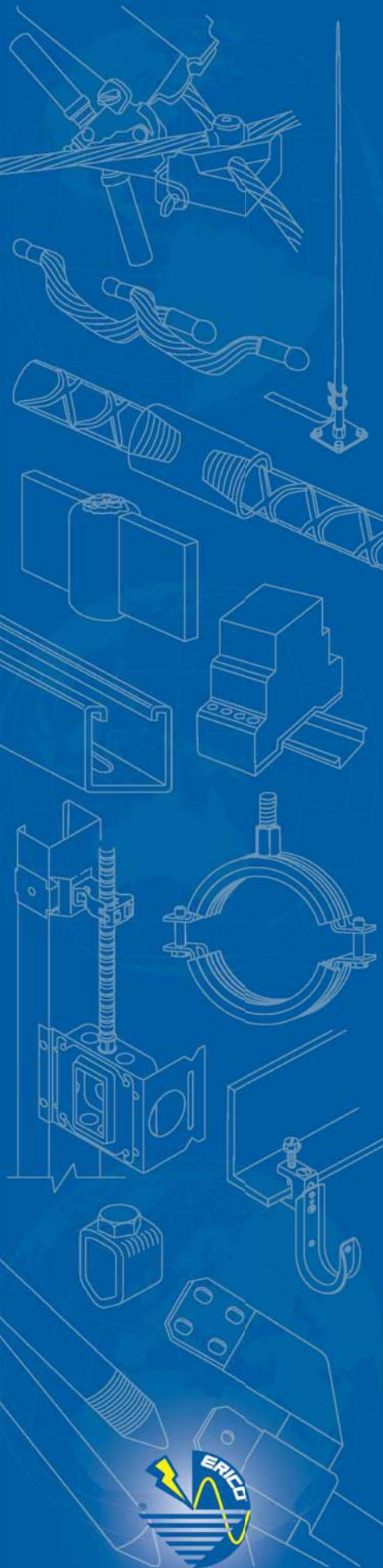
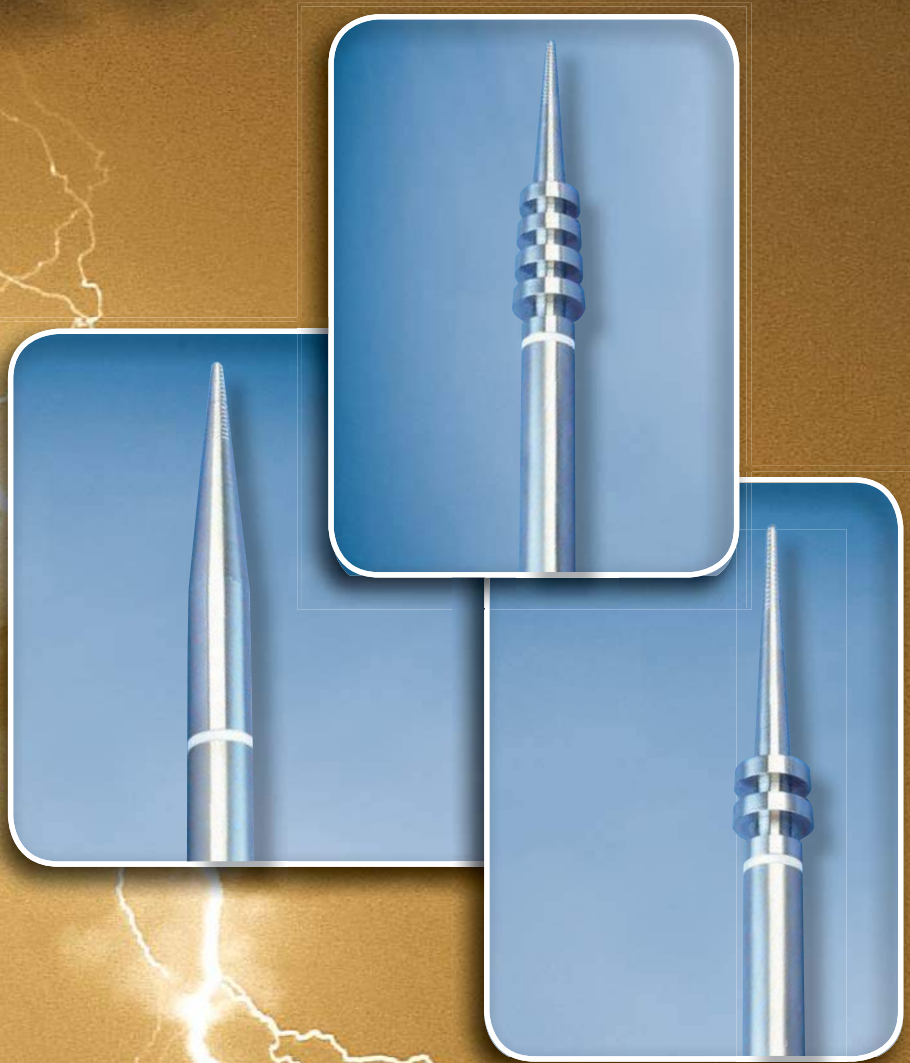


