

Guidelines for Application of 2011 NEC® Changes in Electric Sign Requirements



INTERNATIONAL SIGN ASSOCIATION

Introduction



Electric signs represent an integral and unique segment of the overall electrical industry. Sign companies manufacture prominent, commercial symbols, each tailored to an audience diverse in size and demographics. Signs also frequently become cultural icons closely identified with the historical inheritances of particular communities. To properly fulfill their essential purposes, signs must be built and installed within rules and procedures which support electrical and mechanical safety for sign users, the general public, sign installers and maintenance technicians.

The oldest and foremost safety standard for electric sign usage is the National Electrical Code®, NFPA 70. Conformance with the NEC® is mandatory and governing jurisdictions have no obligation to accept practices based on misunderstandings or misinterpretations concerning how these rules apply to electric signs. In fact, the Electrical Safety Foundation International states that electric-sign professionals should “never assume” the relevant requirements without first reviewing applicable safety standards and regulations.

This publication was developed by ISA's Electrical Subcommittee to facilitate and perpetuate better understandings of the NEC® and how, from both a regulatory and sign-industry viewpoint, Article 600 applies to electric signs and outline lighting. This guide also identifies resources for gaining further knowledge about Code requirements and the basis for corresponding changes. To serve as a timely reference, Guidelines for Application of NEC® Changes to Electric Signs is intended to remain a living document with periodic updates corresponding to the three-year Code cycle.

ISA offers this resource to assist sign professionals, sign users and Authorities Having Jurisdiction (AHJs) in their efforts to ensure safe, Code-compliant practices which support the quality, durability and utilization of electric-sign products.

William S. Dundas
Director, Technical & Regulatory Affairs
International Sign Association

Table of Contents

Summary of Changes & ISA Commentary.....4

Purpose of the NEC.....19

Editorial Notes: General Requirements of the NEC.....20

Listing Electric Signs.....22

Qualifying as a Sign Electrician.....23

Different Editions of NEC® Adopted By Jurisdictions Across U.S.....24

NFPA Report on Proposals (ROP) Report on Comments (ROC).....24

Different Editions of NEC® and Listing to Most Current NEC®.....25

Electrical Signs and the NEC® Are Embedded in U.S. History.....26

Guidelines for Application of 2011 NEC® Changes in Electric Sign Requirements.....27

2011 NEC® Article 600 Summary of Changes & ISA Commentary



2011 NEC® Article 600

600.1 Scope. This article covers the installation of conductors, equipment, and field wiring for electric signs and outline lighting, regardless of voltage.

600.2 Definitions.

LED Sign Illumination System. A complete lighting system for use in signs and outline lighting consisting of light-emitting diode (LED) light sources, power supplies, wire and connectors to complete the installation.

Neon Tubing. Electric-discharge luminous tubing that is manufactured into shapes to illuminate signs, form letters, parts of letters, skeleton tubing, outline lighting, other decorative elements, or art forms...

Informational Note: Where used in illumination systems for signs, outline lighting or skeleton tubing, decorative elements, or art forms, cold cathode luminous tubes are neon tubing as defined by this article.



ISA Commentary

The scope statement provides an overview for the application of Article 600. It was completely rewritten in 2005 to incorporate all equipment and installations using neon tubing, such as signs, decorative elements, skeleton tubing and art forms. In 2011, the traditional Fine Print Note (FPN) designation for unenforceable commentary was changed throughout the Code to an Informational Note to better describe the intent of the Note's commentary, which now describes the various types of sign illumination that are covered in Article 600.

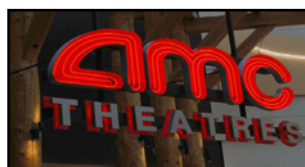
Definitions are the foundation for understanding the intent and basis of Code rules. Definitions within a NEC® Article are specific to that Article's rules. Global definitions that apply to two or more chapters are located in Article 100. These definitions in Article 100 apply to signs in addition to the definitions in Section 600.2.

While UL Standards incorporate a technical definition of light-emitting diode, this is the first definition that defines the application of LEDs in signs. It clarifies that certain compatible components must be used together for LED sign illumination. It establishes a basis for new Section 600.33 that specifically applies to field-wiring of LED sign and outline lighting illumination systems.

Cold cathode accurately describes neon tubing. Cold cathode tubing is used in sign illumination in a variety of configurations, including cold cathode fluorescent lamps (CCFLs). The application/use of luminous cold cathode tubing determines the NEC® installation rules that apply and the appropriate UL Standard for listing. When used in signs and outline lighting, cold cathode luminous tubing is neon tubing and governed by Article 600. Where cold cathode luminous tubing is configured as a luminaire for lighting, rules in Article 410 apply.



Cold cathode: Lighting



Cold cathode: Neon sign



Cold cathode: Skeleton tubing



Cold cathode: Decorative neon

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600

(600.2 Definitions, continued)

Section Sign. A sign or outline lighting system, shipped as subassemblies, that requires field-installed wiring between the subassemblies to complete the overall sign. The subassemblies are either joined physically to form a single sign unit or are installed as separate remote parts of an overall sign.



Subassemblies installed as separate remote parts of a sign.



ISA Commentary

No changes for 2011. The first sentence of this definition was inserted in the 2005 Code to harmonize with a UL 48 update. It describes a listed sign that comprises factory-wired subassemblies shipped disassembled to a job site and requiring field-wiring between the subassemblies. This falls under the jurisdiction of the Authority Having Jurisdiction (AHJ). During the approval process, the AHJ references the required UL 48 installation instructions to ascertain that the subassemblies have been assembled and field wired in accordance with the listing as specified in Section 110.3(B). The second sentence was added in 2008 to clarify that the definition includes a single sign that is sectionalized due to size for handling and shipping. In this scenario, multiple factory-wired subassemblies are joined to form a single sign and the only field wiring is the connections between subassemblies and connection of the subassemblies to the power source. In accordance with UL 48, each subassembly is provided with installation instructions containing detailed information on the mechanical and electrical connections that are performed when the subassemblies are installed (UL 48.8.1.2).



Subassemblies physically joined to form a single sign. Photos courtesy of YESCO.

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600

600.3 Listing.

Electric signs, section signs, and outline lighting, fixed, mobile, or portable, **regardless of voltage**, shall be listed...



ISA Commentary

All installations and equipment covered and described in Article 600 must be listed, regardless of voltage. The only exception is skeleton tubing, which itself is the sign or outline lighting and is not attached to an enclosure or sign body (Section 600.3(A)). Even though listing is not required, skeleton tubing and neon decorative elements and art forms that meet the definition of skeleton tubing must comply with the requirements in Article 600 and general requirements in the first four chapters of the Code.

"Listed" is defined in Article 100 as equipment that is included on a list published by an organization acceptable to the AHJ. These competitive organizations test and certify products for which they maintain a list of products that meet appropriate designated standards or have been tested and found suitable for specific purposes. Organizations acceptable to the AHJ are described in Section 90.7 *Examination of Equipment for Safety* as qualified electrical testing laboratories. These are officially known as Nationally Recognized Testing Laboratories (NRTLs). Any of the NRTLs that has UL 48 within its certification portfolio is eligible to list electric signs. These include but are not limited to CSA International, (CSA); Intertek Testing Services, (ITSNA); MET Laboratories, (MET); NSF International, (NSF); TUV Rheinland of North America, (TUV); Underwriters Laboratories, (UL); Wyle Laboratories, Inc. (WL). (www.osha.gov/dts/otpc/nrtl)

(For additional information on listing, refer to Page 22)



Typical UL Sign Labels

600.4 Markings.

(C) Visibility. The markings required in 600.4(A) and listing labels shall not be required to be visible after installation but shall be permanently applied in a location visible during servicing.

(D) Durability. Marking labels shall be permanent, durable and, when in wet locations, shall be weatherproof.

