HB0586 Letter.pdf
Uploaded by: Caryn McMahon
Position: FAV

February 9, 2024

Senator Brian J. Feldman, Chair
Senator Cheryl C. Kagan, Vice Chair
Education, Energy, and Environment Committee Maryland General Assembly
11 Bladen St.
Miller Senate Office Building
Annapolis, Maryland 21401

Re: SB0586 - Public Safety - Corrugated Stainless Steel Tubing for Gas Piping Systems Requirements and Prohibitions

Dear Senator Feldman and Senator Kagan,

July 9th, 2021 will be a date engraved in my head for the rest of my life, along with my husband and our four young children. The day began like any other with loving chaos but ended in numbing pain.

As I stood outside of our home, watching firemen struggle to find the fire as smoke poured from our roof. This is common in corrugated stainless steel tubing (CSST) fires as the fire is constantly fed by gas through the failed CSST piping. Although I denied this could actually be happening to ME, there was no question our house was in fact on fire. You see, at that time I had been a volunteer at the local fire department for almost 20 years, a fire investigator for almost 14 years and as if that wasn't enough "knowledge and protection" - my husband had been a volunteer AND career fireman for almost 20 years. Despite almost our combined 40 years of public safety, we had failed our own family. Our home was less than five years old, so how could two people with such education and experience have failed our family? Trust; that is how. Building a new home is fun and exciting, so you trust. You trust the contractors to uphold the highest safety precautions (both those required by law and those requested by the homeowner), and you trust the manufacturers to produce the safest and most effective products. Even though CSST had been deemed "unsafe" in the fire industry.. we just trusted. We trusted the manufacturers of CSST had done the right thing by taking extra safety precautions, and/or that the construction industry was no longer using CSST. However, that was not true. Manufacturers have been aware of defects and concerns with CSST since 2012, yet they failed to take any further action to ensure it was manufactured and tested to a higher standard. CSST was installed for our stove with a single propane tank outside of the house.

As I stood there and watched my own home burn down, all my trust was shattered. I had witnessed this scene so many times before in my career, but I had never been "the victim". I was a new statistic. It was an out of body experience as I watched as each phase of the fire raged through our house. From experience, I knew with each broken

window, each new hole in the roof and the collapse of the floor, that more and more of our life was being destroyed. In the end, our insurance claim was well over one million dollars. Fortunately for us, our insurance policy was appropriate for our fire claim but since our fire we have learned many homeowners are underinsured. Therefore, an incident like ours would be mentally AND financially devastating to many citizens within the State of Maryland.

Fire does not discriminate and it will gut you to the core, which I learned in a very humbling experience. This is why I work to educate others of the danger of CSST. A lightning strike over 150 feet away from our house had destroyed our lives within 30 minutes, but it could have been prevented. We must do better for the citizens of the State of Maryland, they deserve to have TRUST in the construction industry and the safety of their homes.

Please ensure the passing of SB0586 to further ensure the safety of the citizens of the State of Maryland.

Sincerely,

Caryn McMahon
Fire Victim
Charles County Resident

Senate Education, Energy, and Enviroment Committee

Uploaded by: Craig Matthews

Position: FAV

February 12, 2024

Senator Brian J. Feldman, Chair
Senator Cheryl C. Kagan, Vice Chair
Education, Energy, and Enviroment Committee Maryland General Assembly
2 West
Miller Senate Office Building
Annapolis, Maryland 21401

Re: SB0586 - Public Safety - Corrugated Stainless-Steel Tubing for Gas Piping Systems Requirements and Prohibitions

Dear Senator Feldman and Senator Kagan,

My name is Craig Matthews, and I am a Captain for the Howard Department of Fire and Rescue Services, specifically in the Office of the Fire Marshal's Fire Investigation Division. I have been assigned to investigate the origin and cause of fires for the last 11 years, having investigated approximately 700 fire incidents to date.

I write to bring your attention to a recurring safety issue that has caused significant property damage and, tragically, fatal injuries in some instances. Over the years, I have come across numerous cases where lightning strikes have resulted in the failure of Corrugated Stainless-Steel Tubing (CSST), leading to fires within structures, often in concealed spaces. As the energy is transferred from the lightning strike to the CSST, as the energy moves through the CSST, the energy can result in an arcing event with causes a hole in the CSST and the escaping fugitive gas then ignites simultaneously. The arcing event is caused by the very thin wall of the construction of the CSST arcing to nearby metallic.

One particular incident that stands out is the tragic loss of Lieutenant Nathan Flynn from the Howard County Department of Fire & Rescue Services in 2018. During my investigation, it was determined that a lightning strike had hit a large oak tree behind the house, transferring the energy to the ground and creating a trench that reached the underground propane tank. From there, the energy traveled through the CSST, which failed in a hidden crawlspace beneath the living room. The energy from the lightning strike transferred over 100 feet from the tree to the propane tank and then to the house. The fire burned for approximately 30 minutes before the first 911 call, and Lieutenant Nathan Flynn made the ultimate sacrifice while operating on this incident.

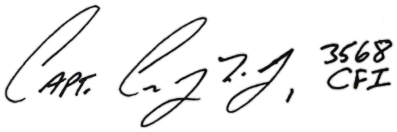
In another case, the line of duty death of Battalion Chief Josh Laird in Frederick County was also attributed to a lightning strike causing the failure of the CSST system, igniting the structure's flooring system resulting in Battalion Chief Josh Laird making the ultimate sacrifice.

Throughout my career, I have investigated numerous incidents involving lightning strikes and CSST failures, even in cases where lightning protection systems were installed on the roofs to prevent such incidents. It is crucial that we consider all these incidents when deliberating on the passage of SB0586.

I kindly request that you give due consideration to the passage of SB0586, which addresses the issues surrounding CSST failures caused by lightning strikes. This proposed legislation aims to enhance safety measures and prevent further property damage and loss of life.

Thank you for your time and attention to this matter. Your support in passing SB0586 will undoubtedly contribute to the safety and well-being of our community. I am here to seek a favorable report from the committee on SB0586, which will contribute to ensuring the safety and well-being of the residents and firefighters of Maryland. If you require any further information or would like to discuss this matter in detail, please do not hesitate to reach out to me.

Yours sincerely,



Captain Craig Matthews, IAAI-CFI, CFEI
ADC Handler “K-9 Sowell”
Howard County Department of Fire and Rescue Services
Office of the Fire Marshal
Fire Investigation Division
410-313-6019
cmatthews@howardcountymd.gov

SB0586-EEE_MACo_SUP.pdf
Uploaded by: Dominic Butchko
Position: FAV

MARYLAND Association of COUNTIES

Senate Bill 586

Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions

MACo Position: **SUPPORT**

To: Education, Energy, and the Environment Committee

Date: February 13, 2024

From: Dominic J. Butchko

The Maryland Association of Counties (MACo) **SUPPORTS** SB 586. This bill requires that corrugated stainless steel tubing (CSST) meet certain requirements in order to be sold, transferred, or distributed. Promoting standards for these materials can help promote safety and avoid some of the worst dangers threatening our first responders during active structure fires.

The Public Service Commission defines CSST as "a flexible, stainless steel piping system used to supply natural gas and propane in residential, commercial, and industrial structures." Over the years, this type of tubing has become a cornerstone of the nation's fossil fuel infrastructure and can be found in most buildings. Recently, there have been several instances where structure fires have become more severe due to failures in the CSST tubing – including the tragic line-of-duty deaths of Frederick County firefighter Joshua Laird and Howard County firefighter Nathan Flynn.

SB 586 addresses these failures by requiring CSST to meet certain standards in the International Fuel & Gas Code and enforcing those standards by establishing a civil penalty of up to $1000 for noncompliance.

This bill helps safeguard the health and safety of our first responders and all residents in Maryland. Counties urge the Committee to give **SB 586** a **FAVORABLE** report.

SB 586, FAV, FCG OCE JF, LS24.pdf
Uploaded by: Jessica Fitzwater
Position: FAV

Jessica Fitzwater
County Executive

FREDERICK COUNTY GOVERNMENT

OFFICE OF THE COUNTY EXECUTIVE

SB 586 – Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions

DATE:	February 13, 2024
COMMITTEE:	Senate Education, Energy, and the Environment Committee
POSITION:	Favorable
FROM:	The Office of Frederick County Executive Jessica Fitzwater

As the County Executive of Frederick County, I urge the committee to give SB 586 – Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions a favorable report. This bill will improve building safety and protect Maryland residents and first responders by requiring that all Corrugated Stainless-Steel Tubing (CSST) meets the LC1 standard using the LC1027 testing criteria.

Since 2018, the state of Maryland has experienced three (two firefighters/one civilian) fatalities because of fires caused by lightning-induced failure of CSST. This issue became deeply personal to Frederick County when a CSST-related fire in 2021 resulted in the line of duty death of Frederick County Battalion Chief Josh Laird. While legislation was passed in 2022 to ban the use of first generation (i.e., non-arc resistant) CSST, further measures are needed to protect our firefighters, first responders, and residents.

Current law allows CSST to be used if it is arc-resistant. This could be using the LC1024 testing criteria with proper bonding or the LC1027 testing criteria. Unfortunately, CSST that only meets the LC1024 testing criteria is only sufficient for up to 4.5 Coulombs or 1000 amps even when properly bonded and grounded, while the average lightning strike in the US is approximately 24-28 Coulombs and can be much higher. This means that even arc-resistant and/or properly installed CSST is highly vulnerable to malfunction, and higher safety standards are needed.

The LC1027 testing criteria is tested at a charge of 36 coulombs and a peak current of 30,000 amp. Importantly, the lighting strike that hit the chimney of the house in the Ball Road Frederick County fire that resulted in the death of Battalion Chief Laird was estimated to be approximately 27,000 amp.

The science around CSST safety is clear and, as a result, the National Association of State Fire Marshal's (NASFM), along with the Fire Service Membership Council (FSMC) and the International Code Council (ICC), voted unanimously to recommend that LC1027 be adopted as the minimum testing requirement to improve the safety of CSST.

As local and state government, we have a responsibility to our constituents, including our first responders, to adopt laws, policies, and building codes that ensure the safety of our communities. Adopting stronger safety standards for the energy systems in our buildings is one simple way we can uphold that responsibility.

Thank you for your consideration of SB 586. I urge you to advance this bill with a favorable report.

Jessica Fitzwater, County Executive
Frederick County, MD

SB586_EEE_FAV.pdf
Uploaded by: Katie Nash
Position: FAV

Career Fire Fighters Association of Frederick County, MD Inc.
International Association of Fire Fighters Local 3666
Affiliated with:
Maryland State Professional Fire Fighters Association and The Central Maryland Labor Council / AFL-CIO

SB 586
Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions
Education, Energy, and the Environment Committee
FAV
February 13, 2024

I write as the President of the Career Firefighters Association of Frederick County, Maryland - Frederick County's public employee organization that represents the over 600 men and women employed with the Frederick County Division of Fire and Rescue. We are grateful that your Committee will consider HB503 to address the danger related to yellow CSST. The deadly combination of yellow CSST and lightning strikes are attributed to the fires that led to the Line of Duty Deaths for Nathan Flynn in Howard County and our own Josh Laird in Frederick County.

