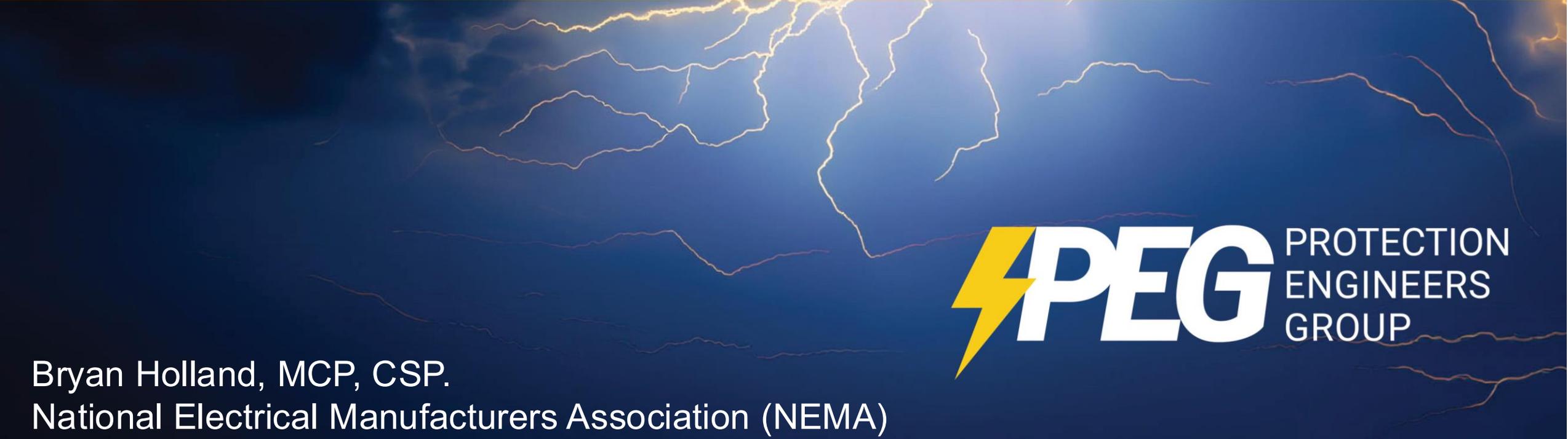




Lightning Protection Systems

Past, Present, and Future



Bryan Holland, MCP, CSP.
National Electrical Manufacturers Association (NEMA)

