



National Association of State Fire Marshals

Comparison of Protective-Jacketed CSST Listing Tests



Over time, new technology and research bring advances to products we use every day. Such is the case with the newest categories of electrical arc resistant CSST (corrugated stainless steel tubing) sometimes referred to as *black CSST*. CSST is utilized in flexible gas piping systems which convey natural gas and propane throughout residential and commercial structures.

The first advance in this area was the development of semi-conductive, black plastic jacketed CSST. These products have been available for a number of years and are listed to the 4.5 coulomb (electrical charge) listing test of the ICC-ES PMG LC1024, and the ANSI LC 1, sec. 5.16 (optional test section). These tests establish the plastic jacket's ability to protect CSST from indirect lightning threats, and also recognize this approach as providing at least the equivalent safety benefit as provided by direct-bonding of standard yellow CSST. These tests however, do not evaluate CSST for the threats of electrical arcing associated with *direct* lightning or household electrical system faults.

With an understanding that higher electrical charge lightning events can damage systems within a home, a stronger electrical arcing test was developed in 2011. The ICC-ES PMG LC1027 listing criteria subjects protective jacketed CSST products to 36 coulombs of electrical arcing charge - a charge 8-times higher than the charge utilized in the ANSI LC 1 test, and high enough to simulate the 50th percentile of negative lightning flashes measured at ground.*

Even with more stringent test criteria no rigid or flexible gas piping products are guaranteed impervious to the potentially destructive and unpredictable power of the full range of lightning strikes.

Table 1 below contains a comparison of key elements of the electrical arcing tests and listings used by the CSST industry:

Table 1. Key elements of the electrical arcing tests and listings used by the CSST industry.
Source: Titeflex Corporation

	ICC-ES PMG LC1024	ANSI LC 1 Sec. 5.16 (Optional)	ICC-ES PMG LC1027
Basis for Test	Indirect lightning resistance (1.2) Equivalence to direct-bonding (4.4.2.2)	Indirect lightning resistance (5.16.3) Alternate to direct-bonding (5.16.1.2)	Represents the 50th percentile of negative lightning flashes measured at ground* (4.4.2)
Minimum Peak Current	1,000 Amp	1,000 Amp	30,000 Amp
Test Charge	4.5 Coulombs	4.5 Coulombs	36 Coulombs
Waveform	Induced current waveform	Induced current waveform	Composite waveform representing lightning currents

*Informed from SAE ARP5412B Aerospace Recommended Practice, 'Aircraft Lightning Environment and Related Test Waveforms'

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