In 2022, the legislature passed HB1052 - Public Safety – Gas Piping Systems – Construction Requirements (Flynn and Laird Act). This legislation was a step in the right direction and we were grateful for the action taken by the Maryland General Assembly. We are grateful for the ongoing work to improve safety measures for firefighters. Line of duty deaths are painful reminders of the sacrifice our members have made for the safety of Marylanders and we truly appreciate your work on this important issue.

We are proud to serve every day and in advance, thank you for considering SB586 and recommending a Favorable Report out of your Committee. Please contact me or Katie Nash (Katie@fiastroconsulting.com/301.524.9142) with any questions.

Stephen Jones
President of Local 3666, Frederick County Career Firefighters

Letter of Support - SB0586.pdf
Uploaded by: Michael Custer
Position: FAV

Maryland State Chapter International Fire Marshal's Association

Michael Custer, President
(202) 425-1317
Michael.s.custer.civ@mail.mil

Donna McGuire, Vice President
(443) 377-5413
donna.mcguire@aacounty.org

Roberta Kelly, Secretary/Treasurer
(410) 313-6040
rkelly@howardcountymd.gov

February 12, 2024

Senator Brian J. Feldman, Chair
Senator Cheryl C. Kagan, Vice Chair
Education, Energy, and the
Environment Committee
2 West
Miller Senate Office Building
Annapolis, Maryland 21401

Re: SB0586-Public Safety-Corrugated Stainless-Steel Tubing for Fuel Gas Piping Systems-Requirements and Prohibitions

The Maryland State Chapter of the International Fire Marshals Association is made up of representatives from Fire Marshal Offices across the State of Maryland. We work in collaboration with the Maryland State Fire Marshal's Office to advocate for strong and effective fire prevention and life safety measures to protect the citizens of the State of Maryland.

We are writing you today to submit our support for SB0586. Though legislation was passed last year in our state requiring Corrugated Stainless-Steel Gas Tubing where newly installed to be of Arc-Resistant Jacketed Tubing, tested and listed in accordance with ICC-ES-LC1027, however, CSST not meeting this standard is still being sold, transferred, and distributed within the State of Maryland.

This proposed bill would ensure that any CSST sold, transferred, or distributed within the state to meet the requirements of ICC-ES-LC027 and that any person who violates this proposed bill would be subject to a civil penalty not exceeding $1,000.

CSST not meeting the requirements of ICC-ES-LC027 has shown to be a danger to both firefighters and residents due to its propensity to leak if affected by lightning strikes. In recent years we have seen two firefighter deaths here in the state of Maryland directly attributable to CSST. We know of many other fires where this issue has occurred, sometimes with devasting damage. These proposed requirements will greatly assist us in alleviating the dangers we currently face in our duties.

Thank you for your consideration of this legislation and we respectfully ask the Environment and Transportation Committee for a favorable report for SB0586.

Sincerely,

Michael S. Custer

Michael (Scott) Custer
President
Maryland State Chapter, International Fire Marshals Association

CSST.pdf
Uploaded by: Michael Fleming
Position: FAV

Priority Legislation

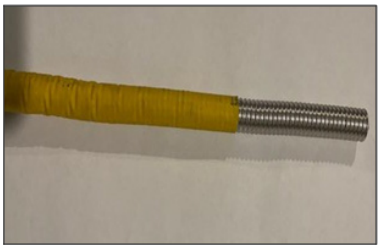
Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions

The products we use in our buildings have the potential to have significantly safety impact our lives. Corrugated Stainless Steel Tubing (CSST) is a product used to deliver propane and methane gas in homes around the county. This product is prone to malfunctions that can cause propane and methane leaks to occur. In 2022, Maryland took a crucial step in improving the safety of this tubing by prohibiting the use of non-arc-resistant CSST with the passage of HB1052. While arc-resistant CSST is a safer product than non-arc-resistant CSST, there are still potential safety issue that must be addressed. Arc-resistant CSST is only sufficient for up to 4.5 Coulombs, while the average lightning strike in the US is approximately 24-28 Coulombs and can be much higher. This means even arc-resistant CSST is highly vulnerable to malfunction and higher safety standards are needed. In 2016, the International Code Council, Fire Service Membership Council, and the National Association of State Fire Marshals unanimously endorsed CSST of an LC1027 rating. LC1027-rated CSST is able to withstand up to 36 Coulombs, making it significantly more durable and less prone to malfunction.

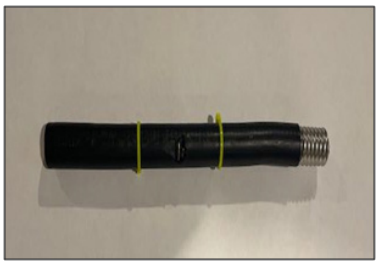
Proposed Legislation:

Frederick County urges legislators to improve the safety of our buildings by passing legislation that prohibits the sale and use of CSST that does not meet a LC1027 rating or higher. This CSST is the lowest-rated tubing capable of withstanding the average lightning strike. Lower arc-resistant tubing is not sufficient to protect residents and first responders from CSST malfunctions and resulting fires. This issue is particularly important to Frederick County because lightning-induced failure of CSST was a contributing factor in the line-of-duty death of Frederick County Battalion Chief Josh Laird. Improving the safety of buildings in Maryland, and therefore the safety of our first-responders, is a fitting and imperative way to honor the legacy of Battalion Chief Laird.

CSST Product Comparison:



◀ This image shows the “yellow” non-arc resistive, single layer jacket CSST. This product only meets the AN-SI LC-1 testing standard.



◀ This image shows the “black” arc-resistive, single-layer jacket CSST. This product meets requirements from 2022’s HB 1052. You can see a perforation from a lightning-induced arcing event, which caused a fire to a single -family home in Ellicott City in 2021.

◀ This image represents the multi-layered jacket CSST. This jacket consists of a conductive jacket, aluminum mesh, and a non-conductive jacket over the CSST. This product meets both the ANSI LC-1 and the ICC-ES-LC1027 testing standard.

Point of Contact: Victoria Venable, Director, Government Relations & Strategic Partnerships
VVenable@FrederickCountyMD.gov, 240-931-7979

LC 1024 listing criteria.pdf
Uploaded by: Michael Fleming
Position: FAV

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PMG LISTING CRITERIA FOR

CORRUGATED STAINLESS STEEL TUBING UTILIZING A PROTECTIVE JACKET (A MINIMUM 4.5 COULOMB CHARGE TRANSFER)

LC1024

Approved February 2010 (Revised February 2012, Revised July 2016)

PREFACE

Plumbing, mechanical and fuel gas (PMG) listings issued by ICC Evaluation Service, LLC (ICC-ES), are based upon performance features of the *International Plumbing Code®*, *International Mechanical Code®*, *International Residential Code®*, *Uniform Plumbing Code and Uniform Mechanical Code.* Section 105.2 of the *International Plumbing Code®* reads as follows:

> **Materials, methods and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material or method of construction shall be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes.

ICC-ES may consider alternate listing criteria, provided the listing applicant submits valid data demonstrating that the alternate listing criteria are at least equivalent to the listing criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features of the codes, ICC-ES retains the right to refuse to issue or renew a listing, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Listing criteria are developed solely for use by ICC-ES for purposes of issuing ICC-ES PMG listings.

1.0 INTRODUCTION

1.1 Purpose: The purpose of this listing criteria is to establish the effectiveness of a protective exterior jacket factory-applied to corrugated stainless steel tubing (CSST) which is currently recognized as code-complying in another ICC-ES PMG listing report. The exterior jacket is intended to protect the inner CSST from leakage due to transient arcing (a minimum 4.5 Coulomb charge transfer) from exposure to lightning voltage/currents that may exist inside a building; utilize the appliance bond as the sole bonding method; and be recognized in an ICC Evaluation Service, Inc. (ICC-ES) listing. This listing criteria addresses a proposed level of arcing from lightning, not a direct strike.

1.2 Scope: This listing criteria defines test methods and performance requirements applicable for evaluating simulated indirect lightning resistance of a protective exterior jacket factory-applied over CSST which is currently recognized in an ICC-ES PMG listing. The lightning-resistant CSST system, for use in fuel gas piping, is intended for use in normal installations when installed in compliance with the manufacturer's instructions and with Sections 309 and 310 of the *International Fuel Gas Code*© and Sections G2410 and G2411 of the *International Residential Code*©.

1.3 Codes and Referenced Standards:

Note: Any standard/code referenced herein shall be the current edition or version adopted by the jurisdiction.

1.3.1 *International Residential Code*© (IRC), Chapter 24, Fuel Gas, International Code Council.

1.3.2 *International Fuel Gas Code*© (IFGC), International Code Council.

1.3.3 *Uniform Plumbing Code*™* (IAPMO UPC), Chapter 12, Fuel Gas Piping, International Association of Plumbing and Mechanical Officials.

1.3.4 *Uniform Mechanical Code*™* (IAPMO UMC), Chapter 13, Fuel Gas Piping, International Association of Plumbing and Mechanical Officials.

1.3.5 ANSI LC 1 / CSA 6.26, Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST) Fuel Gas. American National Standards Institute.

2.0 BASIC INFORMATION

The following basic information shall be provided:

2.1 Product Description: The product consists of corrugated stainless steel tubing (CSST) and brass fittings for fuel gas piping systems recognized in another current ICC-ES PMG listing as conforming to ANSI LC 1 / CSA 6.26, and satisfying the referenced codes listed in Section 1.3, but, with a different covering. The CSST is covered with an electrically conductive protective jacket.

2.2 Installation Instructions: The product shall be installed in accordance with the manufacturer's instructions and the requirements of the applicable codes and referenced standards listed in Section 1.3.

2.3 Product and Packaging Identifications: The unit and the package shall be permanently and legibly marked with the manufacturer's name or trademark, and the model number. The product shall also bear the ICC-ES PMG listing mark. The ICC-ES listing number shall be placed on the listed product's packaging or installation instructions.

3.0 GENERAL REQUIREMENTS

3.1 Corrugated Stainless Steel Tubing: Corrugated stainless tubing shall be currently recognized in an ICC-ES PMG listing as complying with the requirements of ANSI LC 1 / CSA 6.26.

3.2 Electrically Conductive Protective Jacket: The jacket may consist of a single or multi-layers as designed by the manufacturer and shall be tested in accordance with Section 4.0 of this standard.

4.0 TEST METHOD AND PERFORMANCE REQUIREMENTS

4.1 Testing: Testing shall be performed by an International Accreditation Service (IAS) recognized lightning testing laboratory or by a signatory to a Mutual Recognition Agreement to which IAS is a signatory.

