

*The most often heard contractor phrase:
No one else makes me do that, so why do I have to ...*

Lightning Protection Systems

- Violation 1 : Lightning protection system not terminated to dedicated grounding electrodes as required; and/or not bonded to the building's electrical system's grounding electrode system as required; and/or only one grounding electrode installed – minimum of two grounding electrodes are required
- Code Section(s) : 5th Edition (2014) FBC-Residential E3401.2 Scope references the 2011 National Electrical Code: 2011 NEC 250.106 Lightning Protection Systems
5th Edition (2014) FBC-Building 2701.1 Scope references the 2011 National Electrical Code: 2011 NEC 250.106 Lightning Protection Systems
- Comments : Contractor shall properly terminate the lightning protection system to one or more dedicated grounding electrodes and/or properly bond those grounding electrodes to the electrical system's grounding electrode system
- Violation 2 : Lightning protection system not installed in compliance with and/or not documented as being in compliance with NFPA 780 as required
- Code Section(s) : 5th Edition (2014) FBC-Residential (no similar requirement found*)
5th Edition (2014) FBC-Building 449.3.15 Lightning Protection (Hospitals); 450.3.27 Lightning Protection (Nursing Homes); and 453.17.7 Lightning (SREF)
- Comments : Contractor shall provide documentation from a third party field evaluation service that the lightning protection system is in compliance with NFPA 780

A. Violation 1 : Lightning protection system not terminated to dedicated grounding electrodes as required; and/or not bonded to the building's electrical system's grounding electrode system as required; and/or only one grounding electrode installed – minimum of two grounding electrodes are required

The installation of a lightning protection system's air terminals, conductors and termination to the lightning protection system's required dedicated grounding electrodes is covered by NFPA 780 ([NFPA 780, 4.13.1.3](#)), which requires dedicated grounding electrodes.

The lightning protection system's grounding electrodes must be dedicated to the lightning protection system and not tapped off any other grounding electrode or access point to or for the building's electrical system's grounding electrodes or any other system's grounding electrodes.

The lightning protection system's grounding electrodes are dedicated to the lightning protect system – other than being bonded to the building's electrical system's grounding electrodes, the lightning protection system's grounding electrode(s) are separate and dedicated to the lightning protection system. A common error is connecting the lightning protection system's conductor to the required intersystem bonding termination block (required by NEC 250.94) installed at the electrical service equipment or metering equipment enclosure (the terminal block used for common bonding of phone, cable, etc, grounding connections).

Once the lightning protection system's grounding electrodes have been placed in accordance with NFPA 780, those dedicated lightning protection system grounding electrodes are required, by both NFPA 70, National Electrical Code (250.50), and NFPA 780 ([4.14.1.1](#)) to be bonded together.

A minimum of two lightning protection system grounding electrodes are required as a grounding electrode is required for each main/down conductors – two or more paths to ground are required (required by [NFPA 780, 4.9](#)).

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From the 5th Edition (2014) Florida Building Code, Residential (underlining is mine)

○ *Part VIII—Electrical*

CHAPTER 34 GENERAL REQUIREMENTS

SECTION E3401 GENERAL

E3401.2 Scope.

Chapters 34 through 43 shall cover the installation of electrical systems, equipment and components indoors and outdoors that are within the scope of this code, including services, power distribution systems, fixtures, appliances, devices and appurtenances. Services within the scope of this code shall be limited to 120/240-volt, 0- to 400- ampere, single-phase systems. These chapters specifically cover the equipment, fixtures, appliances, wiring methods and materials that are most commonly used in the construction or alteration of one- and two-family dwellings and accessory structures regulated by this code. The omission from these chapters of any material or method of construction provided for in the referenced standard NFPA 70 shall not be construed as prohibiting the use of such material or method of construction. Electrical systems, equipment or components not specifically covered in these chapters shall comply with the applicable provisions of NFPA 70.

(Author's note: This is the section in the FBC-Residential which references the NEC.)