Marks have not been required to be visible since the 1999 NEC® but no reference specifically exempted listing labels. This new declarative statement harmonizes with the 15th Edition of UL 48.7.1.4. Listing labels and other marks are not intended to be viewed by the general public but are for the AHJ's reference during the approval process in the same manner as approval of luminaires and other electrical devices is carried out. Multiple labels can detract from a sign's aesthetics, an important element of effective signage. A proliferation of labels, as has been required for section signs, may also detract from architectural features of the sign mounting surface. Other markings described in UL 48 and Section 600.4 are for the safety of service technicians.



Labels must be accessible and applied to each subassembly of the section sign, but are not required to be visible after installation.

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

(E) Section Signs. Section signs shall be marked to indicate that field-wiring and installation instructions are required.

Added in 2008, no changes in 2011. As a condition of listing, section signs must be shipped to the job site with installation instructions, as detailed in UL 48, that reflect the installation conditions and environment specific to the installation site (UL 48.8.1.2). Listed signs, like other listed electrical equipment, are to be “installed and used in accordance with any instructions included in the listing or labeling” (Section 110.3(B)). The AHJ references the installation instructions to verify that the subassemblies are being assembled, wired and installed in accordance with their listing as designed by the manufacturer for use under the code applicable in the jurisdiction. Determining acceptability and approval of the assembled sections in the field rests with the AHJ.

600.5 Branch Circuits

(A) Required Branch Circuit. Each commercial building or commercial occupancy is to be provided with at least one accessible outlet supplied by a branch circuit rated at least 20 amperes that supplies no other load.

Article 100 Definition. Continuous Load: A load where the maximum current is expected to continue for 3 hours or more. The branch circuit supplying a sign cannot supply any other load.

(B) Rating. Branch circuits that supply signs...and shall be considered to be continuous loads for the purposes of calculations.

(1) Neon Signs. Branch circuits shall not be rated in excess of 30 amperes.

A summary of branch circuit requirements is in Table 210.24. Sign circuits are Specific-Purpose Branch Circuits (Table 210.2). The maximum load for a continuous load circuit is 125% of the continuous load (Section 210.20(A)). For a branch circuit protected by a 20-amp overcurrent device (breaker) the permissible load cannot exceed 16 amps.

(2) All Other Signs. Branch circuits that supply all other signs and outline lighting systems shall be rated not to exceed 20 amperes.

(C) Wiring Methods

(1) Supply

(2) Enclosures as Pull Boxes

(3) Metal or Nonmetallic Poles.

Poles that support signs are permitted to enclose branch circuit supply conductors, provided the poles and conductors are installed in accordance with Section 410.30(B).



Section 410.30(B) A pole shall have a handhole not less than 2 in. x 4 in. with a cover suitable for use in a wet location. A pole with a handhole shall have the equipment grounding terminal accessible from the handhole.

Exception No. 1: No handhole shall be required in a pole 8 feet or less in height where the supply wiring method continues without splice to an accessible connection in the sign.

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600

600.6 Disconnects.

Each sign and outline lighting system, feeder circuit or branch circuit supplying a sign, outline lighting system, or skeleton tubing shall be controlled by an externally operable switch or circuit breaker that opens all ungrounded conductors and controls no other load. The switch or circuit breaker shall open all ungrounded conductors simultaneously on multiwire branch circuits in accordance with 210.4(B).



ISA Commentary

Branch circuit conductors from the service panel to a sign or outline lighting must have an external disconnecting means, either a switch or circuit breaker, that opens all ungrounded conductors and controls no other load.

Multiwire branch circuits are defined in Article 100. A multiwire branch circuit is made up of two ungrounded conductors and one grounded conductor supplied from a 120/240-volt, single-phase, 3-wire system. (For additional commentary, refer to 2011 NEC Handbook®). Multiwire branch circuits are commonly found in electric signs and can pose a significant safety hazard because they expose technicians servicing signs and sign equipment to devices that may be only partially de-energized. This circumstance also applies to other electrical equipment and was first inserted in the 2008 Code (Section 210.4(B)). While applicable to multiwire sign branch circuits since that time, for the convenience of Code users, it was incorporated into Section 600.6 in the 2011 NEC®. Unlike a disconnect switch on a sign or controller, the disconnect for a multiwire branch circuit must be located at the point where the circuit originates. A two-pole breaker or two-pole switch that incorporates a tie bar meets this requirement. The disconnect for a multiwire branch circuit also would have to be lockable as required in Section 600.6(A)(1).

(A) Location

(1) Within Sight of the Sign. The disconnecting means shall be within sight of the sign or outline lighting system that it controls. Where the disconnecting means is out of the line of sight from any section that is able to be energized, the disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means must remain in place at the switch or circuit breaker whether the lock is installed or not...

No changes in 2011. Portable devices for locking the disconnecting means in the open position are not reliable. A more robust system for lockouts is necessary for electrical safety of persons working on equipment that is not within sight of the sign or controller.



(B) Control Switch Rating. Switches, flashers, and similar devices controlling transformers and electronic power supplies shall be rated for inductive loads or have a current rating not less than twice the current rating of the transformer.

No changes in 2011. For switches that are incorporated into listed signs, reference UL 48.4.3.3 Switches and Control Devices. For snap switch ratings, refer to Section 404.14.

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

600.7 Grounding and Bonding.

This section of Article 600 was completely revamped in 2008 to clarify the difference between grounding and bonding by creating separate sections for each, (A) Grounding and (B) Bonding, with specific references to corresponding sections in Article 250 covering grounding and bonding. The “earth” was designated as the new definition for “ground” in Article 100. Additional text under bonding provides rules that delineate what bonding is and how it can be accomplished for compliance with the Code.

The Code provides prescriptive action in Section 600.7 for grounding and bonding of electric signs, outline lighting and skeleton tubing to the equipment grounding conductor (EGC) of the supply branch circuit or feeder.

UL 48 incorporates the procedures for grounding and bonding the sign or outline lighting equipment. A qualified electrical testing laboratory's label, along with the installation instructions certify that the construction and factory-installed wiring meet Code requirements for connection to the branch circuit or feeder and its equipment grounding system.

(A) Grounding.

(1) Equipment Grounding. Signs and metal equipment of outline lighting systems shall be grounded by connection to the equipment grounding conductor of the supply branch circuit(s) or feeder using the types of equipment grounding conductors specified in 250.118.

No changes in 2011. Flexible metal conduit and liquid tight flexible metal conduit may be used as a branch circuit equipment grounding means, provided that the combined length in a ground path shall not exceed 6 feet. The EGC must be identified, and may be bare, covered or insulated with an outer color that is green or green with one or more yellow stripes (Section 210.5(B), Section 250.119, Section 250-134), (UL 48.4.2.4.3).

(2) Size of Equipment Grounding Conductor. The equipment grounding conductor size shall be in accordance with 250.122 based on the rating of the overcurrent device...

No changes in 2011. An EGC for a branch circuit with a 20-amp overcurrent protection device (breaker) is #12 Copper. For a 30-amp circuit, (neon tubing) the EGC size is #10 copper. UL 48 specifies that the sign EGC shall not be smaller than the size (gauge) of the supply wires and not less than No. 14 AWG (UL 48.4.2.4.3.3.1).

(3) Connections. Equipment grounding conductor connections shall be made in accordance with 250.130 in a method specified in 250.8.

No changes in 2011. Contact surface must be free of paint, laquer and enamel (Section 250.12). Where the terminal is a terminal screw (wire binding screw) it must be green with a hexagonal head or be a bolt with a green hexagonal nut. An EGC is required to have a free length of 6 inches from the point of entry into a wiring compartment of a sign (Section 250.126) (UL 48.4.2.4.3.2).

