

# THE NUTS AND BOLTS OF LIGHTNING PROTECTION

Things you ought to know,  
but might not have thought to ask.

Lightning is a dangerous and destructive weather hazard. It's also the peril that affects people, property and places in nearly every region of the U.S. The good news? Effective and affordable protection can be provided when a structure is equipped with a safety standard compliant lightning protection system.

## Q. Why do structures need lightning protection?

**A.** The earth experiences 100 lightning flashes per second and the U.S. experiences as much as 40 million strikes each year. Thunderstorms occur virtually everywhere and that puts just about any type of structure at risk to lightning damage. Lightning routinely strikes in low lying areas of the world, as well as in higher elevations which is why lightning is considered the weather hazard "most commonly experienced by most people in the world." Unlike most other weather hazards, lightning is a preventable risk which is why protection systems are part of the structural design of many homes, commercial buildings, and public facilities worldwide. In a climate where risk reduction is so important, systems are routinely specified for industrial parks, manufacturing plants, churches, schools, banking centers, hospitals, military installation, historical landmarks, emergency centers, sporting complexes, correctional facilities, corporate centers, chemical plants, oil refineries, nuclear plants, and many more structures.

## Q. What is a lightning protection system and how does it work?

**A.** The highly conductive copper and aluminum materials used in a lightning protection system provide a low resistance path to safely ground lightning's dangerous and destructive electricity. These materials and components are specially manufactured for lightning protection. When a lightning protection grounding network is in place, the strike is intercepted and directed to ground without impact to the structure, occupants or contents. A lightning protection system that meets national safety standards includes: strike termination devices, down conductors, bonding, grounding, and surge protection. Failure to follow the standards or use of non-standard materials or methods can result in inadequate protection.

## Q. Don't lightning rods just attract lightning?

**A.** No. This is a common misconception about lightning protection. When employed as part of a complete lightning protection systems, lightning rods also known as "strike termination devices" or "air terminals" simply intercept a lightning strike



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and provide a safe and effective path that takes lightning's harmful electricity to ground. Lightning will strike a location whether there is lightning protection in place or not. When a system is in place it provides a preferential low resistance path for lightning from its intercept location to a ground destination. A lightning protection system directs lightning's harmful current to ground, instead of it traveling through a building's plumbing or electrical system. It's helpful to remember that lightning travels several miles to reach the earth. Small metal components on a rooftop have no influence on controlling the path lightning takes through the air.

## Q. So, does lightning protection prevent lightning from striking?

**A.** Nothing can prevent lightning from striking. If lightning is zeroed in on a particular object it will strike regardless of any device or mechanism on the ground. The purpose of a lightning protection system is to intercept the lightning strike and dissipate it safely into the ground. In a system, the strike termination devices (rods) are placed at regular intervals on the highest and most exposed parts of a structure. The strike termination devices become the most likely point of contact for the lightning streamer attachment, as they represent the quickest path to ground. A lightning protection system doesn't attract, repel or prevent a lightning strike; rather a system provides an efficient grounding network that provides a low-resistance path to ground for lightning's electricity.

## Q. Isn't a whole house surge arrester enough protection?

**A.** No. Surge protection is only one element of a complete lightning protection system. Lightning is the rapid discharge of atmospheric electricity that can pack up to 200 kA of electric energy. A lightning strike to an unprotected structure can be disastrous and a single incident can cost thousands of dollars, with losses ranging from damage to expensive electronics to fires that destroy entire buildings. No surge protection device or "whole-

house" arrester alone can protect a structure from a direct strike packing mega electricity. A grounding network for lightning (lightning protection system) must be implemented to provide structural protection. A complete system includes: strike termination devices, conductors, ground terminals, interconnecting bonding to minimize side-flashing AND surge protection devices for incoming power, data and communication lines to prevent harmful electrical surges. Surge protection + the grounding network = a complete lightning protection system.

## Q. Are there lightning protection requirements?

**A.** While lightning protection is routinely specified, guidelines for requirements can vary. It's imperative that lightning protection systems comply with NFPA 780, the nationally-recognized safety standard for lightning protection design and installation. NFPA 780 is the principle lightning protection Standard in the U.S. and a primary implementing document for the IEC 62305 (International Electrotechnical Commission) series of documents. NFPA 780 also provides the foundation for numerous specialized lightning protection documents such as the DoD, DoE, NASA and the FAA. Prior to the development of the IEC series, NFPA 780 was routinely referenced and used worldwide.

## Q. My electrician says my structure is already "grounded" so why do I need lightning protection?

**A.** The electrical ground installed by your electrician is there to protect the internal workings of the electrical system in your building to accommodate everyday electricity usage. The electrical ground is not designed to handle the mega electricity (100 million volts of power or 200 kA of electrical energy) that a typical lightning strike can pack.



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## **Q. Aren't steel buildings already grounded and safe from lightning?**

**A.** While a building's structural steel will conduct lightning, bonding, interconnection and grounding provided by a lightning protection system is needed to dissipate lightning's harmful electricity safely to ground. Arcing, side-flashing and potential differences can occur without the continuous preferred path to ground provided by the lightning protection system. Without the presence of the system, lightning can fight its way through mechanical, electrical, communication and HVAC systems—none of which are designed to provide a safe path to ground for lightning. A complete lightning protection system is needed to interconnect structural steel and grounded systems at grade level and roof level to equalize potential and keep the lightning on a preferred path to ground.