4.2 Specimen Conditioning: The specimen used for testing shall be previously subjected to a 96-hr corrosion test conducted in accordance with ASTM B117 without evidence of pitting, flaking, cracking or signs of corrosive attack. The specimen must include the protective jacket on a section of CSST and be joined to a fitting in accordance with the manufacturer's installation instructions.

Note: Additional conditioning is only applicable to specimens that contain any metallic components that were not previously evaluated in accordance with ASTM B117 under ANSI LC1. These specimens shall also be tested with fittings installed in accordance with manufacturer's instructions.

4.3 Test Wave Forms: The waveform is defined by its rise-time to peak current and fall-time to 50% of peak amplitude. The applied current wave form shall be determined by the lightning laboratory and shall be representative of induced lightning effects that could appear on gas piping inside a building. For the purposes of this listing criteria, the assumed energy associated with a transient arc inside a building is less than two coulombs and the recognized CSST system must resist a minimum of 4.5 coulombs, which includes a factor of safety in excess of 2, when tested as noted in this listing criteria. A typical current wave form is shown in Figure 1.

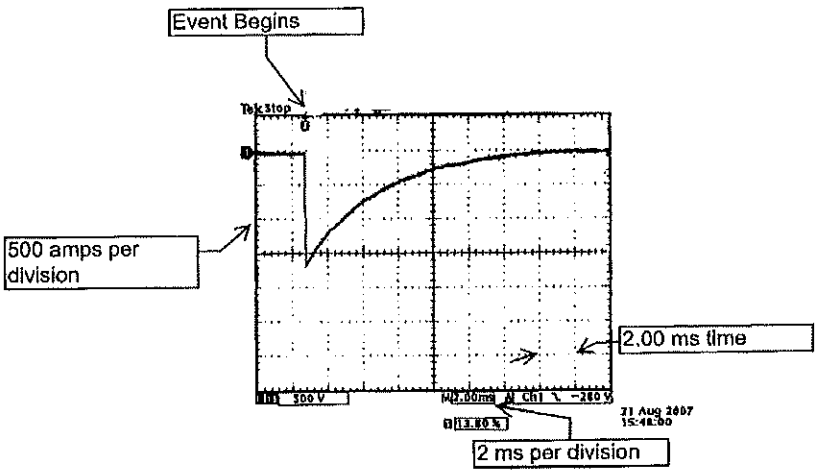

FIGURE 1—TYPICAL CURRENT WAVE FORM

4.4Test Procedures: The procedures noted below shall be used to evaluate the performance of CSST piping. Testing shall be conducted on two samples each of the smallest, largest and an intermediate diameter tubing to qualify all sizes. The minimum performance criteria shall be 1,000 amps minimum peak delivering 4.5 coulombs within 20 milliseconds (0.020 seconds). Following exposure to this level

of arcing, the sample shall be pressure-tested to 5 PSI for 1 minute with air and submerged in water without signs of leakage.

4.4.1Calibration: A test generator is configured to produce and measure the desired current waveform. An appropriately sized copper pipe is installed $^1/_8$ inch underneath the generator's test electrode and grounded to the generator return with a minimum AWG 6 wire or braided strap. The generator is charged to the appropriate level. The generator is then discharged through the copper pipe, and the applied current waveform is recorded. The generator is verified as producing the desired current waveform. The measured current waveform is integrated to determine the applied charge to the copper pipe. The current waveform and charge transfer waveform are recorded. If the high current generator does not yield the desired current waveform or charge transfer, the generator is reconfigured, and the calibration procedures are repeated. The copper pipe is removed from the generator.

4.4.2 Testing:

4.4.2.1 Arcing Resistance: A minimum 3-foot-long CSST test article is installed at least $^1/_8$ inch beneath a $^1/_4$-inch-diameter test electrode. The electrode shall be placed at least 12 inches from the ends of the test article. The brass fitting or inner stainless steel piping of the CSST is grounded to the generator return using a minimum AWG 6 wire or braided strap. A dielectric may be required underneath the test article to ensure the test currents flow along the length of the test article and not to the test bench or support equipment. The lightning generator is charged to the appropriate level, and is then discharged to the test article. If the test generator does not discharge to the test article, it shall be confirmed that sufficient voltage is present to achieve dielectric breakdown of the jacket (energy enter the jacket and not to ground) and adjustments are made accordingly. It is verified that the test current enters the protective jacket and did not arc to any exposed tubing or fittings on either end of the test article. If all or a portion of the test current arced to the exposed ends or fittings of the test article, the test is invalid and must be repeated. The applied current waveform is recorded. The measured current waveform is integrated to calculate the applied charge. If the calculated applied charge is equal to or greater than the values stated in Section 4.4, the applied charge transfer is recorded. The jacket is cut away from the test article at the test location and a visual inspection of the tubing is made to determine if the stainless steel tubing is punctured. If no puncture of the tubing is

noted on visual inspection, the test article shall be pressure-tested to the requirements of Section 4.4. If the test article fails visual inspection or pressure test after being subjected to the required applied charge, the test article fails. If the calculated applied charge is less than the values stated in Section 4.4, the test is performed again at a different location on the same test article, or another test article from the same production lot, until the calculated applied charge requirements are satisfied. The test article is deemed to have passed if all of the requirements are met. In order to achieve a listing to this standard, no test articles can fail this test routine. See Figure 2 for test schematic.

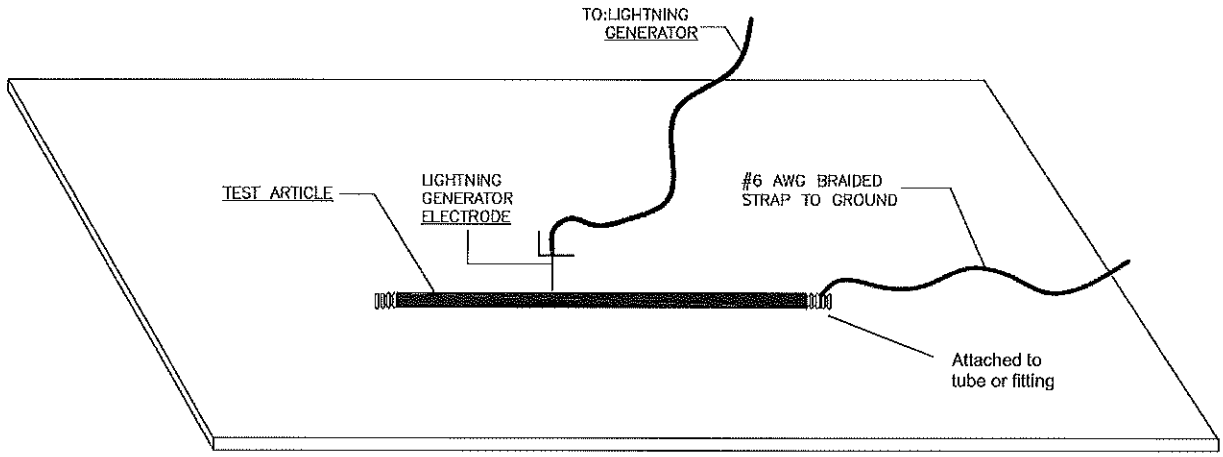

FIGURE 2—TEST SCHEMATIC

4.4.2.2 Bonding Equivalence: For the purpose of evaluating the conductive jacket for resistance to transient arcing using different bonding methods, testing in accordance with this section shall be performed using a simulated appliance consisting of:

1. A steel sheet metal chassis
2. An NPT connection point for the CSST
3. An electrical box with a minimum 10-foot-long, #14 AWG bonding conductor attached
4. A bonding clamp attached to the fitting on the free end of the CSST and a minimum 10-foot-long, #6 AWG bonding conductor

A minimum of two samples of an intermediate size of CSST shall be tested using the following configurations:

1. The #14 AWG conductor as the bond
2. The #6 AWG conductor as the bond
3. Using both as the bond

If the test results for all three configurations comply with Section 4.4.2, bonding of the conductive jacketed corrugated tubing, using a #14 AWG appliance bond, shall be deemed equivalent to using a #6 AWG bond required by IFGC 310.1.1. See Figure 3 for a test schematic.

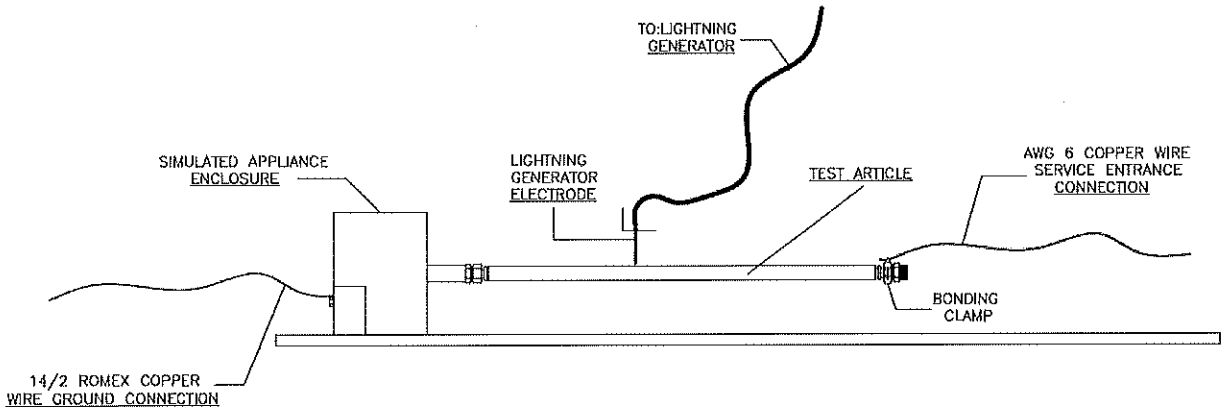

FIGURE 3—TEST SCHEMATIC

4 LISTING RECOGNITION

4.2 Installation shall be in accordance with the manufacturer's instructions and the applicable code.

4.3 The listing shall state that the documented level of resistance to arcing is 1000 amps minimum peak delivering 4.5 coulombs within 20 milliseconds (0.020 seconds).

4.4 The listing shall state the covering has been tested in accordance with ASTM E 84 and meets the minimum ratings of 25 for flame spread and 50 for smoke developed.

4.5 Upon documentation of satisfactory passing of tests noted in Section 4.4.2.2 of this criteria, the listing shall state the following: "Electrical Bonding: The Conductive Jacketed Corrugated Stainless Steel Tubing System is electrically continuous and is considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that

appliance. Additional bonding prescribed by Section 310.1.1 is not required for Conductive Jacketed Corrugated Stainless Steel Piping Systems when installed in accordance with this listing."