ERICO® SYSTEM 1000

ESE Lightning Protection Products



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ERICO®

Active Protection

ERICO is a trusted world leader for providing high-quality grounding solutions, lightning protection and surge protection technologies. By recognizing the importance of an integrated lightning protection strategy, ERICO has incorporated several major concepts into a Six Point Plan of Protection:

1. Capture the lightning strike
2. Convey this energy to ground
3. Dissipate energy into the grounding system
4. Bond all ground points together
5. Protect incoming AC power feeders
6. Protect low voltage data/ telecommunications circuits

ERICO operates in every region of the world and supports the global market with an extensive distribution network, helping to ensure that ERICO products and expertise are available for any project, regardless of size or location. Dedicated consulting teams assess the requirements of any project and provide expertise for optimal lightning protection solutions.

An unparalleled level of engineering support and experience is involved in the development of grounding, lightning protection and surge protection products. ERICO has developed specialized design software to integrate all aspects affecting system performance, including local conditions, to help ensure that requirements of relevant standards are met or exceeded.

ERICO's products are manufactured to ISO® 9001:2008 and are subjected to rigorous field and laboratory testing and computer modeling during product development. The products are supported by test reports, technical papers, literature and installation instructions.



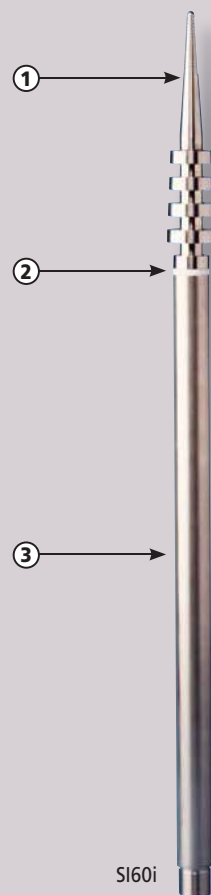
ERICO offers three versions of the ERICO® INTERCEPTOR ESE i-Series air terminals:

- SI25i with a triggering advance of 25 μ s
- SI40i with a triggering advance of 40 μ s
- SI60i with a triggering advance of 60 μ s

