



Inside Fire



Whitemore Fire Consultants, Inc.

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Investigating Fire Losses Involving CSST by Duane A. Wolf, MSPE



In recent years there has been an increase in the number of fires involving Corrugated Stainless Steel Tubing or CSST. CSST is a type of gas tubing which consists of thin-walled corrugated tubing constructed of stainless steel and an outer cover or sheathing which typically has been yellow in color but some new varieties contain a black outer sheathing.

Fire losses involving CSST manifest themselves during or after thunderstorms. Failures of CSST are induced by electrical activity initiated by lightning strikes. In roughly one-third of the CSST-related fires investigated by the author, evidence of a direct lightning strike is observed. This is most typically evidence of electrical activity on a vent cap for a gas fired appliance such as a fireplace or water heater. In the remaining cases, either no evidence of a direct lightning strike is observed or an indirect lightning strike is considered to be the source of the electrical energy. As a result of either a direct or indirect lightning strike, the CSST becomes energized. As the CSST is energized or as the electrical energy transmitted by the CSST is discharged en route to its grounding path, a small hole(s) develops in the CSST. The hole then allows either propane gas or natural gas to be ignited and a fire develops. In none of the cases investigated by the author has there been an explosion due to an accumulation of escaping gas, so it seems most likely that the same electrical activity or arc which compromises the CSST also serves as the ignition source for the escaping gas. Once the escaping gas is ignited, a localized fire develops.

Background on CSST Systems

CSST was originally developed in Japan. It was first manufactured in the United States in 1988. It has been estimated that about 2 million homes in the United States contained CSST as of 2007. Between 1989 and 2001, 160 million feet of CSST were installed in US homes. In 2002, 45 million feet of CSST were installed.

Why has CSST become so popular in such a short time? Answer: It is easy to install. There are minimal tools required to install CSST. There are a limited number of fittings necessary to connect gas systems using CSST. Additionally, the tubing comes in rolls which are sized by diameter and individual runs of tubing are then cut to length.

A gas system installed using CSST typically consists of a main supply run which is routed from the meter (natural gas service) or second stage regulator (propane service). The main supply run is typically of a larger diameter than individual branch runs which progress to specific appliances. The main supply run progresses to a manifold which is typically located in the mechanical room of the residence or loss location. There are typically individual shut-off valves installed for each of the branch runs at the manifold. Each branch run of CSST then progresses from the manifold to a specific appliance.

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Special points of interest:

- Investigating Fire Losses Involving CSST—by Duane A. Wolf, MSPE
- Congratulations to WFC Staff for Anniversaries.
- Recalls—Subaru Recalls 634,000 Vehicles Due to Fire Potential
- Comments from Robert B. Whitemore, President of Whitemore Fire Consultants

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Investigating Fire Losses Involving CSST by Duane A. Wolf, Continued

Considering Lightning Damage to CSST as a Possible Fire Cause

As indicated previously, lightning induced damage to CSST should be considered as a potential cause for a fire loss if the residence contains CSST and the fire loss occurred during or following a thunderstorm. If an initial origin and cause investigation is able to eliminate the CSST as a potential cause, then the presence of CSST at the loss location was merely coincidental. If the origin and cause investigator is able to determine that the CSST may have had a potential role in the fire loss through initial observations of the scene or factual/background information, a more detailed group scene examination is most likely warranted.

Investigating CSST Losses

Since CSST losses involve both mechanical and electrical issues, a multi-disciplinary approach is the most successful. This multi-disciplinary approach would include an origin and cause investigator, an electrical engineer and a mechanical engineer. The origin and cause investigator can identify the area of origin and potential causative scenarios within the area of origin. The electrical engineer is able to address the electrical path followed by the lightning as well as the potential effect of electrical bonding or grounding of the CSST. The mechanical engineer can leak test the gas system for purposes of identifying the leak location(s). Yes, on some occasions, more than one leak location has been identified. The three-team member approach works best for first party property interests and large losses. Where liability interests are involved in smaller losses or losses with a narrow area of origin, a smaller investigative team of an origin and cause investigator and an electrical or mechanical engineer may be appropriate.

Failure Scenario

As indicated previously, CSST is constructed of thin-walled corrugated stainless steel tubing. A typical wall thickness of $\frac{3}{4}$ " CSST is 0.010". For comparison purposes, $\frac{3}{4}$ " black iron pipe (standard) has a wall thickness of 0.113" and $\frac{1}{2}$ " K-copper has a wall thickness of 0.049". It is the thin-walled construction of CSST which makes it susceptible to failure as a result of electrical activity. For comparison purposes, the author has investigated several lightning induced failures of copper tubing and no lightning induced failures of black iron piping. Based upon the field experience of the author, there is a very strong direct correlation between the wall thickness of the particular style of gas tubing and the magnitude of the resistance to lightning induced failures.

