

Proposed Code Modifications

**This document created by the Florida Department of Business and Professional Regulation -
850-487-1824**

WITH COMMENTS

TAC: Electrical

Total Mods for **Electrical** in **No Affirmative Recommendation with a Second**: 2

Total Mods for report: 8

Sub Code: Building

E6460

7

Date Submitted	11/6/2015	Section	2703	Proponent	Bryan Holland
Chapter	35	Affects HVHZ	No	Attachments	Yes
TAC Recommendation	No Affirmative Recommendation with a Second				
Commission Action	Pending Review				

Comments

General Comments	Yes	Alternate Language	No
-------------------------	-----	---------------------------	----

Related Modifications

Yes. See Modification #6458

Summary of Modification

This modification expands the requirements for the installation of lightning protection systems to certain commercial occupancies and provides exceptions to the new rule.

Rationale

Please see the attached file. The FBC currently requires lightning protection for three occupancies in Sections 449, 450, and 453. This modification would expand lightning protection requirements to other commercial occupancies where the calculated Risk Assessment determines a lightning protection system is needed. One- and two-family dwellings would be exempt. The attached substantiation clearly shows the need for lightning protection, especially in the state of Florida, to ensure the health, safety, and public welfare of the citizens of Florida.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This modification will have a slightly elevated impact to the local AHJ relative to enforcement of the code. This modification will increase the number of lightning protection system installations, thus resulting in increased permits, plan review, and inspection requirements.

Impact to building and property owners relative to cost of compliance with code

This modification will increase the cost of compliance. The average cost of a complete LPS is approximately 1% to 5% of total construction cost of the building. However, the cost of the LPS can be off-set as much as 80% by insurance deductions and rebates.

Impact to industry relative to the cost of compliance with code

This modification will increase the cost of compliance to the industry but will also increase the purchase of products and services to complete the LPS installation. This includes engineered documents, project materials, certifications, and permitting.

Impact to small business relative to the cost of compliance with code

The negative impact to small business would be cost of compliance to install an LPS. Small LPS and electrical contractors would benefit from this modification. Small business could also benefit from reduced insurance premiums, cost of repairs, and cost of downtime due to lightning.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification significantly enhances the health, safety, and welfare of the public. Florida is the lightning capital of the US and the citizens of this state would most benefit from expanding the current requirements for lightning protection.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification strengthens the code. Compliance with this modification will save persons and property from losses associated with lightning damage. This modification ensures the state of Florida remains a national leader when it comes to lightning safety.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code but rather enhances the effectiveness of the code by expanding current LPS requirements.

Is the proposed code modification part of a prior code version? No

2nd Comment Period

Proponent Bryan Holland **Submitted** 6/10/2016 **Attachments** Yes

Comment:

E6460-G4 The purpose of this general comment is to clarify the requirements of the proposed modification and to provide the information requested by the members of the TAC.
The members of the TAC requested additional information on performing a risk assessment, an installation cost study, and property insurance discounts or credits.
Please see the attached Comment Files.

1st Comment Period History

Proponent Thomas Lasprogato **Submitted** 2/3/2016 **Attachments** No

Comment:

E6460-G1 I SUPPORT

1st Comment Period History

Proponent Don Whitehead **Submitted** 2/3/2016 **Attachments** No

Comment:

E6460-G2 This change would not affect public schools, since it is the same as 453.17.7. It will bring other building types up to public educational facility standards.

1st Comment Period History

Proponent Vincent Della Croce **Submitted** 2/7/2016 **Attachments** No

Comment:

E6460-G3 Support

Section 2703 Lightning Protection

2703.1 Lightning Protection. A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, *Standard for the Installation of Lightning Protection Systems*.

2703.2 Where additions are constructed to existing building, the existing building's lightning protection system, if connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.

2703.3 Surge protection devices shall be installed for all normal and emergency electrical systems in accordance with NFPA 70, *National Electrical Code*.

Exceptions:

1. One- and two-family dwellings

2. Lightning protection shall not be required for any building or addition where shown unnecessary by evaluation using the *Risk Assessment Guide* in NFPA 780, *Standard for the Installation of Lightning Protection Systems* or an alternative method approved by the authority having jurisdiction.