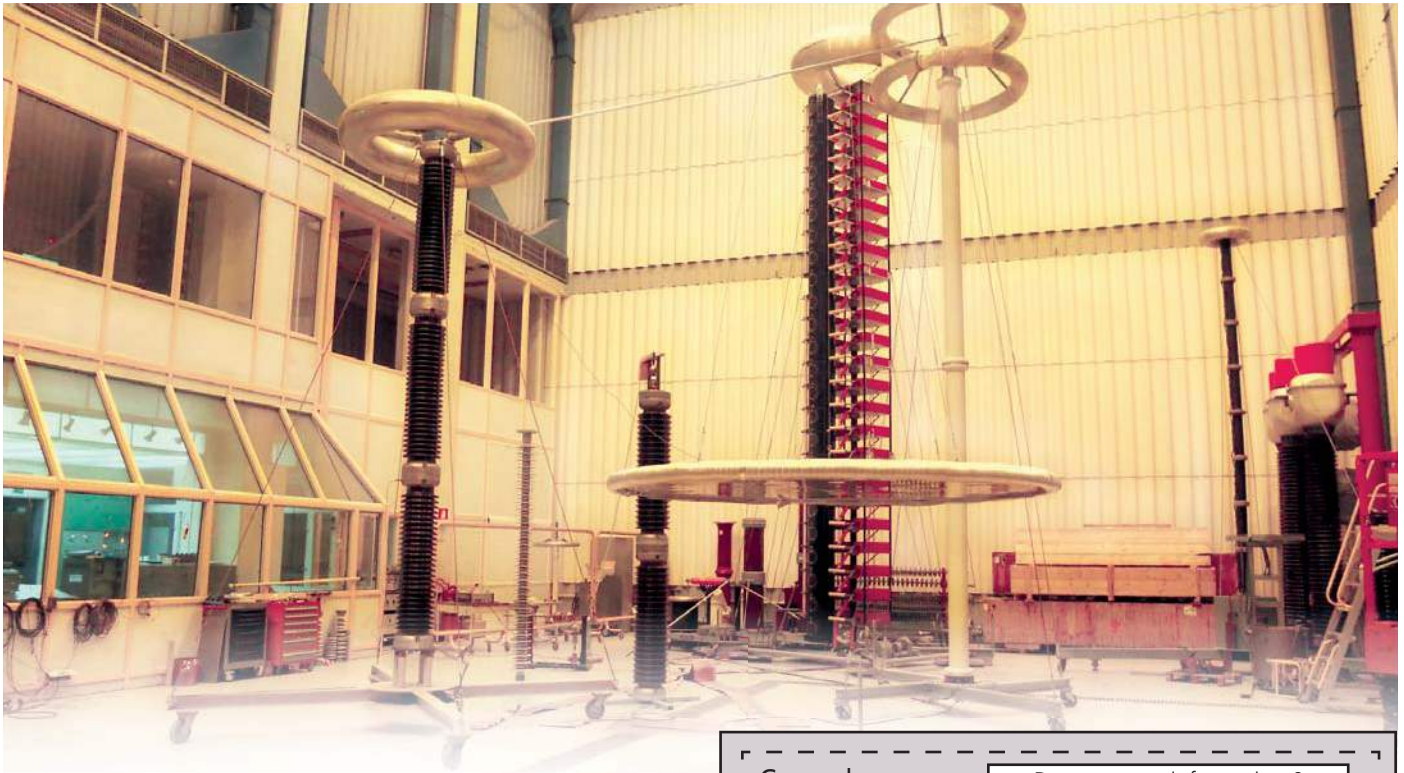
These early streamer emission air terminals (ESEAT) are in accordance with the 2011 edition of NF C 17-102. The design requirements, protection level calculations and protection radius are obtained from this standard.

Due to the internal control circuit, the ERICO INTERCEPTOR ESE i-Series enables the early launching of an upward leader compared to other passive components.

