

SEAWORLD ORLANDO LIGHTNING INCIDENT

**FAILURE OF THE SECOND GENERATION
EARLY STREAMER EMISSION LIGHTNING ROD**



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September 2012
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Introduction

Since they were first introduced in the late 1980s to replace the radioactive lightning rods, the early streamer emission (ESE) lightning rods have repeatedly failed to protect buildings from direct lightning strikes. Lightning experts around the world have continuously opposed the ESE and other non-conventional lightning rods due to the danger they posed to buildings and the public.

<http://www.mikeholt.com/files/PDF/Cooray-CIGRE-2011.pdf>

<http://www.iclp-centre.org/pdf/Invited-Lecture-Cooray-2010.pdf>

<http://www.lightning.ece.ufl.edu/PDF/umanakov.pdf>

In July 2012, a guest received a shock as a result of an indirect lightning strike while visiting the SeaWorld theme park. She was inside the Shark Encounter exhibit when the building was struck by lightning during a thunderstorm.

Since the Shark Encounter exhibit is located well within the claimed protection zone of an ESE lightning rod, the Prevelectron 2 Millennium S6.60, this incident provides direct evidence that ESE lightning rods are unsuitable for the protection of theme parks and other recreational grounds.

Earlier this year, two young persons were reportedly killed when they were struck by lightning. One of the victims was a student who was struck by lightning while playing football at an outdoor stadium in Malaysia while the other was a young lifeguard supervisor who was also struck by lightning at a water theme park in Tampa, Florida.

In both these cases, the victims were located well within the claimed protection zones of the (ESE) lightning rods when they were struck by lightning. Both these lightning rods were manufactured in France and they fully complied with the French ESE standard, NF C 17-102.

http://www.mikeholt.com/files/PDF/Death_at_the_stadium.pdf

<http://www.lightning-risk.org/pdfs/Hartono-Adventure-Island-Lightning.pdf>

Cover picture:

The SeaWorld theme park, Orlando, Florida.

1. LIGHTNING INCIDENT REPORT

The SeaWorld theme park is located south of the city of Orlando, Florida, in the United States of America (USA). Florida, which has the highest number of annual thunderstorm days on the continental USA, is also considered to be the “Lightning Capital” of the nation.

The theme park has been installed with at least seven pole-mounted Prevectron 2 Millenium S 6.60 ESE lightning rods (Prevectron 2) which are located among the attractions (Fig. 1).

