DEATH AT THE STADIUM

REPORT ON THE FATAL USE OF AN EARLY STREAMER EMISSION LIGHTNING ROD IN MALAYSIA

By

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Introduction

On the evening of March 16, 2012, student Mohd Ridwan Jamal was struck and killed by a lightning bolt while he and his friends were about to play football at the Kolej Universiti Islam Melaka (KUIM) mini-stadium. The stadium grandstand had been installed with the early streamer emission (ESE) lightning rod (i.e. air terminal) and the student might still be alive today had he not left the safety of the grandstand.

http://www.nst.com.my/nation/general/student-killed-by-lightning-1.61789

http://www.nst.com.my/latest/student-struck-by-lightning-dies-1.61591

The manufacturers of the ESE lightning rod had claimed that the rod can attract lightning and hence provide a large protection zone of up to 100 m radius or more, depending on the model and make of the rod. However, this claim did not have a sound scientific basis or the support of lightning experts and scientists who studied them for the past 20 years.

Furthermore, the claim has never been proven by independent scientific studies conducted on the ESE lightning rods. In fact, studies have shown that the rods frequently failed to protect buildings from direct lightning strikes.

Several thousand ESE lightning rods have been sold and installed in the country since the late 1980s. They have mostly been installed on public and private buildings nationwide while several hundreds have been installed on recreation sites such as mini-stadiums, stadiums, school playing fields, golf courses and public parks.

Since 1995, the authors have repeatedly highlighted the fact that the ESE lightning rods were ineffective in protecting buildings against lightning strikes in reports and conference/seminar papers. They have also cautioned that the use of the ESE lightning rod may lead to injuries and fatalities. Ridwan's untimely death has confirmed their worst fears and may not be the first casualty involving an ESE lightning rod.

This report provides the detailed information about the fatal incident at KUIM and highlights the fact that the victim was well within the ESE lightning rod's claimed protection zone when he was struck by lightning.

Cover picture:
The KUIM football field in front of the grandstand where the lightning fatality occurred.

1. FATAL LIGHTNING INCIDENT REPORT

Kolej Universiti Islam Melaka (KUIM), formerly known as Kolej Universiti Teknikal Melaka, is located near Kuala Sungai Besar in Malacca. The university was built several years ago as a private institution by the Malacca state government.

Like many other public and private institution of higher learning in the country, most of the KUIM buildings were installed with one of several different types of ESE lightning rods that are commercially available in the country. This is in spite of the fact that the use of the ESE lightning rods is illegal since it contravened the past and current SIRIM lightning protection standard (MS-IEC 62305).

Fig. 1: KUIM administrative building with the ESE lightning rods.

Fig. 2: Another KUIM building with the ESE lightning rods.

The KUIM mini-stadium consists of a grandstand, an indoor game hall, a football field and an athletic track. The grandstand, which is located about 5 m from the athletic track, is a metal roofed structure with a dimension of about 10 m high, 12 m wide and 16 m long. The metal roof is mounted on five large 12 m high metal poles (Figs. 3 and 4).

Fig. 3: Oblique view of the indoor game hall, grandstand and football field.

Fig. 4: Side view of the grandstand and football field.

The ESE lightning rod, model Satelit manufactured by Duval Messien of France, was installed on one of the large metal poles at the edge of the grandstand. The ESE rod is grounded with a copper strip which is attached to the metal pole (Figs. 5 and 6).

Fig. 5: The Satelit ESE lightning rod mounted on the metal pole.

Fig. 6: Close-up photograph of the Satelit ESE lightning rod.

According to the Protection Angle Method (PAM) of lightning protection design, a scientifically approved method which is found in the SIRIM standard MS-IEC 62305, the grandstand roof can provide a protection coverage against direct lightning strikes which is limited to the athletic track immediately in front of it. The remainder of the track and the entire football field is exposed to the danger of lightning strikes.