LC 1027 listing criteria.pdf
Uploaded by: Michael Fleming
Position: FAV

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PMG LISTING CRITERIA FOR A PROTECTIVE JACKETED, CORRUGATED STAINLESS STEEL TUBING (A MINIMUM 36 COULOMB CHARGE TRANSFER)

LC1027

Approved February 2011
(Revised July 2016, November 2016)

PREFACE

Plumbing, mechanical and fuel gas (PMG) listings issued by ICC Evaluation Service, LLC (ICC-ES), are based upon performance features of the *International Plumbing Code®*, *International Mechanical Code®*, *International Residential Code®*, *Uniform Plumbing Code and Uniform Mechanical Code*. Section 105.2 of the *International Plumbing Code®* reads as follows:

> **Alternative materials, methods and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material or method of construction shall be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes.

ICC-ES may consider alternate listing criteria, provided the listing applicant submits valid data demonstrating that the alternate listing criteria are at least equivalent to the listing criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features of the codes, ICC-ES retains the right to refuse to issue or renew a listing, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Listing criteria are developed solely for use by ICC-ES for purposes of issuing ICC-ES PMG listings.

1.0 INTRODUCTION

1.1 Purpose: The purpose of this listing criteria is to establish the effectiveness of an exterior protective jacket system factory-applied to corrugated stainless steel tubing (CSST) which is currently recognized in another ICC-ES PMG listing. The exterior jacket system is intended to protect the inner CSST from leakage due to exposure to arcing (a minimum 36 Coulomb charge transfer) from indirect lightning voltage/currents that may exist inside a building; utilize the appliance bond as the sole bonding method; and to be recognized in an ICC Evaluation Service, LLC (ICC-ES), listing. Two levels of indirect effects are defined. This listing criteria addresses a proposed level of current and energy from lightning and takes into account only indirect effects.

1.2 Scope: This listing criteria defines test methods and performance requirements applicable for evaluating simulated lightning protection of an exterior protective jacket system factory-applied over a CSST which is currently recognized in an ICC-ES PMG listing. The lightning-resistant CSST system, for use in fuel gas piping, is intended for use in normal installations when installed in accordance with the manufacturer's instructions and with Sections 309 and 310 of the *International Fuel Gas Code*© and Sections G2410 and G2411 of the *International Residential Code*©. This listing criteria is for the evaluation of the product from indirect lightning only, and the effect of direct lightning strikes is beyond the scope of the criteria.

1.3 Codes and Referenced Standards:

Note: Any standard referenced herein shall be the current edition of that standard.

1.3.1 2006, 2009, 2012 and/or 2015 *International Residential Code*© (IRC), Chapter 24, Fuel Gas. International Code Council.

1.3.2 2006, 2009, 2012 and/or 2015 *International Fuel Gas Code*© (IFGC). International Code Council.

1.3.3 2006, 2009, 2012 and/or 2015 IAPMO *Uniform Plumbing Code*™* (IAPMO UPC), Chapter 12, Fuel Gas Piping. International Association of Plumbing and Mechanical Officials.

1.3.4 2006, 2009, 2012 and/or 2015 IAPMO *Uniform Mechanical Code*™* (IAPMO UMC), Chapter 13, Fuel Gas Piping. International Association of Plumbing and Mechanical Officials.

1.3.5 ANSI LC 1 / CSA 6.26, Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST). American National Standards Institute.

2.0 BASIC INFORMATION

The following basic information shall be provided:

2.1 Product Description: The product consists of corrugated stainless steel tubing (CSST) for fuel gas piping systems recognized in another current ICC-ES PMG listing as conforming to ANSI LC 1 / CSA 6.26, and satisfying the referenced codes listed in Section 1.3, but with a different covering. The CSST is covered with a protective jacket system.

2.2 Installation Instructions: The product shall be installed in accordance with the manufacturer's instructions and the requirements of the applicable codes and referenced standards listed in Section 1.3.

2.3 Product and Packaging Identification: The unit and the package shall be permanently and legibly marked with the manufacturer's name or trademark, and the model number. The product shall also bear the ICC-ES PMG listing mark. The ICC-ES listing number shall be placed on the listed product's packaging or installation instructions.

3.0 GENERAL REQUIREMENTS

3.1 Corrugated Stainless Steel Tubing: Corrugated stainless tubing shall be currently recognized in an ICC-ES PMG listing as complying with the requirements of ANSI LC 1 / CSA 6.26.

3.2 A Protective Jacket System: The protective jacket may consist of a single or multi-layers as designed by the manufacturer and shall be tested in accordance with Section 4.0 of this criteria.

4.0 TEST METHOD AND PERFORMANCE REQUIREMENTS

4.1 Testing: Testing shall be performed by a lightning testing laboratory accredited by the International Accreditation Service (IAS) or by a signatory to a Mutual Recognition arrangement to which IAS is also a signatory; or by a lightning test laboratory that is otherwise acceptable to the ICC-ES executive director of certification programs.

4.2 Specimen Conditioning: The specimen used for testing shall be previously subjected to a minimum 96-hour corrosion test conducted in accordance with ASTM B 117. The specimen must include the protective jacket on a section of CSST and be joined to a fitting in accordance with the manufacturer's installation instructions. The entire specimen, including the internal and external surface of the fitting shall not have any evidence of pitting, flaking, cracking or signs of corrosive attack.

4.3 Number of Samples: Samples shall be three each of the smallest and largest diameters and one intermediate diameter to be selected by the laboratory.

4.4 Test Waveforms: The waveforms presented represent idealized environments which are to be applied to the CSST for purposes of analysis and testing. The waveforms are intended to be composite waveforms whose effects on the CSST are those expected from natural lightning. In the waveform descriptions that follow, parameters of particular importance to the effects to be considered are included, whereas other parameters are omitted.

4.4.1 Indirect Effects 1 Waveform:

For the indirect effects testing, a 10x1000 µs waveform is utilized as shown in Figure 1. This waveform should have a current amplitude (5.5–7.0 kA) that will result in a transfer charge of a minimum 10 coulombs (integrating to calculate the area under the curve).

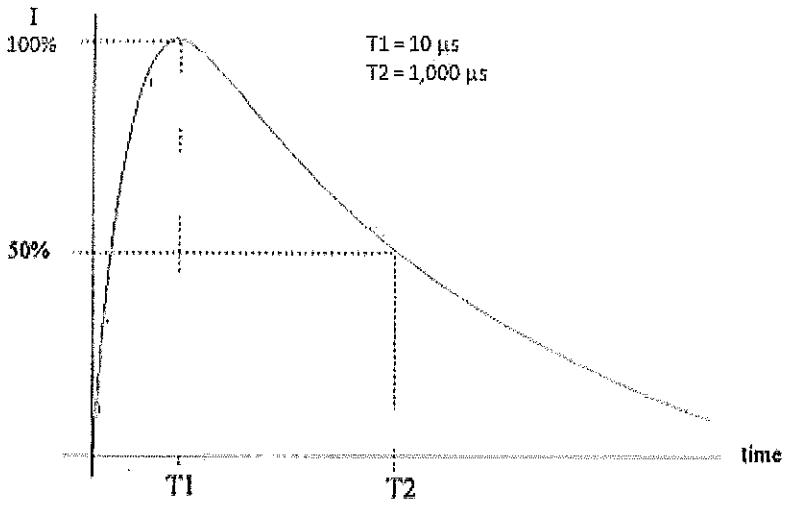

FIGURE 1—10 X 1000 µs WAVEFORM

4.4.2 Indirect Effects 2 Waveforms:

For the purpose of testing under this listing criteria, the indirect effects 2 parameters presented represent the 50 percentile for negative lightning flashes measured at ground. The CSST that resides in a building would have 50 percentile levels below these levels as it does not have a direct attachment to the lightning channel. The current components for evaluating indirect effects 2 are shown in Figure 2, where component:

1) Represents the return stroke.

2) Represents intermediate current.

3) Represents continuing current.

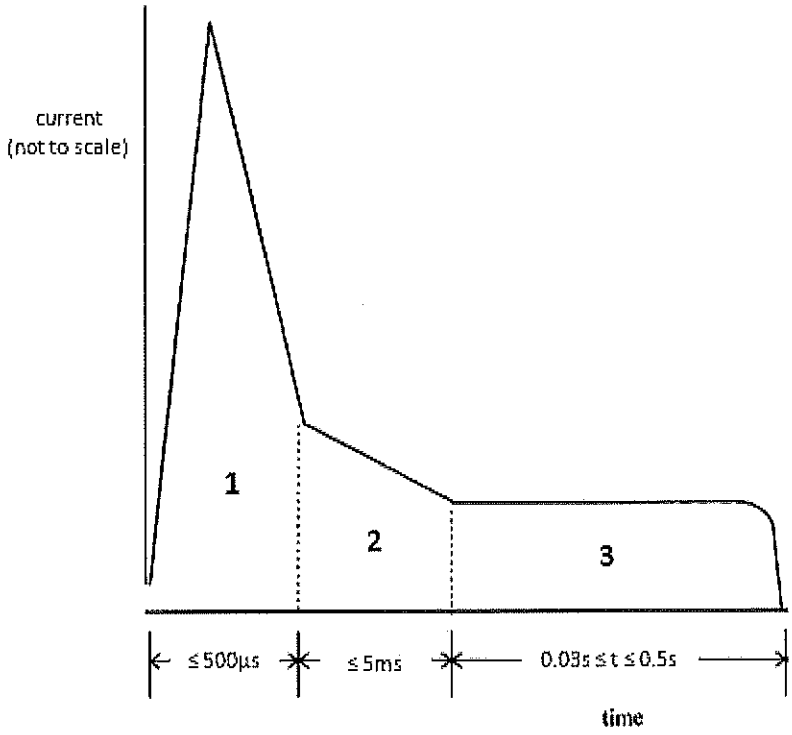

FIGURE 2—CURRENT COMPONENTS FOR INDIRECT EFFECTS 2 TESTING

COMPONENT 1 (Return Stoke)	
Peak Amplitude	30 kA, minimum
Action Integral	0.055×10^6 A^2s, minimum
Time Duration	≤ 500 µs
COMPONENT 2 (Intermediate Current)	
Maximum Charge Transfer	10 coulombs (±10%)
Average Amplitude	2 kA (±20%)
Time Duration	≤ 5 ms
COMPONENT 3 (Continuing Current)	
Amplitude	200–800 A
Charge Transfer	26 coulombs, minimum

Current Component 1 – Return Stroke

Component 1 can be simulated by either oscillatory or unidirectional waveforms as shown in Figure 3 and Figure 4, with a total time duration to 1% peak value less than 500 µs. The current amplitude shall

be a minimum of 30 kA and the rise time shall not exceed 25 µs (time between 10% and 90% of the amplitude). The action integral shall be a minimum of 0.055 x 10^6 A^2s.