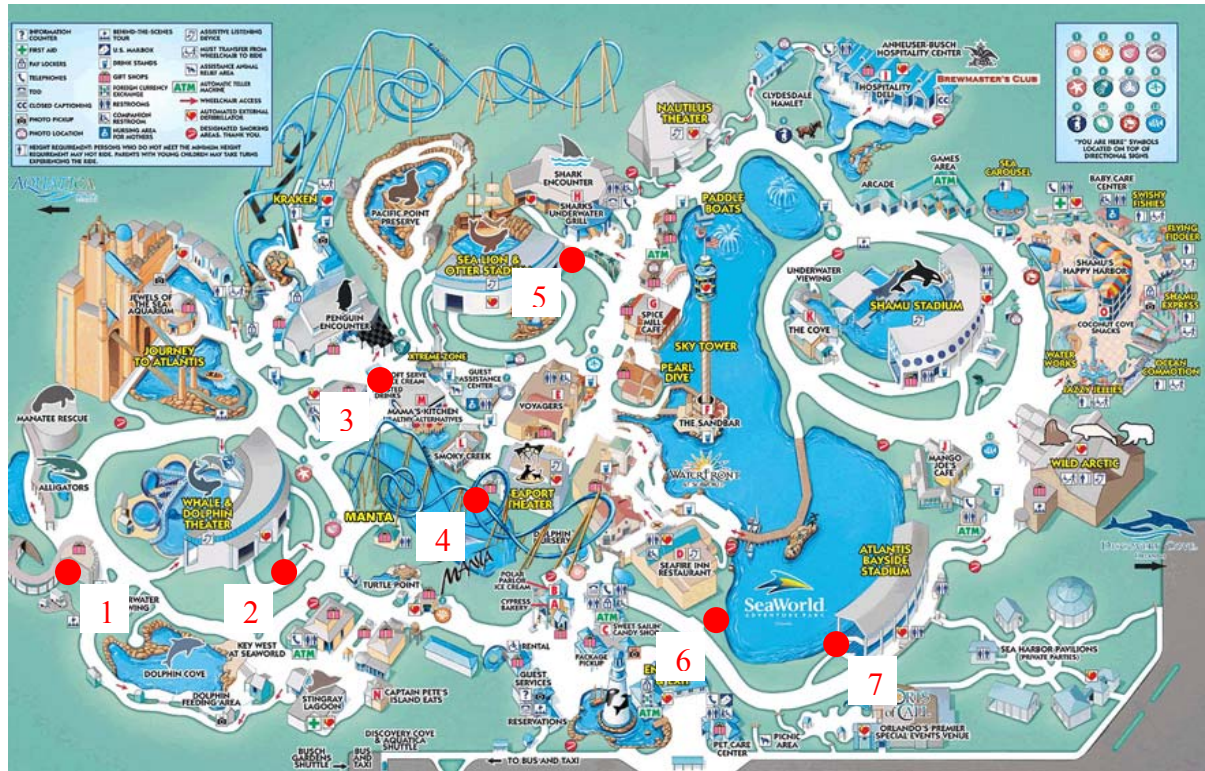


Fig. 1: The SeaWorld theme park with the location of the seven ESE lightning rods (red dots). (Map: Orlando Discount Tickets USA)

The locations of the Prevectron 2 lightning rods are on or near the following buildings/exhibits:

- 1) Underwater Viewing (Fig. 2)
- 2) Whale and Dolphin Theatre (Fig. 3)
- 3) Penguin Encounter (Fig. 4)
- 4) Manta Rollercoaster (Fig. 5)
- 5) Shark Encounter (Fig. 6a and 6b)
- 6) Seafire Inn Restaurant (Fig. 7)
- 7) Atlantis Bayside Stadium (Fig. 8)



Fig. 2: Underwater Viewing.



Fig. 3: Whale and Dolphin Theatre.



Fig. 4: Penguin Encounter.



Fig. 5: Manta Rollercoaster.



Fig. 6a: Shark Encounter.



Fig. 6b: Close-up photograph of the Preactron 2 Millennium S 6.60 lightning rod mounted on top of an approximately 15 m high concrete pole.



Fig. 7: Seafire Inn Restaurant.



Fig. 8: Atlantis Bayside Stadium.

2. SHARK ENCOUNTER BUILDING

The Shark Encounter exhibit is located inside a building which is adjacent to the Sea Lion and Otter Stadium. The Prevector 2 lightning rod is mounted on an estimated 15 m high concrete pole which is located besides a footpath that runs in between both buildings (Fig. 9).



Fig. 9.

Using Google Map Satellite View, both the Shark Encounter building and the Sea Lion and Otter Stadium were found to be located well within 100 m of the Prevector 2 ESE lightning rod (Fig. 10). According to the Indelec website, a 5 m clearance above the surface to be protected will enable the Prevector 2 to provide a 107 m radius protection zone. This puts both buildings within the Prevector 2 claimed zone of protection.

In July 2012, a guest to the theme park received a shock while she was inside the Shark Encounter exhibit during a thunderstorm. The building's metal roof was struck by lightning and fortunately, the guest only suffered a minor injury as a result of the indirect lightning strike.