2011 NEC® Article 600 Summary of Changes & ISA Commentary



2011 NEC® Article 600

(600.7(A) Grounding, continued)

(4) Auxiliary Grounding Electrode. Auxiliary grounding electrode(s) shall be permitted for electric signs and outline lighting systems covered by this article and shall meet the requirements of 250.54.

(5) Metal Building Parts. Metal parts of a building shall not be permitted as...an equipment grounding conductor.

(B) Bonding.

(1) Bonding of Metal Parts. Metal parts and equipment of signs and outline lighting systems shall be bonded together and to the associated transformer or power-supply equipment grounding conductor of the branch circuit or feeder supplying the sign or outline lighting system...

Exception: Remote metal parts of a section sign or outline lighting system only supplied by a remote Class 2 power supply shall not be required to be bonded to an equipment grounding conductor.



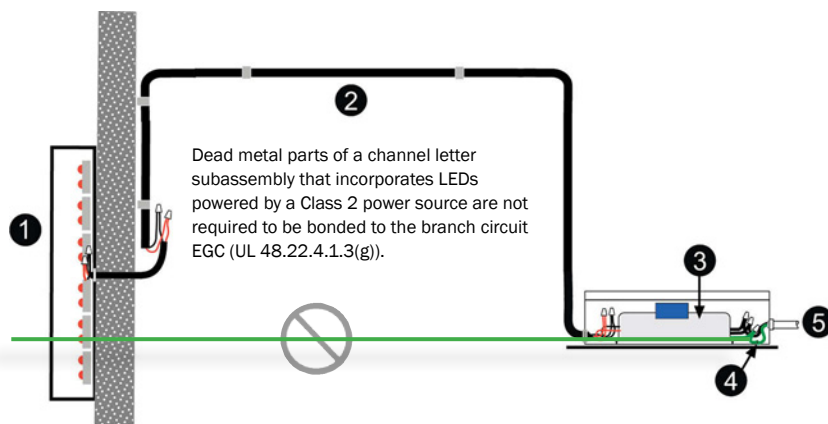
ISA Commentary

Auxiliary grounding electrodes may supplement the EGC that is integral to the branch circuit or feeder but it cannot be the only means of grounding a pole sign. Using these ground rods as the sole means of grounding is unsafe and prohibited by the Code. The earth cannot be used as an effective ground fault path (*Soares Book on Grounding and Bonding*).

No changes in 2011.

No changes in 2011. Bonding is the tying together of non-conductive, dead metal parts in electrical equipment and installations to ensure electrical continuity and the capacity to conduct safely any fault current imposed to the electrical supply system's connection to earth – the Grounding Electrode. In an electric sign, this is accomplished by connecting the non-conductive metal parts of the sign to the sign's equipment grounding conductor. This EGC is connected at the sign's service point to the branch circuit or feeder equipment grounding (safety) conductor. NEC® 100 Definitions Bonded (Bonding).

Section 725.2 defines Class 2 circuits as the portion of wiring between the load side of a Class 2 power source and the connected equipment. Bonding is not required for remote metal parts in subassemblies supplied by these secondary circuits. Class 2 circuits are considered safe from fire initiation and provide acceptable protection from electric shock without being bonded to the EGC (UL 48.4.2.4.1.3(g)).



1. Factory wired, listed subassembly of section sign with Class 2 powered LED array
2. Class 2 Cable per Section 725.154(G)
3. Class 2 Power Supply Section 600.12(C)
4. Branch circuit conductors with EGC connected to enclosure and Class 2 power supply EGC lead, (where supplied with power supply). Section 600.7(A)(1), (B)(1)
5. 20 Amp Branch Circuit with lockable disconnect Section 600.5(B)(2), Section 600.6(A)(1)

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

(600.7(B) Bonding, continued)

(2) Bonding Connections. Bonding connections shall be made in accordance with 250.8.

No changes in 2011. Contact surface must be free of paint, lacquer and enamel for positive metal to metal contact (Section 250.12), (UL 48.4.2.4.2.2). Bonding may be by means of a screw (UL 48.4.2.4.2.3). Where the terminal is a terminal screw (wire binding screw) it, must be green with a hexagonal head or be a bolt with a green hexagonal nut and comply with other requirements specific to metal thickness and screw type (Section 250.126), (UL48.4.2.4.2.3, UL 48.4.2.4.3.2.3).

(3) Metal Building Parts. Metal parts of a building shall not be permitted to be used as a means for bonding metal parts and equipment of signs and outline lighting systems...

No changes in 2011.

(4) Flexible Metal Conduit Length. Listed flexible metal conduit or listed liquid tight flexible metal conduit that encloses the secondary circuit conductor from a transformer or power supply for use with neon tubing shall be permitted as bonding means if the total accumulative length...in the secondary circuit does not exceed 30 m (100 ft).

No changes in 2011. The exception to the general rule, permitting 100 feet of flexible metal and liquid tight conduit for grounding and bonding is amended in Article 600, but it applies only to bonding non-current carrying metal parts in a neon secondary circuit. Where conduit is used as a bonding means, an additional bonding conductor bonding the same metal parts is not permitted (UL 48.4.2.4.2.6).

(5) Small Metal Parts. Small metal parts not exceeding 50 mm (2 in.) in any dimension, not likely to be energized, and spaced 19 mm (¾ in.) from neon tubing shall not require bonding.

No changes in 2011. This allows for the use of listed tube supports with metal bases to be used without bonding each tube support to the EGC.

(6) Nonmetallic Conduit. Where listed nonmetallic conduit is used to enclose the secondary circuit conductor from a transformer or power supply and a bonding conductor is required, the bonding conductor shall be installed separate and remote from the nonmetallic conduit...1½ in. for 100 Hz or less, 1¾ in. for 100 Hz or more.

No changes in 2011. Bonding conductors on the outside of a sign or raceway must be protected from damage (Section 600.7(B)(7)(2)), (UL 48.4.2.4.2.7).

(7) Bonding Conductors.

- (1) Bonding Conductors shall be copper and not smaller than 14 AWG.
- (2) Bonding conductors installed externally of a sign or raceway shall be protected from physical damage.

No changes in 2011. No. 14 AWG is permitted for bonding of remote, non-current-carrying, metal parts of a sign on a branch circuit with a 20- or 30-amp circuit breaker. For the branch circuit supplying a sign, the equipment grounding conductor cannot be smaller than the EGC permitted for use with the branch circuit overcurrent device as specified in Table 250.122. UL 48 specifies that lighting circuits within signs are to be rated at 20 amps and neon circuits at 30 amps in harmony with Section 600.5(B)(1)(2) (UL 48.4.2.5.2.1.2 and 4.2.5.2.1.4). Even though No. 14 AWG is permitted for bonding together metal parts of the sign or outline lighting system, effective October 2, 2012, the leads provided for connection to the branch circuit are required to be sized to match the branch circuit conductors specified in Section 250.122 (UL 48.4.2.5.2.1.5). The minimum size EGC for a 20-amp circuit is No 12 AWG and No. 10 AWG is the minimum size EGC for a 30-amp sign circuit.

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

(600.7 (B) Bonding, continued)

(8) Signs in Fountains. Signs or outline lighting installed inside a fountain shall have all metal parts bonded to the equipment grounding conductor of the branch circuit for the fountain recirculating system...

No changes in 2011.

600.8 Enclosures.

(A) Strength

(B) Material

(C) Minimum Thickness of Enclosure Metal

(D) Protection of Metal.

No changes in 2011. Transformers and other power sources with integral enclosures for secondary and primary circuit connections are not required to have an additional enclosure. (Change added in 2005.) Class 2 power sources with an integral hub for connection of the branch circuit do not require an additional enclosure when installed in accordance with Section 600.24(C) and Section 600.33.