Photograph #1 is an example of a lightning induced failure in CSST. A ruler is also included in the photograph to provide some representative dimensions of the holes which were observed in the CSST.

The electrical activity shown in Photograph #1 occurred between the CSST and a section of abandoned black iron gas pipe such that the same electrical arc which caused the damage shown in Photograph #1 also caused the damage to the black iron pipe shown in Photograph #2. It can be seen that the damage suffered by the black iron pipe consisted of some surface pitting, but the wall thickness was sufficient to prevent full penetration of the black iron pipe and a compromise of the integrity of the black iron pipe. These two photographs provide further documentation that the susceptibility of CSST to lightning induced failures is primarily due to its wall thickness.



Photograph #1

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Investigating Fire Losses Involving CSST by Duane A. Wolf, Continued

Additional Considerations

As indicated previously, the electrical energy which causes lightning induced failures in CSST is traveling along the CSST as it follows a path to a suitable ground. Beginning in 2005, CSST manufacturers began to include electrical bonding or grounding requirements in their installation instructions. When examining CSST losses, the installation date of the CSST at the loss location relative to 2005 is an important item to consider. If the installation occurred prior to 2005, whether or not the CSST was originally bonded to a dedicated electrical ground is generally not a consideration. However, if the installation occurred after 2005, the presence of a dedicated electrical ground becomes more important for a couple of reasons. If a dedicated electrical ground was required by the CSST manufacturer's installation instructions at the time of the installation, the next question is to determine whether or not the presence of a dedicated ground was a causative factor for the loss. Also, from the interests of general contractors, electrical contractors and mechanical contractors, the failure to install a dedicated electrical ground to the CSST (if required) may increase potential liability exposure to these parties.



Final Notes

The purpose of this article is to present some background information regarding how lightning induced failures in CSST occur, how such losses are typically investigated, and to identify some issues which may arise during the investigation of these losses. However, each lightning induced failure of CSST can have its own unique set of circumstances which underscores the need for reliance upon a competent team of investigators and engineers to address all such issues and achieve the best possible investigation.

Duane A. Wolf is the President and Owner of Duane A. Wolf Engineering, P.C. in Ames, Iowa. Duane is a mechanical engineer with over twenty years of experience primarily providing engineering services to insurance companies and law firms throughout the Midwest as it pertains to fires and explosions. For more information regarding the services provided by Mr. Wolf or the article that he has provided, please contact him at 515-520-9585 or via email at duane.a.wolf@q.com.

News About Us . . .

We would like to recognize and congratulate Doug Noah, CFI with Whitmore Fire Consultants, Inc. who celebrated his fourth year with our company as a fire investigator and Brian R. Whitmore, for starting his fourth year with our company in December. Brian has also made application to take his CFI exam with the International Association of Arson Investigators. Brian Haag, CFI on beginning his 13th year as a fire investigator

in January. We would also like to recognize Amy Powell who will be starting her fourth year in February.

We are firm believers that a company is only as strong as the people who represent you everyday. Thank you to all of you for your ongoing contributions to make our company the best.

RECALLS

HEICO Lighting Recalls Platinum Neon Sign Transformers



Model PLATINUM-10000-30



Model TFT-06PL-9000-30

The U.S. Consumer Product Safety Commission in cooperation with HEICO Lighting, a Division of EMD Technologies of Montreal, Quebec, Canada, has issued a voluntary recall of the Platinum Neon Power Supply Transformers. The transformers were manufactured in Canada and have been determined to not meet UL standard for this product. Approximately 3,900 units were sold directly by HEICO distributors nationwide from December 2011 through May 2012 for between \$60 and \$150. The ten distributors are Denco Sales, Graphic Solution, Hart Supply, Interstate Electric, Montroy Supply Company, N. Glantz & Son, Pioneer Supply, Reece Supply Company, Sun Supply, and Tubelite Company.

This recall involves neon power supply transformers designed to power commercial signs. They are in black metal boxes about 4.5 inches long by 3.5 inches wide with rows of vents on all sides. "HEICO LIGHTING™" and the model information are printed on a plate on the transformer. The recalled models include PLATINUM-9000-30, PLATINUM-10000-30, PLATINUM-12000-30, TFT-04PL-6000-30, and TFT-06PL-9000-30. No incidents have been reported.

