SafeStrike

British early streamer emission lightning conductor

Chatsworth House

Birmingham Airport

Royal Albert Hall

Serpentine Gallery

Mossbourne Academy

1 Hyde Park

All photographs show structures protected by ESE systems designed by and/or supplied by DAP Ltd.

Lightning protection design & specification for

Clients

M. O. D.
N. H. S.
Customs & Excise
Home Office
Foreign Office
BAe Systems
R. A. F.
H. M. Prisons

End building users

1 Hyde Park
Royal Albert Hall
Chatsworth House
Heathrow Airport
Houses of Parliament
Great Ormond Street Hospital
Victoria and Albert Museum
Birmingham International Airport

SafeStrike

The 1st british designed, engineered, manufactured and tested Early Streamer Emission Lightning Protection System

5 year guarantee

Product liability insurance

David Andrews Products has 20 years of lightning protection experience and in collaboration with British electronics designers from the aerospace industry has engineered the 1st British high-tech ESE Lightning protection system. With over 3000 completed projects involving technical submissions, design and specification, David Andrews Products offers a complete and professional tailored service.

David Andrews Products has designed specifications for

Gifford & Partners / Ramboll
Edward Pearce and Partners
AECOM / Faber Maunsell
Birmingham City Council
Coventry City Council
Leicester City Council
Balfour Beatty
Hoare Lea
Arup
Harley Haddow
Halligan Associates
Long & Partners
Malcolm Lamb Associates
Norland Managed Services
WSP
Ridge & Partners
Spencer Mayes

Atkins
AMEC
Walsall City Council
Wolverhampton City Council
Aberdeenshire City Council
Hertford Council
White Young Green
Delap & Waller
CPW
Crown House Technology
Cundall
Hulley & Kirkwood
MITIE
Buro Happold
BDSP
Pick Everard
Network Rail

The advantages of a triggered leader

- Improved performance and efficiency
- Reduced installation cost
- Less raw materials, reduced carbon footprint
- Improved aesthetics

SafeStrike generates an early and continuous upward leader using the natural build up in ambient electric field during a thunderstorm and imminent to a lightning strike. The rapid ascent of its upward leader to capture the downward leader means SafeStrike provides the most efficient form of protection for a structure or building. No power source is required.

Technical explanation of SafeStrike

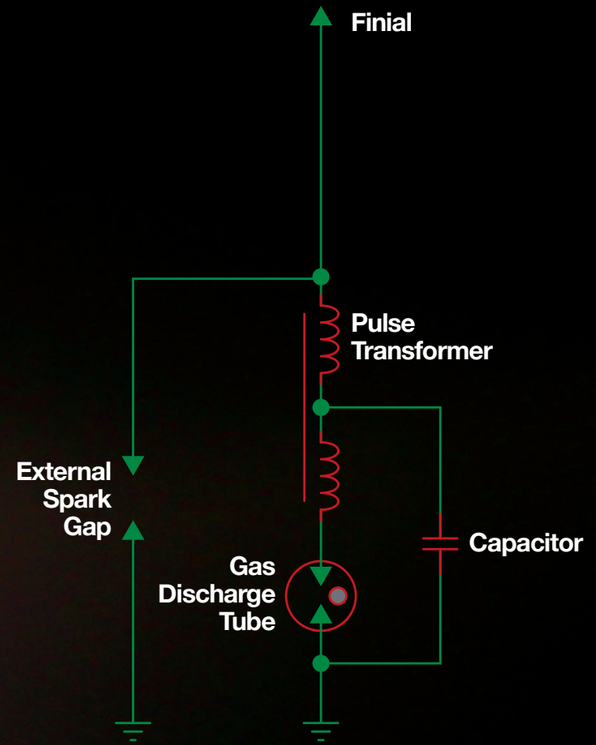
1. During the build up to a lightning strike the electric field around the SafeStrike finial rises to several thousand kilovolts. This static charge flows from the finial, through the top winding of the pulse transformer and charges the capacitor.

2. When the voltage across the capacitor reaches the breakdown voltage of the gas discharge tube, the latter conducts and the charge from the capacitor flows as current into the bottom winding of the pulse transformer.

3. This change of current in the lower winding of the pulse transformer causes a high voltage to be induced. This is multiplied by the turns ratio of the upper/lower windings of the transformer and so a predetermined and sufficient voltage will appear on the finial of the SafeStrike. This is sufficient to encourage an upward leader discharge which creates the initiation advance. It is insufficient to break over the external spark gap formed by the casing of the SafeStrike.

4. When the return strike current hits the SafeStrike the voltage is sufficient to ionise the external spark gap and the main current passes safely through the casing to the downward conductor to earth.