## **Q. Why does the lightning protection system need to be connected to gas and water pipe systems? Doesn't that pose a safety concern?**

**A.** Common bonding connections are needed to eliminate safety concerns. Since lightning is traveling through the soil, it can be picked up on service lines in the ground, such as underground conduits, water pipes or gas lines, and feed a portion of the harmful lightning along these systems back into a structure. The lightning protection Standards require the lightning protection system to be commonly connected to all underground piping systems that enter the structure. These include gas piping, water piping, conduits, etc. The bonding does not introduce lightning charges into your gas and water pipes, but rather routes the charges away from the pipes to bring all grounded systems to the same electrical potential as the lightning protection system ground. The gas and water piping are not substituted for the ground, rather the connection is to provide common ground potential, reducing the risk of side-flash or arcing during a lightning event.

## **Q. What does a lightning protection system cost? Is it expensive?**

**A.** It's difficult to give an exact cost for a lightning protection, as a system is not a "one size fits all" safety measure. Generally, lightning protection is an affordable amenity that offers protection against a leading cause of property damage. While pricing often runs less than 1% of the value of the structure, costs for protection vary depending on the size of the structure, location, construction, roof type and grounding conditions. As a rule of thumb, lightning protection is typically less expensive than other building systems and amenities like security, plumbing, generators and specialty lighting fixtures. A LPI-certified specialist can provide helpful pricing information for your project and region.

## **Q. Will my insurance company provide a discount for my home lightning protection?**

**A.** Insurance companies in most states offer premium credits for security systems, fire alarms, residential sprinkler systems, permanently installed back-up generators and other protective measures for the entire perimeter of the home. Lightning protection systems are generally recognized as "protection for the entire external perimeter" and as such, are often considered for credits. Homeowners interested in securing an insurance credit or discount for their lightning protection system installation should check with their provider. Policies about lightning protection discounts vary by insurance company. Since some providers don't have set policies regarding credits or incentives, the homeowner should contact their agent or broker for assistance in determining their eligibility for a discount.



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## Q. When is the best time to have the lightning protection system installed?

**A.** Lightning protection can be installed for existing structures and new construction, as options are available to incorporate installation at just about any phase of construction. However, lightning protection that is specified during the planning and design phase may provide the most options for concealing components and materials. Early planning can also allow for better coordination of work with other trades. This coordination can be beneficial when making provisions for chases for interior conductor runs, ground locations and use of compatible roofing components and adhesives. LPI-certified specialists can provide design, specification, consultation and installation services to develop a plan that best fits your project needs.

## Q. Who should install lightning protection systems?

**A.** Lightning protection is not a do-it-yourself project. Only experienced and reputable LPI-certified lightning protection contractors should install lightning protection systems. Qualified specialists use materials and methods of installation that comply with NFPA 780, the nationally-recognized safety standard for lightning protection design and installation.

## Q. Why can't my roofer or electrician take care of my lightning protection?

**A.** Lightning protection does not fall under the expertise of most electricians. Lightning protection system design and installation follow NFPA safety standard guidelines, which are separate from the National Electric Code that electricians are trained on. Lightning protection work should be performed by a lightning protection specialty contractor certified by LPI.

## Q. Is maintenance needed for lightning protection?

**A.** Once your lightning protection system has been installed, it's important to take measures to ensure the system remains safe and effective. Industry lightning protection safety standards recommend periodic inspection of lightning protection systems to ensure safety, system continuity and proper maintenance. A maintenance inspection is especially important if modifications to your structure have occurred, including: renovations to roof, electrical system updates, satellite dish installations or HVAC alterations. Maintenance may also be needed if cable T.V. or telephone systems have been serviced in recent years. LPI-certified specialists can advise regarding maintenance plans and industry requirements to ensure the continued performance of your lightning protection system.

## Q. Will lightning protection detract from the looks of my structure?

**A.** Not to worry! Entrusting your lightning protection system design and installation to a LPI-certified professional ensures a safe and effective system that won't compromise aesthetics. In most situations, lightning protection systems are neat and inconspicuous. When properly installed, components such as strike termination devices, conductors and grounding are barely visible to the untrained eye. There are a number of design and installation measures that can be employed to make lightning protection even less noticeable. Contracting with an LPI-certified professional will ensure attention to detail is met for every structure and roof type.



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## Q. What about third-party lightning protection inspection for quality assurance?

**A.** The Lightning Protection Institute Inspection Program (LPI-IP) is the most comprehensive service and the industry's quality assurance benchmark for independent third-party lightning protection system inspection and certification. Since 2010, LPI-IP spans the full spectrum of national standards. Its leadership team and inspectors are experts in the discipline, combining to deliver inspection, certification, specification, design consulting and review, interpretation and other services to meet the needs of property owners, architects, engineers, general contractors and homeowners. For more information, visit [www.lpi-ip.com](http://www.lpi-ip.com).

## Q. Why are LPI credentials important for lightning protection?

**A.** Lightning Protection Institute (LPI-certified) specialists are dedicated to ensuring that today's lightning protection systems provide the best possible quality in both materials and installation practices for maximum safety. LPI's testing and Certification program was created in 1971 by the industry to qualify competence in lightning protection. The program responds to the needs of government agencies, architectural and engineering firms and insurance underwriters to certify excellence in system design, installation and inspection.

## Benefits of LPI Certification

- LPI-certified installers must successfully pass the industry's most comprehensive testing requirements to receive certification.
- Yearly recertification is required for Master Installers and Master Installer/Designers.
- Certification assures that national safety Standards of NFPA 780 and LPI 175 are met.
- Certified installers and designers possess up-to-date knowledge of changes in safety standards and scientific findings in the industry.
- Certified installers and designers possess experience in a highly specialized trade
- to ensure competence in system design, installation, inspection and maintenance.
- Certified installers know the best methods and materials to ensure attention to quality and aesthetics.
- Certification is voluntary within the industry, which means your LPI-certified specialist holds himself/herself to a stringent standard by electing to pursue the highest level of education and excellence in lightning protection.
- Contracting with a LPI-certified specialist saves you time and money.