2017 Triennial Second Comment Period – MOD #6460

The purpose of this general comment is to clarify the requirements of the proposed modification and to provide the information requested by the members of the TAC.

Section 2703.1 will require a lightning protection system to be installed on all new buildings and additions in accordance with the NFPA 780. It should be noted the Special Occupancy TAC has recommended the approval of MOD #6460 which will update the NFPA 780-2004 to the current NFPA-2014 edition. The FBC-B currently requires a lightning protection system on hospitals, nursing homes, and educational facilities. Section 2703.2 will require an existing lightning protection system to be inspected and brought into compliance with the current standards when connected to a new lightning protection system being installed on an addition to an existing building. Section 2703.3 will require the installation of surge protection devices on normal and emergency electrical systems in accordance with Article 285 of the NEC. Surge protection is a fundamental component of a complete lightning protection system. A similar requirement can be found in Section 449.3.15 and 450.3.27.3 of the FBC-B.

There are two proposed exceptions. Exception #1 will exempt one- and two-family dwellings. Exception #2 will exempt those buildings where an approved lightning risk assessment indicates a lightning protection system is not recommended or needed.

The members of the TAC requested additional information on performing a risk assessment, an installation cost study, and property insurance discounts or credits.

Risk Assessment: A risk assessment compares the likelihood of a building being struck by lightning versus the potential losses in life and property as a result of the lightning strike. A building's location, size, and height will determine its likelihood of being struck by lightning. A building's construction type, occupancy level, value of contents, and importance to the community or environment will determine the potential losses in life and property as a result of a lightning strike. Annex L of the NFPA 780 provides a simplified and detailed lightning risk assessment outline and worksheet. There are also several online risk assessment programs available to the public at no charge. These include:

- East Coast Lightning Equipment at <http://www.ecl.ebiz.com/riskcalculator/>
- Mr. Lightning at <http://mrlightning.com/risk.php>
- Maxwell Lightning Protection at <http://maxwell-lp.com/riskcalc.php>
- Alltec Global at <http://alltecglobal.com/resources/lightning-risk-assessment>

Installation Cost Study: Attached is a Lightning Protection Installation Cost Study, prepared by Michael Chusid, RA FCSI for East Coast Lightning Equipment, Inc. 2015-July. During the second quarter of 2015, lightning protection installers were asked to submit "bids" for installation of lightning protection on three hypothetical projects. Prices were to include installer's overhead and profit but not a general contractor's mark-up. The projects include a single-family residence, a low-rise building typical of educational, commercial, and industrial occupancies, and a five story building typical of many office buildings, healthcare, and similar occupancies. Responses were received from 21 installers that are

certified for lightning protection work by the Lightning Protection Institute. The distribution of respondent trade territories is shown on map according to US Census Regions. The distribution of respondents is similar to the frequency of lightning strikes; higher in Eastern and Southern states, least in the West.

Property Insurance Discounts / Credits: Attached are documents from three property insurance providers in the state of Florida clearly showing a discount or credit provided to policy holders with property protected by a lightning protection system. The three property insurers are:

- American International Group (AIG)
- Florida Family Insurance (FFI)
- ACE Limited / Chubb Insurance Group

The Insurance Institute for Business and Home Safety (IBHS), Insurance Information Institute (III), and the Federal Alliance For Safe Homes (FLASH) all recommend and support the installation of lightning protection systems.

There are three notable Lightning Protection Industry Associations that can provide guidance, resources, training, and education related to the installation of lightning protection systems. They are the Lightning Protection Institute (LPI), the United Lightning Protection Association (ULPA), and the Lightning Safety Alliance (LSA).