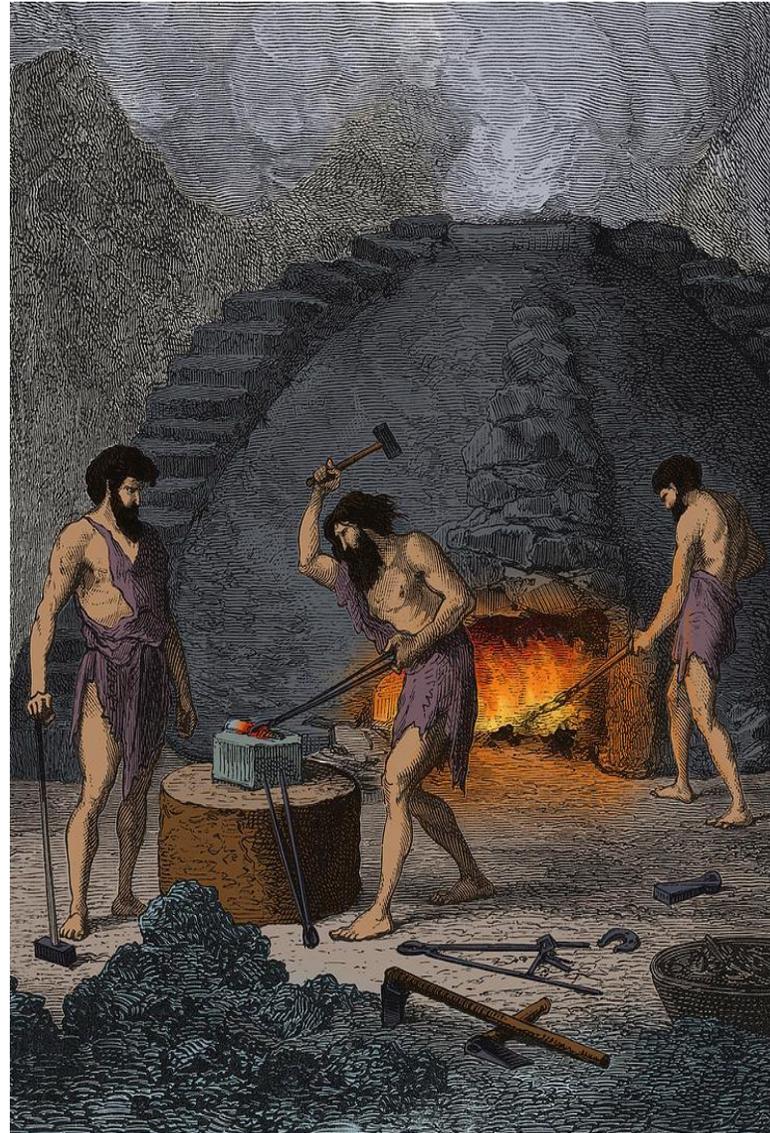
History of Lightning Protection



“You can’t possibly know where you are going, if you don’t know where you are, and where you have been”