Except for secondary conductors in a Class 2 circuit, all live parts of sign and outline lighting are required to be in a metal enclosure (UL 48.4.2.5.5.1.2). Enclosures can be other than metal if listed. "Live Parts" is defined in Article 100 as "energized conductive components" and "Enclosure" is described as a case or housing, "to prevent personnel from accidentally contacting energized parts." The definition for Enclosure in UL 48 doesn't limit the purpose of enclosures to protection from shock and hazardous energy but also includes protection from moving parts that may cause injury. It also specifies that an enclosure may serve as a water shield, sign body or sign face. If a polymeric sign face is to serve as an enclosure, it must be listed as suitable for that purpose. Enclosure requirements are similar between NEC Article 600 and UL 48. By virtue of being listed, compartments designated as enclosures in listed signs would comply with the Code (UL 48.2.2.1, 4.1.3.1, 4.1.3.2.3).

600.9 Location.

(A) Vehicles

(B) Pedestrians

(C) Adjacent to Combustible Materials

(D) Wet Location

No changes in 2011. **(A)** Clearances below signs that are not protected from vehicular traffic must maintain a minimum height of 14 feet above street level. **(B)** Neon tubing readily accessible to pedestrians must be protected from physical damage. This rule does not apply to dry-location portable signs. "Readily" was added to this rule in 2008, to more clearly define accessibility to skeleton tubing (Section 600.41(D)). "Readily Accessible" is defined in Article 100 as being reached quickly without a ladder. **(D)** One drain hole is required at every low point or isolated section of a sign. Listed signs are required to have drain holes at bottom of lowest point, one in each isolated section, one every four feet in an isolated section, one on both sides of a mounting pole, and in horizontal troughs for faces (UL 48.1.3.3).

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

600.10 Portable or Mobile Signs.

- (A) Support
- (B) Attachment Plug
- (C) Wet or Damp Locations
- (1) Cords
- (2) Ground-Fault Circuit Interrupter
- (D) Dry Location

No changes in 2011. Portable and mobile (trailer) signs are required to be listed. As such, they are defined by UL 48. A mobile sign and portable sign are both cord-connected signs. A mobile sign is provided with a means to facilitate movement. A portable sign is defined as a sign that weighs less than 50 lbs. and is provided with a removable mounting means. Note: The factory-installed, integral ground-fault circuit interrupter (GFCI) required for a damp-location, portable or mobile sign must have integral, open-neutral protection (2011 NEC® Handbook), (UL 48.2.37, 2.50, UL 48.4.41, UL 48.2.50).

600.12 Field-Installed Secondary Wiring. Field-installed secondary circuit wiring for electric signs, outline lighting systems, and skeleton tubing systems shall be in accordance with their installation instructions and 600.12(A), (B), or (C).

Section 600.12, applicable to secondary wiring for section signs, was added in 2005 and revised in 2008 to apply to all signs incorporating secondary circuit wiring less than 50 volts. The category "Less than 50 volts" was replaced in 2011 to specify the output voltage of a power-limited, Class 2 power source. Installation instructions are required for all secondary field wiring.

(A) 1000 Volts or Less. Secondary circuit wiring of 1000 volts or less shall comply with 600.31.

(B) Over 1000 Volts. Secondary circuit wiring of over 1000 volts shall comply with 600.32.

(C) Class 2. Where the installation complies with 600.33 and the power source provides a Class 2 output that complies with 600.24, either of the following wiring methods shall be permitted as determined by the installation conditions.

The rewording of this subsection recognizes that new Section 600.33 in Part 2 is applicable to low-voltage field wiring for LED secondary circuits and limits the secondary voltage to the output of Class 2 power-limited sources listed to UL 1310. This establishes consistency with standard electrical industry nomenclature and rules for power-limited circuits used with LED illumination systems for signs and luminaires.

- (1) Wiring methods identified in Chapter 3
- (2) Class 2 cables complying with Part III of Article 725

(1) Provides field-wiring options for section signs with remote subassemblies that may be installed in ducts, plenums or other environmental air space. (2) Affirms that prescriptive rules for power-limited circuit power sources and conductors in Article 725 Part III apply to electric signs and outline lighting.

600.21 Ballasts, Transformers, and Electronic Power Supplies.

- (A) Accessibility
- (B) Location
- (C) Wet Location
- (D) Working Space
- (E) Attic and Soffit Locations
- (F) Suspended Ceilings

No changes in 2011. Section 600.21(E) was amended in 2008 to include a requirement for a light in an attic or a soffit where subassemblies of section signs, outline lighting and skeleton tubing systems are installed. The lighting requirement is for service technicians and is a general rule for equipment spaces (Section 210.70(A)(3)). A revision to the size of the opening for the access door to match the standard spacing between ceiling joists was also made at the same time (Section 210(A)(3)).

2011 NEC® Article 600 Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

600.22 Ballasts.

- (A) Type
- (B) Thermal Protection

No changes in 2011.

600.23 Transformers and Electronic Power Supplies.

- (A) Type
- (B) Secondary-Circuit Ground-Fault Protection
- (C) Voltage
- (D) Rating
- (E) Secondary Connections

Reworded to clearly distinguish transformers and electronic power supplies with SGFP from other transformers and power supplies described in Section 600.23(B)(1)(2) that don't require SGFP.

(F) Marking. Transformers and electronic power supplies that are equipped with secondary-circuit ground-fault protection shall be so marked.

600.24 Class 2 Power Sources. Signs and outline lighting systems supplied by Class 2 transformers, power supplies, and power sources shall comply with the requirements of Class 2 circuits and 600.24(A), (B), (C), and (D).

(A) Listing. Class 2 power supplies and power sources shall be listed for use with electric signs and outline lighting systems or shall be a component in a listed electric sign.

Class 2 power sources eligible for use in UL Listed signs are certified by UL as "Recognized Components" and cataloged in UL's Sign Component Manual, (SAM). Power sources in the SAM require evaluation for suitability in a sign that is to be listed and are not listed electrical equipment. The additional wording recognizes this distinction and clarifies that UL Recognized Component Class 2 power sources are Code compliant when used in a listed electric sign.



A Class 2 Power Source with this label complies with Section 600.24(A) when used as a component in a listed sign.

(B) Grounding.

(C) Wiring Methods on the Supply Side of the Class 2 Power Supply. Conductors and equipment on the supply side of the power source shall be installed in accordance with the appropriate requirements of Chapter 3.

The special wiring permitted on the load side of the Class 2 LED illumination system does not apply to the branch circuit conductors supplying a section sign which incorporates Class 2 power sources. The branch circuit conductors and equipment must meet the appropriate requirements in Chapter 3.

(D) Secondary Wiring. Secondary wiring for Class 2 power sources shall comply with 600.12(C) and 600.33.

Basic rules for field-wiring Class 2 LED Sign Illumination Systems have been added in new Section 600.33 which includes reference to Part III of Article 725.

II. Field-Installed Skeleton Tubing, Outline Lighting, and Secondary Wiring.

The title of Part II has been revised to include all field-installed sign and outline lighting secondary wiring as well as skeleton tubing. In Part II of Article 600, Section 600.12 references rules covering field-installed wiring at voltages ranging from Class 2 to 1000 volts or more.

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

600.30 Applicability. Part II of this article shall apply to all of the following:

- (1) Field Installed skeleton tubing
- (2) Field-installed secondary circuits
- (3) Outline lighting

Addition of field-installed secondary wiring harmonizes with the revisions to Section 600.12 and Section 600.24(D), and new Section 600.33. The original intent for creating Part II of Section 600.30 has been compromised by market-driven technological advances in electric signs during the past 16 years. It wasn't anticipated that listed section signs using neon power supplies would share many of the same field-wiring and installation features as non-listed skeleton tubing, thus requiring on-site evaluation by the AHJ. Neither was it anticipated that Class 2 LED illumination systems would play a major role in sign illumination, thus requiring installation of field-wiring between remote subassemblies. Part II's exclusive applicability to skeleton tubing is no longer valid because listed signs of all voltages and types, as well as non-listed skeleton tubing, share field-wiring that requires approval by the AHJ for Code compliance.