1. Strike tip
2. Insulator ring
3. High voltage control section



Testing and Working Principles



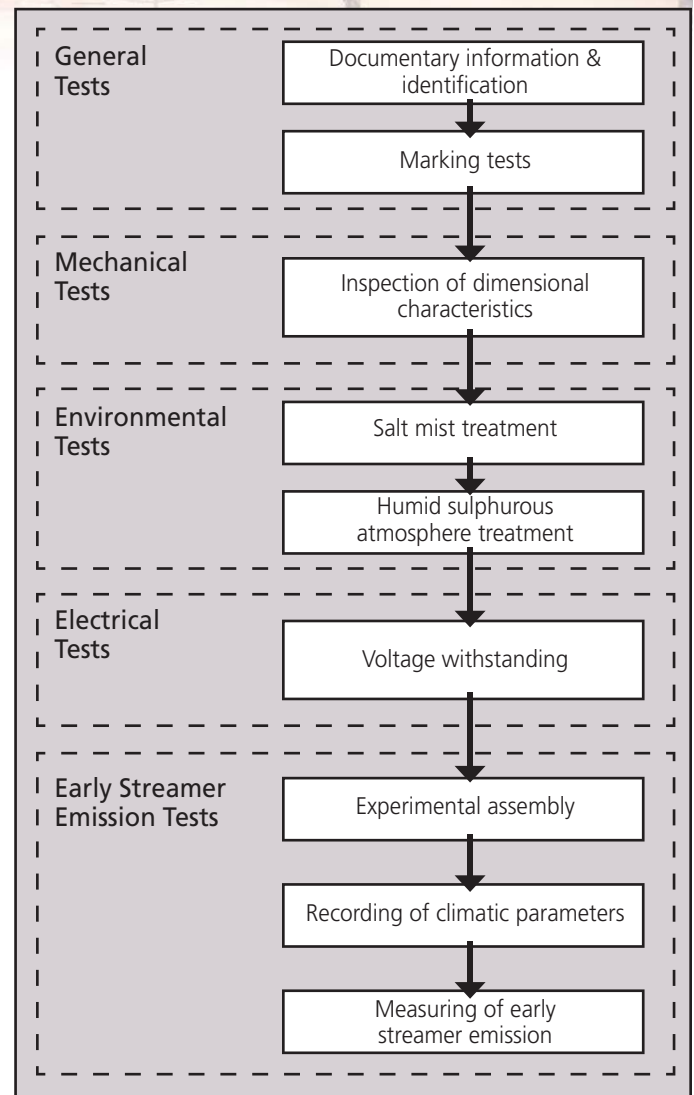
Testing

The ERICO® INTERCEPTOR ESE i-Series has been extensively tested at an independent high-voltage laboratory* in accordance with the revised 2011 requirements of French NF C 17-102 or equivalent standards. The testing, as defined in the standard, was designed to simulate naturally occurring conditions and allow comparison of the performance between differing types of lightning protection systems.

The test simulates natural field conditions where a field impulse (from the downward leader approaching ground, simulated by a Marx Generator with a long front time) is superimposed onto a permanent field (from the charge between cloud and ground, simulated in the laboratory by a DC generator).

The corona at the tip of the rod is measured by a photo-multiplier that enables the determination of the triggering time of both the simple rod air terminal (SRAT) and the ESEAT. The average value is then determined for both a simple rod and the ESEAT. The time difference is then $T(SRAT)$ subtracted from $T(ESEAT)$ to achieve the ΔT advantage for the ERICO INTERCEPTOR ESE i-Series.

The 2011 revision of the standard has defined more rigorous environmental and performance criteria during terminal testing and has created a higher standard for early streamer emission terminals. The requirements became effective September 2012.

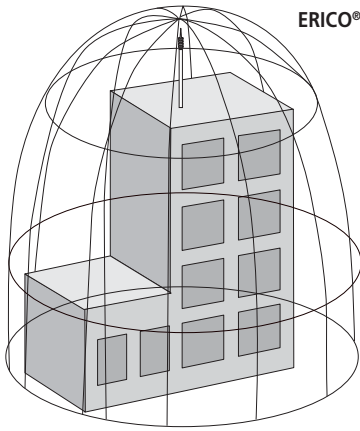


* Test reports available upon request.

Testing and Working Principles

Working Principles

During thunderstorm conditions when the lightning down leader is approaching ground level, an upward leader may be created by any surface. In the case of a passive lightning rod, the upward leader propagates only after a long period of charge reorganization. In the case of the ERICO® INTERCEPTOR ESE i-Series, the initiation time of an upward leader is greatly reduced. The ERICO INTERCEPTOR ESE i-Series generates controlled magnitude and frequency pulses at the tip of the terminal during high static fields prior to a lightning discharge. This enables the creation of an upward leader from the terminal that propagates toward the downward leader coming from the thundercloud.



