TracPipe® CounterStrike® White Paper

The Best Gets Better: TracPipe® CounterStrike®

TracPipe® CounterStrike®
Flexible Gas Piping by OmegaFlex®

Patented Protection Against Arcing From Lightning Strikes

Lightning is unpredictable; the chance of an individual building being struck by lightning is based upon a number of factors, including the geographical location and the topography of the site. There is a wide range of differences in the frequency and density of lightning strikes in various geographical areas of the United States. There are areas along the west coast of the United States where there is barely any occurrence of lightning strikes. On the other hand, Central Florida is nicknamed “Lightning Alley” with the highest lightning density recorded in the United States. While New York is not especially prone to lightning, the Empire State Building is hit by lightning on average 100 times a year.

Besides being unpredictable, lightning is also powerful. It is common for lightning to exceed 100,000 volts and 25,000 or more amperes. A leader of a bolt of lightning can travel at speeds of 40,000 mph, and can reach temperatures approaching 30,000°C (54,000°F).

The Effects of Nearby Lightning Strikes on Homes...

Lightning can cause extensive damage to buildings that are not protected against its deleterious effects through a lightning protection system. According to insurance industry, there were about 185,000 insurance claims for lightning damage submitted in 2009, causing almost $800 million in damages. While installation of a lightning protection system (using lightning rods pioneered by Benjamin Franklin) is highly effective in preventing damage due to lightning, the residential building codes in the United States do not require installation of those systems for new homes. If a home is directly hit by lighting, it can cause fires by ignition of structural framing and timbers, or ignition of flammable materials as a result of arcing inside the building. In nearby lightning strikes, where lightning attaches to an object outside the home, the energy of the lightning can be transmitted into the building either through magnetic coupling of the lightning channel to metal systems inside the house, or through utility lines entering the home.

The current induced by lightning strikes does not take the path of least resistance as popularly believed; it takes all paths of resistance to ground. This may present hazards for mechanical systems due to differences in electrical potential between the grounded electrical systems and any non-bonded metallic mechanical or communication system. Once this energy is inside a building, it will seek to return to ground along every possible path. If two metallic systems are not connected to the electrical ground, they could have unequal electrical potentials, and if those two systems are in proximity to each other, it is possible for the lightning energy to transfer from one system to the other by an electrical arc through the air between the two systems, allowing electric current to flow within the path of the arc. This arcing may cause damage to mechanical and electrical systems.

Electrical systems are susceptible to damage from arcing due to their prevalence within the home, and the low insulation value protecting the current-carrying metal wire. For residential applications, electrical wiring has an insulation value of 600 volts, which is enough for household current, but entirely inadequate to resist damage from high voltage arcing in a lightning strike. As a result, the insulation on the electrical wiring may be punctured by electrical arcing, allowing electricity from the damaged wiring to cause a fire either through a power follow current, or by direct contact with flammable materials.

Similarly, gas piping systems are susceptible to damage because they are a potential conductive path for lightning energy, and are likely to be routed near other metal utility lines inside the home. Like electrical wiring, gas piping also conveys a dangerous substance; however, gas piping has a much more substantial construction than electrical wiring. Rigid gas piping has thick side walls that can resist damage due to arcing. Flexible gas piping has a plastic jacket with an insulation value of at least 25,000 volts, as well as a steel pressure liner that can withstand arcing damage from most lightning strikes.

Grounding and Bonding of Building Systems Help Prevent Damage...

Nearby lightning strikes during an electrical storm can cause damage to electrical and mechanical systems in buildings. Bonding of these systems to a common grounding electrode allows the energy to move at the same rate as the electrical system in unison with the energy wave. When all mechanical and electrical systems of the building are properly bonded, the risk of damage is greatly reduced.

Provisions for grounding of the electrical system and bonding other metallic systems are contained in the National Electric Code (NEC NFPA 70) and the National Fuel Gas Code (NFGC NFPA 54). *Grounding* is the process of making an electrical connection to the general mass of the earth. It is most often accomplished with ground rods, ground mats or some other grounding system. Low resistance grounding is critical to the operation of the electrical system, as well as lighting protection systems. *Bonding* is the process of making an electrical connection between the grounding electrode and any equipment, appliance or metal conductor: pipes, plumbing, flues, etc. Equipment bonding serves to protect people and equipment in the event of an electrical fault by eliminating touch potential differences, and bonding is also critical in protection of the structure and mechanical systems in the event of a lightning strike. The requirement for bonding and grounding is very specific depending on the area's building codes. If a Lightning protection system is installed, the entire system for the building and building systems is covered in NFPA 780, *Installation of Lightning Protection Systems.*

Equipotential bonding of all metallic supply lines entering a building is a vital but often overlooked requirement when considering protection of a building and its contents during an electrical storm. Equipotential bonding is the process of making an electrical connection between the grounding electrode and any metal conductor: pipes, plumbing, flues, etc., which may be exposed to a lightning strike and can be a conductive path for lightning energy toward or away from the grounding electrode.