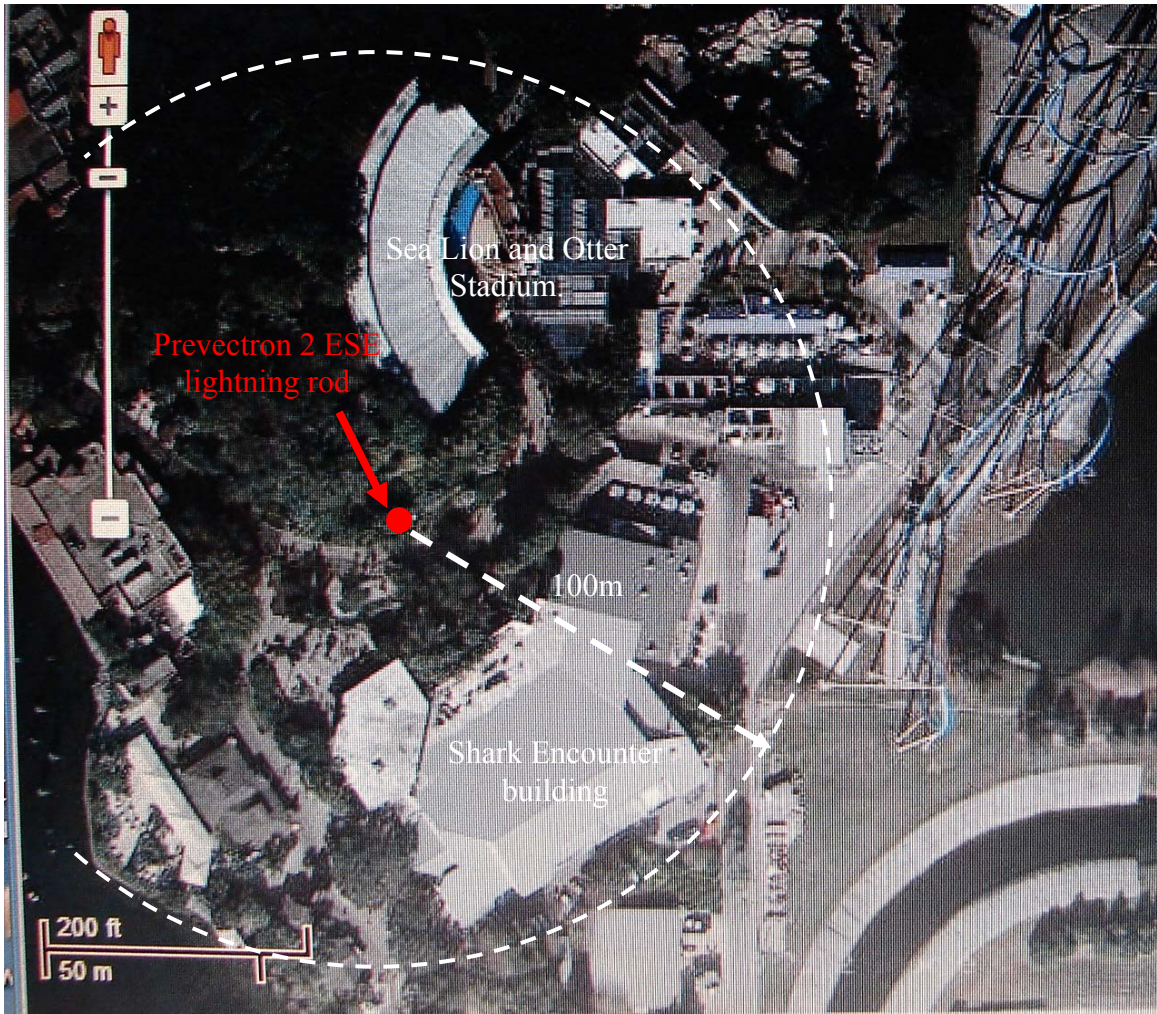


Fig. 10: The location and claimed protection zone of the Prevectron 2 ESE lightning rod (Satellite view source: Google Map).

2. DISCUSSION AND SUMMARY

The lightning incident at the SeaWorld Shark Enclosure exhibit is another clear example of the failure of the ESE lightning rod to protect a structure from lightning strikes within its claimed zone of protection. Unlike the lightning incident which occurred at the Adventure Island theme park earlier this year, where the first generation Prevectoron lightning rods were used, the incident at the SeaWorld theme park involved the use of the Prevectoron 2, a second generation device which is claimed by its manufacturer as having “total reliability” due to its “ultra-safe capture tip”. Such claims are unfounded since the failures of the Prevectoron 2 have been well documented in Malaysia for the past several years, and now it is also happening in the USA.

In Malaysia, whenever an ESE lightning rod failed to protect a building from being struck by lightning, the ESE vendor will sometimes re-install the rod on a higher pole to assure the building owner of a larger protection zone. However, this method is futile since bypasses have been known to occur very close (eg. <10 m) to ESE lightning rods that were mounted on 5 m poles.

Hence, re-installing the Prevectoron 2 lightning rods on taller poles at the SeaWorld theme park will not improve the protection of the buildings and open areas. After all, the Prevectoron lightning rods at the Adventure Island theme park were installed on much taller (25 m) poles and that did not prevent the fatal direct lightning strike within their claimed protection zones.

The protection zone of the ESE lightning rod is based on the claimed streamer velocity of one million metres per second ($1 \times 10^6 \text{ ms}^{-1}$) which all ESE manufacturers knew to be false and unproven i.e. well before the French ESE standard was first published in 1995. The streamer velocity that were observed in nature and in the laboratory is about one order of magnitude lower (i.e. 10^5 ms^{-1}) hence lightning scientists and standards organization (eg. CIGRE, NFPA, IEC) have repeatedly rejected the claimed enhanced protection zone made by the ESE manufacturers.

The safety-challenged ESE lightning rod is nothing more than a major technical scam that had led to numerous building damages due to direct lightning strikes for more than two decades. For open areas, such as stadiums and theme parks, the use of the ESE lightning rods have proven to be fatal. Based on this fact, the ESE manufacturers and those who promote and implement them should be held directly responsible for any damages, injuries and deaths that resulted from the use of the ESE lightning rods.