

Your Church, July/August 2007

Lightning Protection

Lightning does strike—but it doesn't have to destroy.

by Thomas G. Dolan

Lightning is the leading cause of church fires (30 percent) in the U.S. (Insurance Information Institute).

Lightning is the most dangerous and frequently encountered weather hazard that most people experience each year (National Severe Storm Laboratory).

Lightning causes more than one billion dollars annually in structural damage to buildings in the U.S. (Underwriter's Laboratory).

Located at the top of a prominent hill in Port Washington, Wisconsin, the Friedens Evangelical Free Church has seen countless thunderstorms since its founding more than 150 years ago. The church had been struck by lightning several times over the decades, never receiving more than minor damage. On the evening of July 8, 2002, lightning struck again. "We're not positive of the time," says Senior Pastor Mark Voll. "But the hands on the old clock were stopped at 10:10 P.M."

Lightning is a powerful force—a single bolt can carry over 30 million volts of electricity. It has enough power to rip through roofs and explode walls of brick and concrete. But lightning causes the most property damage by its ability to ignite fires.

For Friedens Evangelical Free Church, the lateness of the hour on July 2 meant no one was in the church, so there were no injuries. But there was also no one to notice the start of the fire.

Fifty-five firefighters from Port Washington and the surrounding towns battled to put the fire out. It was under control in about a half an hour, but the sanctuary was considered a total loss. Firemen had to break a number of historical stained glass windows, and the heat of the fire melted the pipes on the church's 1914 organ. Damage amounted to 1.2 million dollars.

The Facts About Lightning

Lightning is the visible discharge of static electricity within a cloud, between clouds, or between a cloud and the earth. Scientists still don't fully understand the cause, but most believe that different kinds of ice interact in a cloud causing positive charges to move up while negative charges move down. The separation of charges eventually leads to a major electrical discharge. Buildings and lives are at risk when the discharge occurs between a cloud and the ground.

The job of a lightning protection system is to allow the electrical discharge to occur without causing damage to a building or injury to people. The system neither attracts nor repels a lightning strike—it is designed to receive the strike and route it harmlessly into the earth.

Just how vulnerable a particular structure is to lightning strikes depends on the nature of the structure relative to other structures around it, and the surrounding geography. For instance, a church on a lone hill with an upward thrusting steeple is

much more of a target than the same size church in a city surrounded by 20-story buildings. Likewise, if the same church is located in a rural area and is surrounded by much higher trees, the trees will be more likely to take the bolt.

Richard Roux, senior electrical engineer at the National Fire Protection Association (NFPA) in Quincy, Massachusetts, says lightning can strike anywhere on earth, even the North and South Poles. But in any particular geographical location in the United States, lightning storms can occur as few as five times or as many as 100 times per year. "Places like Montana, Iowa, or Idaho are not that bad," Roux says. "Much more vulnerable are the entire Gulf Coast area and Florida, as well as all the way up the East Coast to New Jersey."

The *NFPA 780 Lightning Protection Code* provides a risk assessment guide for determining lightning loss potential for all types of structures. This guide takes into consideration the type of structure, type of construction, structure location, topography, occupancy, building contents, and lightning frequency.

Protection: All Or Nothing

Bud VanSickle, executive director of the Lightning Protection Institute in Maryville, Missouri, says you either have a full lightning protection system or none at all. Unlike most products, there is no such thing as a "good, better, or best" lightning protection system. You simply cannot cut corners to save cost and remain protected.

The *NFPA 780 Lightning Protection Code* provides standards for system design and installation. Because every situation is unique, there is no such thing as an "off-the-shelf" solution. The NFPA 780 code gives system designers and installers the guidance they need to create effective solutions for every situation.

Even though every situation requires a customized solution, VanSickle provides a way to make a pretty good cost estimate. For a large commercial building, the cost of a lightning protection system can be estimated at about one percent of the cost of the building's electrical system. For a residential building, the system will cost about one percent of the building's total construction costs. A system for a large commercial building costs more than a residential system, but it represents a lower percentage of the building budget.

A small, neighborhood church would be similar to a residential building, while a large church building will be closer to a commercial building. So the cost for a lightning protection system for many churches would be somewhere between the two benchmarks.

System Components

As a reminder, a lightning protection system does not attract or repel lightning. Instead, it creates a safe path for an electrical discharge that might otherwise flow through or near the building. A properly designed and installed system can be very effective at protecting the building and its occupants.

An effective lightning protection system has five basic components:

1. Air terminals
2. Cable conductors
3. Ground rods
4. Bonding points
5. Surge arrestors

bonded to a network of conductive cables. The air terminals and cable network can often be installed in ways that are not easily seen from around the building. The entire system is then "grounded" through conductive rods that are driven deep into the soil. Metal components inside the building, such as plumbing, electrical wiring, and steel framework, are likewise grounded.

Finally, surge arrestors are placed on all incoming power and communication lines. A lightning strike could send a voltage spike through these lines into the building causing extensive electrical damage and even fires. Surge arrestors route most of that energy to the ground, protecting the building and the electrical systems inside it. Expensive electronic and communication devices should also be plugged into high-quality surge protection devices inside the building.

Some states, like Florida, require a lightning protection system for new buildings. Specifying and installing a system is a job for qualified professionals only. If you need or choose to install a system, insist on working only with lightning protection contractors that are certified through a recognized third-party agency. More information is available from the Lightning Protection Institute (lightning.org), National Lightning Safety Institute (lightningsafety.com), and Underwriter's Laboratory (ul.com/lightning).

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Lessons from Lightning

The leaders at Friedens Evangelical Church in Port Washington, Wisconsin, learned some very important lessons when their sanctuary was destroyed by lightning-induced fire in July 2002.

"We discovered we had a very good insurance company," comments Senior Pastor Mark Voll. "Our insurance was adequate, but they made it so we did not suffer a financial strain.

We've since improved our coverage."

Voll offers this advice to other pastors: "The cheapest insurance is not necessarily the best. Find a carrier that understand how churches work, and shows a real empathy toward your needs—then go with that insurance."

One of the key ways lightning causes havoc is how it damages an electrical system. "We thought we didn't have any old wiring," says Voll. "It turns out we did.

So make sure you have an electrician do a thorough examination of your wiring. Also make sure you have a reliably monitored fire alarm system. Ours was unreliable."

If your church facility should be damaged by any kind of an event, Voll says to be wary of the many calls you will get from contractors, insurance adjusters, and others. "They will have read in the newspaper what has happened and will want to make money off of it. Call other pastors who have gone through the same thing and ask their advice."

Of course, more damage is done than just what is visible to the facility. "With a church this old, the congregation felt a profound sense of identity with the

building," says Voll. While the loss is painful, Voll says it can also be seen in a different way. "I had preached a number of times that the church had to have a larger dimension than the building. The lighting forced the issue."

—Thomas G. Dolan