**CHUBB
PERSONAL
INSURANCE**

Superior Protection Credits:

- Security protection for the entire external perimeter of the house consisting of any one or more of the following:
 - Closed-circuit TV cameras monitored 24 hours a day
 - Detection system, external to the residence, which is motion activated and monitored 24 hours a day
 - 24 hour, on-site security guard
- Full time caretaker who lives at the residence year round
- 24 hour signal continuity protection for central station or direct fire and burglar alarm systems which activates the alarm when interrupted
- Sprinkler system water flow alarm which activates a central station or direct alarm
- Temperature monitoring system, to protect against freezing, which activates a central station alarm
- Permanently installed, electrical back-up generator
- Perimeter gate where vehicular and pedestrian access is limited to entrances controlled by locked or electronic gates
- Explosive gas leakage detector which activates a central station or direct fire alarm
- Automatic seismic shut-off valve to gas lines
- **Lightning protection system including lightning rods and lightning arrestors protecting the electrical wiring and all electronic devices of the entire house**
- Water leak detection system monitoring all areas containing plumbing devices and outlets
- Wildfire suppression system which is either manually activated, activated through the telephone, or automatically activated by a fire sensor

AIG Offers Credit on Your Homeowner's Insurance

Effective March 4, 2004, AIG Private Client Group will offer a 2% credit off your homeowner insurance policy base rate contingent upon the following:

Your home has a lightning protection system, with a U.L. Master Label, installed by a certified Lightning Protection Institute installer. The system must include lightning rods and lightning surge arresters to protect the electrical wiring and all electronic devices for the entire residence.

To receive the credit, print out this page, have it completed by a certified Master Installer or Master Installer Designer, in good standing with the Lightning Protection Institute (call the LPI office at 1-800-488-6864 for certified installers), and take it to your AIG agent for processing.

Customer Name on Policy

Address

City, State, Zip Code

AIG Policy Number

I, _____, certify that I am a Master Installer or Master Installer Designer, in good standing with the Lightning Protection Institute, and I installed a lightning protection system on the above residence, which included lightning rods and lightning surge arresters to protect the electrical wiring and electronic devices for the entire residence in accordance with the latest LPI-175, NFPA-780 and UL 96A Standards of Code. Attached is a copy of the U.L. Master Label received on this residence.

Signature

Date

Florida Family Insurance offers a number of policy discounts designed to help you lower your insurance cost:

Burglar and Fire Alarm

Provides a discount when the property is protected by burglar and fire alarms. A higher discount applies when the alarm is monitored by an alarm company.

Building Code Effectiveness Grades

Discounts apply if your property is located in a community that participates in the BCEG program, and was constructed after the community joined the program.

Lightning Surge Protection

A discount is available if you have a qualified, certified lightning protection system installed in your property.

Wind Mitigation

Provides credits for properties that have been built or updated to meet stronger building codes, such as the installation of approved storm shutters. A wind mitigation inspection may be required.

Hip Roof

Provides a discount for structures that have a roof shape where the ends and sides of the roof slope down to the wall.

Fire Sprinkler Systems

Provides additional credits if fire sprinklers are installed throughout the property.

Lightning Protection Installation Cost Study

Prepared by Michael Chusid, RA FCSI for East Coast Lightning Equipment, Inc.
2015-July

Background

Lightning accounts for about \$1 billion a year in homeowner's insurance claims for property damage. Lightning fires in non-residential properties cause an average of over \$100 million in direct property damage annually, not including damage due to electrical or equipment malfunctions, non-fire-related structural damage, or consequential damages. Additional risks include injury and death due to lightning strikes.¹

Fortunately, reliable lightning protection of buildings and structures is available. Data on the cost of installing lightning protection, however, has not been readily available. The purposes of this study, therefore, are 1) to understand the cost of installing lightning protection, and 2) to provide building owners and their architects, engineers, and risk management consultants with cost estimating guidelines for use during the planning and design phases of construction projects.

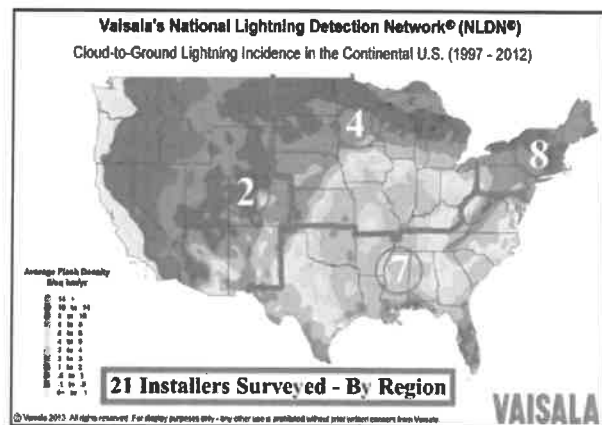
To prepare this study, East Coast Lightning Equipment, Inc. (www.ecle.biz) collected construction cost data from lightning protection installers throughout the US. The cost data, summarized below, confirms that lightning protection is economical and can be justified on a cost-to-benefit basis in at-risk buildings.