600.31 Neon Secondary-Circuit Wiring, 1000 volts or Less, Nominal.

Applies to neon secondary wiring 1000 Volts or less.

- (A) Wiring Method
- (B) Insulation and Size

"Listed for the purpose" deleted and replaced with "listed."

- (C) Number of Conductors in Raceway
- (D) Installation
- (E) Protection of Leads

No changes in 2011.

600.32 Neon Secondary-Circuit Wiring, over 1000 Volts, Nominal.

No changes in 2011.

- (A) Wiring Methods
 - (1) Installation
 - (2) Number of Conductors
 - (3) Size
 - (4) Spacing from Grounded Parts
 - (5) Metal Building Parts as a secondary return or grounding conductor

- (B) Insulation and Size
- (C) Installation
- (D) Bends in Conductors
- (E) Spacing
- (F) Insulators and Bushings
- (G) Conductors in Raceways

- (H) Between Neon Tubing and Midpoint Return

"Listed for the purpose" deleted and replaced with "listed."

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600

600.33 LED Sign Illumination Systems, Secondary Wiring. The wiring methods and materials shall be installed in accordance with the sign manufacturer's installation instructions using any applicable wiring methods from Chapter 3 and the requirements for Class 2 circuits contained in Part III of Article 725.

(A) Insulation and Sizing of Class 2 Conductors. Listed Class 2 cable that complies with Table 725.154(G) shall be installed on the load side of the Class 2 power source. The conductors shall have an ampacity not less than the load to be supplied and shall not be sized smaller than 22 AWG.

(1) Wet Locations. Class 2 cable used in a wet location shall be identified for use in wet locations or have a moisture-impervious metal sheath.

(2) Other Locations. In other locations, any applicable cable permitted in Table 725.154(G) shall be permitted to be used.

(B) Installation. Secondary wiring shall be installed in accordance with (B)(1) and (B)(2).

(1) Support wiring shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable is not be damaged by normal building use. Such cables shall be supported by straps, staples, hangers, cable ties, or similar fittings designed and installed so as not to damage the cable. The installation shall also comply with 300.4(D).

(2) Connections in cable and conductors shall be made with listed insulating devices and be accessible after installation. Where made in a wall, connections shall be enclosed in a listed box.

(C) Protection against Physical Damage. Where subject to physical damage, the conductors shall be protected and installed in accordance with 300.4.

(D) Grounding and Bonding. Grounding and bonding shall be in accordance with 600.7.

(Schematic of Class 2 field-wiring for section sign on next page.)



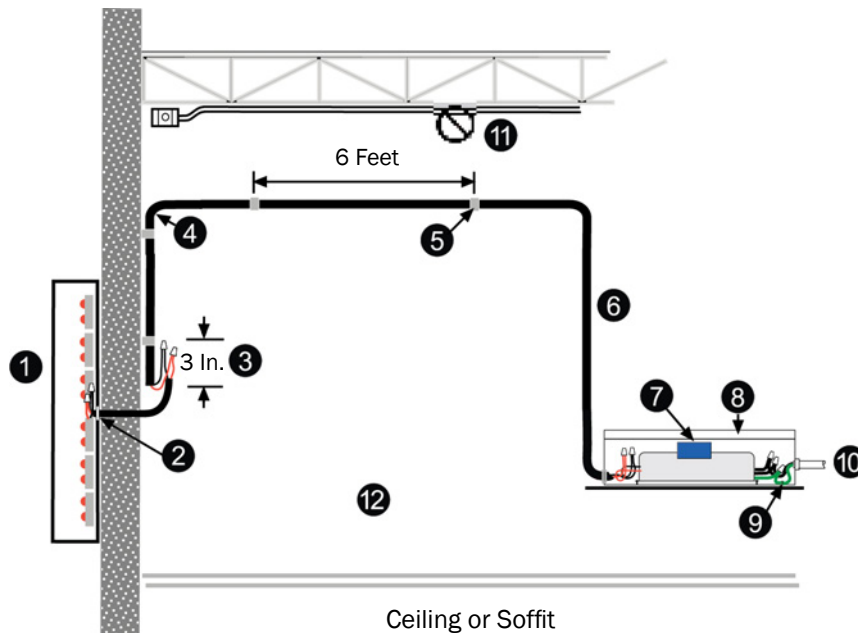
ISA Commentary

New Section 600.33 incorporates basic rules from Part III of Article 725 for field-wiring power-limited circuits for LED illumination systems in section signs. Wiring methods in Article 300 may also be employed, depending on the installation conditions. Installation instructions will show the wiring method selected to conform to the conditions where the Class 2 field wiring is being installed. Section signs incorporating LED systems are required to be listed, and must comply with UL 48 as well as the Code (UL 48.4.2).

ISA commentary on the following page.

2011 NEC® Article 600 Summary of Changes & ISA Commentary

600.33 LED Sign Illumination Systems, Secondary Wiring. (Schematic of Class 2 field-wiring for section sign)



ISA Commentary

1. Factory wired, listed subassembly of section sign incorporating a Class 2 powered LED array.
2. Bushing to protect cable from sharp edges on metal letter backing (Section 300.4), (UL 48.4.2.5.5.3.2).
3. Connections in cable must be made with listed insulating devices and accessible after installation (Section 600.33(B)(2)). Cable must be secured within 3 inches of splice (UL 48.4.2.6 (c)).
4. Bends in cable must not be more than 4 x the diameter of the cable (UL 48.4.4.2.6).
5. Cable must be supported not less than 6-0 Feet between supports (UL 48.4.2.6(B)).
6. Class 2 cable between the subassembly and the Class 2 Power source — Per Table 725.154(G). Class 2 cables must be supported by the building structure so as not to be subject to physical damage during normal building use. Where subject to physical damage, cables shall be protected (Section 600.33(B)(1)), (Section 300.4).
7. Power source enclosures shall be durably marked to indicate the circuit is Class 2 (Section 725.124).
8. Unless supplied with means for connection of a listed box, power source must be in enclosure for connection of branch circuit conductors (Section 600.8, Section 600.21(F)). Enclosure must be securely fastened in place and be accessible (Section 600.21(F), Section 300.11(A)).
9. Metal enclosures must be connected to the equipment grounding conductor (EGC). Grounding must be in accordance with Section 600.7(A), Section 600.33(D). Subassemblies on load side of Class 2 power supply do not require bonding to the EGC (Section 600.7(B)(1)), (*Exception* (UL 48.22.4.1.3(g))).
10. 20-amp branch circuit conductors to disconnect per Section 600.24(C), Section 600.5(B)(2), Table 210.2.
11. Class 2 cable cannot be strapped, taped or attached to the exterior of conduit for support (Section 725.143).
12. Cables installed in air handling space above hung ceilings must comply with Section 300.22.
13. Wiring must be installed in a neat and workmanlike manner (Section 600.33(B)(1)).

2011 NEC® Article 600

Summary of Changes & ISA Commentary



2011 NEC® Article 600



ISA Commentary

600.41 Neon Tubing.

- (A) Design
- (B) Support

No changes in 2011. Text revised in 2008 to require neon tubing to be supported within 6 inches from an electrode connection.

- (C) Spacing
- (D) Protection

No changes in 2011. New requirement added in 2008 requiring protection for skeleton tubing accessible to pedestrians.



600.42 Electrode Connections.

- (A) Points of Transition
- (B) Accessibility
- (C) Electrode Connections
- (D) Support
- (E) Receptacles

No changes in 2011. New requirement in 2008. Electrode receptacles must be listed.