CSST with Enhanced Lightning Protection...

Omega Flex, Inc. is the pre-eminent international producer of quality engineered flexible metallic piping products. Omega Flex manufactures CSST, which was initially developed during the early 1980s as a safe and effective gas distribution system that can withstand damage that can occur during earthquakes and other natural disasters. The CSST system consists of flexible pipe between the building gas source and appliances, as well as fittings and other accessories. The flexibility of the tube allows it to be routed through the building in continuous lengths without the many joints required with rigid piping, and without the need for any special tools.

As a part of its commitment to continuous product improvement, OmegaFlex® began testing its original CSST product, TracPipe®— in 2003 to determine the mechanisms by which the CSST could be damaged by electrical arcing. The company worked with Lightning Technologies Inc. (LTI; Pittsfield, Mass.), which operates one of the world's most complete, accredited, simulated-lightning test laboratories. By providing research, development, engineering and testing services, LTI works to eliminate lightning hazards in products in various industries, including aerospace, commercial airlines, ground support systems and electrical distribution. LTI developed a number of tests and created a protocol using waveforms to simulate electrical arcing within a building.

Based on this research, OmegaFlex® determined that the ability of the yellow jacket to resist voltage was a product of its thickness. However, while increasing the thickness of the jacket would provide additional levels of resistance to high voltage, it would make the product too stiff to fulfill its function as a flexible pipe. Further, the testing revealed that this high-insulation type product would only transfer the energy to other components of the system. OmegaFlex® then began to develop a conductive CSST jacket that would dissipate the energy from a nearby lightning strike, instead of acting as an insulator.

The first generation of OmegaFlex's TracPipe® CounterStrike® product had an energy-dissipating jacket that was tested by LTI and shown to dissipate one coulomb of energy, or eight times the amount of energy that TracPipe® could resist. The patented conductive jacket spreads the energy over a larger area and does not allow a pinpoint arc of energy to reach the pipe, protecting the stainless steel pressure liner as well as other fuel gas system components if TracPipe® CounterStrike® becomes energized due to lightning.

After even further testing, a second generation of TracPipe® CounterStrike® was developed that not only increased the product's resistance to energy, but also exceeded fire and smoke requirements, permitting it to be installed in firewalls and return air plenums. The improved version of TracPipe® CounterStrike® has been tested by LTI and was shown to be up to 400 times more resistant to the damaging effects of electrical energy than conventional CSST, and is at least six times more resistant to the damage than the first version of TracPipe® CounterStrike®.

The conductive black jacket improves its ability to dissipate arcing energy, reducing the level as it moves downstream which helps to protect regulators, appliance connectors and other mechanical systems, all of which could result in the potential for fire. Omega Flex® introduced their first generation TracPipe® CounterStrike® in 2004 and the second generation product in 2007, Both have been proven highly effective, with several million installed feet. TracPipe® CounterStrike® recently achieved the prestigious PMG 1058 listing from the International Code Council after it was shown to resist a minimum of 4.5 coulombs of arcing energy—more than twice the maximum expected inside a building during an indirect lightning event.

TracPipe® CounterStrike® has all the Approvals and Listings...

TracPipe® CounterStrike® is approved for use by all major model codes including:

- National Fuel Gas Code
- International Fuel Gas Code
- Uniform Plumbing Code

TracPipe® CounterStrike® is also listed/evaluated by:

- ANSI LC 1-2005/ CSA 6.26 *Standard for Fuel Gas Piping Systems using Corrugated Stainless Steel Tubing (CSST)*
- ICC-ES (PMG-1058) for lightning resistance
- IAPMO ER 0227 for lightning resistance
- UL for 1, 2 and 4 hour firewall penetrations

In addition, TracPipe® CounterStrike® satisfies plenum installation requirements with a flame spread index of less than 25 and a smoke developed index of less than 50.

TracPipe® CounterStrike® Can Be Installed Easily and Quickly...

TracPipe® CounterStrike® provides the same level of installation and operational convenience as conventional CSST. TracPipe® CounterStrike® uses the same easy-to-install AutoFlare® fittings as conventional TracPipe® with the yellow coating. It is sold on wooden reels of varying lengths and seven sizes from 3/8” to 2” to meet the needs of the gas piping contractor.

TracPipe® CounterStrike® is proven to be the safest, highest performing gas piping available, and the clear choice for new home construction, renovations, commercial applications and more.

For more information about TracPipe® CounterStrike® visit:

tracpipe.com

For safety issues concerning gas piping systems visit:

csstfacts.org