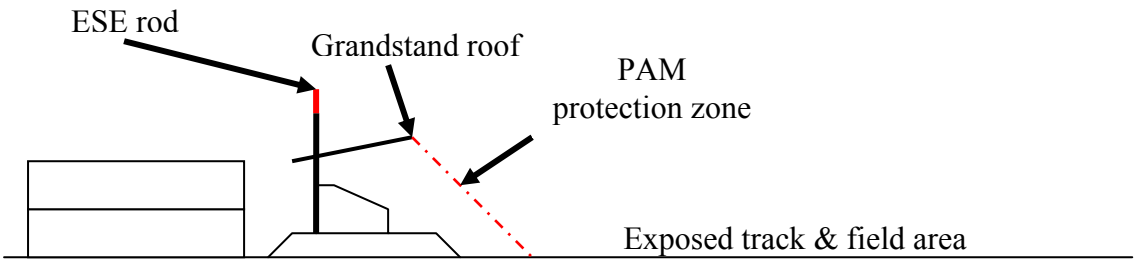

Fig. 7: Protection zone according to SIRIM standard

However, the manufacturers of the ESE lightning rods had claimed that their rods can provide a very large protection zone i.e. up to 100 m or more depending on the make and model of the rod. According to GIMELEC, an organisation that is affiliated to French ESE manufacturers, a single ESE lightning rod installed centrally on the roof can provide protection for the entire building and the open area surrounding the building. This is shown in the GIMELEC diagrams below (figs 8 and 9).

Source: http://www.lightningconductor-ese.com/etude1.htm

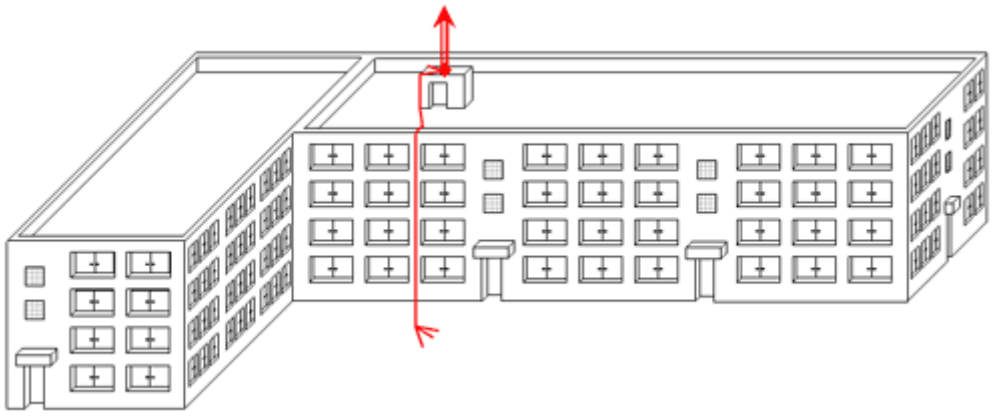

Fig. 8: A school building installed with a single ESE lightning rod at the centre of the roof. (Source: GIMELEC)

