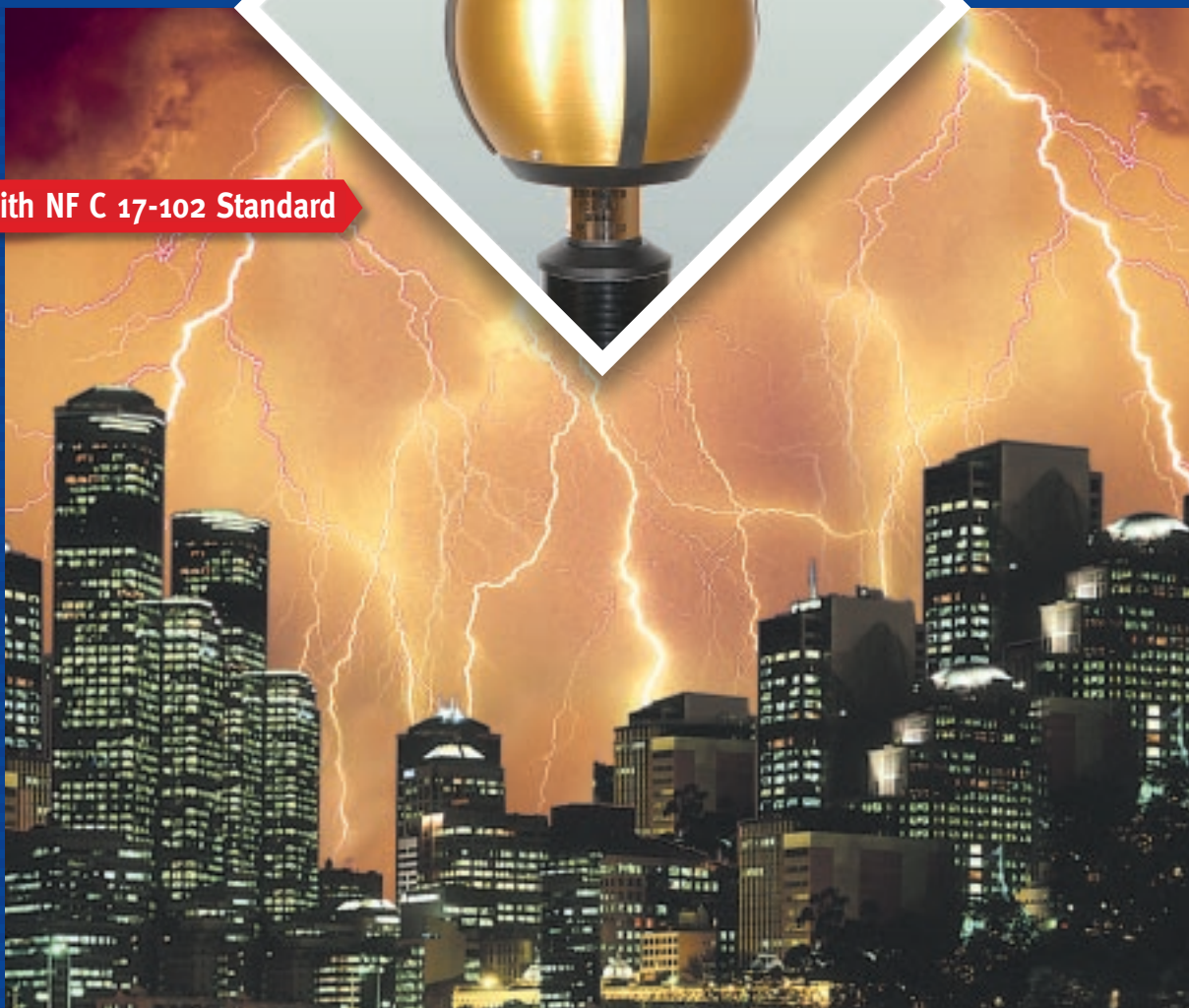




Complies with NF C 17-102 Standard



STORMMASTER

ESE Air Terminal

LIGHTNING PROTECTION INTERNATIONAL PTY LTD



Who is LPI?