Methodology

During the second quarter of 2015, lightning protection installers were asked to submit "bids" for installation of lightning protection on three hypothetical projects. Prices were to include installer's overhead and profit but not a general contractor's mark-up. The projects include a single-family residence, a low-rise building typical of educational, commercial, and industrial occupancies, and a five story building typical of many office buildings, healthcare, and similar occupancies. See Appendix for survey instrument.

Responses were received from 21 installers that are certified for lightning protection work by the Lightning Protection Institute. The distribution of respondent trade territories is shown on map according to US Census Regions. The distribution of respondents is similar to the frequency of lightning strikes; higher in Eastern and Southern states, least in the West.

The results were tabulated by Michael Chusid, RA, FCSI, an independent construction consultant, www.chusid.com, and are summarized below.



¹ www.iii.org/fact-statistic/lightning, accessed 2015-06-03.

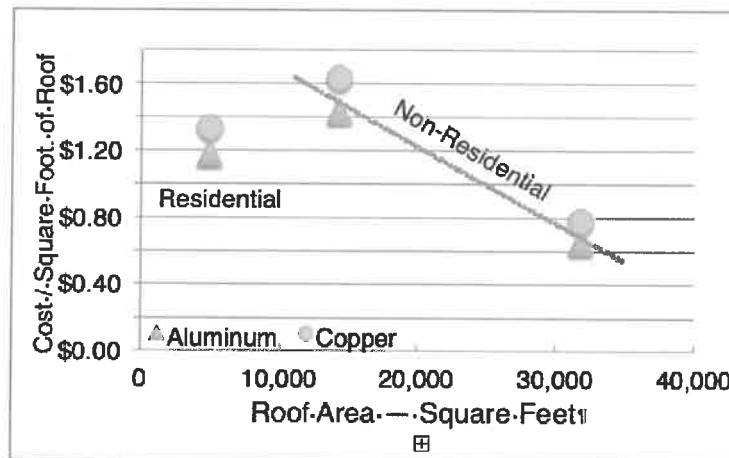
Lightning Protection Installation Cost Study

Key Findings

Lightning Protection Installation Cost Estimates						
	Residential Building		Low-Rise Building		5-story Building	
	Aluminum	Copper	Aluminum	Copper	Aluminum	Copper
Northeast						
\$/Sq.Ft. of Roof	\$1.56	\$1.58	\$0.74	\$0.89	\$1.75	\$1.89
\$/Sq.Ft. of Floor	\$0.94	\$0.95	\$0.54	\$0.65	\$0.35	\$0.38
South						
\$/Sq.Ft. of Roof	\$0.98	\$1.10	\$0.42	\$0.50	\$1.16	\$1.33
\$/Sq.Ft. of Floor	\$0.59	\$0.66	\$0.31	\$0.37	\$0.23	\$0.27
Midwest						
\$/Sq.Ft. of Roof	\$0.88	\$1.06	\$0.78	\$1.02	\$1.45	\$1.82
\$/Sq.Ft. of Floor	\$0.53	\$0.64	\$0.58	\$0.75	\$0.29	\$0.37
West						
\$/Sq.Ft. of Roof	\$1.60	\$1.77	\$0.88	\$1.04	\$1.46	\$1.61
\$/Sq.Ft. of Floor	\$0.96	\$1.06	\$0.65	\$0.76	\$0.29	\$0.32
National						
\$/Sq.Ft. of Roof	\$1.18	\$1.34	\$0.65	\$0.78	\$1.44	\$1.64
\$/Sq.Ft. of Floor	\$0.71	\$0.80	\$0.48	\$0.58	\$0.29	\$0.33

Cost of protecting sitework, such as trees, is not included.

Estimated Cost of Lightning Protection per Square Foot of Roof Area, National Averages



Lightning Protection Installation Cost Study

Analysis

General: Variations between regions are due to regional trade practices, wages and benefits, soil conditions governing the type of ground terminals used, and other factors. Variations within regions can also be significant, especially between urban and rural locations.