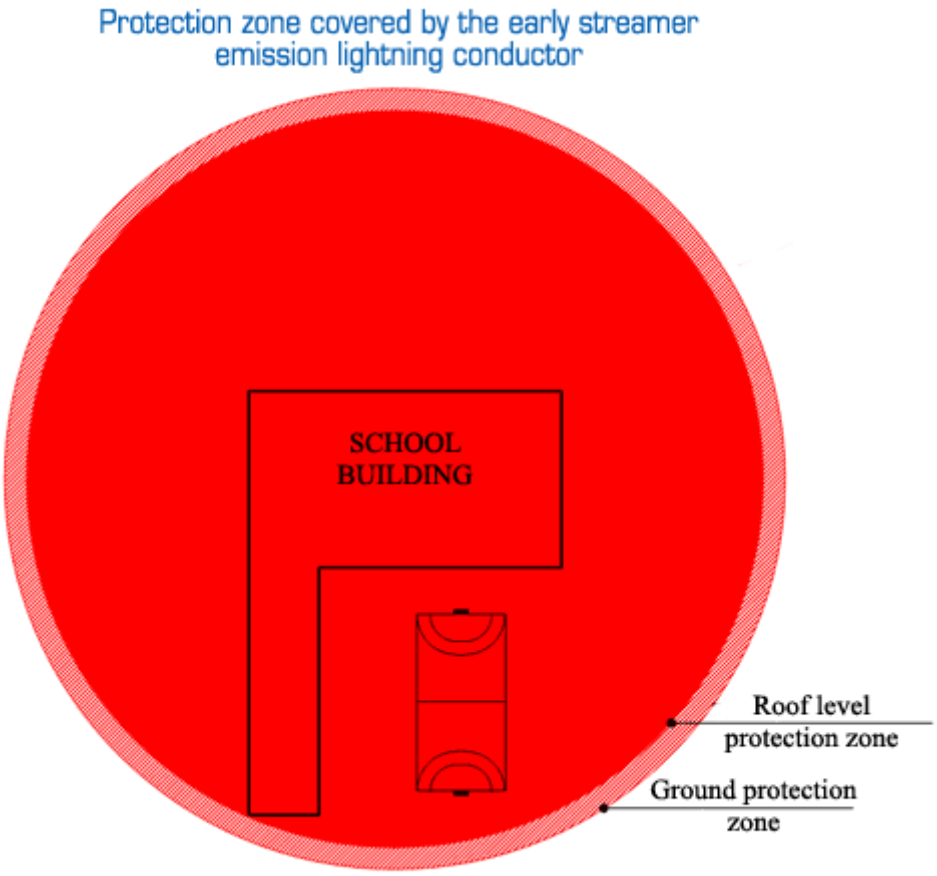

Fig. 9: The claimed protection zone provided by the single ESE lightning rod for the school building and surrounding area. (Source: GIMELEC)

When this ESE lightning protection method is applied to the KIUM stadium, the claimed ESE protection zone will include most, if not all, of the football field and athletic track at KIUM (Fig. 10). Every project consultant who is competent in lightning protection engineering knows that buildings with robust metal roofs do not need protection against lightning strikes, hence the ESE lightning rod installed on the KIUM grandstand was for the purpose of open area protection only.

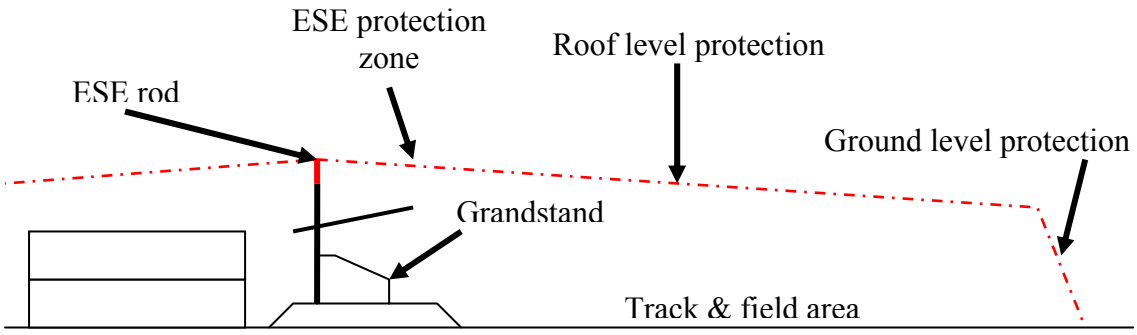

Fig. 10: The claimed ESE protection zone at the KIUM mini-stadium.

Based on the above recommendation of the project consultant and ESE vendor, the end users were misled into a dangerous situation, as follows:

a) The owner:

The Malacca State Government believed that they have provided the best available lightning protection for the university staff, students and assets by purchasing the ESE lightning rods. In fact, they have been deceived into purchasing a lightning protection system which has been discredited scientifically for the past 20 years.

b) The university administrator:

The vice chancellor believed that the staff and students are well protected against lightning and hence no additional safety measures are needed to protect them while they are in the campus open spaces during a thunderstorm.

c) The students and staff:

They are under the false impression that it is safe for them to go out in the open areas of the stadium and campus during a thunderstorm.

It is this deception on the part of the ESE manufacturer, vendor and the project consultant that led to the unfortunate death of the KIUM student. His untimely and unfortunate death should be regarded by the authorities as an act of reckless endangerment by those involved rather than a case of "sudden death".