Lightning Protection International Pty Ltd (**LPI**) is a fully owned Australian manufacturer and supplier of direct strike lightning, surge & transient protection equipment and earthing products to a wide range of industries throughout the world.

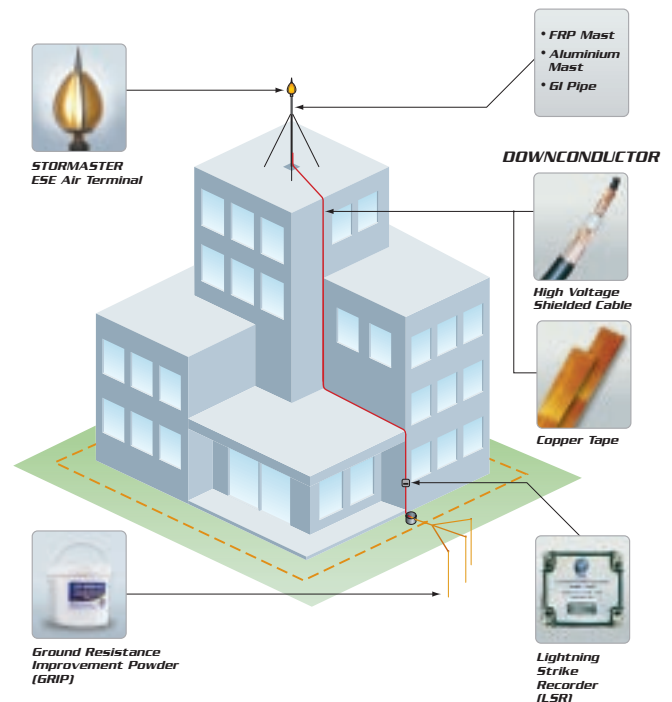
LPI personnel and their associates have combined experience over many years in servicing customers throughout the world on many types of projects in some of its most lightning prone areas. Our personnel have vast experience in providing direct strike area protection, surge and transient protection and earthing solutions. Our extensive experience has involved risk management, system design, training, certification and installation and commissioning in key industry groups such as:

- Telecommunications & Broadcasting
- Petrochemical, oil & gas
- Highrise buildings and hotels – all types of structures
- Sporting centre and grounds – Golf courses, race tracks, stadiums
- Aviation - Civil & Military
- Mining – coal, gold, nickel, iron, copper, bauxite etc.
- Industrial facilities of all kinds
- Defence – communications, surveillance and storage of armaments
- Power generation and distribution
- Rail / transport systems
- Monuments / Ecological sites

LPI Product Offering

Lightning Protection International Pty Ltd offers a comprehensive range of products and services as part of its complete solution to your lightning problems. These products cover Direct strike protection, surge and transient protection and earthing solutions.

- Stormaster range of ESE Air terminals, compliant to NF C 17-102
- Guardian Lightning Protection System 5, tested to IEC 60-1:1989
- Conventional lightning protection
- Surge and Transient protection products for power lines
- Surge and Transient protection products for data, communications and signal lines
- “EXOWELD” range of exothermic welding products for the connection of earthing conductors
- Earth rods and accessories
- Earth Enhancing Compounds for the lowering of soil resistivity



LPI's Stormaster ESE

The **LPI** Stormaster ESE range of terminals provides a safe and efficient system for the protection of your facility from direct lightning strikes. The LPI Stormaster ESE terminal captures the lightning energy at a **preferred point**.

How does the LPI Stormaster ESE Terminal work?

The Stormaster Early Streamer Emission air terminal uses the naturally occurring electrical field to complete the timely release of an upward streamer. This process provides for a safe and efficient method of controlling dangerous lightning energy at a **preferred point**.

As a thunder storm gathers overhead the ambient electrical field surrounding the Stormaster ESE begins to rise in voltage. Upon the approach of a downleader towards the protected area there is a rapid increase in the electric field

The energy is conveyed to ground via downconductor(s). When the energy enters the dedicated lightning earth, it is safely dissipated without risk to personnel and equipment.

which initiates the triggering of an upward streamer from the Stormaster ESE terminal. The concept of earlier allows for a larger or enhanced area of protection to be provided by the Stormaster ESE in comparison to a conventional rod.