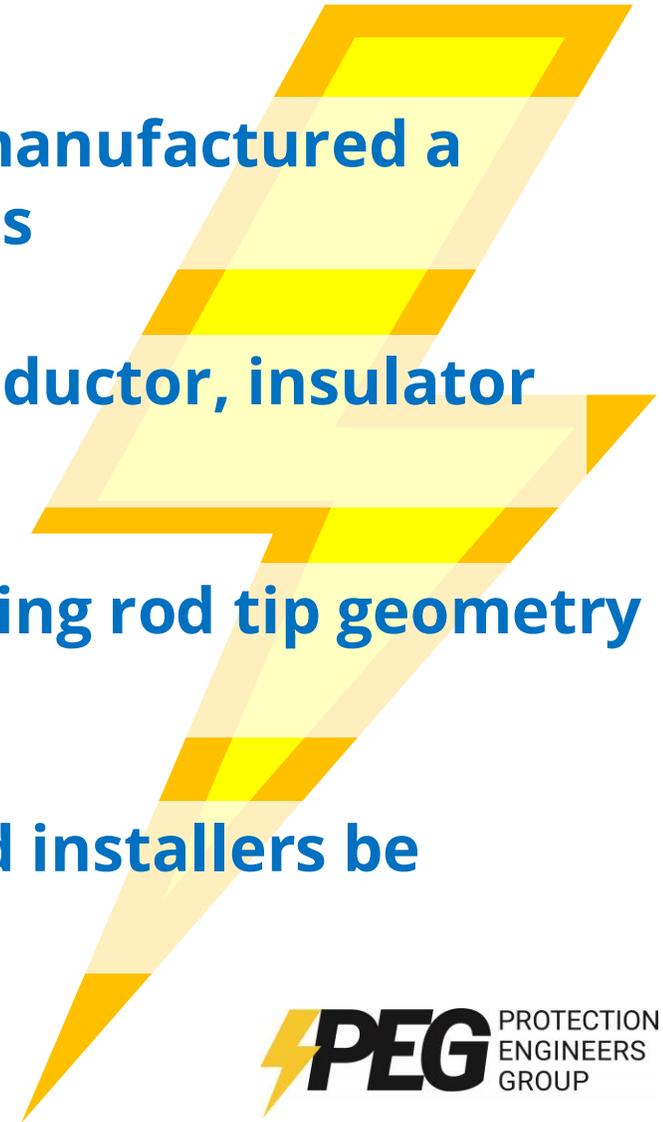
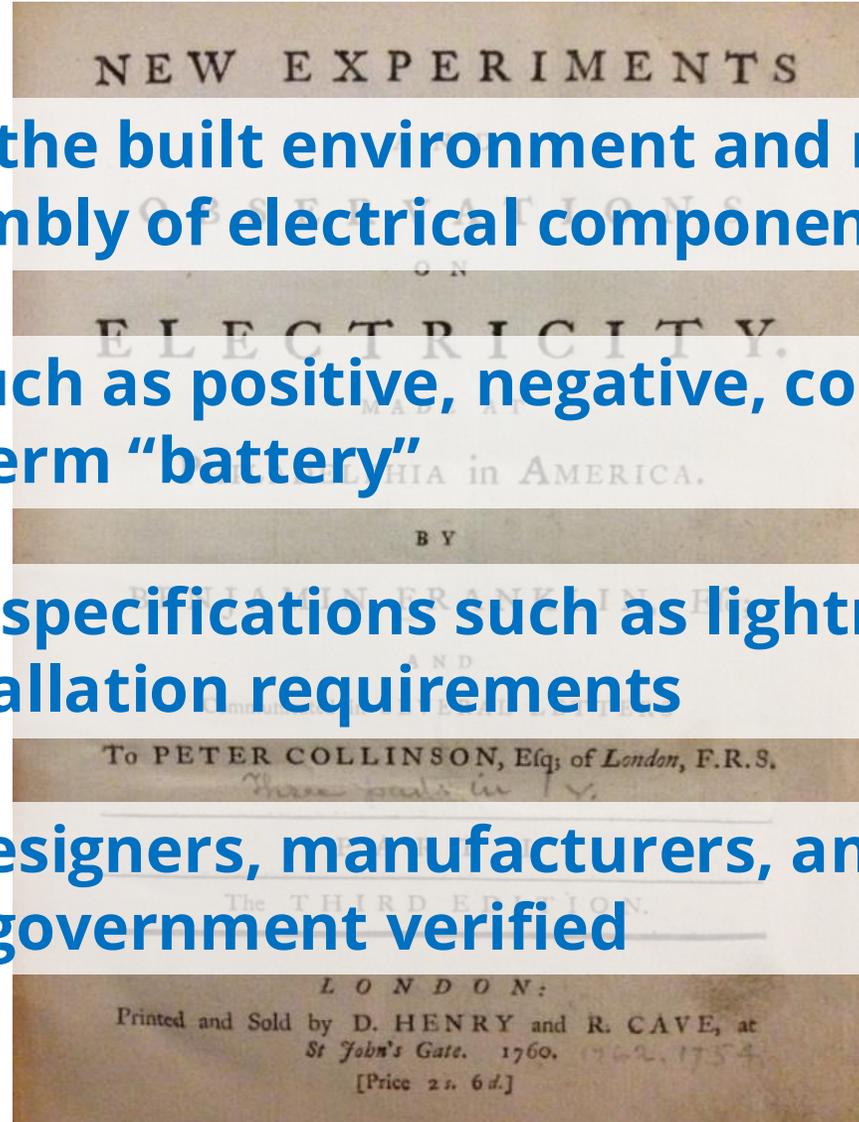
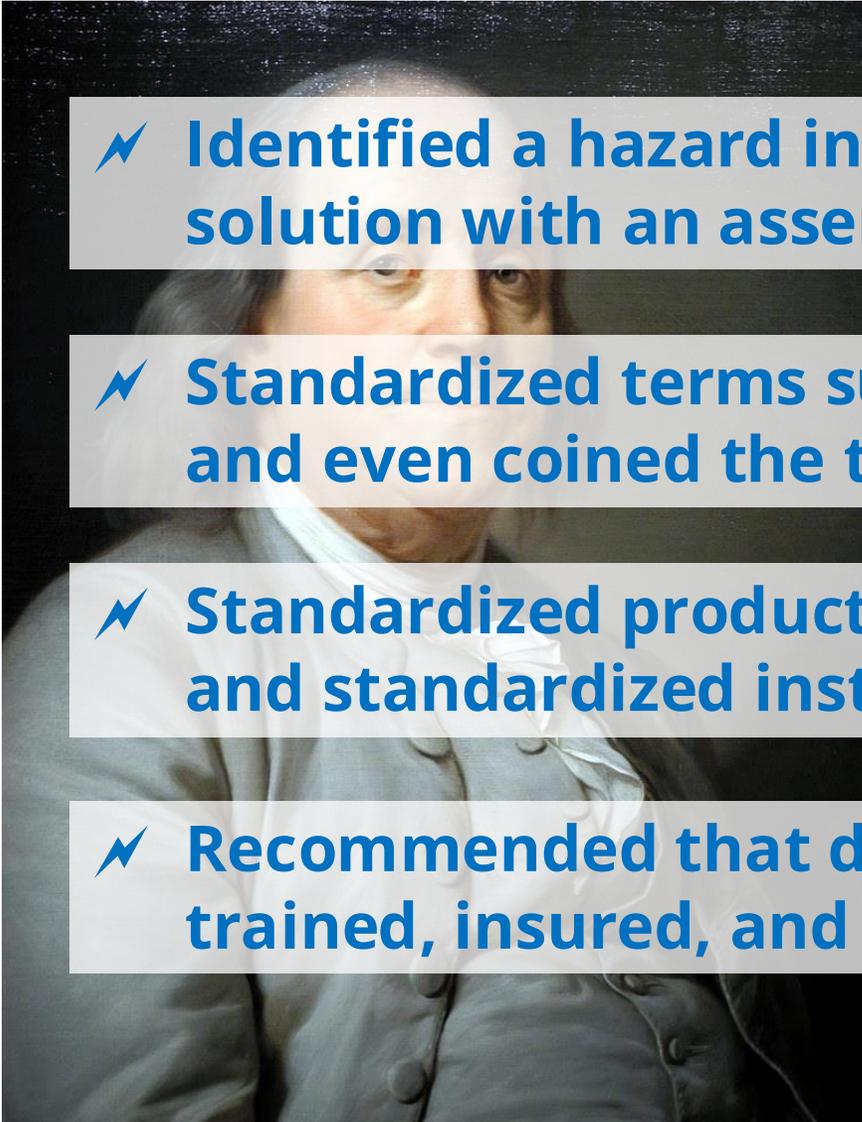
Benj. Franklin