Consumers should stop using these recalled power supply transformers and unplug them immediately until a free replacement transformer has been professionally installed. Contact HEICO lighting to schedule the free installation of a replacement transformer.

For more information, contact HEICO lighting at (800)665-1166 or visit the firm's website at www.heicolighting.com.

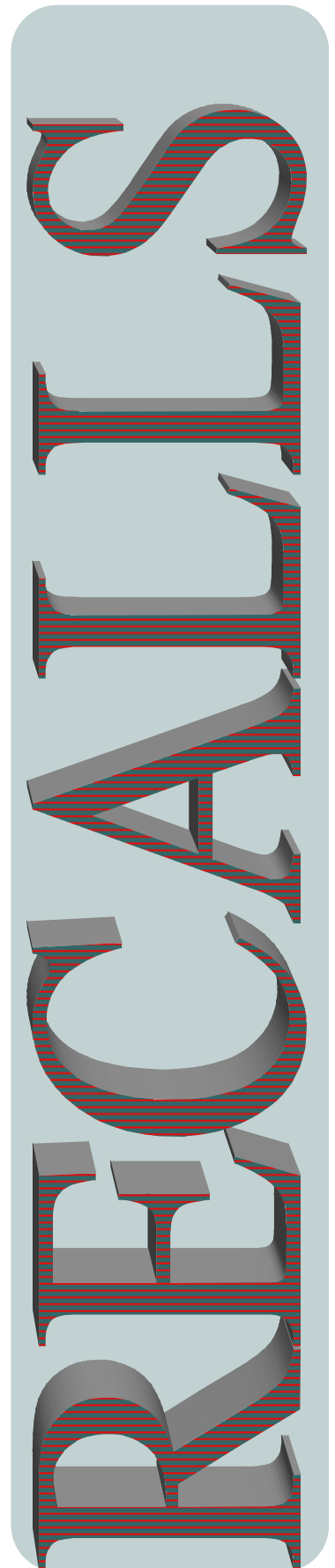
Columbia Sportswear Recalls Batteries Sold with Jackets

The U.S. Consumer Product Safety Commission in cooperation with Columbia Sportswear Company of Portland, Oregon has voluntarily issued a recall of the Omni-Heat™ Lithium-Polymer Rechargeable Batteries. Approximately 66 batteries (33 jackets with two battery packs each) were sold online and at Columbia stores in various cities, including Albertville, Minnesota and Pleasant Prairie, Wisconsin from September and November 2012 for \$260. The batteries have a cell defect which can cause overheating, posing a fire hazard. The firm has received one report of an overheating battery in Europe. No incidents or injuries were reported in the U.S.

This recall involves battery packs that power heating systems in jackets. The black battery packs are 3.25 inches long by 2.3 inches wide by 0.7 inches deep and marked with "Columbia" on the top and "OMNI-HEAT™" on the bottom of the pack. Part number 054978-001 is printed on the side of the battery label. Two battery packs were included with styles from: Fall 2011 Men's: Electro Amp™ Jacket (SM7864) and Circuit Breaker™ Softshell (SM7855); Fall 2011 Women's: Circuit Breaker™ Softshell (SL7856); Snow Hottie™ Jacket (SL7866), and Snow Hottie™ Parka (SL7853).

Consumers should immediately check the battery packs included with the electric jacket to determine if they are part of this recall. Those with affected batteries should immediately remove the affected battery pack(s) from the jacket and contact Columbia Sportswear for a free replacement.

For more information, contact Columbia Sportswear Company, (800) 622-6953 or visit the firm's website at: www.Columbia.com/Recall.



SALES
CALLS
RECALLS

John Deere Recalls Gator Utility Vehicles



Deere & Company of Moline, Illinois in cooperation with the Consumer Product Safety Commission has recalled approximately 4,650 Utility vehicles. The fuel line can separate, posing a fire hazard to consumers.

John Deere has received three reports of a separated fuel lines, however no injuries have been reported.

This recall involves the John Deere Gator™ RSX850i Base, Sport and Trail model recreational utility vehicle manufactured between May 2012 and October 2012. They have side-by-side seating for two people and were available in Realtree® Hardwoods™ HD Camo, olive and black, or traditional green and yellow. RSX850i is located on the hood. The serial number is on the rear frame above the receiver hitch. Only utility vehicles with the following serial numbers are included in this recall:



Serial Numbers
IM0850TB++M010013 thru IM0850TB++M010768
IM0850TS++M010001 thru IM0850TS++M011932
IM0850TT++M010001 thru IM0850TT++M012765

John Deere dealers nationwide distributed these vehicles from August 2012 through October 2012 for between \$12,900 and \$15,500.

