

CUI	– Copper Insulated Conductor
HVI	– High-Voltage-resistant, Insulated Conductor
LPS	– Lightning Protection System

Sports ground lightning protection from touch and step potentials

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Effective lightning protection should be installed for playing fields and sports grounds, as well as for the nearby spectator galleries.

The Rio Olympics 2016 serves as a reminder that sporting events can gather thousands of unsuspecting people from all walks of life together into one big space – an open sports field. Statistics show that the highest frequency (45%) of South African lightning strikes occur in open areas, including sports fields, and it is ranked the highest in the frequency of lightning strikes activity. As a recommendation, DEHN Africa advises that effective lightning protection is installed for playing fields and sports grounds, as well as in the nearby spectator galleries.

The damage that can be caused by increased thunderstorm frequency has resulted in greater emphasis being placed on protection measures against lightning strikes on floodlights, spectator galleries, fences or even playing fields, which can endanger sports persons and spectators. People who are directly hit by lightning, or stand next to lightning current carrying objects or who, as a result of a flashover may even be carrying partial lightning current themselves, could sustain serious injuries or possibly die. Moreover, those who are not directly hit by the lightning, but are standing next to the point of strike (potential gradient area) bridge a life-threatening voltage difference with their legs (step voltage) or by touching other people. This may result in injuries such as ventricular fibrillation, cardiac arrhythmia and injuries caused by fright. Hence the lightning protection installation requires that protection measures must be considered:

Structures that could easily be struck by lightning must sufficiently be equipped with permanent effective lightning protection systems. It is crucial to recognise these areas as hazards, so that dangerous areas can be evacuated and buildings or designated shelters can be sought in the event of a thunderstorm. Additional lightning protection measures reduce the risk of injuries in critical areas that contain floodlights, metal fences and escape routes.

Lightning protection for buildings or lightning equipotential bonding

Covered stands, locker rooms and clubhouses provide shelter in case of unexpected heavy rainfall and thunderstorms. A lightning protec-

tion system (LPS) according to Lightning Protection Level (LPL) III as per SANS 62305-3 [1] (IEC/ EN62305-3) is at least required for these types of structures. In the event of a lightning strike, partial lightning current may also flow through metal fences, parts of the spectator gallery and flagpoles or even the scoreboards. This could result in an uncontrolled flashover which may cause fire and jeopardise people and animals in close proximity. In order to prevent this, all conductive elements in the LPS, like railings down conductors, fencing, etc. should be equipotentially bonded to earth. After this, the installation of a LPS to the 230/400 V power supply system at the entry point of the main low-voltage distribution board, is required. In addition, the associated lightning equipotential bonding system for metal and electronic systems prevents fire in these structures.

Isolated air-termination system

According to the latest lightning protection standards, isolated air-termination systems can be used to protect metal floodlight pylons, parts of the spectator gallery, scoreboards and flagpoles against direct lightning strikes. These parts are conductively connected with sensitive electronics. Isolated air-termination systems can prevent flashover. Consequently, no lightning currents will travel through these structures, thus preventing dangerous lightning currents from flowing into sensitive electrical systems. The height of the air-termination tip depends on the relevant class of LPS, which must be determined in advance. The HVI conductor can be directly installed at the pylon in line with the installation instructions using system-specific accessories to prevent lightning currents from flowing through the pylon and the electrotechnical installation.

Lightning protection for floodlights

Floodlights next to the sideline or spectator galleries should also be provided with a lightning protection system. The earth-termination systems of the individual pylons should be connected to each other and to the earth-termination systems of the sports buildings (club houses, locker rooms or technical buildings). These additional con-

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nections improve equipotential bonding and the efficiency of the individual foundation earth electrodes. If correctly installed, they form a protected volume in case of a direct lightning strike to the cable routes of the floodlight.

Standing surface insulation, touch and step voltage (potential control)

People standing directly next to lightning current carrying floodlight pylons, fences, flagpoles or cover stands during a lightning strike are exposed to high potential differences with their legs (step voltage) or may directly touch conductive structures (touch voltage). The potential risk and injury can be reduced by insulating the standing surface (standing surface insulation), and this measure reduces the risk of impermissibly high touch and step voltages following a lightning strike. According to SANS 62305 (IEC/EN 62305) [1], an insulating asphalt layer of at least 5 cm around these parts is sufficient. As an alternative, CUI conductors with dielectric strength of ≥ 100 kV (1,2/50 μ s) can be used.

Conclusion

Potential control also allows for step voltages to be reduced and additional earthing conductors are buried around the pylons or metal spectator galleries and they are interconnected. Consequently, the potential difference in the probable control area is reduced and the lightning current is evenly distributed in the ground. When the distance from the pylon increases, the depth increases as well by 0,5 m. The more evenly the earth electrodes are installed, the lower the potential difference (step voltage). Thus, the risk of injury is considerably reduced.

Reference

- [1] SANS 62305-3. 2011. Protection Against Lightning - Part 3: Physical damage to structures and life hazard.



Kirk Risch joined the South African Air Force in 1988 as an apprentice, learning trade skills in radar technologies and electronics. He also holds a diploma in marketing. In 2010, Kirk joined Webb Industries, a specialist ancillary telecommunications company, becoming its lightning and surge protection expert. He joined DEHN Africa as sales and marketing manager in 2013, becoming sales and marketing director the following year. Enquiries: Email kirk.risch@dehn-africa.com