ERICO® INTERCEPTOR i-series ESE
Early Streamer Emission
Lightning Terminal

According to
the NF C 17-102
and similar
ESE standards

SI60i

SI40i

SI25i

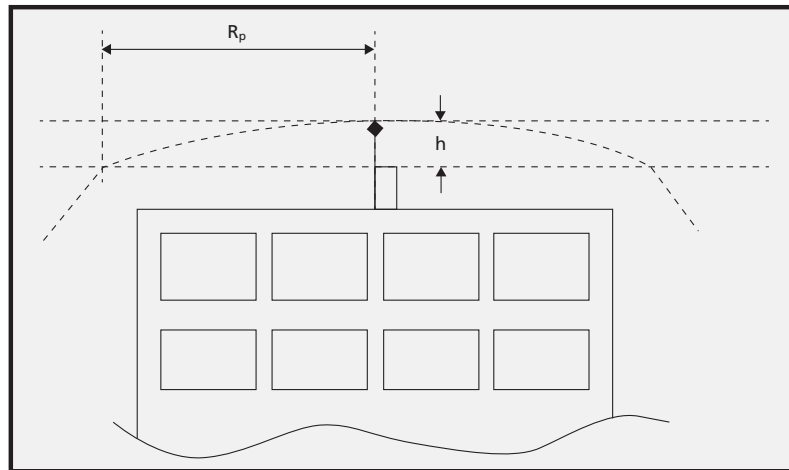
Features

- Designed and tested to NF C 17-102 and similar standards
- 304 stainless steel design suitable for most environments
- Available in three models to suit specific site requirements
- Suitable for use with a variety of downconductor systems, including tape, cable, smooth-weave, Isolated Downconductor (ISODC) and ERICO® ERICORE conductor



Protecting Areas

According to NF C 17-102:2011, the standard protection radius (R_p) of the ERICO® INTERCEPTOR ESE i-Series is linked to ΔT (below), the protection levels I, II, III or IV (as calculated in EN 62305-2) and the height of the ERICO INTERCEPTOR ESE i-Series above the structure or feature to be protected (h , defined by NF C 17-102 as a minimum 2 m).



Protection Level	Protection Level I (99%, D = 20 m)			Protection Level II (97%, D = 30 m)			Protection Level III (91%, D = 45 m)			Protection Level IV (84%, D = 60 m)		
Model	SI25i	SI40i	SI60i	SI25i	SI40i	SI60i	SI25i	SI40i	SI60i	SI25i	SI40i	SI60i
ΔT (μs)	25	40	60	25	40	60	25	40	60	25	40	60
R_p (m) Protection Radius												
h (m)												
2	17	23	32	19	26	34	23	30	40	26	34	44
3	25	35	48	26	39	52	34	45	59	39	50	65
4	34	46	64	39	52	68	46	60	78	52	67	87
5	42	58	79	49	65	86	57	75	97	65	83	107
6	43	59	79	49	66	86	58	76	97	66	84	107
7	44	59	79	50	66	87	59	76	98	67	85	108
8	44	59	79	51	67	87	60	77	99	68	86	108

Where $h > 5$ m, then R_p can be calculated from

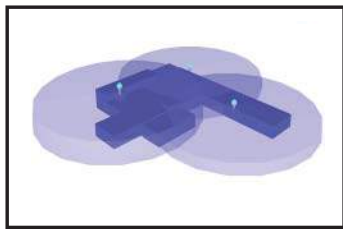
$$R_p = \sqrt{h(2D-h) + \Delta L(2D+\Delta L)}$$

$\Delta L = v(m/\mu s) \times \Delta T(\mu s)$, where v is assumed to be $1m/\mu s$
 $D =$ Protection Level, where $D = 20, 30, 45$ or 60 m

