BURGLAR & FIRE ALARM ASSOCIATION OF MICHIGAN

ESTABLISHED 1981

APPRENTICESHIP PROGRAM

BURGLAR & FIRE ALARM ASSOCIATION OF MICHIGAN ESTABLISHED 1981

APPRENTICESHIP PROGRAM

Period 4
Related Training Instruction (RTI)
Module 6 – NFPA 70 National Electrical Code

Reading material associated with this module:
Chapters 7 and 8
NFPA 70, National Electrical Code, 2023 Edition

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APPRENTICESHIP PROGRAM

NFPA 70
National Electrical Code
2023 Edition
Chapter 7 – Special Conditions

NFPA 70 National Electrical Code (NEC) 2023 Edition

Article 700 – Emergency Systems:

- Emergency systems, specifically engine-driven generators, are referenced in Article 760 as secondary power supplies as follows:
  - NFPA 72, 2022 Edition: Chapter 10 Fundamentals
    - Section 10.6.7.3 Secondary Power Supply for Protected Premises Fire Alarm Systems and Emergency Communications Systems:
      - 10.6.7.3.1: The secondary power supply shall consist of one of the following:
        - (1) A storage battery dedicated to the system arranged in accordance with 10.6.10.
        - (2) An automatic starting engine-driven generator serving the branch circuit specified in 10.6.5.1 and arranged in accordance with 10.6.11.3.1, and storage batteries dedicated to the system with 4 hours of capacity arranged in accordance with 10.6.10.

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Article 700 – Emergency Systems:

- NFPA 72, 2022 Edition: Chapter 10 Fundamentals
  - Section 10.6.11.3 Secondary Power Supplies - 10.6.11.3.1: Protected Premises:
    - 10.6.11.3.1.1: Engine-driven generators used to provide secondary power for a protected premises fire alarm system, or an emergency communications system, shall comply with NFPA 110, Standard for Emergency and Standby Power Systems, Chapter 4, requirements for a Type 10, Class 24, Level 1 system.
    - 10.6.11.3.1.2: Installation of engine-driven generators used to provide secondary power for a protected premises fire alarm system or emergency communications system shall be in accordance with NFPA 70, National Electrical Code, Article 700.

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Article 700 – Emergency Systems:

- 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: 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 communication systems, industrial processes where current interruption would produce serious life safety or health hazards, and similar functions.
- Informational Note No. 4: See NFPA 110, Standard for Emergency and Standby Power Systems and NFPA 111, Standard on Stored Electrical Energy and Standby Power Systems, for further information regarding performance of emergency and standby power systems. Emergency systems are considered Level 1 systems when applying NFPA 110.

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NFPA 110 (2022 Edition) – Chapter 4 Classification of Emergency Power Supply Systems (EPSSs):

- 4.1 General: The EPSS (Emergency Power Supply System) shall provide a source of electrical power of required capacity, reliability and quality to loads for a length of time as specified in Table 4.1(a) and within a specified time following loss or failure of the normal power supply as specified in table 4.1(b)
- 4.2 Class: The Class defines the minimum time, in hours, for which the EPSS is designed to operate at its rated load without being refueled or recharged.
- 4.3 Type: The type defines the maximum time in seconds that the EPSS will permit the load terminals of the transfer switch to be without acceptable electrical power.
- 4.4 This standard recognizes two levels for equipment installation, performance, maintenance.
  - 4.4.1 Level 1 systems shall be installed where failure of the equipment to perform could result in loss of human life or serious injuries.
  - 4.4.2 Level 2 systems shall be installed where failure of the EPSS to perform is less critical to human life and safety.

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NFPA 110 (2022 Edition) – Chapter 4 Classification of Emergency Power Supply Systems (EPSSs):

Table 4.1(a) Classification of EPSSs.

Class	Minimum Time
Class 0.083	0.083 hour (5 minutes)
Class 0.25	0.25 hour (15 minutes)
Class 2	2 hours
Class 6	6 hours
Class 48	48 hours
Class X	Other time, in hours, as required by the application, code, or user

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NFPA 110 (2022 Edition) – Chapter 4 Classification of Emergency Power Supply Systems (EPSSs):

Table 4.1(b) Types of EPSSs

Designation	Power Restoration
Type U	Basically uninterruptible (UPS Systems)
Type 10	10 seconds
Type 60	60 seconds
Type 120	120 seconds
Type M	Manual stationary or nonautomatic – no time limit

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Article 700 – Emergency Systems:

- Article 100 – Definitions:
- Emergency Power Supply System: A complete functioning EPS system coupled to a system of conductors, disconnecting means, and overcurrent protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals or the transfer equipment needed for the system to operate as a safe and reliable source of electric power.
- Emergency Systems: 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.

