

CSST: THE FLEXIBLE OR FLAMMABLE ALTERNATIVE FOR GAS PIPING?

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Lightning. For generations, it has inspired and impressed. For the present generation of owners of newer homes, as spring and summer storms loom, lightning means only one thing: Fear. In our September 2006 Alert, we informed you of an emerging trend that we had identified involving gas-fueled fires caused by gas lines failing when they become energized during a direct or nearby lightning strike. The gas lines at risk are known as corrugated stainless steel tubing (CSST) and they are used primarily in residential settings.

Since our original Alert, the emerging trend we identified has become a steady report of wide-spread losses involving CSST. Case in point, we received three assignments related to a series of storms that passed through Indiana in one day. When we contacted an expert to help investigate one of these losses, we found him working at another fire involving CSST. When we spoke to the fire chief where one of these losses occurred, he informed us that his department had experienced twelve fires in the last three years and each one of them was related to lightning-induced CSST failures. He indicated that, if a fire is called in during a storm, they now naturally assume that the fire is CSST-related.

Several years ago, many lightning-related fire losses in homes containing CSST went unreviewed for recovery potential. In those days, most people incorrectly assumed that since the loss involved a fire that was precipitated by a lightning strike, no further inquiry was necessary. However, as more losses have occurred and knowledge of CSST and its weaknesses have become more well-known, more and more clients have realized the recovery potential in these losses. In order to stream-line and maximize our ability to handle these losses, Cozen O'Connor has created a task force dedicated to the handling of these losses.

CSST: A QUICK PRIMER

CSST is a flexible stainless steel product that is wrapped in PVC. The product gains its flexibility by its corrugations and thin-steel

skin. A ¾ inch CSST line has a wall-thickness of 10 mils (.008 inches). To understand how thin this is, it bears noting that mils are the most common unit of measurement used to describe the thickness of plastic garbage bags.

In a CSST system, gas comes in from the outside meter and goes into a central manifold. Each gas-utilizing appliance receives a home run feed from the manifold. The net result of this configuration is there are more gas lines in the home and the system operates at a slightly higher operating pressure in comparison to black-iron pipe systems.



This photograph shows a central manifold for a CSST system. Notice how many gas lines come off the manifold.



Each of these PCV covered lines is a home run, such as the one shown to the hot water heater.

CSST began to gain a foothold in the U.S. in the early 1990's and is now widely used across the country. In the Indianapolis area alone, there have been approximately 114,000 new homes built in the last ten years and nearly every one of them utilizes CSST. CSST markets itself as the new, more modern alternative to black iron pipe. While CSST tends to be slightly more expensive than black iron pipe, it is significantly less expensive in terms of the cost of labor. It is estimated that labor savings associated

with CSST range from 25% to 65% for new construction and upwards of 75% for remodeling work. Lastly, CSST also does not require expensive equipment that must be used when working with black pipe, such as threaders and saws, and is fast becoming the preferred material for plumbing contractors throughout the nation.

LIGHTNING: A QUICK PRIMER

Lightning is a fascinating and complicated display of power from nature. Lightning in its simplest concept results from friction of water and ice droplets in the clouds as they move around the earth and amongst each other. As charges build-up in the cloud or cloud-to-cloud, many times they are drawn to the earth as a way to balance the charges between the clouds and the earth.

Approximately 90% of all lightning strikes that strike the earth are what is known as negative ground to cloud lightning, where negative charges from the clouds seek to balance with positive charges of the earth. As the charges between the earth are pulled from each other, the air between these charges becomes ionized, which creates a conductive path for lightning to follow. Once the path is established, there follows several pulses of energy to the ground, followed by visible return strokes to the clouds. The entire process takes less than a second with the duration of each pulse lasting less than hundreds of milliseconds each. The resulting lightning bolt can have anywhere between 25,000 amperes to more than 100,000 amperes of current with millions of volts. The amount of voltage created is dependent on numerous factors, including soil properties in the area of the strike. However, even with this type of power, many negative cloud to ground lightning strikes are forked so their power is dispersed to some degree.

Energy from lightning can energize materials in two fundamental ways. The first way is by impression, meaning that energy from the lightning strike flows directly from the bolt to the material being energized. For example, a lightning strike may strike a tree and travel down that tree to the earth. From there, the energy from the lightning strike may travel miles from the initial strike and has potential to energize many items in its path, including entire homes. The second way lightning can energize a material is through induction. When lightning strikes, a tremendous magnetic field is created around the bolt. The field is charged and if another conductive path is in the vicinity, charge from the field can be displaced to the other conductive path. The amount of charge that is transferred is dependent upon the objects' inductance. Studies have shown that lightning has the ability to induce current in an object as far as a mile away.