According to a news report, the victim and his friends took shelter in the grandstand when heavy rain and lightning interrupted their football practice that evening. When the downpour became a drizzle, they went down to the football field and was just about to restart their football game when the victim was struck by lightning. This would place the victim's location somewhere on the football field in front of the grandstand when he was struck i.e. within about 40 m from the ESE lightning rod (Fig. 11).

According to another news report, the victim and his friends was near the edge of the football field when the incident occurred. If that was the case, he would have been much closer to the ESE lightning rod than estimated above.

This incident is another indisputable evidence of the failure of the ESE lightning rod with fatal consequences since the victim was clearly within the claimed protection zone of the rod when he was struck by lightning. With hundreds of recreation sites around the country using the ESE lightning rods as protection for open areas, it will not be long before another student or member of the public fall victim to a direct lightning strike.

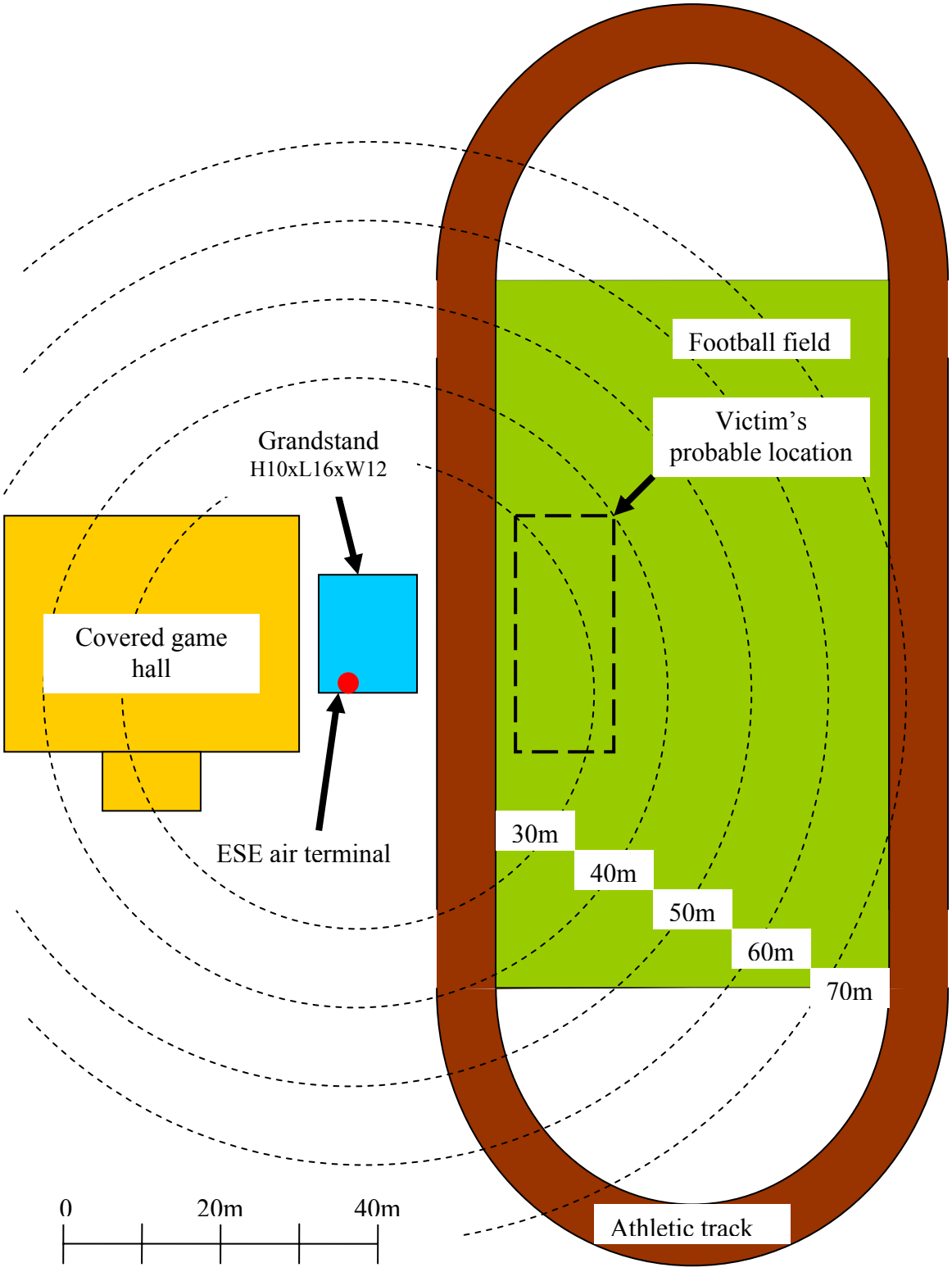

Fig. 11: Plan diagram showing the location of the ESE lightning rod and the victim.

2. DISCUSSIONS

The fatal lightning incident involving the use of the ESE lightning rod at KIUM has been anticipated and may not be the first of its kind since less than 50% of fatal lightning incidents actually made it into the press annually. If non-fatal lightning incidents are included, then the failures of ESE lightning rods to protect recreational sites may be much higher.

The failures of the ESE lightning rods to attract lightning have been highlighted by the authors in several technical reports and conference/seminar papers since 1995. In their latest conference paper presented in 2011, the authors have highlighted the fact that lightning can strike within 10 m of the ESE lightning rod.

http://www.mikeholt.com/download.php?file=PDF/CloseProximityBypasses.pdf

Hence, it is not surprising that the victim in this incident was struck well within the claimed ESE protection zone. In fact, the failure of the Satelit ESE lightning rod has been observed in a number of cases within Kuala Lumpur. One of them is shown below (Fig. 12).

Fig. 12: The Wisma Tanah building in 2007 (before the damage was repaired).

The authorities must act quickly to avoid another fatal lightning incident since the ESE lightning rods have been used on hundreds of recreational facilities around the country. Examples are shown below:

2.1 School football field in Putrajaya