- (F) Bushings
- (G) Wet Locations
- (H) Electrode Enclosures
 - (1) Dry Locations
 - (2) Damp and Wet Locations

No changes in 2011.

Purpose of the NEC

Since its inception, the purpose of NFPA 70, The National Electrical Code® has been the “practical safeguarding of persons and property from hazards arising from the use of electricity.” The “Code contains provisions that are considered necessary for safety” (Section 90.1(A), Section 90.1(B)).

The NEC® contains prescriptive rules for the safe use of electrical devices and equipment, but is not a standard for the design or manufacturing of electrical equipment (Section 90.1(C)). The NFPA 70 rules do, however, influence manufacturing standards, becoming part of ANSI Standards for electrical equipment such as UL 48 for electric signs.

Inasmuch as NFPA 70 incorporates Article 600 in Chapter 6, "Signs and Outline Lighting", it can be reasonably concluded that the Code “contains provisions that are considered necessary for sign safety.”

Electrical safety is not merely an academic discussion but a real-time, life-saving pursuit for sign electricians to embrace. The following statistics from OSHA's website are quite revealing and should demand the attention of every sign installer and service technician.

During 2010, there were 4,070 worker fatalities. Electrocution was one of the "fatal top four." Three of the top 10 most frequently violated OSHA standards in 2011 were related to the electrical industry:

1. Control of hazardous energy (lockout/tagout), general industry (29 CFR 1910.147)
2. Electrical, wiring methods, components and equipment, general industry (29 CFR 1910.305)
3. Electrical systems design, general requirements, general industry (29 CFR 1910.303)

(Source: www.osha.gov/oshstats/commonstats.html)

Editorial Notes: General Requirements of the NEC

The NFPA 70 NEC® is an American National Standards Institute (ANSI) standard for installation and use of all electrical equipment. It is the standard under which all signs, regardless of voltage, are approved for installation and use in the United States.

The NEC® is not a design specification for manufacturing electrical equipment, nor is it an instruction manual for untrained persons (Section 90.1(C)). It contains prescriptive rules for the safe use of electrical devices and equipment and their connection to the power source. NEC® rules do influence manufacturing standards for signs and other electrical equipment, and often become a part of a UL standard's mechanical and electrical requirements.

Electric signs are defined as “electrically illuminated utilization equipment” (Article 100 Definitions, Electric Sign).

Article 600 in Chapter 6 is titled, "Electric Signs and Outline Lighting." It covers the installation of conductors and equipment for all signs and outline lighting regardless of voltage, including neon tubing used as decorative elements or art forms. Part 1 covers general requirements for electric sign use. Part 2 applies to skeleton tubing and all field wiring with voltages ranging from Class 2 to 1000 volts or more.

NEC® rules for wiring and wiring methods in Article 300 or Article 725 for power-limited circuits are not intended to apply to conductors that form an integral part of listed utilization equipment (Section 300.1(B)), (Section 725.1). Rules in these Articles are referenced, however, in Article 600 because some section sign and outline lighting systems require field wiring that is in addition to the internal wiring, installed outside the subassembly and attached to surfaces upon which the sign lighting is displayed.

These section signs are defined in Section 600.2 as “subassemblies installed as separate remote parts of an overall sign.” Field wiring for these listed signs and outline lighting installations must conform to Article 600 and other articles referenced in Article 600, (e.g. Article 300 and Article 725 for Class 2 wiring).

The NEC® stipulates that factory-installed internal wiring in utilization equipment does not need inspection at the time of installation if it is listed by a qualified electrical testing laboratory (QETL), except to detect alterations or damage (Section 90.7). Section signs and outline lighting that are composed of subassemblies and installed as separate, remote parts of a sign requiring additional external field wiring to match installation conditions do not meet the criteria for factory-installed wiring. They are subject to more robust inspection by the Authority Having Jurisdiction (AHJ) for compliance with installation instructions and Code wiring requirements.

In the absence of any rules for Class 2 LED illumination systems in signs, beginning with the 2005 NEC®, rules found in Article 725 have been incrementally incorporated into Section 600.12 and Section 600.24 by reference, culminating in a new section being added to Article 600 in the 2011 NEC® that consolidates many of the field wiring rules from Article 725 (for Class 2 powered LED signs) into Section 600.33. This is a significant improvement and makes it easier for the sign electrical technician to complete Code compliant low-voltage field wiring.

The Code is arranged so that Chapters 1–4 apply generally to all special equipment or special conditions in Chapter 5, 6 and 7. These latter chapters can also modify the rules in 1–4 for special circumstances. According to the NEC® 2011 Handbook, reference to “the introduction” in Section 90.3 is intended to include Article 90 with the general application of Chapters 1–4.

Editorial Notes: General Requirements of the NEC

Some examples of modifications of basic rules in Articles 1–4 in Article 600 include:

Section 250.112 requires all signs and outline lighting and associated equipment to be grounded by connection to an equipment grounding conductor (EGC), regardless of voltage. The 2011 NEC® contains an Exception in Section 600.7(B)(1) permitting section signs powered by Class 2 power sources to be installed without bonding to the EGC.

Section 250.118.5(c) limits the maximum length of flexible metal conduit or flexible liquid tight metal conduit to 6 feet in a ground path. Section 600.7(B)(4) allows the use of 100 feet maximum length as a ground path when the flexible conduit is used with GTO in a secondary neon circuit.

Section 300.15 requires the use of a box at each splice point for conductors. Section 600.33(B)(2) requires a box only where the conductor splices in a Class 2 circuit are located in a wall.

Other rules in Chapters 3 and Article 725 apply when installing Class 2 cable for LED-illuminated section signs. Class 2 power limited cable (PLTC) cannot be attached to the exterior of conduit (Section 725.143, Section 300.11). Where PLTC cable passes through a wall, suitable bushings or fittings are required (Section 314.72(B), Section 600.33(C)). Also, rules for wiring in environmental air spaces must be followed (Section 300.22).

Branch Circuit Loading.

Signs: Rated not to exceed 20 Amps/20 Amp Breaker (OCPD) Section 600.5(B)(2).

Neon: Rated not to exceed 30 Amps/30 Amp Breaker (OCPD) Section 600.5(B)(1).

A permissible load for a sign and outline lighting circuit is 125% of the continuous load or 16 amps. For a branch circuit supplying a neon sign or skeleton tubing, the maximum load is 24 amps (Section 210.20, Section 210.23(A)).

Branch circuit loads for inductive and LED lighting loads must be based on the power supply amps and not on total lamp wattage (Section 220.18).

Minimum volt-amps for a sign circuit is 1200 VA (Section 220.14(F)).

Installation instructions.

All listed electric signs, outline lighting and skeleton tubing are required to be furnished with installation instructions as a part of listing (UL 48.8.1.1). The content of instructions for section signs is spelled out in UL 48 (UL 48.8.2).

As referenced above, the UL 48 safety standard requires all signs and outline lighting, and skeleton tubing to be furnished with installation instructions. The Code requires listed equipment to be installed in accordance with any instructions included in the listing (Section 110.3(B)). Where the sign is a section sign made up of separate subassemblies, the instructions show how the subassemblies are designed for assembly and field wiring that complies with the Code. Where the subassemblies are joined to form a single sign, the instructions show the mechanical connections and interconnections of the pre-wired sign circuits. As with other electrical equipment, the AHJ relies on the installation instructions during the approval process because the installation instructions reveal how the sign's electrical system was designed for use under the NEC® or amended code in the jurisdiction. Unlisted skeleton tube systems also are required by the Code to be installed in accordance with installation instructions (Section 600.12).

Listing Electric Signs

Electric signs and outline lighting are required to be listed wherever the NEC® is the adopted and enforced safety standard for electrical equipment and electrical installations (Section 600.3). The Code defines listed equipment as equipment that is included on a list published by an organization acceptable to the AHJ, that evaluates products and states the equipment or material meets appropriate standards (Article 100 Definitions, Listed). Listing organizations are described in the Code as “qualified electrical testing laboratories” (Section 90.7). After April 1988, these laboratories were officially recognized in the U.S. as Nationally Recognized Testing Laboratories (NRTLs).

