



DELTA
TECHNOLOGY

LEADER®



*Technology
and Protection*



ATMOSPHERIC DISCHARGE



Before an atmospheric discharge, a thundercloud – cumulo nimbus – emits a series of ions known as down tracers or leaders.

The negative polarity leaders fall towards the ground in successive fifty meter drops at speeds of 0.15 to 1 m per microsecond (μs), whereas the positive leaders fall more steadily.



As they approach the ground, the tips of the highly ionized down leaders generate a powerful electric field that can reach several hundred kilovolts per meter. This powerful disturbance triggers the creation of opposite polarity up leaders, primarily at high and prominent spots along the ground.



As the down and up leaders join, an ionized channel to the ground fills with cloud. A return arc, known as the atmospheric discharge, returns through this ionized channel. It consists of several arcs between the ground and the cloud.

THE «LEADER®» EARLY STREAMER EMISSION LIGHTNING CONDUCTOR

The function of the LEADER® Early Streamer Emission (E.S.E.) lightning conductor is to be the preferred and obligatory lightning strike point for the entire area it protects.

The most reliable and consistent way to create such a strike point is to exploit the important electromagnetic disturbances produced by the approaching down leaders just before the atmospheric discharge, in order to produce up leaders that are faster, steadier and more powerful than the ones in the protected area.

The LEADER® lightning conductor uses its tip and entire metal casing to capture these disturbances. The disturbances are greatly amplified by a device based on the increase in electrical fields between opposite geometric components and highly inductive systems that regulate electrical disturbances.

The significant amplification of electrical disturbances and regulation of leader creation enables the LEADER® ESE lightning conductor to produce faster, more powerful and more regular leaders than all the other leaders in its vicinity.

These three characteristics are important safety and operational consistency factors for both positive and negative discharges.

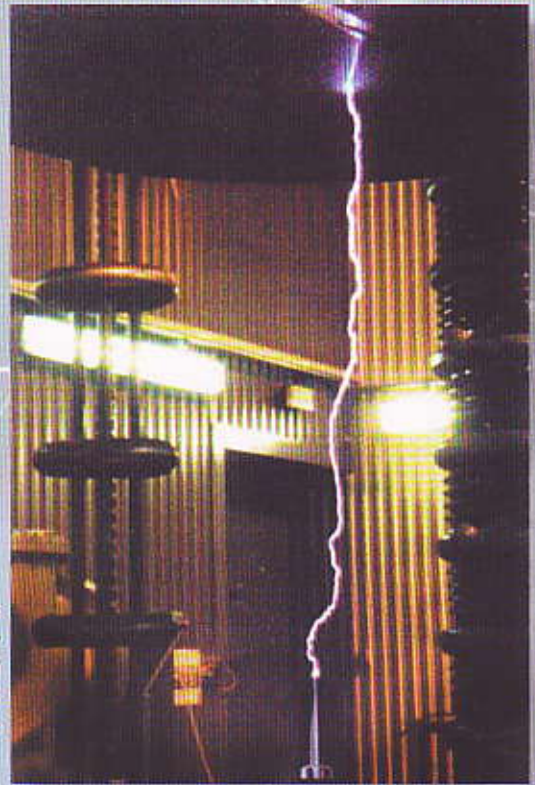
At the time of the atmospheric discharge, the high impedance of the LEADER® lightning conductor's inductive and regulator device prevents any current penetration in the ionizing device. The lightning current naturally flows along the outside of the LEADER® metal casing, whose impedance is very low. Since the atmospheric discharge never flows through the ionizing device, the LEADER lightning conductor can resist extremely high intensity strikes without altering its ionizing device or its performance.