This school field is situated on top of a barren hill and is therefore considered as a high risk lightning location. An ESE lightning rod has been installed beside an all metal mini-grand stand (Figs. 13 and 14).

Fig. 13: An ESE lightning rod installed on a school field in Putrajaya.

Fig. 14: A close-up photograph of the ESE lightning rod.

2.2 Public football field in Petaling Jaya

This public football field has been installed with two ESE lightning rods on the flood lights located at opposite ends of the field (Figs. 15 and 16).

Fig. 15: An ESE lightning rod installed on the floodlight of a football field.

Fig. 16: A close-up photograph of the ESE lightning rod.

3. SUMMARY

The death of the university student at KUIM should not be taken lightly by the authorities since tens of thousands of students like him are exposed to the hazards of lightning whenever sporting activities are conducted before, during and after a thunderstorm. The death should not be classified as "sudden death" by the authorities since an element of criminal negligence has been established.

The project consultant, the ESE vendor and the ESE manufacturer have created a false atmosphere of safety in the KIUM stadium complex by claiming that the ESE lightning rod can provide a large protection zone around it. This led the victim and his friends to venture out of the safety of the grandstand as soon as the downpour ended instead of waiting for the thunderstorm to be completely over.

Project consultants who recommended the installation of the ESE lightning rods around the country for the past 20 years should be investigated by the relevant professional bodies for professional negligence since they have clearly breached the organisation's code of ethics on public safety and have clearly neglected the nation's standard on lightning protection. They should be held responsible for any fatal and non-fatal incident that had occurred in the past that are related to lightning since the public had relied on their professional knowledge to ensure their safety. The project consultants should also be compelled by the authorities to replace all the ESE lightning rods with SIRIM compliant systems before another lightning incident occurs.

Like any other products that are severely lacking in safety features, the relevant government ministry should recall all ESE lightning rods until they can be certified as effective and safe to use by recognised international technical organisations such as CIGRE. While conducting studies on the ESE lightning rods, CIGRE have found firm evidence of the ESE lightning rod failures (in Malaysia) more than a decade ago.
http://www.iclp-centre.org/pdf/Cooray-CIGRE-2011.pdf