Welcome to the Nationally Recognized Testing Laboratory (NRTL) Program, which is a part of OSHA's Directorate of Technical Support and Emergency Management. The Program recognizes private sector organizations as NRTLs, and recognition signifies that an organization has met the necessary qualifications specified in the regulations for the Program. The NRTL determines that specific equipment and materials (“products”) meet consensus-based standards of safety to provide the assurance, required by OSHA, that these products are safe for use in the U.S. workplace (www.osha.gov/dts/otpc/nrtl/index.html).

The appropriate, consensus-based safety standard for listing of electric signs is UL 48, 15th Edition. Each sign company must, as part of its operations, choose an NRTL that is eligible to certify its sign products comply with UL 48 and place the sign company's name and products on the NRTL's list of accredited products. Conversely, the sign manufacturer affixes the qualified electrical testing laboratory's label to the sign as a symbol that provides the AHJ with a basis for approval of the installation of the sign or outline lighting system (Section 110.2, Informational Note).

There are multiple independent testing laboratories (QETLs) acceptable to AHJs, a number of which evaluate electric signs and associated equipment to UL Standards.

Most sign makers will immediately recognize Underwriters Laboratories, (UL) and the Canadian Standards Association, (CSA) as sign listing organizations. Other NRTL organizations that have UL 48 within the scope of their listing are identified on the web at www.osha.gov/dts/otpc/nrtl/index.html. Each offers procedures for listing and follow-up services that meet the NRTL standards for sign certification and listing.

Electrical products listed by these NRTLs, by virtue of their national accreditation, are recognized by the AHJ as qualified to certify electrical products to designated standards. As a general rule, all jurisdictions have a list of accredited QETLs that may include other testing organizations in addition to those on the U.S. Department of Labor's (OSHA) national list of NRTLs.

All NRTLs use the same standards to evaluate sign or outline lighting electrical design and construction, primarily UL 48, 15th Edition and other standards applicable to signs (e.g. UL 879 and UL 2161). During this evaluation, the NRTL auditor verifies that the sign conforms to the applicable UL Standard and is suitable for installation and use under the NEC®. Conversely, each NRTL evaluates and lists signs for use in Canada to CAN/CSA-C22.2 No.207-M89 for use under the Canadian Electrical Code, Part 1.

With respect to NRTL status, Underwriters Laboratories and the Canadian Standards Association have a unique, dual status that separates them from other NRTLs. UL and CSA are standards organization, writing and maintaining sign manufacturing and sign equipment safety standards. They also maintain separate business entities that compete with other NRTLs for the business of evaluating and listing electric signs and outline lighting, as well as other electrical equipment.

Over the years, the sign industry has developed a close working relationship with UL in standards development, participating on UL Standards Technical Panels (STP) that develop and maintain sign and sign equipment standards under the ANSI consensus protocol. As an NRTL, UL LLC, in cooperation with the industry, has developed a robust follow-up service program that is readily accessible throughout North America.

Qualifying as a Sign Electrician

Electric signs and outline lighting share Chapter 6 with 24 other categories of special electrical equipment. All require qualified electrical technicians with skills and knowledge unique to the special equipment being installed or maintained. Specialty electricians run the gamut of the electrical industry and, in many jurisdictions, specialty licensing is a requirement for sign installers and service personnel, as well as for many of the other 24 types of special equipment covered in Chapter 6.

Chapter 6: Special Equipment

Article 600: Electric Signs and Outline Lighting
Article 604: Manufactured Wiring Systems
Article 605: Office Furnishings
Article 610: Cranes and Hoists
Article 620: Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts and Stairway Chairlifts
Article 625: Electric Vehicle Charging System
Article 626: Electrified Truck Parking Spaces
Article 630: Electric Welders
Article 640: Audio Signal Processing, Amplification and Reproduction Equipment
Article 645: Information Technology Equipment
Article 647: Sensitive Electronic Equipment
Article 650: Pipe Organs
Article 660: X-Ray Equipment
Article 665: Induction and Dielectric heating Equipment
Article 668: Electrolytic Cells
Article 669: Electroplating
Article 670: Industrial Machinery
Article 675: Electrically Driven or Controlled Irrigation Machines
Article 680: Swimming Pools, Fountains, and Similar Installations
Article 682: Natural and Artificially Made Bodies of Water
Article 685: Integrated Electrical Systems
Article 690: Solar Photovoltaic Systems
Article 692: Fuel Cell Systems
Article 694: Small Wind Electric Systems
Article 695: Fire Pumps

By Code definition, a person installing or servicing an electric sign is qualified when he or she has skills and knowledge related to the construction, installation and operation of electric signs (Article 100 Definitions, Qualified Person). An Informational Note added to the definition of Qualified Person includes safety training on the hazards involved as a prerequisite and refers to ANSI *NFPA 70-E Standard for Electrical Safety in the Workplace*. This standard provides prescriptive language for compliance with OSHA 29 (CFR) Part 1910 and replicates many of the rules in NEC® Article 600.

To qualify as a sign electrician a person must possess skills and knowledge about installing electric signs, electric sign construction and electric sign operation as well as be knowledgeable of the electrical hazards involved and prescriptive rules to mitigate the danger as outlined in NFPA 70E.

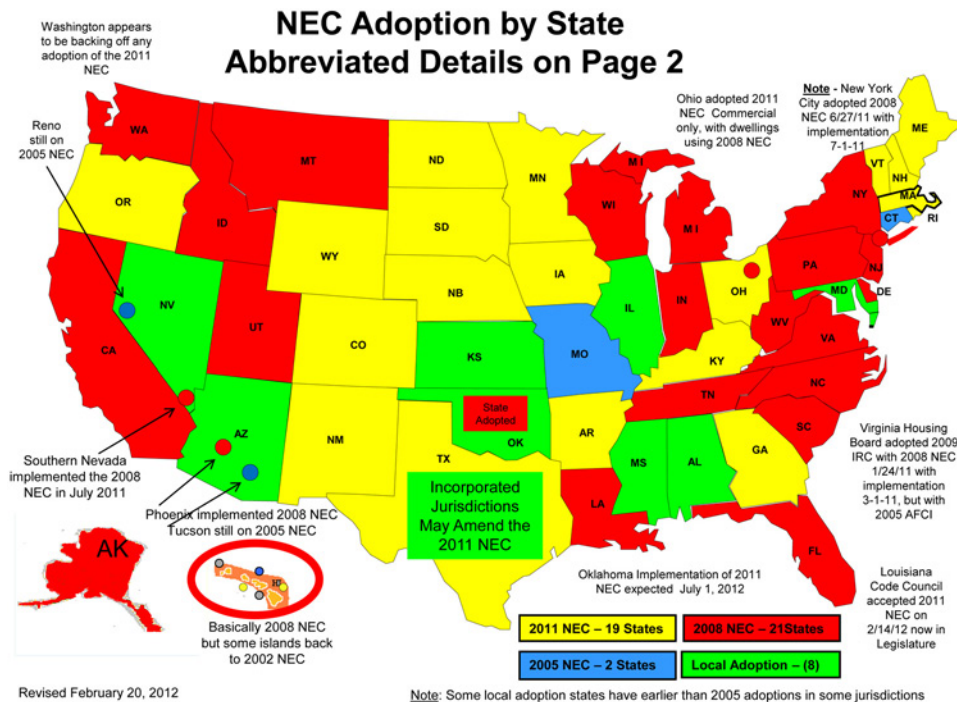
Conversely, personnel qualified to construct electric signs must also have knowledge of the NEC® to comply with the UL 48 Standard for Safety, which stipulates electric signs and outline lighting eligible for listing must be constructed for compliant use within NEC® rules.