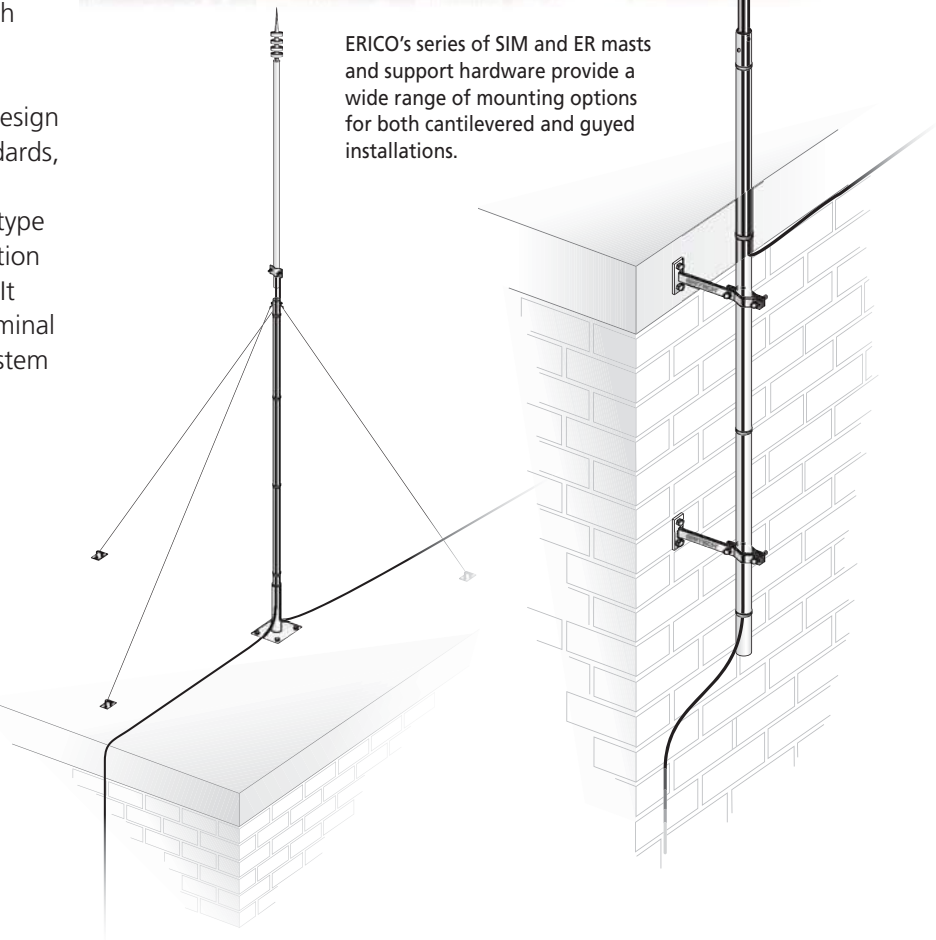
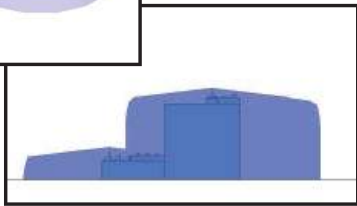


The aim of lightning protection design is to mitigate all the factors that can impact the lightning risk. The requirements of EN62305-2 provide guidance on calculation and selection of protection levels for each specific application.

ERICO's unique computer-aided program provides design support for a variety of design techniques and standards, including NF C 17-102. Based on individual site parameters, such as structure dimensions, terminal type and protection requirements, each Lightning Protection System Design (LPSD) is customized for the project. It provides elevation, 3-D and plan views enabling terminal location, downconductor routing and grounding system requirements to be optimized for your facility.



LPSD Design Software



ERICO's series of SIM and ER masts and support hardware provide a wide range of mounting options for both cantilevered and guyed installations.

System Requirements:

The design and installation of the terminals should be completed in compliance with the requirements of the French Standard NF C 17-102. In addition to terminal placement requirements, the standard requires a minimum of two paths to ground per terminal for non-isolated conductor systems. A downconductor cross-sectional area of $\geq 50 \text{ mm}^2$ is specified. The downconductors are to be secured at three points per meter with equipotential bonding made to nearby metallic items.

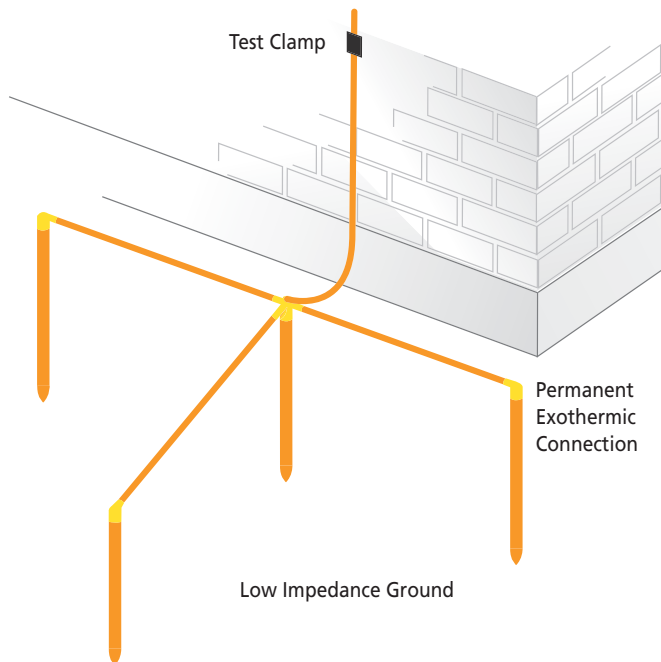
Each downconductor requires a test clamp and dedicated earth system of 10 ohms or less. The lightning protection ground should be connected to the main building ground and any nearby buried metallic items. The NF C 17-102 and similar ESE standards requirements for inspection and testing range from each year to every four years dependent upon location and protection level selected. Refer to your ERICO representative or the ERICO® SYSTEM 1000 installation manual for additional information.