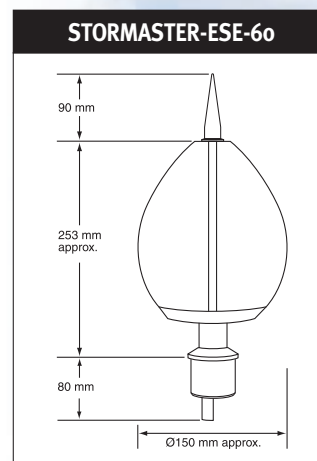
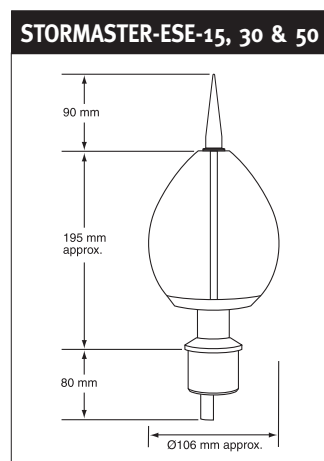
With the release of the upward streamer from the finial tip earlier than other competing structural points, the Stormaster ESE terminal becomes a **preferred point** for the capture of the lightning discharge within the protected area.

The Stormaster ESE Range

LPI offers four models in it's range of Early Streamer Emission air terminals.

All terminals have been tested to **NF C 17-102**.

- Stormaster-ESE-15
- Stormaster-ESE-15-GI
- Stormaster-ESE-30
- Stormaster-ESE-30-GI
- Stormaster-ESE-50
- Stormaster-ESE-50-GI
- Stormaster-ESE-60
- Stormaster-ESE-60-GI



- GI Model - For direct mounting to 2" dia. GI Pipe.
- Stainless Steel Stormaster ESE terminals available upon request.

Lightning Strike Recorder (LSR)

LPI have developed a Lightning Strike Recorder (LSR) which is designed for easy mounting on a downconductor to effectively count the number of lightning strikes captured by the Stormaster ESE Terminal.

The LSR has a current sensitivity range of 1500A through to a maximum of 220kA @ 8/20µs impulse and operates by sensing current by means of an inductive pickup loop. The strike recorder has a mechanical 6 digit display secured within a polycarbonate IP 67 rated enclosure. The LSR is self powered and does not require the use of a battery or any external power source.



Certified Performance

As one of the leading companies in the field of lightning protection, **LPI** has invested heavily in field and laboratory testing as part of its on-going commitment to research and development.

Throughout the product development of the Stormaster ESE the proto-type models were subjected to intense testing under high voltage conditions. Following further refinements the Stormaster terminals were subjected to final testing by an independently accredited test laboratory which completed testing in full compliance with the **French National Standard NF C 17-102**. The final testing of Stormaster ESE terminals showed effective performance as defined in the French National Standard.

The objective of the testing under **NF C 17-102** is to obtain a statistical result between a single reference rod and the ESE terminal whereby a time difference is obtained between the two and by definition, a triggering time advance ΔT is calculated. Safety margins are applied to the measured values in order to provide a conservative measured result.

Advantages of the Stormaster ESE Terminal

A typical Stormaster ESE installation consists of a single Stormaster ESE terminal with an enhanced area of protection and one or more downconductors connected to a dedicated low impedance lightning earth.

- **LPI**'s Stormaster ESE system is simple to install and requires no special maintenance.
- **LPI**'s Stormaster ESE system is a cost effective solution for providing your lightning protection whilst providing superior safety.
- The Stormaster ESE range of terminals have been fully tested in accordance with **NF C 17-102** in a high voltage laboratory.



Ground Resistance Improvement Powder (GRIP)

Ground Resistance Improvement Powder is an earth enhancing material which is applied in and around an earthing system to reduce the soil resistivity and lower ground impedance. GRIP is supplied in 10kg and 40kg kits and is particularly useful in difficult sites such as sandy soils and rocky ground. LPI recommends the installation of a radial lightning earth to aid in the efficient dissipation of the lightning energy.