History of Lightning Protection



History of Lightning Protection

- Identified a hazard in the built environment and manufactured a solution with an assembly of electrical components
- Standardized terms such as positive, negative, conductor, insulator and even coined the term “battery”
- Standardized product specifications such as lightning rod tip geometry and standardized installation requirements
- Recommended that designers, manufacturers, and installers be trained, insured, and government verified



History of Lightning Protection

SPECIFICATIONS FOR PROTECTION OF BUILDINGS AGAINST LIGHTNING.

Protection against lightning is advisable on isolated buildings, and on all buildings having tall chimneys, steeples, high peaked or gable roofs, or flag poles.

One "rod" with proper air and earth terminal is recommended per unit of roof area, as follows:

Pitched roofs of metal, 1 each 2,000 square feet of ground area.

Pitched roofs other than metal, 1 each 5,000 square feet of ground area.

Flat roofs of metal, 1 each 5,000 square feet of ground area.

Air terminals should never be more than 50 feet apart and each should be provided with its individual ground.

A low, broad building of greater area than 75x100 feet can best be protected by an additional rod through the center of the building.

The air terminal to be placed at the highest point of the roof or structure. Where there are two or more gables, or other projections above the roof, of nearly equal height, each to have an air terminal and all to be connected together.

Where trees stand so close to a building that branches overhang, or approach very close to the roof, a conductor with proper earth terminal to extend along the trunk of each tree to near the highest branch-top, fastened by a band around the branch or trunk, and equipped with a cluster of points.

⚡ **Benjamin Franklin (1749-1760)**

⚡ **Ships and Maritime Vessels (1830s)**

⚡ **Lightning Rod Conference (1878-1882)**

⚡ **NFPA Specifications for Protection of Buildings Against Lightning (1904)**

Origin and Development of NFPA 780

- ⚡ NFPA first adopted **Specifications for Protection of Buildings Against Lightning** in **1904**.
- ⚡ Commencing with the **1992** edition of the **Lightning Protection Code**, the NFPA numerical designation of the document was changed from NFPA 78 to NFPA 780.
- ⚡ With the issuance of the **1995** edition, the name of the document was changed from **Lightning Protection Code** to **Standard for the Installation of Lightning Protection Systems**.
- ⚡ **2026** edition was issued by the Standards Council on April 17, 2025, with an effective date of May 7, 2025, and supersedes all previous editions. This edition of NFPA 780 was approved as an American National Standard on May 7, 2025.