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Article 700 – Emergency Systems:

- 700.3 Tests and Maintenance:
- (A) Conduct or Witness Test: The authority having jurisdiction shall conduct or witness the commissioning 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.

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Article 700 – Emergency Systems:

- 700.3 Tests and Maintenance:
- (F) Temporary Source of Power for Maintenance or Repair of the Alternate Source of Power:
  - If the emergency system relies on a single alternative 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 that shall be available for the duration of the maintenance or repair.

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Article 700 – Emergency Systems:

- 700.4 Capacity and Rating:
- (A) Capacity and Rating: An emergency system shall have adequate capacity in accordance with Parts I through IV of Article 220, *Branch-Circuit, Feeder, and Service Load Calculations,* 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.
- (B) Selective Load Management: The alternate power source shall be permitted to supply emergency *(Article 700),* legally required standby *(Article 701),* and optional standby *(Article 702)* system loads where the source has adequate capacity or where load management (that includes automatic selective load pickup and load shedding) is provided as needed to ensure adequate power to the following in order of priority:
  - (1) Emergency circuits.
  - (2) Legally required standby circuits.
  - (3) Optional standby circuits.

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Article 700 – Emergency Systems:

- 700.4 Capacity and Rating:
- (C) Parallel Operation: Parallel operation of the emergency source(s) shall consist of the sources specified in 700.4(C)(1) and (C)(2).
  - (1) Normal Source: The emergency source shall be permitted to operate in parallel with the normal source in compliance with Part I or Part II of Article 705, *Interconnected Electric Power Production Sources,* where the capacity required to supply the emergency load is maintained at all times. Any operating condition that results in less than the required emergency source capacity shall initiate a system malfunction signal in accordance with 700.6(A). Parallel operation shall be permitted for satisfying the test requirements of 700.3(B), provided all other conditions of 700.3 are met.
  - (2) Emergency Source: Emergency sources shall be permitted to operate in parallel where the necessary equipment to establish and maintain a synchronous condition is provided.

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Article 700 – Emergency Systems:

- 700.6 Signals: Audible, visual, and facility or network remote annunciation devices shall be provided, where applicable, for the purpose described in 700.6(A) through (D).
  - (A) Malfunction: Malfunction signals indicate a malfunction of the emergency source.
  - (B) Carrying Load. Load carrying signals indicate that the emergency source is carrying load.
  - (C) Storage Battery Charging Malfunction: Storage battery charging malfunction signals indicate a charging malfunction on a battery required for source readiness, including starting the prime mover, is not functioning.
  - (D) Ground Fault: Ground-fault signals indicate a ground in solidly grounded wye emergency systems of more than 150V to ground and circuit-protective devices rated 1000 amperes or more.

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Article 700 – Emergency Systems:

- 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 sources.
  - (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).

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Article 700 – Emergency Systems:

- 700.8 Surge Protection: A listed SPD shall be installed in or on all emergency system switchgear, switchboards, and panelboards.

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Article 700 – Emergency Systems:

- 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 25'.

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Article 700 – Emergency Systems:

- 700.10 Wiring, Emergency System:
  - (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 the following:
    - (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.
    - (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 within a traveling cable to an elevator.

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Article 700 – Emergency Systems:

- 700.10 Wiring, Emergency System:
  - (6) Wiring from an emergency source to supply emergency and other (nonemergency) loads in accordance with sections a, b, c, d, and e (not shown – refer to NFPA 70).
  - Wiring of two or more emergency circuits supplied from the same source shall be permitted in the same raceway, cable, box, or cabinet.
- (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.

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Article 700 – Emergency Systems:

- 700.10 Wiring, Emergency System:
  - (D) Fire Protection:
    - (1) Occupancies: Emergency systems shall meet the additional requirements in 700.10(D)(2) through (D)(4) in the following occupancies:
      - Assembly occupancies for not less than 1000 persons.
      - Buildings above 75’ in height.
      - Educational occupancies with more than 300 occupants.