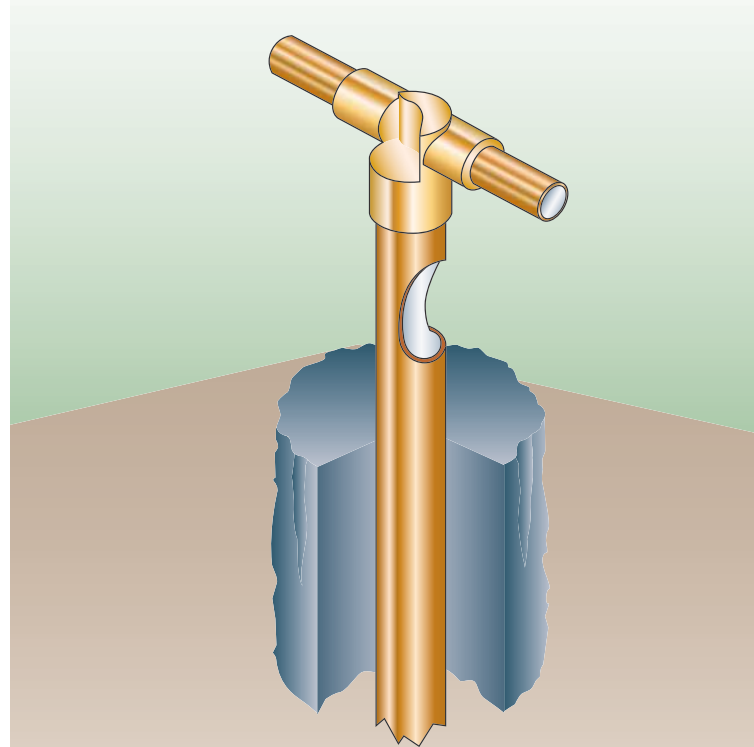
Importance of Grounding

The transient nature of lightning with its associated fast rise times and large magnitude currents mean that special consideration needs to be given to grounding for lightning protection to be effective. A poorly grounded system increases the likelihood of the strike flashing over to the structure and/or finding a non-preferred path within the structure. Many factors, such as soil resistivity variations, installation accessibility, layout and existing physical features are all site-specific and tend to affect decisions on grounding methods employed. The primary requirements of a direct strike grounding system are to:

- Efficiently dissipate lightning energy into the ground
- Help protect equipment and personnel
- Provide good corrosion resistance/long life



The ground electrode system should be corrosion resistant and bonded to the structural ground system. Copper and copper-bonded steel are the most common materials used for grounding conductors. Mechanical coupling can be used to join ground conductors, but suffers from corrosion effects when dissimilar metals are involved. In addition to mechanical strength, ERICO® CADWELD® connections provide excellent, low-impedance and long-life electrical connections with excellent corrosion resistance.