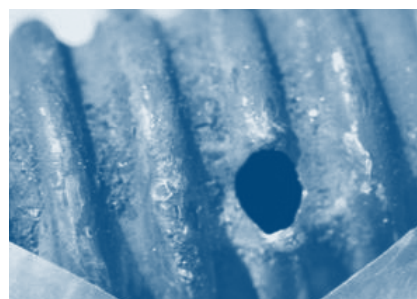
Once an object is energized, it can fail from a lightning strike in one of two generic ways. First, lightning can damage the item

through heating, which is a function of the item's electrical resistance. Resistance is a measure of how well an item can conduct electricity, and is nothing more than a function of Ohm's Law. The better an object conducts, the less heat is produced. The poorer it conducts, the more heat is produced. The second method of damage results from arcing. As the energy from a lightning strike seeks out ground, it will attempt to do so through all available paths. Sometimes, the energy will even create new paths by jumping through the air from one conductor to another. This is known as arcing. When this occurs, intense heat measured in thousands of degrees results.

CSST AND LIGHTNING

The thin corrugated stainless steel has not proven to be very good at handling the energy from a lightning strike. The melting temperature of the stainless steel for CSST is 2400° F. When lightning energizes a CSST line, it is not very difficult to burn a hole through the pipe's thin skin through either resistive heating or arcing to a nearby metallic object. Once this occurs, the pressurized gas contained within the CSST can escape its confines. At the same time the heat from the event is sufficient to ignite the escaping gas, creating a blow-torch effect.

The likelihood of failure of CSST is truly incomparable to the product it replaces—black iron pipe. While black-iron pipe has always had its drawbacks, its ability to withstand lightning as an expected and foreseeable event has been proven over time. Intuitively, this makes sense. Black pipe is significantly thicker and can withstand the energy of a lightning strike much better because of its larger wall thickness. While lightning may cause pocking or pitting on a black-iron pipe, it is such a short-lived event that it does not have the time needed to burn a hole through the entire wall of the pipe. If pulses of lightning lasted for seconds at a time as opposed to hundreds of milliseconds, then perhaps this would be a different story. On the other hand, the short pulses of energy during a lightning strike is long enough to create a hole in the much thinner wall of the CSST line.



Black-iron pipe also has several other advantages compared to CSST when attacked by lightning. First, black iron pipe has less resistance than CSST so it can handle the energy better. Secondly, CSST

has a high inductance capacity when compared to black-iron pipe so it is more likely to become energized by inductance than black-iron pipe is.

THE INDUSTRY'S RESPONSE

In our prior Alert, we anticipated that the industry was not likely to admit any dangers associated with its product, which has proven to be true. Manufacturers of CSST have used a variety of arguments to deflect liability for failures of CSST. Manufacturers of CSST continue to assert that their product is safe, provided that it is installed properly and in accordance with all applicable codes and manufacturer's instructions. In particular, manufacturers assert that bonding of their product to a home's electrical grounding system will prevent CSST from failing during a lightning strike.

Bonding is the permanent joining of metallic parts to form an electrically conductive path. Under most codes, piping systems that are bonded should then be connected to the grounding system by use of a jumper cable. Grounding is the intentional connection of a current carrying conductor to ground (earth) so that the current has a direct path to ground. While many experts question whether bonding is enough, it should be noted that the codes and instructions regarding bonding of gas lines, and CSST in particular, have changed radically through the last few years. With each change, the bonding instructions have become more specific. For instance, the 2009 National Fuel Gas Code most recently adopted specifically speaks to bonding of CSST (as opposed to other generic gas piping) for the first time. Other codes now also require a larger air space around the product to prevent arcing between nearby conductors in the event that these measures prove to be insufficient. Similarly, the manufacturer's original instructions went from no discussion of bonding to suggesting that bonding occur, to recommending bonding specific points with specific bonding clamps and specific gauges of jumper cables.

The obvious intent of all these changes is to attempt to make CSST a safer product, but only time will tell if it is enough. In the meantime, thousands of houses across the country have been built utilizing CSST when the codes and manufacturer's instructions regarding bonding were either limited or non-existent. Sadly,

the industry has shown no urgency to alert these homeowners of the dangers that lurk within their walls, contending it has no responsibility to do so. As such, we expect that these losses will continue on into the indefinite future.

PURSuing RECOVERIES FOR CSST FIRES & THE COZEN O'CONNOR CSST TASK FORCE

CSST fires present numerous theories for recovery against several parties. First, the manufacturers have an obligation to ensure that the products they are placing into the stream of commerce are safe and do not present an unreasonable risk of harm, particularly when comparing their product to other alternative products that perform the same function. In addition, general contractors, electrical subcontractors, and plumbing subcontractors all have varying responsibilities to ensure that the products used in construction are safe and that they are properly installed. Lastly, the failure of general contractors, electrical contractors or plumbing contractors to properly bond the CSST per code and manufacturer's instructions may also increase the dangers associated with CSST.

Drawing on our vast experience in handling CSST-related matters, Cozen O'Connor has created a special task force to handle these losses. The members of the CSST task force are trained to identify issues that are unique to CSST losses and handle them in a coordinated and systematic approach. We have worked with experts across the country and understand the need for a cohesive approach to handling these losses so as to maximize your recovery. Handling losses throughout the country, we have seen different defenses and arguments and understand what needs to be done to successfully prosecute your case for your maximum benefit.

Lightning can strike anywhere in the country. Not all lightning fires are caused by Acts of God; those involving CSST may be attributable to product defects or acts of negligence. We stand ready and prepared to help you. So the next time lightning strikes, don't get struck unprepared.

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