From the 5th Edition (2014) Florida Building Code, Building (underlining is mine)

○ *CHAPTER 27 ELECTRICAL*

SECTION 2701 GENERAL

2701.1 Scope.

This chapter governs the electrical components, equipment and systems used in buildings and structures covered by this code. Electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of NFPA 70.

(Author's note: This is the section in the FBC-Building which references the NEC.)

From the 2011 National Electrical Code (underlining is mine)

○ *Article 250 Grounding and Bonding*

250.50 Grounding Electrode System. All grounding electrodes as described in 250.52(A)(1) through (A)(7) that are present at each building or structure served shall be bonded together to form the grounding electrode system. Where none of these grounding electrodes exist, one or more of the grounding electrodes specified in 250.52(A)(4) through (A)(8) shall be installed and used.

Exception: Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete.

250.106 Lightning Protection Systems.

The lightning protection system ground terminals shall be bonded to the building or structure grounding electrode system.

Informational Note No. 1: See 250.60 for use of strike termination devices. For further information, see NFPA 780-2011, Standard for the Installation of Lightning Protection Systems, which contains detailed information on grounding, bonding, and sideflash distance from lightning protection systems.

Informational Note No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electrical equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2011, Standard for the Installation of Lightning Protection Systems.

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From NFPA 780 (underlining is mine)

○ 4.9 Conductors

Main conductors shall interconnect all strike terminations devices and shall form two or more paths from each strike termination device downward, horizontally, or rising at no more than 1/4 pitch to connection with ground terminals, except as permitted by 4.9.1 and 4.9.2.

(Author's note: 4.9.1 and 4.9.2 permit dead ends to dormers and the like where there is just one path [4.9.1] between a main conductor a dead end tapped from the main conductor which has two paths, and an air terminal at a dead end [4.9.2])

○ 4.13 Ground Terminals

4.13.1.3 Electrical system and telecommunication grounding electrodes shall not be used in lieu of lightning ground electrodes; this provision shall not prohibit the required bonding together of grounding electrodes of different systems.

○ 4.14 Common Grounding

4.14.1.1 This interconnection shall include lightning protection, electric service, telephone, and antenna system grounds, as well as underground metallic piping systems..

B. Violation 2 : Lightning protection system not installed in compliance with and/or not documented as being in compliance with NFPA 780 as required

The Florida Building Code, Building, sections 449 (Hospitals), 450 (Nursing Homes), and 453 (SREF), reference the *NFPA 780 Standard for the Installation of Lightning Protection Systems* as the standard to which lightning protection systems are to be in compliance with.

There are other lightning protection system standards available, such as UL 96A *Installation Requirements for Lightning Protection Systems*, and Lightning Protection Institute LPI 175 – 2014 *Standard for the Design – Installation – Inspection of Lightning Protection Systems* ; however, the Florida Building Code, Building *specifically requires that the lightning protection systems be in accordance with NFPA 780*. No other standard is referenced by, or will be in compliance with, the code's requirements. There are similarities between each of the standards, and a thorough review of the other standards may provide documentation that one of the other standards meets or even exceeds NFPA 780 – however, the code specifically references NFPA 780 ... any acceptance or certification by a Field Evaluation Body (FEB) is required to state that the lightning protection system is in compliance with NFPA 780 (that acceptance or certification may also reference additional standards, but compliance with NFPA 780 must be stated).

Reviewing lightning protection systems for compliance with NFPA 780, then inspecting the lightning protection system for compliance with NFPA 780, will require knowledge that most plans examiners and inspectors are not trained in. Requiring that the lightning protection system design documents be signed and sealed by an engineer is good practice for plan review. Field evaluation and acceptance by a Field Evaluation Body which issues a certification stating that the lightning protection system is installed in compliance with NFPA 780 is a good practice for inspecting and approving the installation of a lightning protection system.