Consumers should stop using the recalled utility vehicle and contact a John Deere dealer to schedule a free inspection and free repair. John Deere is contacting all registered owners of the recalled vehicles directly. For more information, visit the firm's website at: www.johndeere.com and click on Services & Support.

Subaru Recalls Vehicles Due to Puddle Lamp Short Circuits



Subaru is recalling as many as 634,000 vehicles in the United States for potential lighting problems that could lead to smoke or fire, according to U.S. safety regulators.

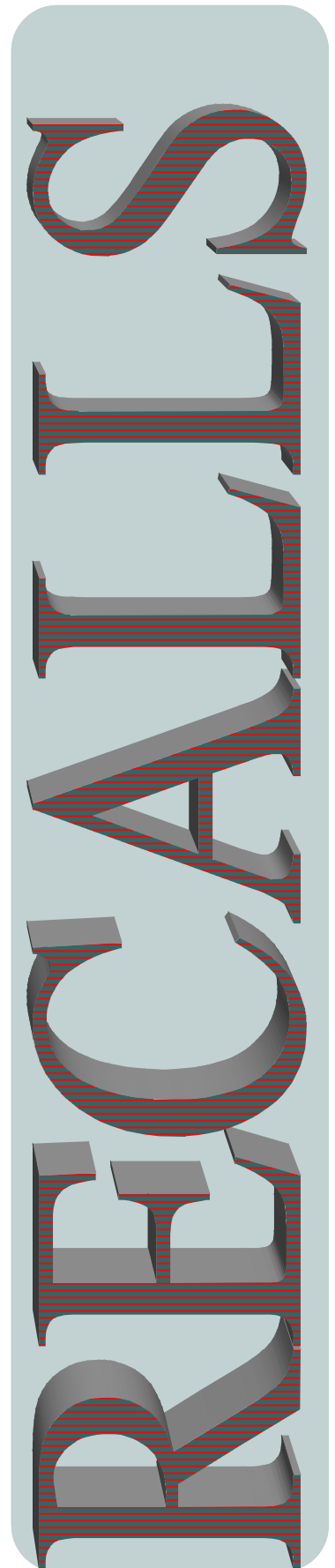
The recall by Subaru, owned by Fuji Heavy Industries, Ltd., potentially affects some Forester vehicles from model years 2009 through 2012, all Legacy and Outback vehicles from model years 2010 and 2011, and some

Tribeca vehicles from model years 2006 through 2012, according to documents files with the U.S. National Highway Traffic Safety Administration.

The 633,842 vehicles potentially affected by the recall may be equipped with accessory puddle lights that when lit brighten the areas under the doors. According to Subaru, the recall involves only 53,999 cars equipped with the lights, but the wider number of owners must be alerted because the company does not know which cars have them.

There have been no reports of accidents or injuries related to this recall, but there was one report of smoke. A short circuit can develop when the light or connector are exposed to an electrolytic moisture source such a road spray that has road salt in it. This can cause heat that could melt plastic, resulting in smoke or fire.

For more information, visit the Subaru's website at: www.subaru.com.





Robert B. Whitmore, CFI
President

Happy New Year! January is that time of year when many of us sports-minded enjoy the outdoors, including ice fishing and snowmobiling. Unfortunately, oftentimes these recreational activities can lead to tragedy. Recently five individuals were seriously injured in a fish house explosion in northern Minnesota. Alternative heat sources to keep us warm while out in the elements need to be carefully monitored to ensure that we all come home safely after a day outdoors. Not only explosions and fires, but carbon monoxide. If you are one of those that play in the outdoors this time of year, take a few minutes to ensure that you are being safe in your environment. Be sure and check out Columbia's recent recall involving battery packs in jackets that were sold in Minnesota and Wisconsin.

Also, a big thank you to Duane Wolf for his article this month regarding CSST. CSST has been a topic of conversation over the past few years and it's role in fires pertaining to lightning strikes.

I'd also like to take a minute to recognize members of my staff that are celebrating their anniversary this quarter. Congratulations and thanks to Brian Haag, Brian Whitmore, Doug Noah and Amy Powell for their continued contributions. It has been an honor and pleasure to work with each of you.



Brian Haag



Brian Whitmore



Amy Powell



Doug Noah

Submit a Loss



It's Easy go to the Whitmore Fire Consultant's Website:

www.whitemorefire.com

Click on "Submit a Loss" tab

Complete the online form and press "submit" and you will receive an electronic confirmation of our receipt of your loss request. You will also receive a response from our on-call representative as well as a follow-up during the next business day.

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