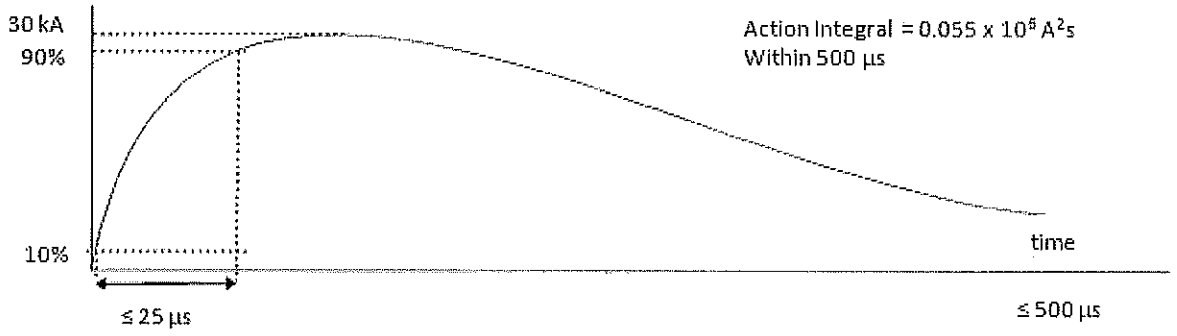

FIGURE 3—UNIPOLAR PULSE

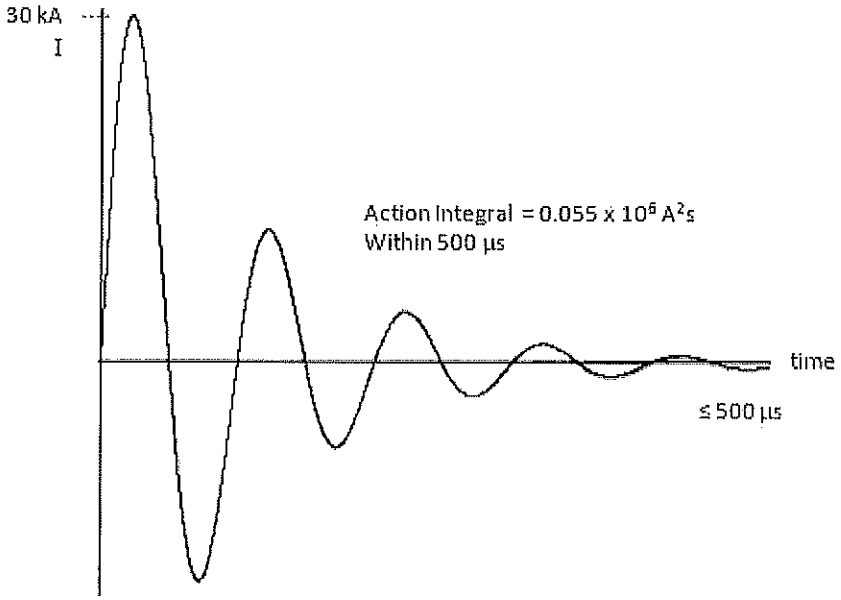

FIGURE 4—DAMPED SINUSOIDAL CURRENT

Current Component 2 – Intermediate Current

This component should be unidirectional as shown in Figure 5. The average current amplitude must be 2 kA (±20%) flowing for a duration of 5 ms (±10%) with a charge transfer of 10 coulombs (±10%).

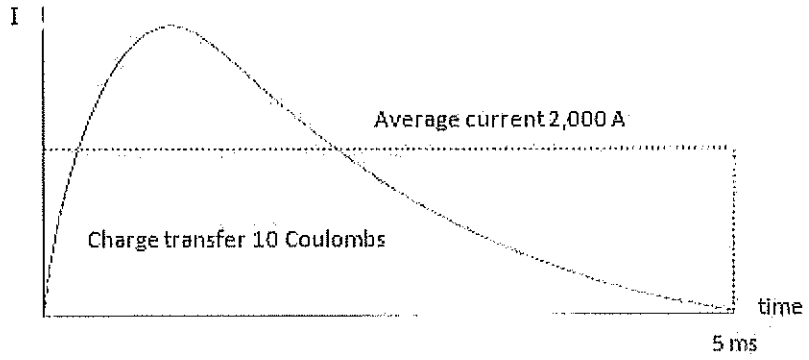

FIGURE 5—CURRENT COMPONENT 2

Current Component 3 – Continuing Current

Component 3 should have a unidirectional waveform as shown in Figure 6 (example). This waveform should have a current amplitude between 200 and 800 A and a corresponding time duration that will result in a transfer charge of a minimum 26 coulombs.

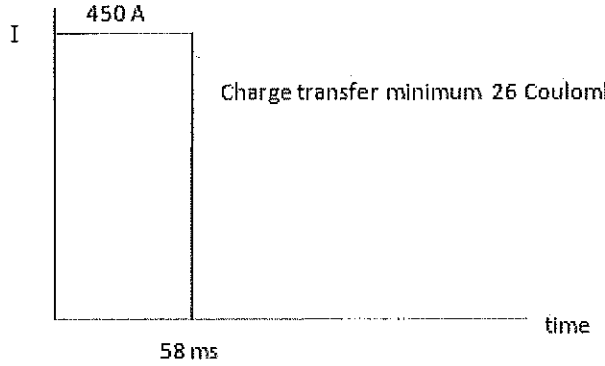

FIGURE 6—CURRENT COMPONENT 3

4.5 Test Procedures: The procedures noted below shall be used to evaluate the performance of CSST piping. Testing shall be conducted on three samples each of the smallest, largest and an intermediate diameter tubing to qualify all sizes. Testing shall be conducted utilizing the waveforms and parameters outlined in Section 4.4. Following exposure to this level of current and energy, the sample shall be pressure-tested to 7.5 psi and the pressure held for five minutes without signs of leakage.

4.5.1 Calibration: A test generator is configured to produce and measure the desired current waveforms. The generator is charged to the appropriate levels. The generator is then discharged

through a copper pipe, and the applied current waveforms are recorded. The waveforms are verified to confirm the test configuration is producing the desired current waveforms. The waveform shapes are captured using an oscilloscope and calculations are made to verify the desired current levels, action integral, rise times, decay times, duration, and charge levels are achieved. This information is recorded along with the oscilloscope graphs. If the high current generator does not yield the desired levels and waveforms, the generator setup is reconfigured, and the calibration procedures are repeated. Once the calibration yields the desired levels and waveforms, the copper pipe is removed from the generator.

4.5.1.1 Indirect Effects 1 Calibration Setup: An appropriately sized copper pipe is installed $^1/_8$ inch underneath the generator's rod electrode (¼ inch diameter) and grounded to the generator return via a braided strap (adequately sized to handle the current). The rod electrode is connected to the generator.

4.5.1.2 Indirect Effects 2 Calibration Setup: An appropriately sized copper pipe is installed vertically $^1/_8$ inch away from the generator's ground plate (electrode – rectangular cross-section $^1/_2$ inch in thickness) and connected to the generator via a braided strap (adequately sized to handle the current). The pipe shall be constrained to a 1-inch movement on both sides and opposite the ground plate as shown in Figure 7. The ground plate (electrode) is grounded to the generator return.

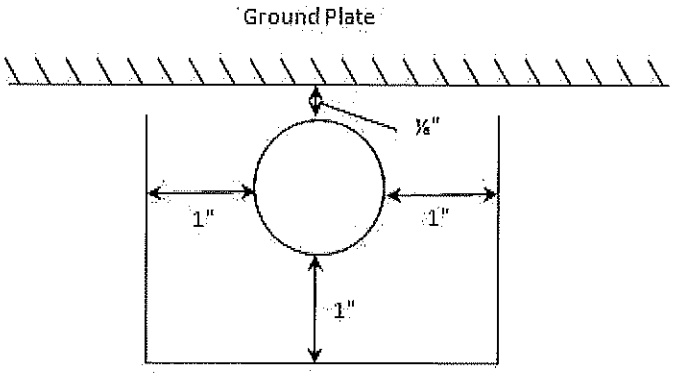

FIGURE 7—TOP VIEW OF COPPER PIPE/TEST ARTICLE AND CONSTRAINT SPACING

4.5.2 Testing:

4.5.2.1 Arcing Resistance, Indirect Effects 1: A minimum 3-foot-long CSST test article is installed at least $^1/_8$ inch beneath a $^1/_4$-inch-diameter test electrode. The test article is to be assembled on one end with the manufacturer's fitting. The electrode shall be placed at least 12 inches from the ends of the test

article. The fitting end of the test article is grounded to the generator return using a braided strap (adequately sized to handle the current) as shown in Figure 8. A dielectric may be required underneath the test article to ensure the test currents flow along the length of the test article and not to the test bench or other support equipment. The lightning generator is charged to the appropriate level, and is then discharged to the test article. If the test generator does not discharge to the test article, it shall be confirmed that sufficient voltage is present to achieve dielectric breakdown of the jacket (attachment to metallic layers or tubing), and adjustments are made accordingly. It is verified that the test current did not arc to the exposed tubing or fitting on either end of the test article. If all or a portion of the test current arced to the exposed ends of the test article, the test is invalid and must be repeated. The applied current waveform is recorded using an oscilloscope; calculations are made to verify the desired current levels, rise times, decay times, and charge levels are equal or greater than the values stated in Section 4.4.1. If the calculated levels are equal to or greater than the values stated in Section 4.4.1, the levels are recorded. The jacket is cut away from the test article at the test location and a visual inspection of the tubing is made to determine if the stainless steel tubing is punctured. If no puncture of the tubing is noted on visual inspection, the test article shall be pressure-tested to the requirements of Section 4.5. If the test article fails visual inspection or pressure testing after being subjected to the required levels, the test article fails. If the calculated levels are less than the values stated in Section 4.4.1, the test is performed again on a new test article from the same production lot, until the required levels and parameters are satisfied. The test article is deemed to have passed if all of the requirements are met. See Figure 8 for test schematic.

