers shall be designed to the demands of the prime mover

- Sizing of fuel lines
- Valve locations
- Battery powered equipment
- Gas regulators
- Vent piping
- Flexible fuel line section
- Fuel line filters

Exhaust

- The exhaust system shall be installed to ensure satisfactory EPS operation and meet the requirements of the manufacturer
- Exhaust system requirements shall be in accordance with NFPA 37
- Inform the local zoning department

When Is an Emergency System Required?

- Egress Illumination
- Emergency Communications
- Fire Pumps
- High-rise Building Elevators
- Processes involving the handling and use of Hazardous Materials

Where is an Emergency System Required?

- Group A (voice/alarm systems)
- Smoke Control Systems
- Exit Signs
- Means of Egress Illumination
- Accessible Means of Egress Elevators and Platform Lifts

- Horizontal Sliding Doors
- Semiconductor Fabrication Facilities
- Membrane Structures
- Hazardous Materials
- Highly Toxic and Toxic Materials
- Organic Peroxides
- Pyrophoric Materials

- Covered Malls
- High-rise Buildings
- Underground Buildings
- Group I-3 Occupancies
- Airport Traffic Control Towers
- Elevator Smokeproof Enclosures





Referenced Codes and Standards for this Presentation

- IBC 2003, 2012
- NEC 2011, 2014
- NFPA 110, 111
- IFC 2003
- NEC Articles; 445, 480, 517, 692, 700, 701, 708