Copper lightning protection equipment is generally more expensive than aluminum due to commodity prices. There are also regional biases that favor one material over the other.

Nonresidential Buildings: In nonresidential buildings, roof area is the most significant factor in determining the work required to install lightning protection. Hence, multistory buildings will generally cost less per square foot of interior floor area.

Costs will generally be more in buildings with extensive roof top equipment and demanding architectural considerations; less in building with a modicum of rooftop equipment and a simple configuration.

Buildings over 75 feet in height (Class II) will incur additional expenses. These estimates do not apply to buildings that house explosives and other special occupancies.

Residential Buildings: In most homes with pitched roofs, air terminals need only be installed at the roof ridge, not the perimeter of the roof. This explains why lightning protection costs for the home in our study is below the trend line shown for non-residential construction.

Note, however features such as dormers, chimneys, balconies, skylights, rooftop equipment, and large flat areas can add to the cost.

How to Use

These cost estimates can be used in the early stages of planning or designing a project. Once the overall configuration of a building is determined, consultation with a qualified lightning protection designer or installer will yield a more accurate estimate and identify ways to improve protection while reducing costs.

These cost estimates are subject to change with time and can be adjusted using the *Engineering News Record* Construction Cost Indexes or other databases of historical construction costs. Lightning protection costs are also subject to fluctuations in raw material costs.

For Additional Information

Lightning Safety Alliance, www.LightningSafetyAlliance.org

Lightning Protection Institute, www.lightning.org

East Coast Lightning Equipment, Inc., www.ecle.biz, info@ecle.biz, +1 860-379-2046

© 2015, East Coast Lightning Equipment, Inc.

Lightning Protection Installation Cost Study

APPENDIX

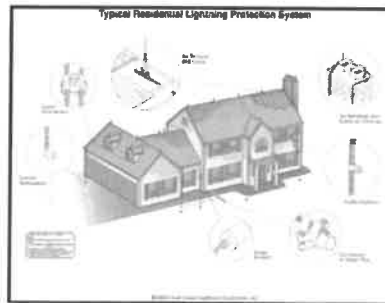
The following survey instrument was sent via e-mail to qualified lightning protection professionals.

ECLE requests your assistance in creating cost estimating guidelines that can be used by architects and engineers. Many designers ask us about the cost of installing lightning protection so they can include lightning protection in their project estimates. Your information will help them make better cost-to-benefit calculations that will, we believe, make it more likely for them to specify lightning protection. Please take a few minutes to look at the three buildings below then send us your price estimate to perform each of the installations.

Your data will be **confidential**. Michael Chusid, RA FCSI, a construction industry consultant, will compile regional and national averages and use the information to write articles for leading construction industry publications. We will send you a copy of his report as our thank you.

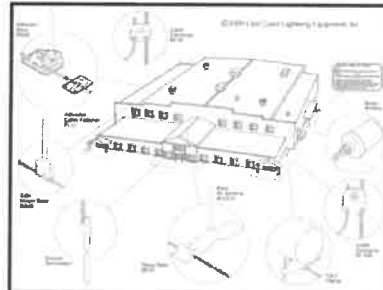
Residential Project

- Assume the following:
- Normal grounding conditions
- Concealed installation - new construction
- LPI or UL Certification Required
- Please price in copper and aluminum
- Price as you would to a GC or EC



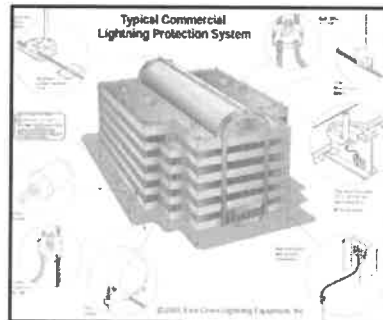
High School Project

- Assume the following:
- Normal grounding conditions
- Exposed installation - existing construction
- EPDM Roof
- LPI or UL Certification Required
- Please price in copper and aluminum
- Price as you would to a GC or EC



Government Office Building Project

- Assume the following:
- Normal grounding conditions
- Structural Steel to Ground installation
- New construction
- Built-Up Roof
- LPI or UL Certification Required
- Please price in copper and aluminum
- Price as you would to a GC or EC
- Click to download office dimensions



End of Document

Page 4

2017 FBC – Modification #6460

Substantiation:

1. According to the National Weather Service:
 - a. There are an average of 20 Million lightning strikes in the US each year
 - b. The average lightning strike delivers between 100 Million and 1 Billion volts of electricity
 - c. The average lightning strike delivers between 10,000 and 200,000 amperes of electricity.