2026 Edition Development Stats

⚡ First Draft

- 132 Public Inputs | 86 First Revisions

⚡ Second Draft

- 38 Public Comments | 6 Second Revisions

⚡ NITMAM / CAM

- 22 NITMAMs withdrawn by submitter

⚡ TIA

- TIA 23-1 (TIA Log #1808)



First Draft Task Groups

- ⚡ TG1: Definitions
- ⚡ TG2: Surge Protection
- ⚡ TG3: Misc. Public Inputs
- ⚡ TG4: Chapter 4
- ⚡ TG5: Copper Clad Steel
- ⚡ TG6: Annexes
- ⚡ TG7: Chapter 7
- ⚡ TG8: Chapter 8
- ⚡ TG9: Annex N
- ⚡ TG10: Watercraft – Masts
- ⚡ TG11: Watercraft - ZoP

- ⚡ TG12: Inducing Potentials
- ⚡ TG13: Combustible/Flammable
- ⚡ TG14: Use of Piles
- ⚡ TG15: Class III Materials
- ⚡ TG16: Chapter 4
- ⚡ TG17: Termination Bracing
- ⚡ TG19: Copper Clad Steel
- ⚡ TG20: Inspection/Maintenance

***TGs 1-11: Pre-First Draft**

***TGs 12-20: Post-First Draft**

Second Draft Task Groups

- ⚡ TG1: Definitions
- ⚡ TG2: Surge Protection
- ⚡ TG3: Misc. Public Inputs
- ⚡ TG4: Chapter 4
- ⚡ TG5: Copper Clad Steel
- ⚡ TG6: Annexes
- ⚡ TG7: Chapter 7
- ⚡ TG8: Chapter 8
- ⚡ TG9: Annex N
- ⚡ TG10: Watercraft – Masts
- ⚡ TG11: Watercraft - ZoP

- ⚡ TG12: Inducing Potentials
- ⚡ TG13: Combustible/Flammable
- ⚡ TG14: Use of Piles
- ⚡ TG15: Class III Materials
- ⚡ TG16: Chapter 4
- ⚡ TG17: Termination Bracing
- ⚡ TG19: Copper Clad Steel
- ⚡ TG20: Inspection/Maintenance



NFPA 780-26 Edition Code Improvements



Chapter 1 - Administration

⚡ FR-47 to 1.7

1.7 Periodic Inspection.

~~Periodic inspections~~ Inspections or testing for compliance to this standard shall be ~~done~~ conducted annually or at intervals determined by the authority having jurisdiction.

Chapter 3 - Definitions

⚡ FR-41 to 3.3.8

3.3.8* Conductive.

Any material that has an electrical relaxation time constant **less** than 100 ns.

⚡ FR-81 to 3.3.34

3.3.34* Nonconductive.

Any material that has an electrical relaxation time constant **greater** than 100 ms.

*See A.3.3.8 for “Explanatory Material”

Chapter 4 – General Requirements

⚡ **FR-29 to 4.19.2.14 (FR-32 to 4.19.3.9 for surge arresters)**

4.19.2.14

SPDs shall be installed such that they are accessible for inspection and maintenance. (FR-26 deleted 4.19.2.11)

⚡ **FR-30 to 4.19.2.15**

4.19.2.15 Indicating.

An SPD shall provide visual indication that it is functioning properly.

5.10 Outdoor Athletic Scoreboards

⚡ FR-49 to 5.10

5.10.1

Outdoor athletic scoreboards shall be protected in accordance with Chapter 4.

5.10.2

Surge protection shall be provided for all circuits entering or exiting outdoor scoreboards in accordance with Section 4.19.

L.5.3 Critical Facilities

⚡ FR-70 to L.5.3

L.5.3.1 lists (11) critical facilities (risk category III and IV buildings)

L.5.3.2 states that “critical facilities should have a lightning protection system installed in compliance with this standard or have a detailed risk assessment conducted in accordance with Section L.6.”