ADDITIONAL QUALITIES

Tests made in a high voltage laboratory and in situ installations have all confirmed the **LEADER®** lightning conductor's unquestionable qualities:

- proven safety as demonstrated by the testing laboratory, which measured a major initiation advance of 165 μ s
- optimal operation for both positive and negative discharges
- a completely autonomous lightning conductor that doesn't require any specific maintenance.
- excellent resistance to electric shocks
- excellent resistance to atmospheric and chemical corrosion due to its total metal casing in stainless steel

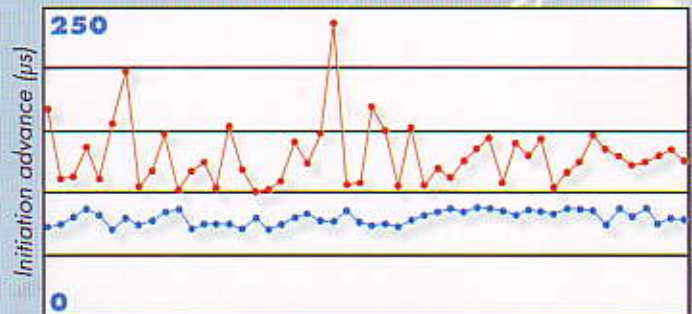
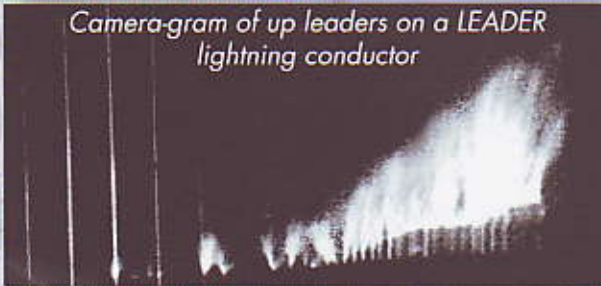


LEADER® lightning conductor test in Pau's high voltage laboratory IN ACCORDANCE WITH NFC 17-102 UNE 21-186

Camera-gram of up leaders on a Franklin lightning rod (reference)



Camera-gram of up leaders on a LEADER lightning conductor



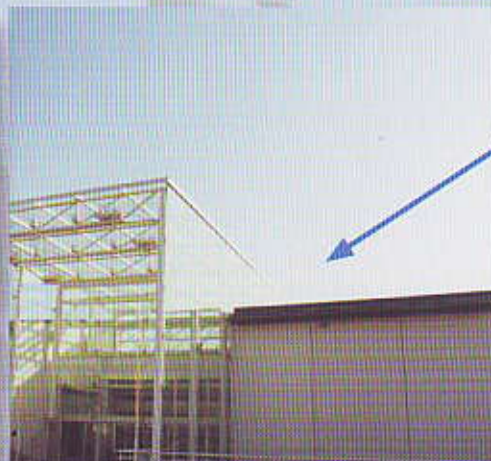
Comparison table of response time for a reference Franklin lightning rod (•) and a **LEADER®** lightning conductor (•)

Companies and fitters who install LEADER® lightning conductors underline how easy they are to install on various supports. Its size and lightweight (2.4 kg) make it easy to install on hard to reach structures : pylon, bridge, factory chimney, ...

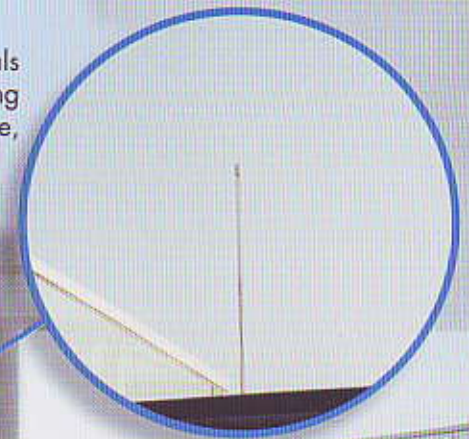
The LEADER® lightning conductor's slenderness, restrained curves and choice of materials (stainless steel, brass or red copper) enable it to perfectly integrate the most demanding environments: historical monuments, architectural buildings, corrosive atmosphere, industrial plants, etc.