With the exception of the capacitor charging in stage 1, all of the above steps happen in virtually instantaneous succession. The time advantage of the initiation advance is in the range of 50-60 microseconds in comparison to a simple finial or striking plate. To put the advantage into perspective, a lightning strike has a 200-250 microsecond time duration.



Standards
IEC 62305 / EN 62305 *
NF C 17-102 (2011) Performance / product standard

*CENELEC BT 136/DG7907/DL (April 2010)
Decisions at CENELEC meetings that led to how ESE systems are specified

D136/011 - BT noted the information provided by CLC/TC 81 X concerning the relation between the EN 62305 series and NF C 17-102

D136 / 013 - BT asked those national committees that have a national standard endorsing the ESE system... to offer the corresponding national standard to IEC for possible endorsement at international level

D136/014 - BT asked CLC / TC 81 X to examine the possibility to establish a pure performance standard independent from any technology and enabling the development of existing and future technologies on lightning protection systems

Legal position
European Competition *

The European Commission has issued a resolution to prevent the attempt by industry to create a trade barrier based on standards and their illegal implementation. Accordingly, the standard specification for ESE systems is legally equal according to UK and European Law. At present, the standard used is IEC / EN 62305 and NF C 17-102. It is equal to BSEN 62305.

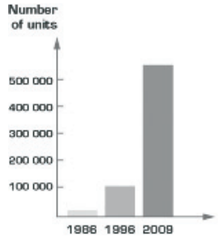
The Office of Fair Trading **

The UK Office of Fair Trading concluded an investigation into competition within the U.K lightning protection industry with the decision that a lightning protection system should be installed to the British Standard or any national equivalent standard body in any Member State of Europe. Therefore, the ESE standard is equal to the British Standard and is fit for use in the U.K.

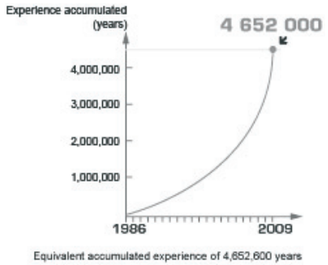
* International Lightning Protection Association Symposium (24-25th November 2011)
** Correspondence / dialogue between DAP Ltd and OFT

Statistics of E.S.E use *

Cumulated installed units



Equivalent accumulated experience



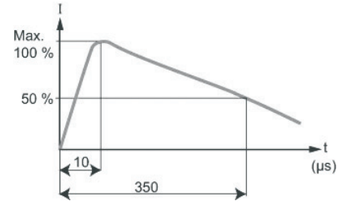
* International Lightning Protection Association

Environmentally friendly

Our British ISO certified production boasts the lowest consumption of raw materials and offers the lowest co^2 emissions for any lightning protection system in the U.K. Our whole process of production is as sustainable as possible and is an ideal fit for any organisation adhering to Environmental Management System ISO 14001.
Taking an average building of 40m x 20m with a height of 10m and considering the density of copper as 8920 kg/m^3, the amount of copper used in the SafeStrike installation is 22kg compared to 217kg for an installation to BSEN 62305.

Test & Certification
IEC 62305 / EN 62305
NF C 17-102

100 kA 10/350 µs wave



Impulse current waveform used for testing - (I imp)

The impulse current I imp is defined by a peak current I and a charge Q, and tested in accordance with the test parameters set out in the standard (Annex C) It is used to test lightning conductors that are subject to a direct lightning strike. It is also the standard waveform used for testing class I surge protection devices.

What is the 10/350 microsecond waveform?

The 10/350 microsecond waveform describes two parameters of an impulse of energy. The “10” denotes the amount of time, in microseconds, it takes to achieve 90% of its rise to peak amplitude. The “350” refers to the duration, in microseconds, it takes for the trailing edge to diminish down to 50% of that peak.

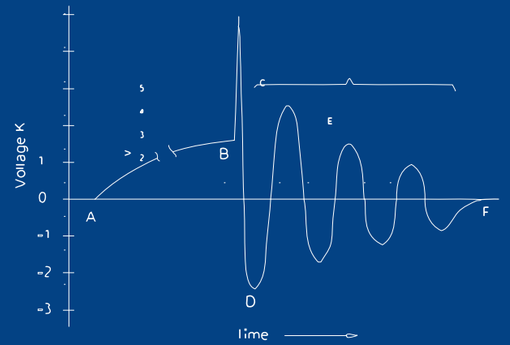
3rd Party Testing

Testing carried out at UK test facilities during September and October 2012

Proven by results

SafeStrike has been subjected to repeated lightning phenomena and high voltage testing at one of the UK's leading specialist lightning research facilities. Cobham offers a state of the art facility in Oxfordshire and has 40 years experience in solving technical problems relating to the direct and indirect effects of lightning strikes. Cobham has validated the results obtained during testing.