These requirements cover all electric signs, art forms and outline lighting for use in accordance with the National Electrical Code, NFPA 70 (Scope UL 48.1.1).

Under UL's revised Follow Up Services agreement, a Manufacturers Technical Representative, (MTR) must be designated by an electric sign manufacturer to oversee and coordinate UL's Product Compliance Assessment process (Revisions to UL Listing and Follow UP Service For Electric Signs, September 15, 2010). It seems logical to conclude that, to comply with the introductory statement in UL 48, a sign personnel filling this position would need to meet the Code definition of a Qualified Person.

Different Editions of NEC® Adopted By Jurisdictions Across U.S.

The National Fire Protection Association's (NFPA) National Electrical Code® is accepted as the fundamental national safety standard for installation of electrical equipment in the U.S. It is a living document with revisions added in three-year cycles. Each jurisdiction makes the Code and its own local amendments lawfully enforceable by adoption. The timing of NEC® adoption varies from jurisdiction to jurisdiction, resulting in different versions of the Code being enforced simultaneously throughout the nation. The following chart from the NEMA website shows the NEC® versions in effect as of February 20, 2012.



Source: www.nema.org/Technical/FieldReps/Pages/National-Electrical-Code.aspx

NFPA Report on Proposals (ROP) and Report on Comments (ROC)

Under the auspices of the NFPA, Code updates are developed over a period of 19-22 months every three years, and new Code editions are released four months prior to the beginning of the Code year (i.e. editions commencing with Y2K: 2002, 2005, 2008, 2011, 2014). Each Code Cycle, a list of proposals with the relevant Code Making Panel action is recorded in a Report on Proposals. The Report is a public document that provides useful insight for understanding each new rule and the rationale for adoption. After publishing the ROP, comments on Code Panel actions are solicited by the NFPA and an additional Report on Comments, (also a public document) is published. It is recommended that those who manufacture, install or maintain electric signs review the ROP and ROC that is concurrent with each pertinent Code year. The ROP and ROC for the 2011 NEC® can be accessed at these URLs:

www.nfpa.org/assets/files/AboutTheCodes/70/70-A2010-ROP.pdf

www.nfpa.org/assets/files/AboutTheCodes/70/70-A2010-ROC.pdf

Different Editions of NEC® and Listing to Most Current NEC®



Lee Hewitt, P.E.
Principal Engineer – Lighting
UL LLC

UL Product Safety Standards and NFPA 70 (National Electrical Code® or NEC®) have historically maintained a mutually supportive relationship with the common goal of promoting safety in products and installation. All UL product certifications for the US are based on product safety requirements that anticipate installation in accordance with the NEC®. This information is clearly stated in UL product certification guide information UXYT for Electric Signs.

UL technical staff play an important role in the continuing development and maintenance of requirements in the NEC® to address safety issues and new technologies that affect product installation. UL provides technical representation on all NEC® Code Making Panels as well as the Technical Correlating Committee. As new requirements are added or revised in the NEC® as a result of the three-year maintenance cycle, UL reviews the impact of changes on all product certification standards and works through the affected Standards Technical Panels to make any necessary changes to UL product safety standards to maintain compliance with the latest edition of the NEC®.



Jonathan Cadd
Education Codes and Standards Coordinator
International Association of Electrical Inspectors

While it is true that every AHJ tends to look at the National Electrical Code (NEC®) a little differently, there are many things that do not change from edition to edition and are viewed universally the same in all jurisdictions (e.g. the scope of the NEC® in 90.3). The general requirements in Chapter 1 through 4 of the NEC will always be considered when approving and installing a piece of electrical equipment, particularly with respect to how they are modified by other articles in the NEC® such as Article 250, 300, or 600, for signs.

In the case of new equipment that is listed for use in accordance with the most current edition of the NEC®, if the AHJ is currently using a previous version of the Code, the procedure is a bit different but nevertheless achievable. The AHJ first looks at Section 110.3(A) to see if criteria in Section 110.3(A)(1–8) has been met, and the equipment is installed according to its manufacturer's installation requirements as mandated in Section 110.3(B).

Many times, new listings supersede previous listings and include new information about the equipment which can be found in the listing information. Often, this includes the installation requirements as well.

When an installer is going to perform a sign installation in a city or town where they have never done work before, it's always recommended that they contact the local AHJ to see what edition of the NEC® is being enforced and then determine if any local requirements, in addition to the NEC®, might affect the installation. In short, education and communication are the keys to a safe, Code compliant installation.

Electrical Signs and the NEC® are Embedded in U.S. History

Electric signs occupy a unique place in the electrical industry. Unlike other electrical devices and equipment, electric signs channel electrical energy into a communications medium that serves commercial and non-commercial visual communication purposes. Electrical advertising indexes the public environment, indoors and outdoors, day and night. Signs convert electrical energy into art forms that become exciting visual monuments, as illustrated in Times Square and on the Las Vegas Strip. Electrical advertising has been an integral part of the American culture since the early 1900s.

In tandem with the history of electrical advertising, the National Electrical Code®, introduced in 1897, has been the guide for evaluating the installation and use of electric signs. Incandescent lamps were the original source for illuminating electric letters on signs in the early 1900s. This was followed by the introduction of neon illuminated letters on signs for a car dealership in Los Angeles in 1923. The National Fire Protection Association (NFPA) included Signs & Outline Lighting in Article 38 of the 1925 National Electrical Code® (NEC). Subsequently, Signs and Outline Lighting became the lead article in Chapter 6, "Special Equipment," and in 1953 was assigned to Code Making Panel 3. Article 600 was delegated to CMP 21 in 1975 before its current assignment to CMP 18 began in 1981.

Since its early beginnings at the turn of the 20th Century, and except for during World War II, the NEC® has been a living document, with revisions incorporated every three years.

During the past 25 years, some of those representing ISA and its precursor NESA on Code Panel 18 include Bob Wintermute, American Sign & Indicator; Mark Johnson, Heath & Company; Randy Wright, Wright Signs; and Steve Kieffer, Kieffer Signs. Mel Kochan, YESCO currently is ISA's Principal, and Bill Dundas, ISA Director of Technical and Regulatory Affairs, is the Alternate for the 2011 and 2014 Code Cycles.

Guidelines for Application of 2011 NEC® Changes in Electric Sign Requirements

Copyright © 2011 by:
International Sign Association
1001 N. Fairfax Street, Ste. 301
Alexandria, VA 22314

All rights reserved.

www.signs.org
info@signs.org

The material presented in this publication has been prepared for the general information of the reader. While the material presented is believed to be technically correct, neither ISA nor its affiliated consultants, nor state and local associations warrant the publication's suitability for applications other than as an informational guide to assist the reader in navigating the various changes in requirements of NFPA 70, The National Electrical Code® 2011, as applied to electric signs and outline lighting.

Sources for material used in this publication include but are not limited to:
(Inclusion of material does not constitute an endorsement of this publication)

NEC® Analysis of Changes, 2011, 2008, 2005; Neon Lighting — A Professional Advantage
Soares Book on Grounding and Bonding
(IAEI) International Association of Electrical Inspectors, www.iaei.org

NEC® Adoption by State
(NEMA) The Association of Electrical Equipment and Medical Imaging Manufacturers, www.nema.org

NEC® 2011, NEC® 2008, NEC® 2005; NEC® Handbook, NFPA 70E National Electrical Code and NEC are registered trademarks of the (NFPA) National Fire Protection Association, Inc., www.nfpa.org

Standard for Safety UL 48, Electric Signs UL, 15th Edition
(UL) Underwriters Laboratories, www.ul.com/signs

Standards & Regulation — Never Assume
(ESFi) Electrical Safety Foundation International, www.esfi.org