Keep in mind that a field evaluation certifies that something is in compliance the standard 'as it is where it is' ... unlike a UL or other NRTL listing – any relocation of a field evaluated item voids that field evaluation ... like a UL or other NRTL listing – any changes or modification to a field evaluated item voids that field evaluation just as any changes or modification to a listed items voids the listing of that item.

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The following items are from NFPA 780-04 and address some of the items included herein:

(Author's note: NFPA 780-04 is the edition referenced in the 5th Edition (2014) Florida Building Code; NFPA 780-08 references are included for comparison and expanded content)

Topic	NFPA 780-04 Edition	NFPA 780-08 Edition
Typical Roof Types and Slopes	NFPA 780-04	NFPA 780-08
Rolling Sphere Depiction	NFPA 780-04	NFPA 780-08
Air Terminal Height	NFPA 780-04	NFPA 780-08
Air Terminal Locations	NFPA 780-04	NFPA 780-08
Grounding Electrodes	NFPA 780-04	NFPA 780-08
Annex L Risk Assessment	NFPA 780-04	NFPA 780-08

The air terminals (strike termination devices) of a lightning protection system are connected to a main conductor (also known as the primary conductor, down conductor, etc) which goes across the roof from air terminal to air terminal, then down to the grounding electrodes. The conductor which goes down to the grounding electrodes is commonly referred to as the 'down conductor' as it goes 'down' to the grounding electrodes, the 'down conductor' is the same conductor as the 'main conductor' and the 'primary conductor'. The lightning protection system is required by [NFPA 780, 4.13.1.1](#) to terminate at dedicated grounding electrodes.

From NFPA 780 (underlining is mine)

[4.13.1](#) *General*

4.13.1.1 Each down conductor shall terminate at a grounding electrode dedicated to the lightning protection system.

4.13.2 Ground Rods.

4.13.2.1 Ground rods shall be not less than 12.7 mm (1/2 in.) in diameter and 2.4 m (8 ft) long.

From the 5th Edition (2014) Florida Building Code, Residential

- (no similar requirement found*)

From the 5th Edition (2014) Florida Building Code, Building (underlining is mine)

○ *CHAPTER 4 SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY*

● *SECTION 449 HOSPITALS*

449.3.15 Lightning protection.

449.3.15.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Installation of Lightning Protection Systems.

● *SECTION 450 NURSING HOMES*

450.3.27 Lightning protection.

450.3.27.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Installation of Lightning Protection Systems.

● *SECTION 453 STATE REQUIREMENTS FOR EDUCATIONAL FACILITIES*

453.17.7 Lightning.

All facilities in high lightning risk areas shall be evaluated using the Risk Assessment Guide in NFPA 780 and other standards which address lightning protection, and shall be protected accordingly.

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The requirement in 453.17.7 that lightning risk be evaluated in accordance with NFPA 780, Annex L – Lightning Risk Assessment, makes that Annex L part of the code.

Given that Florida is the lightning capitol of the United States, see Figure L.2(a) in Annex L, and given that Section 453 addresses additional requirements for educational facilities, see L.1.1 in Annex L, the lightning risk is elevated, the result should be that lightning protection systems are required to be installed on educational facilities.

- **CHAPTER 35 REFERENCED STANDARDS**

NFPA National Fire Protection Association

780—04 Installation of Lighting Systems 449.3.15.1, 450.3.27.1

- * While there are no stated requirements for lightning protections system on buildings other than as specified in the Florida Building Code, Building, in sections 449, 450, and 453, the installation of any lightning protection system should be in compliance with the requirements for lightning protection systems as provided for in the aforementioned sections – there is no other method or mechanism for code approval of a lightning protection system installation – there is only one lightning protection system standard referenced by the code: NFPA 780.

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All contributors will be acknowledged and given credit for their contributions ... PLEASE help others by sharing the items, issues, and tips you have found in the field or during plan reviews.

I look forward to all contributions, and suggestions for future topics.

Respectfully submitted,



Jerry Peck

Editor/Publisher

Inspectors' Field Comments Newsletter©

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