MS IEC 62305:2011 Protection Against Lightning
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Lightning is formed when there is a natural build-up of electrical charge separation in storm clouds. There are two types of storm clouds which will generate a static electrical charge, namely heat storm and frontal storm.

Heat or convective storms are more common in tropical regions and mountainous areas while frontal storms are more common in temperate climates. Incidences of lightning are expected to increase because of the increase in Earth's temperature.

Malaysia is one of the regions in the world that is most highly struck by lightning. In 1984, there was a big change in the standards in the United Kingdom due to hazards caused by lightning such as fires and damage to properties. When buildings are hit, it may may lead to debris falling on and hurting pedestrians.

Over the years, the development of lightning protection systems has been getting more advanced. On 27 June 2022, a one-day seminar on MS IEC 62305:2011 Protection Against Lightning was conducted by Mr. Gary Blackshaw, Mr. Yeffry Wiyana and Mr. Chan Chin Loon from Furse and ABB. It was aimed at educating participants on the latest lightning protection measures based on the IEC 62305 Protection against lighting.

IEC 62305 was developed on 1 September 2006 and had undergone some revisions. The latest version is IEC 62305:2011. It is adopted from BS 6651 which has a simple risk assessment of structural damage based on two levels of lightning protection – ordinary and high. The revised version (IEC 62305) consists of comprehensive risk management calculations based on 4 types of risks and is associated with 4 levels of Lightning Protection System (LPS). IEC 62305 consists of 4 parts:

Part 1: General Principles.
Part 2: Risk Management.
Part 3: Physical Damage and Life Hazard.
Part 4: Electrical & Electronic System within the Structures.
Part 1: General Principles lists the principles of lightning protection. It explains the storyline on how to design the LPS in accordance with accompanying parts of the standard. The protection measure includes structures, installations, contents, persons and services connected to the structures.
In order to evaluate whether lightning protection is required, a risk assessment (Part 2) needs to be carried out in accordance with IEC 62305-2. There are 4 types of risks:

- R1: Risk of loss of human life.
- R2: Risk of loss of services to the public.
- R3: Risk of loss of cultural heritage.
- R4: Risk of loss of economic value.

It starts with identifying the structures to be protected. The identification of types of loss relevant to the structure is then carried out. For each loss to be considered, the tolerable level of risk is classified. It is then used to calculate the score after including all the relevant parameters. In summary, extra protection should be installed if the total risk score is less than the threshold. Otherwise, the structure is adequately protected for the assessed type of loss. At the workshop, the speaker introduced the software, ABB Furse StrikeRisk, which was able to simulate and calculate the Tolerable Risk, R_T for the risk assessment.

Part 3 of the standard consists of protection against physical damage to structures and life hazards. Basically, a lightning protection shall consist of:

1. Capture/intercept the lightning strike (Air Termination System).
2. Safely conduct the lightning current to earth (Down Conductor System).
3. Safely and effectively dissipate the lightning current into the ground (Earth Termination System).
4. Provide equipotential bonding and electrical insulation (separation distance) to prevent dangerous sparking.
5. Protect against the secondary effects of lightning caused by surges and transients (i.e. SPD).

Lightning protection systems are split into conventional (passive) system and non-conventional (active) system. Conventional systems usually include Franklin Rod and Faraday Cage Systems and non-conventional systems usually adopt Early Streamer Emission System and Dissipation Array System. Minimal protection must be installed on the entire building/structure because lightning does not necessarily only strike the highest part of the building. Hence, protection against side strikes is necessary.

Electronic systems are now part of our daily lives. We are totally dependent on these running smoothly and efficiently. A lightning strike can create malfunction, loss of data and other disastrous effects. Part 4 recognises the importance of protecting electrical/electronic systems housed within structures and this is an integral part of BS EN 62305. This protection is installed to protect from electrical surge or transient overvoltage. This transient overvoltage is rated according to the impact level under the categories of Disruption, Degradation and Damage. It leads to loss of business, loss of productivity and incurs additional cost to recover from the damage. The protection against electrical surge has to be thorough as lightning can strike up to 6000 V (almost 20 times the main supply) and it happens in split seconds (typically 50 microseconds). Surge can travel to far distances. An indirect strike can cause transient or surge problems as far as 1 km away, irrespective of whether structural LPS has been fitted or not. However, the LPS only protects the structure and not the equipment within the structure. Hence, the idea that “I have a structural lightning protection system (LPS), so I do not need transient protection” is a misconception that should be discarded.

The Surge Protection Device (SPD) can be classified into Type 1, Type 2 and Type 3. Type 1 is protection against equipotential bonding or lightning current which is installed in the main distribution board. Types 2 and 3 are overvoltage SPD but these protect against different test waveforms and are installed in the sub-distribution board and terminal equipment respectively. Type 1 SPD is a mandatory part of the structural system.

The workshop introduced a comprehensive new lightning protection document, detailed risk management calculations, 4 lightning protection levels and different methods of applying protection as well as types of earthing system and SPD.