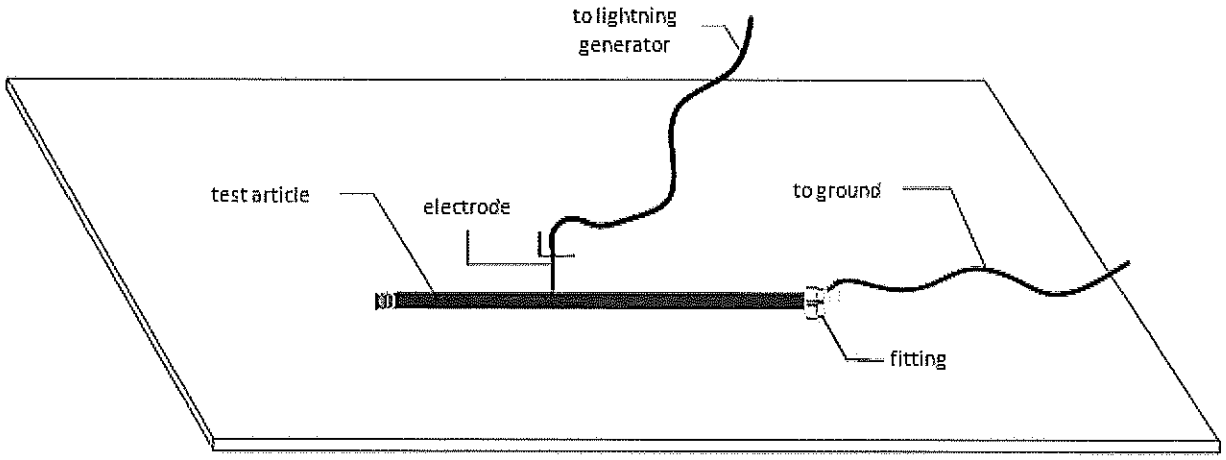

FIGURE 8—INDIRECT EFFECTS TEST SETUP

4.5.2.2 Arcing Resistance, Indirect Effects 2: A minimum 3-foot-long CSST test article is installed at least $^1/_8$ inch away from the generator's ground plate (electrode – rectangular cross-section $^1/_4$ inch in thickness) and constrained as shown in Figure 7. The test article is to be assembled on one end with the manufacturer's fitting. The electrode shall be placed at least 12 inches from the ends of the test article. The fitting end of the test article is connected to the generator using a braided strap (adequately sized to handle the current). A dielectric may be required underneath the test article to ensure the test currents do not flash over to the floor or other support equipment. The lightning generator is charged to the appropriate levels, and is then discharged to the test article. If the test generator does not discharge to the test article, it shall be confirmed that sufficient voltage is present to achieve dielectric breakdown of any air gaps in the test setup, and adjustments are made accordingly. It is verified that the test current did not arc to the exposed tubing on the end opposite the fitting. If all or a portion of the test current arced to the exposed end of the test article, the test is invalid and must be repeated. If metallic layers are present in addition to the tube inner core, separation between the metallic tube and metallic layers may be necessary on the end opposite the fitting to prevent flashover. The three current waveforms are captured using an oscilloscope and calculations are made to verify the desired current levels, action integral, rise times, decay times, duration, and charge levels are equal or greater than the values stated in Section 4.4.2. If the calculated levels are equal to or greater than the values stated in Section 4.4.2, the levels are recorded. The jacket is cut away from the test article at the test location and

a visual inspection of the tubing is made to determine if the stainless steel tubing is punctured. If no puncture of the tubing is noted on visual inspection, the test article shall be pressure-tested to the requirements of Section 4.3. If the test article fails visual inspection or pressure testing after being subjected to the required levels, the test article fails. If the calculated levels are less than the values stated in Section 4.4.2, the test is performed again on a new test article from the same production lot, until the required levels and parameters are satisfied. The test article is deemed to have passed if all of the requirements are met. See Figure 9 for test schematic.

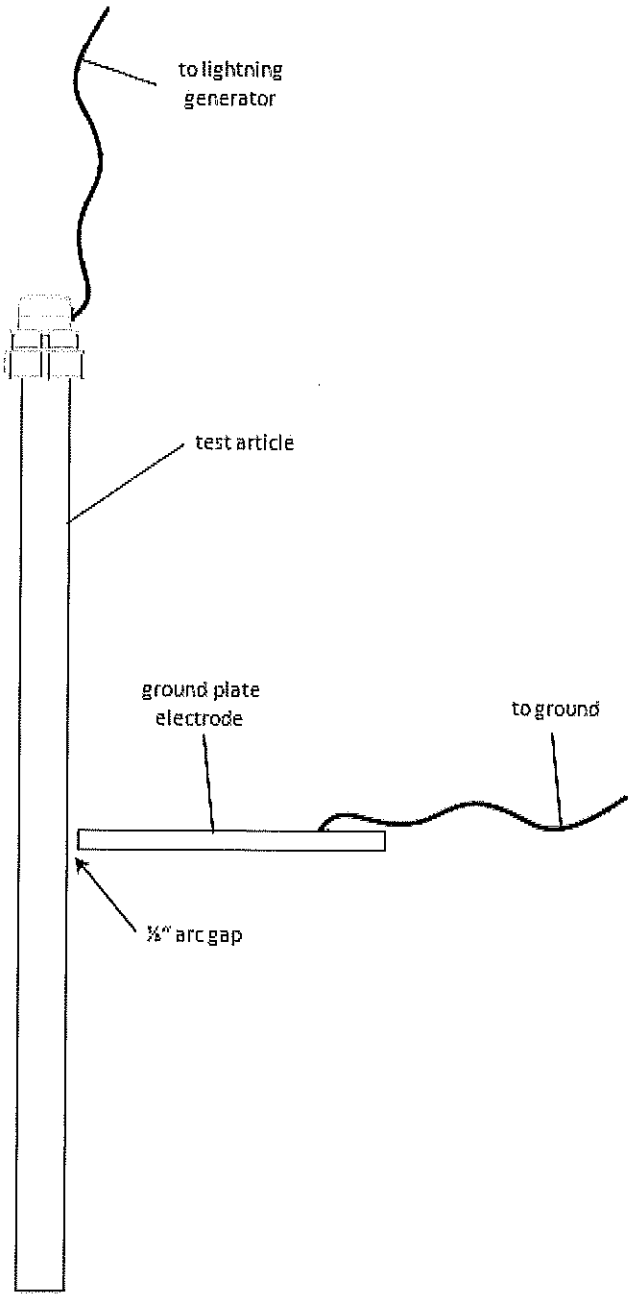

FIGURE 9—INDIRECT EFFECTS 2 TEST SETUP

4.5.2.3 Bonding Equivalence: For the purpose of evaluating the protective jacket system for resistance to transient arcing (indirect effects) using different bonding methods, testing in accordance with this section shall be performed utilizing the testing protocol stated in Section 4.5.2.1 while using a simulated appliance consisting of:

1. A steel sheet metal chassis
2. An NPT connection point for the CSST
3. An electrical box with a minimum 10-foot-long, #14 AWG bonding conductor attached
4. A bonding clamp attached to the fitting on the free end of the CSST and a minimum 10-foot-long, #6 AWG bonding conductor

A minimum of two samples of an intermediate size of CSST shall be tested using the following configurations:

1. The #14 AWG conductor as the bond
2. The #6 AWG conductor as the bond
3. Using both as the bond

If the test results for all three configurations comply with Section 4.5.2.1, bonding of the protective jacketed corrugated tubing, using a #14 AWG appliance bond, shall be deemed equivalent to using a #6 AWG bond required by IFGC 310.1.1. See Figure 10 for a test schematic.

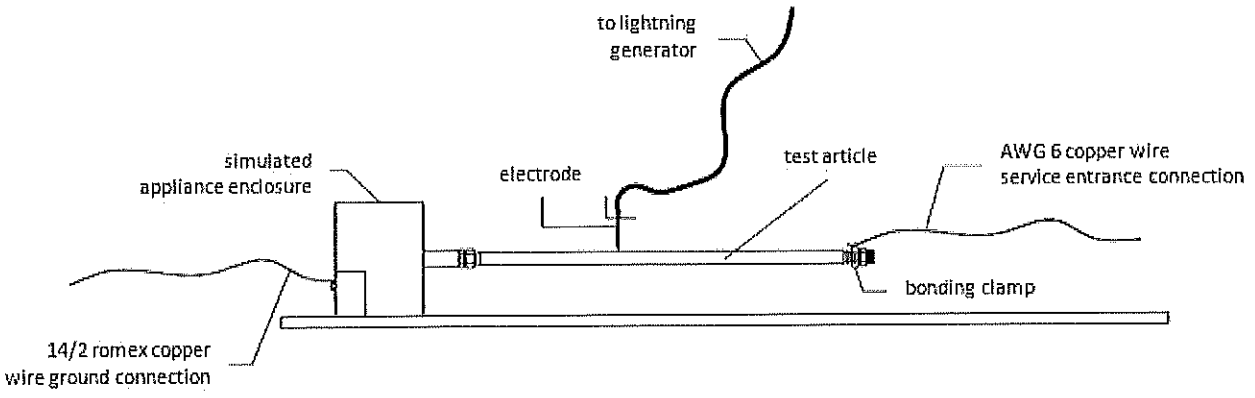

FIGURE 10—BONDING EQUIVALENCE TEST SETUP

5.0 LISTING RECOGNITION

5.1 Installation shall be in accordance with the manufacturer's instructions and the applicable code.

5.2 The listing shall state the product complies with the minimum performance threshold for indirect effects lightning testing.

1) Indirect Effects 1 Threshold: 10 coulombs minimum utilizing a 10x1000 µs current waveform

2) Indirect Effects 2 Threshold:

COMPONENT 1 (Return Stoke)	
Peak Amplitude	30 kA, minimum
Action Integral	0.055×10^6 A^2s, minimum
Time Duration	≤ 500 µs
COMPONENT 2 (Intermediate Current)	
Maximum Charge Transfer	10 coulombs (±10%)
Average Amplitude	2 kA (±20%)
Time Duration	≤ 5 ms
COMPONENT 3 (Continuing Current)	
Amplitude	200 – 800 A
Charge Transfer	26 coulombs, minimum

5.3 Upon documentation of satisfactory passing of tests noted in Section 4.5.2.3 of this criteria, the listing shall state the following: "Electrical Bonding: The Protective Jacketed, Corrugated Stainless Steel Tubing System is electrically continuous and is considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance. Additional bonding prescribed by Section 310.1.1 is not required for A Protective Jacketed, Corrugated Stainless Steel Piping Systems when installed in accordance with this listing."

5.4 The listing shall state the protection is from indirect lightning only, and the effect of direct lightning strikes is beyond the scope of the listing.

5.5 Product must be installed in accordance with the manufacturer's instructions.

Letter for SB586.pdf
Uploaded by: Mike McKay
Position: FAV

MIKE MCKAY
Legislative District 1
Garrett, Allegany, and Washington Counties

Judicial Proceedings Committee

Executive Nominations Committee

James Senate Office Building
11 Bladen Street, Room 416
Annapolis, Maryland 21401
410-841-3565 · 301-858-3565
800-492-7122 *Ext.* 3565
Mike.McKay@senate.state.md.us

THE SENATE OF MARYLAND
ANNAPOLIS, MARYLAND 21401

January 30, 2024

RE: Fire/EMS Coalition Support for Senate Bill 586

Dear Chairman Feldman, Vice Chair Kagan, and Members of the Education, Energy, and the Environment Committee,

The Fire/EMS Coalition would like to express their support for Senate Bill 586: **Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions.** The bill will establish the prohibition of the sale, offer for sale, transfer, or distribution of corrugated stainless steel tubing if it does not meet a certain International Code Council standard. This bill will require tubing used in the construction of fuel gas piping systems in buildings to meet a certain standard. This bill also provided for civil penalties of up to $1,000 for a violation of the Act.