Contact **LPI** or an authorised representative for design assistance and for further details on LPI's complete range of earth enhancing compounds.



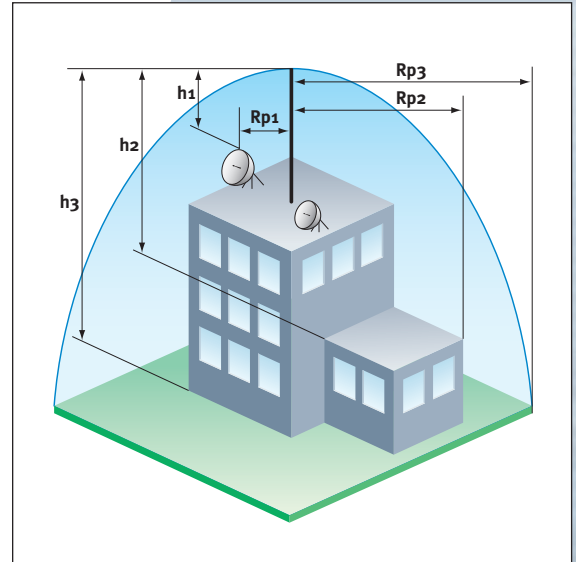
Protection Performance

The protection radius (Rp) of a Stormaster ESE terminal is calculated using the following formula as defined by the French National Standard NF C 17-102 (July 1995).

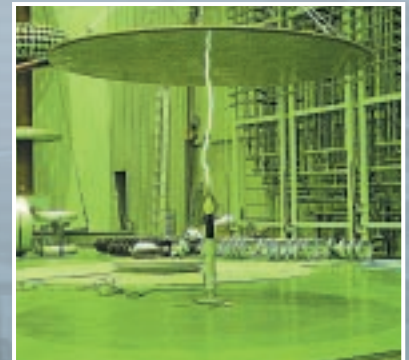
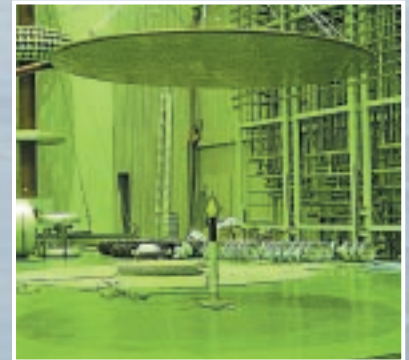
$$R_p = \sqrt{h(2D-h) + \Delta T(2D + \Delta T)} \text{ for } \geq 5\text{m where:}$$

The following key parameters determine the calculation of RP.

- ΔT as established during the test.
Stormaster-ESE-15 = ΔT (μs) 15
Stormaster-ESE-30 = ΔT (μs) 30
Stormaster-ESE-50 = ΔT (μs) 50
Stormaster-ESE-60 = ΔT (μs) 60
- h = actual height of Stormaster terminal above the area to be protected (m).
- D (in m) depends on the selected level of protection, protection levels are specified in annex B of the standard NF C 17-102.
D = 20m for protection level 1 (High Protection)
D = 45m for protection level 2 (Medium protection)
D = 60m for protection level 3 (Standard protection)



