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Thunderstorm, Lightning, and Hail

Thunderstorm | Mitigation (Property: Lighting Rods and Surge Protectors)

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Thunderstorm | Mitigation (Property: Lighting Rods and Surge Protectors)

Phase: Before ❶

Validity Rating: Robust/Sufficient Assessing Validity of the Action ▼

Supporting Research ❶

- “Table 2 provides details of 21 events with 31 deaths and 4 injuries that involved people who were killed since 1992 while inside dwellings in the US, as shown by the dataset for this study. All but three cases occurred as a result of a home catching fire after a lightning strike. The number of fatalities was small, and nearly all occurred due to fires involving elderly, young, or physically or mentally disabled people, usually at night.” “Deaths inside US dwellings and other buildings are due to nighttime fires started by lightning, usually involving elderly, young, or physically or mentally disabled people. In summary, bring inside a US dwelling is safe from lightning unless it catches fire and an elderly, young, or disabled person is unable to leave, especially at night.” [1]
- “Today, most authorities agree that lightning rods define and control the points where lightning will strike the structure and then guide the current safely into ground.” [2]
- “The electrical power to and within structures and the electronic equipment located within structures, such as televisions and computers, should be protected from... (2) the voltages resulting from lightning-induced signals entering the structure via power lines and communication lines, given that these utility lines may have relatively large voltages induced on them by direct or nearby strikes. Protection of electronics is accomplished by shielding from electromagnetic fields, filtering out the damaging high-frequency currents and voltages due to lightning, and using surge-limiting devices. The National Fire Protection Association (NFPA) the organization that publishes the US lightning protection standard NFPA 780, reports that there are about 30,000 lightning-caused house fires in the US each year, with an annual cost of about \$175 million.” [3]
- “While lightning does strike sharp rods when no competing receptions are nearby, we find that the rate of electric field intensification for return stroke leader formation must be much greater for sharp rods than for blunter ones... Our field experiments and our analyses indicate that the strike-reception probabilities of Benjamin Franklin's rods are greatly increased when their tips are made moderately blunt.” [4]
- Deaths inside U.S. dwellings: All but three (of 31 deaths) were due to a home catching fire. [5]
- “Interior devices, such as surge protectors, are simple and practical ways to mitigate damage to most of the electric appliances

and electronics in your home.” [6]

- “Surge protection alone is not intended to prevent or limit physical damage from a direct lightning strike to a facility or structure. Rather, it is intended to defend against indirect lightning effects imposed upon the electrical services to a structure as part of a coordinated lightning protection system installed in accordance with the requirements of this standard. Surge currents and their corresponding overvoltage transients can be coupled onto electrical utility feeders in a number of ways. These mechanisms include magnetic or capacitive coupling of a nearby strike or the more dramatic but much less frequent conductive coupling of a direct cloud-to-ground discharge. These overvoltage transients pose a significant threat to modern electrical and electronic equipment... Properly located and installed, these basic [lightning protection systems] components improve the likelihood that the lightning discharge will be conducted harmlessly between the strike termination devices and the ground terminals.” [7]
- “During 2004-2008, U.S. fire departments responded to an estimated annual average of 24,600 fires started by lightning. These fires caused annual averages of 12 civilian deaths, 47 civilian injuries, and \$407 million in direct property damage. Only 18% of reported lightning fires occurred in homes, but these accounted for 88% of the civilian deaths, 77% of the associated injuries and 70% of the property damage.” [8]

[1] Ronald Holle, “Lightning-Caused Deaths and Injuries In and Near Dwellings and Other Buildings,” (paper presented at the 4th Conference on the Meteorological Applications of Lightning Data, January 11-15, 2009), 2.

[2] Philip Krider, “Benjamin Franklin and Lightning Rods,” in *Lightning Protection*, ed. by (https://ed.by) Vernon Cooray, (London: Institution of Engineering and Technology, 2010), 11.

Martin Uman, “The Art and Science of Lightning Protection,” (New York, NY: Cambridge University Press, 2008), 17.

[3] C.B. Moore, G. Aulich, W. Rison, “Measurements of Lightning Rod Responses to Nearby Strikes,” *Geophysical Research Letters*, 27 no 10, (May 2000), 1490.

[4] Ronald Holle, “Recent Studies of Lightning Safety and Demographics,” (paper presented at the 2012 International Conference on Lightning Protection, Vienna, Austria, September 02-07, 2012).

[5] Federal Alliance for Safe Homes, *If Disaster Strikes Will You be Covered?: A Homeowner’s Insurance Guide to Natural Disasters*, (Tallahassee, FL: Federal Alliance for Safe Homes, Inc., 2006), 20.

[6] National Fire Protection Agency, *Standard for the Installation of Lightning Protection Systems*, NFPA 780, 2004 ed.

[7] National Fire Protection Association, “Public Education: Lightning,” accessed February 18, 2014, <http://www.nfpa.org/safety-information/for-consumers/outdoors/lightning> (<http://www.nfpa.org/safety-information/for-consumers/outdoors/lightning>).

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There are no further research recommendations at this time.

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