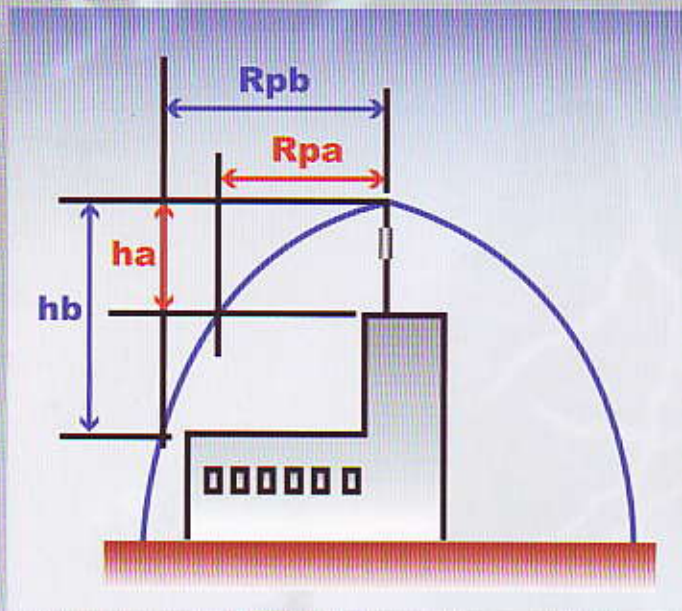
Cinéma multiplex



Mallin Senart's Commercial Mall (the biggest Mall of Europe : 100 000 m²)



PROTECTION RADIUS



- h_n:** Height between the tip of the LEADER® lightning conductor and the protected area.
R_{pn}: LEADER® protection radius based on its height
D: According to standard NFC 17-102:
 20 m at level 1
 45 m at level 2
 60 m at level 3
ΔT: Startup discharge (or initiation) advance
V(m/μs): Tracer speed

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

with $h \geq 5m$. $\Delta L = V(m/\mu s) \cdot \Delta T (\mu s) = 10^6 \cdot \Delta T$



French standard NFC 17-102 defines the protection level, the criteria and the calculations to define the lightning protection needs for a site, a building, a structure, etc. The protection level corresponds to a strictness level that should be adopted to protect a structure or open area according to the risk factors and consequences of a lightning strike on the structure.

		Height h(m)		PROTECTION RADIUS R _p (m)									
LEADER		Reference	ΔL	2	3	4	5	7	10	20	30	60	
LEVEL 3	LEADER 3	L1003	60	43	64	85	107	108	109	113	116	120	
	LEADER 2	L1002	45	36	58	72	89	90	92	97	101	105	
	LEADER 1	L1001	30	28	48	57	72	73	75	81	85	90	
LEVEL 2	LEADER 3	L1003	60	39	58	78	97	98	99	102	104	105	
	LEADER 2	L1002	45	32	52	65	80	81	83	86	89	90	
	LEADER 1	L1001	30	25	39	51	64	65	66	71	73	75	
LEVEL 1	LEADER 3	L1003	60	31	47	63	79	79	79	80	80	80	
	LEADER 2	L1002	45	25	40	51	63	64	64	65	65	65	
	LEADER 1	L1001	30	19	29	38	48	49	49	50	50	50	

The LEADER® lightning conductor's excellent performance has been proven in Pau's high voltage laboratory: 165 μs. However, the NFC 17-102 interpretation form limits use of the initiation advance to 60 μs for installations in France.

Material : stainless steel Weight: 2.4 kg Dimensions: 470 mm, Ø 50 mm

An optional test function is available for the entire LEADER® lightning conductor range, including data transfer by dry contact or optical fibre. It enables one to easily and reliably test operation from the lightning conductor base or down conductor (without removing the lightning conductor), particularly after a lightning strike. The test function is a useful complement to usual lightning strike counters, particularly for plants of building governed by an ISO procedure.

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