The Fire/EMS Coalition supports Senate Bill 586 as it will be beneficial to public safety in Maryland as the bill would ensure that the tubing in all buildings is up to par to prevent health and safety issues. Stainless steel tubing that does not meet standard is unsuitable to be used as gas pipes and can cause serious harm to the safety of the public. The Coalition supports this bill for the safety of the public of Maryland.

Sincerely,

Senator Mike McKay
Representing the Appalachia Region of Maryland
Serving Garrett, Allegany, and Washington Counties

<u>Voting Organizations</u>:
Maryland Fire Chief's Association (MFCA)
Maryland State Firemen's Association (MSFA)
State Fire Marshal (OSFM)
Maryland Fire Rescue Institute (MFRI)

Maryland Institute for Emergency Medical Services System (MIEMMS)
Metro Fire Chief's Association
Professional Firefighters of Maryland

Our Mission Statement

The Maryland Fire/EMS Coalition unites Republicans and Democrats in support of fire/emergency services legislation that benefit all first responders. Becoming a member does not require taking positions on legislation; rather Coalition members are asked to offer support in a way that best benefits fire/emergency services in their respective Legislative Districts.

Md State Firemen's Association Testimony

Uploaded by: Robert Phillips

Position: FAV

MARYLAND STATE FIREMEN'S ASSOCIATION

REPRESENTING THE VOLUNTEER FIRE, RESCUE, AND EMS PERSONNEL OF MARYLAND.

Robert P. Phillips
Chairman
Legislative Committee
17 State Circle
Annapolis, MD 21401
email: rfcchief48@gmail.com
cell: 443-205-5030
Office: 410-974-2222

SB 586: Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions

My name is Robert Phillips, I am the Legislative Committee Chair for the Maryland State Firefighters Association (MSFA). The MSFA represents the 25,000 plus volunteer Fire/EMS and Rescue first responders across the state.

I wish to present testimony in favor of Senate Bill 586: Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions

The MSFA fully supports the adoption of this bill. We have seen first hand the effects of the original Corrugated Stainless Steel Tubing (CSST) when it is affected by a large electric voltage discharge. The fire service of Maryland has seen the deaths of two firefighter in fuel fed fires from the perforation of original CSST. An electrical arc can perforate the original CSST and cause a gas leak which will add fuel to a fire. Arc-resistant CSST (AR-CSST) has gone through several upgrades to its insulation that would better protect it from a perforation due to an electrical arc. This bill also mandates that the sale of non-AR-CSST will be illegal. This will stop the sale of any stock that is still available so that going forward we are doing all we can do to protect first responders and the public we serve.

I thank the committee for their time and attention to this important bill and ask that you vote favorable on Senate Bill 586.

I will now be glad to answer any questions, or my contact information is listed above and welcome any further inquiries you might have.

Senate Laird (2).pdf
Uploaded by: Sara Laird
Position: FAV

February 9, 2024

Senator Brian J. Feldman, Chair
Senator Cheryl C. Kagan, Vice Chair
Education, Energy, and Environment Committee Maryland General Assembly
11 Bladen St.
Miller Senate Office Building
Annapolis, Maryland 21401

Re: SB0586 - Public Safety - Corrugated Stainless Steel Tubing for Gas Piping Systems Requirements and Prohibitions

Dear Senator Feldman and Senator Kagan,

My name is Sara Laird, and I am the widow of Frederick County Battalion Chief Joshua Laird. My husband was killed in the line of duty on August 11, 2021, while fighting a fire in Ijamsviile, Maryland. The cause of the fire was determined and documented in the after-action report to be a failure of the Corrugated Stainless Steel Tubing (CSST) under lightning strike conditions. My husband served the citizens of Maryland for 21 years. He was also a loving father, husband, son, brother, fireman, and friend. His death has left an enormous void that will never be filled, nor will our grief ever be gone.

I am writing to you today in support of SB0586. Since the day I learned of the cause of my husband's fire, I have been continually educating myself and researching CSST. There are no words to adequately describe my feelings when I learned that not only are the dangers of CSST well-researched and documented but they have also been known by the industry since the mid-2000s. Even more distressing was the fact that an almost identical fire was responsible for the death of Lt. Nathan Flynn of Howard County three years before my husband's death and the death of a Frederick County citizen.

The proposed bill will require CSST products sold or installed in Maryland to meet safer testing criteria. It also provides the ability to enforce the legislation by establishing a fine for violating the sale or use of products that do not satisfy the testing criteria. In 2016, the National Association of State Fire Marshalls publicly called to raise the ANSI LC1 performance standard by requiring a more vigorous testing protocol (ICC-ES PMG LC1027). Massachusetts Institute of Technology (MIT) has also conducted significant research on CSST, which supports using the LC1027 testing criteria. Unfortunately, the industry has been slow to adopt these recommendations, prioritizing profits over safety.

Based on my research, I have documented 23 CSST fires in Maryland over the past six years; however, this number is certainly not representative of the actual number of CSST fires. Currently, there is no system to track these fires, and absent a fatality, there is often no

investigation that would identify and document the connection to CSST. The danger of CSST fires grows by the year as we continue to experience more extreme weather. Based on research conducted by the University of California, Berkeley, for every 1 degree Celsius (1.8 degrees Fahrenheit) rise in the global average temperature, lightning strikes will increase by about 12%. Dr. David Rompas, a researcher at UC Berkeley, stated, “For every two lightning strikes you had at the beginning of the century, we will have three at the end of the century.” The current testing criteria only ensure that CSST used in Maryland can withstand up to 1000 amps or 4.5 Coulombs but research from the Lightning Protection Institute shows that the average lightning strike ranges from 24 to 28 Coulombs. Combining this with the continued increase of population density, the question is not if there will be another CSST fire and fatality, but when. Regardless of what the industry might say or how they might try to confuse the conversation, science provides unbiased truth.

Had the LC1027 testing criteria been the law in Maryland, my husband would still be here. I would not be a widow, and my daughters would still have their father.
It is time to take action to protect the citizens of Maryland and firefighters. My husband was a dedicated public servant. Please do not let his death be in vain; my greatest hope is that his legacy will be to continue his service to Maryland by protecting others from the same fate.
Thank you for considering this legislation. I respectfully ask the Education, Energy, and Environment Committee for a favorable report of SB0586.

Sincerely,

Sara Laird

Sara Laird
Widow of Battalion Chief Joshua Laird

SB586 Written Testimony from Tom Coe 020924.pdf
Uploaded by: Tom Coe
Position: FAV

Jessica Fitzwater
County Executive

FREDERICK COUNTY GOVERNMENT

DIVISION OF FIRE & RESCUE SERVICES
Office of the Chief

Thomas E. Coe, Chief

SB586 – Public Safety – Corrugated Stainless Steele Tubing for Fuel Gas Piping Systems Requirements and Prohibitions

Written Testimony from: Chief Thomas E. Coe, Frederick County Division of Fire and Rescue Services

Position: Favorable

Committee: Education, Energy and the Environment

Date: February 9, 2024

The dangers of Corrugated Stainless Steel Tubing (CSST) is not common knowledge to the general public. When high levels of electricity are introduced into a structure by a direct or indirect lightning strike CSST commonly fails when an arc is created with nearby metal objects. The ensuing gas fed fire has caused millions of dollars of property loss but more over those fires have cost lives.

In Frederick County alone we have experienced two fire fatalities within the last 6 years from lighting striking a structure that contained CSST that was not arc resistant. In 2018, a civilian died in a residential fire south of Urbana after lightning struck the residence, CSST failed and the occupant was trapped by the ensuing fire.

Then on August 11, 2021 this issue hit close to home when Battalion Chief Josh Laird, a 22 year veteran of our organization, died in the line of duty fighting a residential fire in a home that had been struck by lightning and experienced a failure in the CSST.

In 2022, the Maryland Legislature took a step forward to protect both our citizens and first responders by passing The Flynn Laird Act. Time and experience has demonstrated that we still have work to do to protect our citizens from the dangers of CSST. SB586 identifies CSST constructed to pass the LC1027 testing standard as the new standard in Maryland. CSST that is built to pass the LC1027 testing standard can take a larger electrical insult than other models on the market. Additionally, this bill makes the sale, offer for sale, transfer or distribution of non-compliant CSST illegal and associates a $1,000 civil penalty.

For the safety of all Marylanders as well as our firefighters who respond to these fires, I urge a **FAVORABLE** report for Senate Bill 586.

SB586_Brooks.pdf
Uploaded by: Benjamin Brooks
Position: FWA

Benjamin Brooks
Legislative District 10
Baltimore County

Education, Energy, and the Environment Committee

Energy Subcommittee

Chair, Joint Electric Universal Service Program Workgroup

THE SENATE OF MARYLAND
Annapolis, Maryland 21401

Annapolis Office
James Senate Office Building
11 Bladen Street, Room 303
Annapolis, Maryland 21401
410-841-3606 · 301-858-3606
800-492-7122 *Ext.* 3606
Benjamin.Brooks@senate.state.md.us

District Office
Windsor Mill Office
8419 Liberty Road, Suite B
Windsor Mill, Maryland 21244
410-496-4037

TESTIMONY IN SUPPORT OF SB586
Public Safety – Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems – Requirements and Prohibitions

Education, Energy and the Environment Committee
February 13, 2024

Chair Feldman, Vice-Chair Kagan and Members of the Committee,

Thank you for the opportunity to testify before you on SB586: Public Safety - Corrugated Stainless Steel Tubing for Fuel Gas Piping Systems - Requirements and Prohibitions. The purpose of this bill is to prohibit the distribution, sale or transfer of corrugated stainless steel tubing that does not meet the LC 1027 testing criteria for the ANSI LC1 Standard as described by the International Code Council in The International Fuel Gas Code.

Corrugated Stainless Steel Tubing (CSST) is a flexible pipe that provides natural gas and propane in many homes and businesses. While this tubing is easy to install, it has many risks regarding its integrity under high amounts of electric current. For example, if a house were struck by lightning, the current from the lightning could create perforation in the tubing and cause a gas leak and/or fire. What makes a CSST-related fire uniquely destructive is that it converts the tubing into a flamethrower, that is hidden within walls, floors and ceilings. The resulting fire cannot easily be extinguished, thus putting residents and firefighters in immense danger.

Unfortunately, the risks posed by CSST-fires have already brought harm to our communities in Maryland. Two firefighters, Frederick County Battalion Chief Josh Laird and Howard County Department of Fire and Rescue Services Lt. Nathan Flynn, died in the line-of-duty responding to CSST-related house fires, triggered by a lightning strike.