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Article 700 – Emergency Systems:

- 700.10 Wiring, Emergency System:
  - (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.
    - (3) The cable or raceway is a listed fire-resistive cable system with a minimum 2-hour 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 50mm (2”) of concrete.

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Article 700 – Emergency Systems:

- 700.10 Wiring, Emergency System:
  - (3) Feeder-Circuit Equipment: Equipment for feeder circuits (including transfer switches, transformers, and panel boards) 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) Source Control Wiring: Control conductors installed between the emergency power supply system/stored-energy power supply system (EPSS/SEPSS) and transfer equipment or control systems that initiate the operation of emergency sources or initiate the automatic connection to emergency loads shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(2). The integrity of source control wiring shall be monitored for broken, disconnected, or shorted wired. Loss of integrity shall result in the following actions:
    - (1) Generators: Shall start the generator(s).
    - (2) All other sources: Shall be considered a system malfunction and initiate the signals in 700.6(A).

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Article 700 – Emergency Systems:

- 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(H) shall satisfy the applicable requirements of this article.
  - (A) Power Source Consideration: 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.

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Article 700 – Emergency Systems:

- Part III – Sources of Power:
  - (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 75’ in height.
    - (3) Educational occupancies with more than 300 occupants.

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Article 700 – Emergency Systems:

- 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.
  - 700.18 Circuits for Emergency Power: For branch circuits that supply equipment classed as emergency, there shall be an emergency system supply source to which the load will be transferred automatically upon the failure of the normal supply.
- Part VI – Overcurrent Protection:
  - 700.30 Accessibility: The branch-circuit overcurrent devices in emergency circuits shall be accessible to authorized persons only.

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Article 701 – Legally Required Standby Systems:

- Emergency systems, specifically engine-driven generators, are referenced in Article 760 as secondary power supplies as follows:
  - NFPA 72, 2022 Edition: Chapter 10 Fundamentals
    - Section 10.6.7.4 Secondary Power Supply for Supervising Station Facilities:
      - 10.6.7.4.1: The secondary power supply shall consist of one of the following:
        - (1) Storage batteries dedicated to the supervising station equipment arranged in accordance with 10.6.10.
        - (2) A branch circuit of an automatic starting, engine-driven generator arranged in accordance with 10.6.11.3.2.1 and 10.6.11.3.2.2, and storage batteries dedicated to the supervising station equipment with 4 hours of capacity arranged in accordance with 10.6.10.
        - (3) A branch circuit of multiple engine-driven generators, at least one of which is arranged for automatic starting in accordance with 10.6.11.3.2.1 and 10.6.11.3.2.2.

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Article 701 – Legally Required Standby Systems:

- NFPA 72, 2022 Edition: Chapter 10 Fundamentals
  - Section 10.6.11.3 Secondary Power Supplies - 10.6.11.3.2: Supervising Station:
    - 10.6.11.3.2.1: Automatic-starting, engine-driven generators used to provide secondary power for a supervising station shall comply with NFPA 110, Standard for Emergency and Standby Power Systems, Chapter 4, requirements for a Type 60, Class 24, Level 2 system.
    - 10.6.11.3.2.2: Installation of automatic-starting, engine-driven generators used to provide secondary power for a supervising station shall be in accordance with NFPA 70, Article 701.
    - 10.6.11.3.2.3: Manual-starting, engine-driven generators used to provide secondary power for a supervising station shall comply NFPA 110, Chapter 10 requirements for a Type M, Class 24, Level 2 system.
    - 10.6.11.3.2.4: Installation of manual-starting, engine-driven generators used to provide secondary power for a supervising station shall be in accordance with NFPA 70, Article 702.

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Article 701 – Legally Required Standby Systems:

- 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 for illumination, power, or both, to required facilities 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 entirely, including the power source.
- Informational Note No. 2: See NFPA 110, Standard for Emergency and Standby Power Systems, for further information regarding performance of emergency and standby power systems.
- Informational Note No. 4: Legally required standby systems are typically installed to serve loads, such as heating and refrigeration, communications, ventilation and smoke removal, sewage disposal, and 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.

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Article 701 – Legally Required Standby Systems:

- Informational Note No. 5: Legally required standby systems are considered Level 1 systems when failure to perform could result in loss of human life or serious injuries and Level 2 systems when failure of legally required standby systems to perform is less critical to human life and safety when applying NFPA 110.

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Article 701 – Legally Required Standby Systems:

- Article 100 – Definitions:
- 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.

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Article 701 – Legally Required Standby Systems:

- 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.