2. According to the National Weather Service:
 - a. Between 1959 and 1993, 53.1% of all deaths in the state of Florida related to weather were due to lightning. This is more than drowning, tornadoes, hurricanes, wind and, cold combined.
 - b. During these same years, a total of 449 persons died in the state of Florida from lightning, another 1788 were injured. In comparison, the average number of deaths during this period nationwide is only 48.
 - c. The number of lightning deaths and injuries in the state of Florida outpaces every other state in the nation by 3:1.

3. According to the National Fire Protection Association:
 - a. There is an average of 70 to 100 thunderstorm days per year in the state of Florida. (National Weather Services)
 - b. There is an average of 8 to 14+ lightning strikes in the state of Florida for every square kilometer per year. (U.S. National Lightning Detection Network)

4. According to the National Lightning Safety Institute:
 - a. In 2008 alone, there were 246,200 insurance claims on residential structures in the US. Insured loses on residential properties exceed \$1 billion dollars annually. (Insurance Information Institute, NY, press release, 6/22/09)
 - b. Lightning is responsible for more than \$5 billion dollars in total insurance losses annually. (Hartford Insurance Co. – TMCNet Newsletter, Sept 14, 2006)
 - c. During 2002-2004, fire departments responded annually to about 31,000 fires caused by lightning with \$213,000,000 in direct property damage. (NFPA Report, January 2008)
 - d. Looking specifically at storage and processing facilities, lightning accounts for 61% of the accidents initiated by natural events. 16 out of 20 accidents involving petroleum products storage tanks were due to lightning strikes. (Journal of Hazardous Materials 40 (1995) 43-54)
 - e. 30% of U.S. businesses suffer damage from lightning storms. (Carnegie Mellon Report, 02/06)

- f. 30% of all power outages annually are lightning-related, on average, with a total cost of \$1 billion dollars. (Ralph Bernstein, EPRI; Diels, et al (1997))
5. According to the National Oceanic and Atmospheric Administration
 - a. The average cost of lightning-caused damages in the US is between \$5,000 and \$50,000. (Storm Data)
 - b. Between 1959 and 1994, there were 17 lightning losses of over \$5 million dollars. (Storm Data)
 - c. During these same years, 92 lightning losses exceed \$500,000 dollars.
6. According to the Factory Mutual System:
 - a. Lightning related private sector property damage costs for the 1990-1992 period averaged \$27 million annually.
 - b. Information compiled by the nation's fire chiefs indicate structural lightning losses at \$138.7 million as average over 1989-1993.
 - c. There were 20,000 lightning-caused residential annually during that same period.
 - d. During the period of 1973-1982, there were 2,926 lightning claims for a total cost of \$385 million dollars. Lost time from an idle workforce was not included therein.

Cost:

1. The average cost of a complete lightning protection system, including design, materials, installation, and maintenance is approximately 1% to 5% of total construction cost of the building.
2. The average cost to renovate a building with lightning protection after completion of construction is approximately 10 times that of a new building under construction.
3. The cost of the lightning protection system can be off-set as much as 80% by insurance deductions and rebates.
4. Lightning risk assessment calculations are readily available free online and take approximately 15 minutes to complete.

Enforcement:

1. Standard and reference materials are readily available. The NFPA 780 is already a referenced standard in the FBC and mandated by section 449, 450, and 453.
2. Underwriter's Laboratories offers lightning protection education for design professionals, installers, and enforcement officials. Systems installed under the provisions of NFPA 780 must be in compliance with UL96 and 96A.

3. UL has been testing and certifying lightning protection equipment since 1908. UL issues inspection certificates for systems by inspecting system components and checking completed installations. Installations are required to comply with UL's internationally recognized Standards for lightning protection systems.