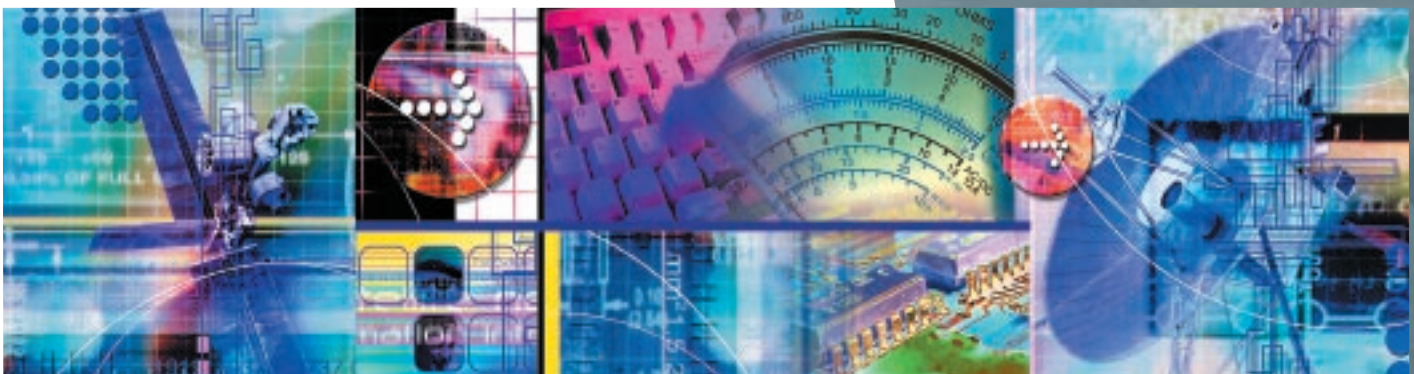
PROTECTION RADIUS (M) - (Rp)									
h = height of Stormaster terminal above area to be protected (m)	2	4	5	6	10	15	20	45	60
Protection Level 1 (High Protection)									
Stormaster 15	13	25	32	32	33	34	35	35	35
Stormaster 30	19	28	48	48	49	50	50	50	50
Stormaster 50	28	55	68	69	69	70	70	70	70
Stormaster 60	32	64	79	79	79	80	80	80	80
Protection Level 2 (Medium Protection)									
Stormaster 15	18	36	45	46	49	52	55	60	60
Stormaster 30	25	50	63	64	66	68	71	75	75
Stormaster 50	35	69	86	87	88	90	92	95	95
Stormaster 60	40	78	97	97	99	101	102	105	105
Protection Level 3 (Standard Protection)									
Stormaster 15	20	41	51	52	56	60	63	73	75
Stormaster 30	28	57	71	72	75	77	81	89	90
Stormaster 50	38	76	95	96	98	100	102	110	110
Stormaster 60	44	87	107	107	109	111	113	120	120



Research and Development

The company has an ongoing commitment to Research and Development.

LPI personnel and its associates have been involved in a number of field trials throughout lightning prone regions of the world. This experience has extended throughout such countries as Australia, Indonesia, Sri Lanka the USA and South Korea.





LPI Customers

LPI Proudly services customers from the following countries:

- | | | |
|--------------|--------------------|------------------|
| • Australia | • Japan | • Philippines |
| • Bahrain | • Kuwait | • Qatar |
| • Bangladesh | • Laos | • Saudi Arabia |
| • Brunei | • Mainland China | • Singapore |
| • Burundi | • Malaysia | • South Korea |
| • Cambodia | • Maldives | • Sri Lanka |
| • Chile | • Mauritius | • Taiwan |
| • Costa Rica | • Myanmar | • Thailand |
| • Ecuador | • New Zealand | • UAE |
| • Guatemala | • Nigeria | • United Kingdom |
| • Haiti | • Oman | • USA |
| • Hong Kong | • Papua New Guinea | • Vietnam |
| • India | • Peru | |
| • Indonesia | | |
| • Iran | | |

LPI's 4-Step Approach to Lightning Protection

It is the strategic aim of our company to be able to provide a complete packaged solution. **LPI** has identified 4 key steps when considering the complete approach to lightning protection, ask for our LPI 4 Step approach to lightning protection.

Our system design approach includes:

- 1** Definition and provision of area protection
- 2** Creation of a bonded earthing system
- 3** Protection of power lines
- 4** Protection of signal, data and communication lines



Disclaimer

- LPI maintains a policy of on-going product development, specifications are subject to change without notice.
- Application detail, illustrations and schematic drawings are representative only and should be used as guides.
- It should be noted that 100% (100 percent) protection level for direct strike lightning and surge and transient protection equipment is not possible and cannot be provided due to the lightning discharge process being a natural atmospheric event.

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