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Article 701 – Legally Required Standby Systems:

- 700.4 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, *Branch-Circuit, Feeder, and Service Load Calculations,* 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 *(Article 701),* and optional standby *(Article 702)* 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.

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Article 701 – Legally Required Standby Systems:

- 701.4 Capacity and Rating:
- (D) Parallel Operation: Parallel operation shall comply with Part I or Part II of Article 705, Interconnected Electric Power Production Sources, 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, *Interconnected Electric Power Production Sources,* where the capacity required to supply the emergency load is maintained at all times. Any operating condition that results in less than the required emergency 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.

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Article 701 – Legally Required Standby Systems:

- 700.4 Capacity and Rating:
  - (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.

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Article 701 – Legally Required Standby Systems:

- 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.
  - (D) Ground Fault: Ground-fault signals indicate a ground in solidly grounded wye, legally required standby systems of more than 150V to ground and circuit-protective devices rated 1000 amperes or more.

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Article 701 – Legally Required Standby Systems:

- 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.
  - (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).

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Article 701 – Legally Required Standby Systems:

- 701.10 Wiring Legally Required Standby Systems:
  - (A) General: The legally required standby system wiring shall be permitted to occupy the same raceways, cables, boxes, and cabinets with other general wiring.

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Article 701 – Legally Required Standby Systems:

- 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, 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 Consideration: 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.

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Article 701 – Legally Required Standby Systems:

- Part IV – Overcurrent Protection:
    - 701.30 Accessibility: The branch-circuit overcurrent devices in legally required standby circuits shall be accessible to authorized persons only.

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Article 702 – Optional Standby Systems:

- 701.1 Scope: This article applies to the installation and operation of optional standby systems.
- The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.
- Article 100 – Definitions:
- Optional Standby Systems: Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated or stored power to selected loads either automatically or manually.

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NFPA 70
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2023 Edition
Chapter 8 – Communications Systems

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Article 800 – General Requirements for Communications Systems / 805 – Communications Circuits:

- 800.1 Scope: This article covers general requirements for communications systems.
- 805.1 Scope: This article covers communications circuits and equipment.
- Article 760: 760.32 Fire Alarm Circuits Extending Beyond One Building: This section states that non-power-limited fire alarm circuits and power-limited fire alarm circuits that extend beyond one building and run outdoors shall meet the installation requirements of Parts II, III, and IV of Article 805 and shall meet the installation requirements of Part 1 of Article 300.
- Article 722: 722.135(I) Installation of Circuit Conductors Extending Beyond One Building: This section states that power-limited fire alarm circuits that extend beyond one building and are such that they are subject to accidental contact with electric light or power conductors operating over 300 volts to ground or are exposed to lightning on interbuilding circuits shall comply with 800.44, 800.53, 800.100, 805.50, 805.93, 805.170(A), and 805.170(B) and shall meet the installation requirements of Part 1 of Article 300.

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Article 800 – General Requirements for Communications Systems / 805 – Communications Circuits:

- Part 1 of Article 300 covers the general requirements for wiring methods and materials for all wiring installations.
- 805.18 Installation of Equipment: Equipment electrically connected to a communications network shall be listed in accordance with 800.171 *(Listed as being suitable for electrical connection to a communications network)*.

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Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- Article 100 – Definitions:
- Block: A square or portion of a city, town, or village enclosed by streets and including the alleys so enclosed, but not any street.
- Cable Sheath: A single or multiple layers of a protective covering that holds and protects the conductors or optical fibers, or both, contained inside.
- Communications Circuit: A metallic, fiber, or wireless circuit that provides voice/data (and associated power) for communications-related services between communications equipment.
- Communications Circuit, Premises: The circuit that extends voice, audio, video, data, interactive services, telegraph (except radio), and outside wiring for fire alarm and burglar alarm from the service provider's network terminal to the customer's communications equipment.
- Exposed (to Accidental Contact): A circuit that is in such a position that, in case of failure of supports or insulation, contact with another circuit may result.

NFPA 70 National Electrical Code (NEC) 2023 Edition

Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- Article 100 – Definitions:
- Premises: The land and buildings located on the user's side of the point of demarcation between the communications service provider and the user.
- Wire: A factory assembly of one or more insulated conductors without an overall covering.