(NEMA Proposal G150 to 2027 IBC)

TIA 23-1 (TIA Log #1808)

⚡ TIA 23-1 (TIA Log #1808) to 1.8.1, Table 4.1.1.1.1, Table 4.1.1.1.2, 4.18.3.3, and 4.18.3.4(new)

Normally, units of measurement are a minimum value, and no standard deviations are permitted (1.8.1)

The standard will now permit a tolerance of **-4%** for air terminals (Table 4.1.1.1.1, Table 4.1.1.1.2, 4.18.3.3, and 4.18.3.4)

25-4-8 NFPA 780	The Council voted to issue proposed Tentative Interim Amendment No. 1808 to revise section 1.8.1, Table 4.1.1.1.1, Table 4.1.1.1.2, paragraphs 4.18.3.3, and 4.18.3.4(new) of the 2023 edition of NFPA 780, <i>Standard for the Installation of Lightning Protection Systems</i> . The TIA achieved the necessary support of the Technical Committee on technical merit and emergency nature when balloted prior to submission to the Standards Council.
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Standard Development Summary

- ⚡ Lightning protection was the first practical electrical system in the history of society – 275+ years ago!
- ⚡ NFPA 780 has been in development since 1904!
- ⚡ 2026 edition is the first to recommend protection for buildings beyond just risk assessment.
- ⚡ 2024 IBC edition was the first to require LPS comply with NFPA 780. (2021 IFC requires NFPA 780 compliant LPS for structures containing barrel storage of distilled spirits and wines)

Hot-Topics and Elephants in the Room

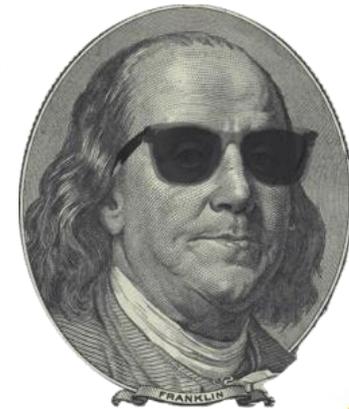
- ⚡ Enhanced corrosion protection
- ⚡ Copper-clad steel conductor use
- ⚡ Improving risk assessment criteria
- ⚡ Non-conventional LPS (ESE / CDS / DAS / CVM)

The Future of Lightning Protection Systems

- ⚡ Impact of a connected, digital, & automated built environment
- ⚡ Impact of distributed energy resources
- ⚡ Impact of machine learning and AI

Final Thoughts and Questions

- ⚡ Why isn't lightning protection a fundamental design consideration for every building and structure?
- ⚡ Should NFPA 780 include installation mandates?
- ⚡ None of this matters if the next generations are not inspired – be a mentor and educate the youth!
- ⚡ Benjamin Franklin was one cool dude!



Electrical Safety Foundation International

SAFETY Enlightenment

Lightning MYTHS & Shocking FACTS:

MYTH
If it's not raining or cloudy, you're safe from lightning.

FACT
If you can hear thunder, lightning is nearby. Lightning often strikes over **10 miles** from the center of a thunderstorm.

MYTH
In the event of a lightning strike, the rubber in a car's tires protect occupants from being harmed.

FACT
Lightning travels at about 220,000,000 mph and will have exited the body by the time you approach. Check for a pulse and render first aid if possible. **Call 911 immediately.**

MYTH
A lightning strike victim carries a charge and should not be touched.

FACT
If struck, it is the **metal frame** of the car that provides protection. The charge travels through the frame and into the ground without harming occupants if they avoid touching anything that conducts a charge.

PROTECT YOURSELF

30 Use the **30/30 rule**: When you see lightning, count until you hear thunder. If that time is **30 seconds** or less, the thunderstorm is within six miles of you and is dangerous. Immediately seek shelter indoors or in a hardtop vehicle and remain until you have not heard thunder for **30 minutes**.

Don't touch concrete surfaces, including those in a basement or garage. Lightning can travel through the metal wires in concrete walls and flooring.