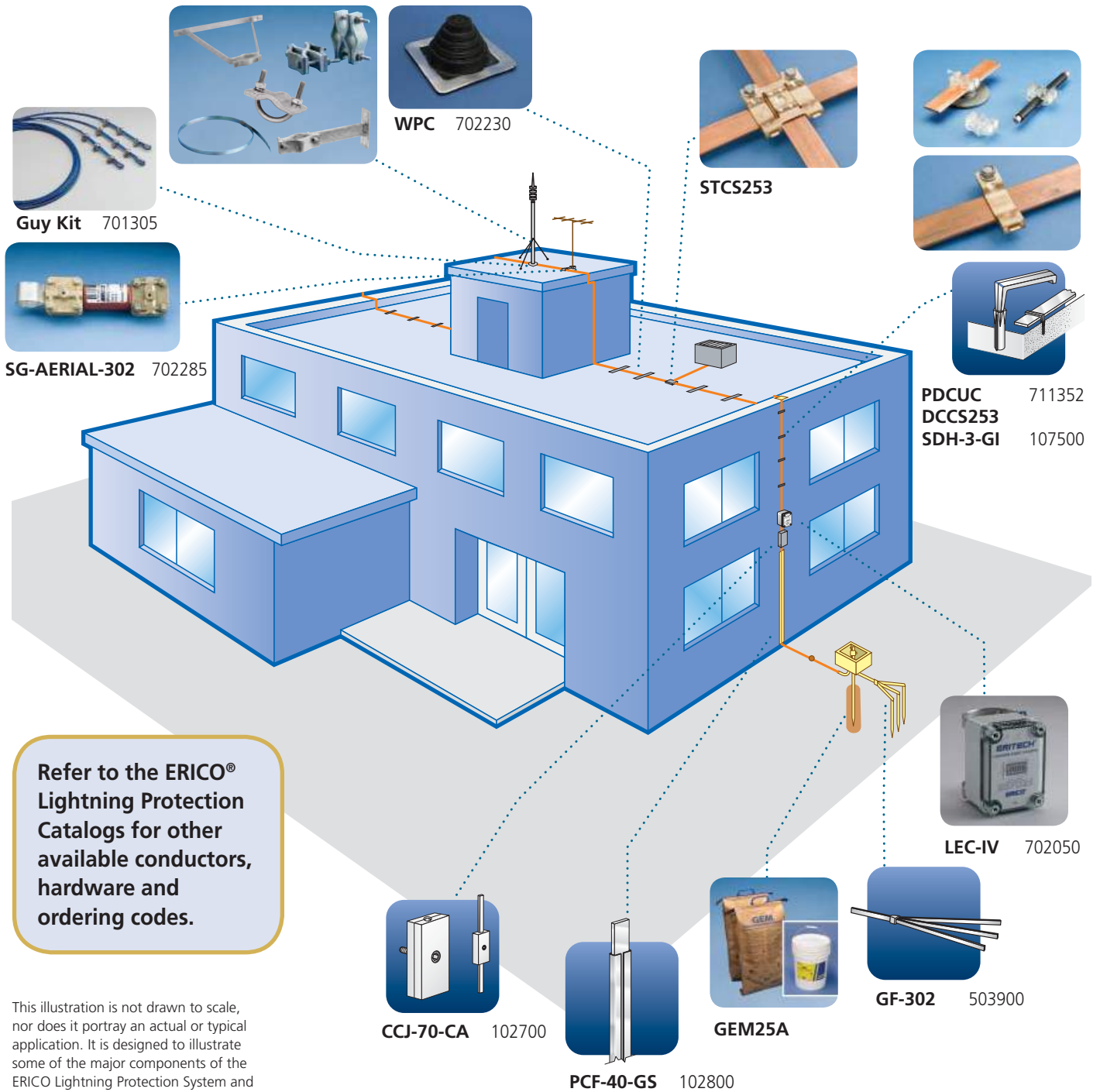


ERICO also recommends the use of Ground Enhancement Material (GEM) to ensure an optimal ground. GEM is a low-resistance, non-corrosive, carbon dust-based material that helps improve grounding effectiveness, especially in areas of poor conductivity. GEM contains cement, which hardens when set to provide a permanent, maintenance-free, low-resistant grounding system that never leaches or washes away. GEM does not adversely affect soil and will not leach ions or contaminate ground water. GEM conforms to IEC 62561-7 Standard, and is identified in NF C 17-102 as an option for reducing soil resistivity.



ERICO recommends an annual inspection and maintenance program to verify the long-term effectiveness of the lightning protection and grounding system.

Other Lightning Protection and Grounding Accessories



Refer to the ERICO® Lightning Protection Catalogs for other available conductors, hardware and ordering codes.

This illustration is not drawn to scale, nor does it portray an actual or typical application. It is designed to illustrate some of the major components of the ERICO Lightning Protection System and their relationship with one another.

WARNING
ERICO products shall be installed and used only as indicated in ERICO's product instruction sheets and training materials. Instruction sheets are available at www.erico.com and from your ERICO customer service representative. Improper installation, misuse, misapplication or other failure to completely follow ERICO's instructions and warnings may cause product malfunction, property damage, serious bodily injury and death.

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