NFPA 70 National Electrical Code (NEC) 2023 Edition

Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- 800.44 Overhead (Aerial) Communications Wires and Cables: Overhead (aerial) communications wires and cables entering buildings shall comply with 800.44(A) through (D):
  - (A) On Poles, In-Span, Above Roofs, on Masts, or Between Buildings: If communications wires or cables and electric light or power conductors are supported by the same pole or are run parallel to each other in-span, the conditions in 800.44(A)(1) through (A)(4) shall be met:
    - (1) Relative Location: If practicable, the communications wires and cables shall be located below the electric light or power conductors.
    - (2) Attachment to Cross-Arms: Communications wires and cables shall not be attached to a cross-arm that carries electric light or power conductors.
    - (3) The climbing space through communications wires and cables shall comply with the requirements of 225.14(B).

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Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- (4) Clearance: Supply service drops and sets of overhead service conductors of 0–750 volts running above and parallel to communications wires and cables shall have a minimum separation of 300mm (12”) at any point in the span, including the point of their attachment to the building, provided the ungrounded conductors are insulated and that a clearance of not less than 1.0m (40’) is maintained between the two services at the pole.
- (B) Above Roofs: Communications wires and cables shall have a vertical clearance of not less than 2.5m (8’) from all points of roofs above which they pass.
- 800.53 Separation from Lightning Conductors: Where practicable on buildings, a separation of at least 6’ shall be maintained between lightning protection conductors and all communications wires and cables.
- 800.100 Cable and Primary Protector Bonding and Grounding: This section covers the bonding and grounding requirements for outdoor conductors.

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Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- 800.47 Underground Systems Entering Buildings: Underground communications wires and cables entering buildings shall comply with 800.47(A) and (B). The requirements of 310.10(C) shall not apply to communications wires and cables.
  - (A) Underground Systems with Electric Light, Power, Class 1, or Non-Power-Limited Fire Alarm Circuit Conductors: Underground communications wires and cables in a raceway, pedestal, handhole enclosure, or manhole containing electric light, power, Class 1, or non–power-limited fire alarm circuit conductors shall be in a section separated from such conductors by means of brick, concrete, or tile partitions or by means of a suitable barrier.
  - (B) Direct-Buried Cables and Raceways: Direct-buried communications wires and cables shall be separated at least 300mm (12”) from conductors of any light or power, non-power-limited fire alarm circuit conductors, or Class 1 circuit.

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Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- 805.47 Underground Communications Wires and Cables Entering Buildings – Underground Block Distribution: Where the entire street circuit is run underground and the circuit within the block is placed so as to be free from the likelihood of accidental contact with electric light or power circuits of over 300 volts to ground, the insulation requirements of 800.50(A) and (C) shall not apply, insulating supports shall not be required for the conductors, and bushings shall not be required where the conductors enter the building.

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Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- 805.90 Protective Devices:
  - (A) A listed primary protector shall be provided on each circuit run partly or entirely in aerial wire or aerial cable not confined within a block. Also, a listed primary protector shall be provided on each circuit, aerial or underground, located within the block containing the building served so as to be exposed to accidental contact with electric power conductors operating at over 300 volts to ground. In addition, where there exists a lightning exposure, each interbuilding circuit on a premises shall be protected by a listed primary protector at each end of the interbuilding circuit. Installation of primary protectors shall also comply with 110.3(B).
  - Informational Note No. 1: On a circuit not exposed to accidental contact with power conductors, providing a listed primary protector in accordance with this article helps protect against other hazards, such as lightning and above-normal voltages induced by fault currents on power circuits in proximity to the communications circuit.

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Article 800 – General Requirements for Communications Systems / Article 805 – Communications Circuits:

- 805.90 Protective Devices:
  - Informational Note No. 2: Interbuilding circuits are considered to have a lightning exposure unless one or more of the following conditions are exists:
    - (1) Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.
    - (2) Interbuilding cable runs of 42 m (140 ft.) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metal conduit containing the cable is connected to each building grounding electrode system.
    - (3) Areas having an average of five or fewer thunderstorm days per year and earth resistivity of less than 100 ohm-meters (Such areas are found along the Pacific coast).

END OF PERIOD 4 – MODULE 6

Period 4 Conclusion

- This concludes Period 4 of the apprenticeship program.
- The test will consist of questions about the material covered in Period 4 and will include questions from ***both*** NFPA 70, National Electrical Code, 2023 Edition and the PowerPoint presentations.
- Apprentices will need a passing score on the test as well as their supervisor's approval to graduate from Period 4 of the program.