



GrayStone Industries

Embedded Engineering Solutions

Using Wireless Sensor Networks to Reduce Property Damage from Lightning

by Roger Bishop, May 21, 2013

Lightning is where you find it and in the United States, that's pretty much everywhere with more than 22 million cloud-to-ground occurrences reported each year across the United States. The areas of greatest frequency and intensities are those along the east and gulf coasts with Florida having the dubious honor of being the most lightning prone State in the country.



Lightning can be a very destructive force of nature. A single stroke of lightning can carry 5,000 to over 200,000 Amperes (A) of current with the average stroke at 30kA. Any structure is at risk of being hit by lightning. According to data taken by the National Weather Service, more than 300,000 insurance claims for lightning damage are made each year at a cost of over \$600M a year. Obviously cell and radio tower structures are at great risk, but so are buildings and homes, a huge percentage of insurance claims arise from damage to building, homes and the property therein. While cell and radio sites are more susceptible to lightning strikes due to their tower heights and structure, these sites will generally see little if any damage as a result, if the site employs lightning protection and grounding practices that are accepted in the industry. However this is not the case for buildings and home. The building and home construction standards found in the National Electrical Code (NEC) do not address the issue of safety or construction practices with respect to lightning or Ground Potential Rise (GPR); leaving most buildings and homes in this country at risk to property damage. Needless to say it is bad enough to have your business or personal property destroyed by lightning, but it gets worse if electrical fires or exploding gas lines are a consequence of a severe lightning strike or GPR. In an effort to mitigate insurance payout and liability lawsuits, a number insurance companies and building materials manufacturers have decided to take a proactive approach to discovering the source and magnitude of this lightning and GPR problem.



To assist in resolving this problem, GrayStone Industries offers a convenient and easy to install wireless lightning sensor network capable of monitoring lightning and electrical surges on gas lines, AC distributions, communication wiring and other building utility infrastructure. Our sensors are capable of detecting transient currents as low as 200A and as high as 50kA. When a lightning or GPR transient event occurs, the end device sensors immediately respond, capturing the entire transient waveform and then wirelessly sending the data to the wireless coordinator where the data is logged and time stamped. The data is accessible for analysis from the coordinator directly, with a USB connection to a PC or via the internet through a WiFi connection.

Data retrieved and analyzed thus far from several of our customers have shown some interesting and surprising results. Not the least of which is the relatively large level of current that passes along many of the gas lines located in homes and small business buildings; possibly as a result of GPR. Needless to say this is a cause for concern should the gas line rupture as a result of arcing; resulting in fire and severe property damage. Additional analysis has demonstrated that the AC entry point of a building or home is also a serious entry point for lightning into a structure.



As the data collection and study continues and it becomes clearer how lightning can enter into a structure and created havoc, no doubt in time insurance companies, manufacturers of building material and home owners will be better able to develop products and construction practices that greatly mitigate the damage and costs result from lightning and GPR events. GrayStone Industries will continue to support these industries by continuing to provide state-of-the-art sensors and wireless sensor networks.

To learn more about GrayStone Industries wireless sensor networks and technologies, visit us at www.graystone-ind.com.

Roger Bishop is Director of Product Development at GrayStone Industries. Roger has also held the position of Engineering Manager at PolyPhaser Corporation.