SafeStrike has successfully undergone its own HV testing with results that confirm the efficient performance of the upward leader. Testing certifies that the voltage present on the finial is formed at an early stage for its upwards propagation.

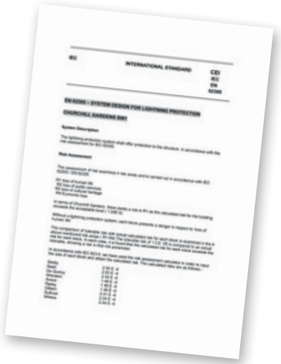


FOLPS

Federation of
Lightning Protection Specialists

SafeStrike

Design & Specification
IEC / EN 62305
NF C 17-102



Main components of a design -

- Risk assessment
- Lightning protection efficiency statement for insurers
- Calculation for radius of protection (Rp)

Risk assessment (IEC / EN 62305)

The level of protection is calculated for a lightning protection system by the guidelines contained within IEC / EN 62305 and an appropriate risk level given from levels I, II, III, IV depending upon the following ascertained risk criteria -

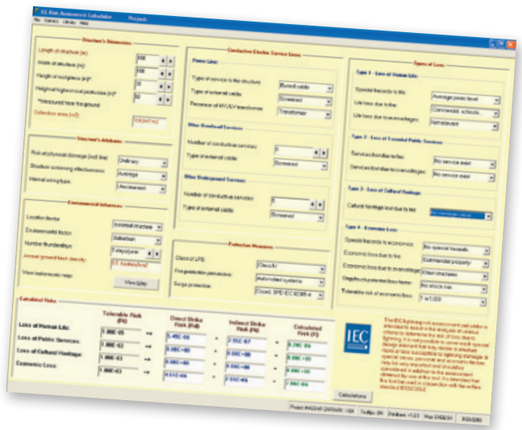
- R1 Loss of life (10^{-5})
- R2 Loss of public service (10^{-3})
- R3 Loss of cultural heritage (10^{-4})
- R4 Loss of economic value (a variable)

Lightning protection efficiency (IEC / EN 62305)

The probability that a peak current will exceed the maximum stated values in (kA) gives rise to the following efficiency for each assigned level of protection -

Level I (200 KA @ 10/350) 99%
Level II (150 KA @ 10/350) 97%
Level III (100 KA @ 10/350) 91%
Level IV (100 KA @ 10/350) 84%

The efficiency of the system is quite literally its ‘guarantee’ to perform. As part of an overall due diligence, the level and corresponding efficiency is communicated to both insurer and end client. The optimum efficiency is Level I and this provides a 99% guarantee.



Calculation for radius of protection (Rp)
The ‘umbrella of protection‘ (NF C 17-102)

The radius of protection is provided by the ESE product / performance standard NF C 17-102 (2011) and is used in conjunction with the common elements of IEC / EN 62305.

With the level assigned, the protective umbrella (Rp) is calculated in accordance with the ESE product / performance specification (5.2.3.2)

$$Rp(h) = \sqrt{2rh - h2 + \Delta(2r+\Delta)} \quad \text{for} \quad h \geq 5m \qquad (1)$$

$$Rp = h \times Rp\ (5)/5 \quad \text{for} \quad 2m \leq h \leq 5m \qquad (2)$$

where

Rp = radius of protection in a horizontal plane
h = height of SafeStrike tip above roof line to be protected
r(m) 20m level I
30m level II
45m level III
60m level IV
Δ = initiation advance of upward leader in accordance with appendix C of NF C 17-102 (2011)

In simple terms the following table provides each Rp in each level for each SafeStrike device for each height (m) above the main roof line to be protected -

* the physical height of the SafeStrike is not taken into consideration

Radius of protection table with corresponding efficiencies (IEC/EN 62305)

	Level 1 - 99%			Level 2 - 97%			Level 3 - 91%			Level 4 - 84%		
h (m)	S35	S40	S65	S35	S40	S65	S35	S40	S65	S35	S40	S65
2	41	50	66	45	56	71	52	67	79	58	73	98
3	49	64	80	56	72	88	64	84	99	76	90	112
4	51	66	81	57	73	89	66	85	99	77	92	112

Installation and Testing

The installation and testing of the SafeStrike system is in accordance with IEC / EN 62305 and NF C 17-102 (2011). The SafeStrike system can be periodically tested with the SafeStrike test kit to ensure that a high voltage appears at the tip of the spike.

Simple Installation Diagram

A simple installation uses 2 no. conventional down conductors that each terminate in an earth pit. We recommend that the most direct and discreet paths to earth are selected. (not to scale)

David Andrews Products Ltd.
20 years of lightning protection

IEC 62305
NF C 17-102

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