Stay off corded phones and plugged in electronics.

Avoid plumbing and water, including bathing or doing laundry.

Never seek shelter under trees, poles or other tall structures as they are more likely to be struck by lightning.

PROTECT YOUR PROPERTY

Unplug appliances and other electrical items, such as computers and televisions, to prevent damage from surges caused by lightning strikes.

Surge protection can help prevent damage to your electronics. There are two types of surge protection:

Point-Of-Use Surge Protection: Protects only the items that are directly plugged into the device from most electrical surges.

"Whole Home" Surge Protection: Located at your main electrical panel or the base of the electric meter, this device provides protection for your entire electrical system.

However, neither type can safeguard against a direct lightning strike. If you live in an area prone to lightning, consider a lightning protection system.

ESFi For additional severe weather resources please visit www.esfi.org

www.facebook.com/ESFI.org www.twitter.com/ESFIdotorg www.youtube.com/ESFIdotorg

LIGHTNING PROTECTION PREVENTING A DIRECT STRIKE

In the first quarter of 2017 alone, thunderstorms caused a record **\$5.7 billion** in losses, and lightning kills an average of **30 people a year**. Learn how to keep you, your family, and property safe from lightning.

▶ LIGHTNING IS DEADLY

22,600 According to Aon Benfield's Impact Forecasting, **insured losses** from lightning strikes are at an **all-time high**.

An average of 22,600 fires were caused by lightning between 2007 and 2011.

Year	Losses (Billions of Dollars)
2010	0.1b
2011	0.8b
2012	3.6b
2013	2.1b
2014	0.8b
2015	0.1b
2016	5.1b
2017	5.7b

▶ LIGHTNING IS FAR REACHING

1/3 of all lightning related injuries occur indoors – stay away from:

- Corded phones
- Electronics
- Plumbing

10 Lightning can strike **10 miles** from a thunderstorm.

Lightning can strike **anywhere**, not just the tallest objects.

According to the Lightning Protection Institute, the top 5 states most often **struck by lightning** are:

- Florida: **25.3** strikes per sq. mile
- Louisiana: **20.3** strikes per sq. mile
- Mississippi: **18.0** strikes per sq. mile
- Alabama: **15.9** strikes per sq. mile
- South Carolina: **14.6** strikes per sq. mile

Oklahoma (tied)

▶ LIGHTNING PROTECTION

Power surges caused by lightning can damage the electronics in your home.

Lightning protection systems **intercept lightning strikes** and provide a grounding path for dangerous electricity to **discharge safely**, leaving occupants and homes safe from harm.

Panel box surge protective devices (SPDs) serve as the **first line of defense** against harmful home electrical surges, limiting voltages by diverting currents at the electrical service entrance. Only a **qualified electrician** should install SPDs.

Protects electronics plugged into the device from surges, must be **replaced** over time or after a major surge event.

Power strips **DO NOT** provide surge protection.

No surge device can handle a **direct lightning strike**. Unplug sensitive electronics **WELL** before a storm to prevent damage.

ESFi Please share this free resource to save lives

www.facebook.com/ESFI.org www.twitter.com/ESFIdotorg www.youtube.com/ESFIdotorg

National Lightning Safety Awareness Week

June 21 - 27, 2026

National Lightning Safety Awareness week was started in 2001 to call attention to this underrated killer. Since then, U.S. lightning fatalities have dropped from about 55 per year to about 20. This reduction in fatalities is believed to be largely due to greater awareness of the lightning danger, and people seeking safety when thunderstorms threaten. During National Lightning Safety Awareness Week, we encourage you to learn more about lightning and lightning safety.

Here are some topics and links to help you become more informed during the week.

Sunday: An Introduction to Lightning Safety

Monday: The Science of Lightning and Thunder

Tuesday: Lightning Safety Outdoors

Wednesday: Lightning Safety Indoors

Thursday: Lightning Safety and Sports Activities

Friday: Medical Effects on Lightning Victims

Saturday: Protecting Your Home from Lightning





Lightning Protection Systems

Past, Present, and Future



THANK YOU FOR ATTENDING!



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National Electrical Manufacturers Association (NEMA)