Before 2022, it was legal to sell CSST in Maryland that had no protections against lightning threats, but the Flynn and Laird Act prohibited the sale of non-arc-resistant jacketed CSST. Arc-resistant CSST has a protective jacket that prevents electrical arcs from forming on the tube which causes perforations that ignites the gas inside. That bill was an immense step forward in reducing the likelihood of fires and deaths related to CSST malfunctions. However, even arc-resistant CSST has a fatal flaw. Its jacket is not the most resistant CSST option for protecting against a lightning strike.

When arc-resistant CSST was first developed, the International Code Council Evaluation Service tested the arc-resistant CSST jacket with 4.5 coulombs of electric current, thus yielding the testing criteria called “LC-1024”. This standard is sufficient at providing some protection against lightning threats. Currently, a lightning strike is between 20-28 coulombs of current, which means that most arc resistant CSST, for sale in Maryland, cannot withstand this charge. To resolve this, the International Code Council also developed the “LC-1027” testing criteria that subjects arc-resistant CSST jackets to 36 coulombs of current. This kind of CSST is stronger and safer than all previous iterations and ensures that a CSST-related fire is less likely to happen during a lightning strike or household electrical system fault.

SB586 will ensure that all CSST sold in Maryland will be able to better withstand threats from lightning strikes. It is time to finish the work we started in 2022 and ensure that Maryland firefighters are safe in the line of duty while protecting our constituents to the best of their ability.

For these reasons I am requesting a favorable report on SB586.

With kindest regards,

Benjamin Brooks

SB586_OnePager.pdf
Uploaded by: Benjamin Brooks
Position: FWA

PROHIBITING UNSAFE

CSST TUBING

SENATE BILL 586 / HOUSE BILL 503

CSST *DEFINITION*

Corrugated Stainless Steel Tubing (CSST) is a flexible pipe used to provide natural gas and propane to many homes and businesses.

DANGERS OF CSST

Certain kinds of CSST has been connected to several lethal fires. CSST is vulnerable to mechanical and electrical failure that can result in gas leaks or fire. This is especially an issue if lightning strikes a property with CSST that cannot withstand 20,000-28,000 Coulombs.

WHAT SB 586/HB 503 DOES

This bill will ban the distribution of CSST that does not meet the ANSI LC1 Standard using LC 1027 testing criteria.

THE FLYNN & LAIRD ACT (2022)

Passed House of Delegates (129-1)
Passed Senate (47-0)

In Maryland, two firefighters, Frederick County Battalion Chief Josh Laird and Howard County Department of Fire and Rescue Services Lt. Nathan Flynn died in the line-of-duty responding to house fires caused by CSST malfunctions. In particular, these CSST malfunctions were caused by lightning strikes.

This bill prohibited the use of non-arc-resistant jacketed corrugated stainless steel tubing (CSST). This was to prevent tragedies, like with Flynn and Laird, from occuring again.

While passing this Act was a significant step forward, our latest bill will expand upon the Legislature's work and ensure that all CSST sold in Maryland can withstand lightning strikes.

CAN CSST SURVIVE A LIGHTNING STRIKE?

Average Coulombs of Lightning:
24-28 Coulombs
Average Amps of Lightning:
20,000-28,000 amps

Many CSST that are available to buy in Maryland **cannot withstand a lightning strike.**

Old Non-Arc Resistant CSST

Can it handle a lightning strike?
No, this kind of CSST does not have an arc-resistant jacket so it is not able to withstand any lightning strike. It was banned in Maryland in 2022.

ARC Resistant CSST (Meets the LC 1024 Testing Critera)

Can it handle a lightning strike?
No, while this CSST was designed to better withstand lightning strikes, its jacket has only been tested for 4.5 Coulombs. This kind of CSST is still legal to sell in Maryland.

CSST (Meets the LC 1027 Testing Criteria)

Can it handle a lightning strike?
Yes, this CSST has a jacket which can withstand 36 Coulombs. SB 586/HB 503 will make this type of CSST the only kind which can be sold in Maryland.

NOTE ON TESTING STANDARD

The bill specifies that CSST which is "ANSI LC1 STANDARD USING THE LC 1027 TESTING CRITERIA" only can be sold or distributed. This is because ANSI LC1 is technically the standard for CSST in the International Fuel and Gas Code. LC 1027 or LC 1024 are testing criterias developed by the International Evaluation Service for ANSI LC1 Standard CSST, not a standard by itself.

SB586_Opposition (3).pdf
Uploaded by: Jamie Gregory
Position: UNF

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Calfee Strategic Solutions, LLC

1627 I Street NW
Suite 1120
Washington, D.C. 20006-4127
202.672.1010 Phone

SB586: Public Safety – Corrugated Stainless-Steel Tubing for Fuel Gas Piping Systems – Requirements and Prohibitions.
Introduced by Senators Brooks, Lewis Young, Augustine, and Watson

OPPOSE

- SB586 will require that only corrugated stainless steel tubing that meets the LC-1027 standard may be used in new construction or renovated properties.
- The issue is LC-1027 is not a building code standard but a testing criterion that was created for one particular product, FlashShield manufactured by Gastite.
- FlashShield is patented and is the only product in the market that meets the LC-1027 criteria.
- Passage of SB586 will create a monopoly for one product.
- Recognized Atmospheric Physicist Michael Stringfellow, who is an expert in lightening and grounding, stated in his 2017 report, *Critical Review of LC-1027 Listing Criteria for Multi-Layer Conductive, Jacketed Corrugated Stainless-Steel Tubing*, "the LC-1027 listing appears to have chosen test criteria to suit the particular product for which it was developed."
- Since 2014, the LC-1027 testing criteria has been discussed and considered in communities and legislatures across the country. To date, no jurisdiction has the LC-1027 criteria in their Code.

Legislative History

- During the 2022 MGA Session, HB1052 was adopted and signed into law that states "non-arc resistant jacketed corrugated stainless-steel tubing may not be used" in new construction or renovated property.
- The Senate Finance Committee considered an amendment to add LC-1027 and decided not to include it.
- The 2022 Joint Chairmen's Report requested a report from the Public Service Commission concerning the potential creation of a consumer website to educate the public about potential safety risks of improperly installed yellow CSST as well as consumer protections such as replacement, signage to alert first responders of its presence, and/or proper grounding or bonding of the piping.
- The report noted that since 2006, all manufacturers' instructions have specified direct bonding and grounding of yellow corrugated stainless steel tubing in new construction.
- As noted in the Fiscal and Policy Note, the Department of Labor and the State Fire Marshal advise that the LC-1027 standard specified under the bill (HB503/SB586) does not exist in any edition of the International Fuel and Gas Code.

Sargeant-SB586 why standards matter-testimony.pdf
Uploaded by: Jonathan Sargeant
Position: UNF

Manufacturer of Flexible Metal Hose and Gas Piping Products

Why National Consensus Standards Matter

The principal concern with SB586 revolves around the issue of whether it matters that all equipment and piping systems installed within Maryland homes be referenced to a national consensus standard (recognized by the State Fuel Gas Code) or be allowed based only on what is a called listing criteria. The issue involves different types of corrugated stainless steel tubing (CSST) used to distribute natural gas and propane within residential and commercial buildings. At issue is the basis for what constitutes an approved product/material (in compliance with the state building and fire codes) that have been determined to be safe, reliable and in the best interest of the public welfare.

Precedence and conventional wisdom in the development and maintenance of both model and state level building codes is to rely exclusively on national consensus standards which are developed through a rigorous public review process. Every piping product and/or building material referenced in the State Fuel Gas Code has a national consensus standard with no exceptions. The one and only national consensus standard for CSST is the ANSI/CSA LC-1 Standard which has been in place since 1990.

National consensus standards are developed by organizations that are certified by the American National Standards Institute (ANSI) or other similar sanctioning organization. All fuel gas appliance standards used in North American have been developed by the Canadian Standards Association or CSA Group which is a recognized standards development organization (SDO). These standards have rigorous protocols for the development and maintenance of the standards that are enforced through audits from the ANSI. The technical committees (TC) charged with the development and maintenance of these standards must be balanced (in terms of the various organizations that have voting members on the technical committee so that no one group has a voting monopoly). Proposals for revisions can be submitted by anyone and all proposals must be deliberated by the TC. All proposed revisions must be sent out for public review, and all received comments must be fully resolved before the revisions can be reviewed for approval. Approval has its own process which involves independent US and Canadian over-sight bodies that separately sanction (or reject) the revisions under consideration. There is also an appeal process for parties that believe the process and/or the technical decisions were erroneous.

The use of a listing criteria is intended for those emerging products that are not currently covered by a national consensus standard. The biggest difference between a consensus standard and the listing criteria is the development process. The listing criteria can be developed by an organization other than an SDO. ICC Evaluation Services is such a non-SDO. The LC-1027 is such a listing criteria that was developed at the behest of a single CSST manufacturer specifically for their special arc-resistant CSST design without any other considerations. Furthermore, the ICC development process is not a public consensus process such as the one used for ANSI sanctioned standards, and without a balanced TC and with limited or no public input.

The intention of the listing criteria is to allow the testing and evaluation of emerging products until such time that they can be covered by an existing national standard or a new one created. Listing

criteria are not meant to be long-lived in lieu of such national standards. Such has been the case with LC-1027 which has essentially been obsoleted because of the inclusion of arc-resistance testing requirements within the national consensus standard LC-1. The standards community, through the LC-1 TC, reviewed all options and performance requirements for arc-resistance (including those contained within LC-1027) when the LC-1 Standard was updated in 2014 to include general requirements for arc resistance. All arc-resistant CSST are now tested and certified based on the LC-1 Standard, thus making the LC-1027 listing criteria superfluous. It should be noted that the LC-1027 listing criteria is NOT included in the ICC International Fuel Gas Code as an alternative to LC-1.

Adopting ICC-ES LC-1027 in lieu of ANSI/CSA LC-1 would create a number of unintended consequences for the State of Maryland:

- It would create a state sanctioned monopoly for one patented product and one manufacturer of CSST as LC-1027 was developed specifically for just that unique product design and not for the generic variety of CSST.
- It would eliminate three of the four arc-resistant CSST products currently offered for sale in the State of Maryland.
- Creating such a legal barrier to commerce is tantamount to a restraint of trade.
- Protection against direct lightning strikes can only be met by the installation of a certified lightning protection system. To date, the State of Maryland has not deemed such protection a necessity for Maryland homeowners.
- The requiring inclusion of LC-1027 into the State Fuel Gas Code would conflict with the accepted standard of care of adopting only national consensus standards. Furthermore, LC-1027 is not a complete standard and does not stand alone as a replacement for CSA LC-1.

In summary, this issue has already been litigated with the signing of HB 1052 in 2022 establishing the requirement for arc-resistant CSST in accordance with its national consensus standard ANSI/CSA LC-1. Adoption of LC-1027 in lieu of LC-1 will create numerous potential conflicts as well as unwarranted interference by the State of Maryland into flow of commerce.

Respectfully submitted,

Jonathan Sargeant
Director of Codes and Standards
Jonathan.sargeant@omegaflex.com