49, RUE DE LA BIENFAISANCE - 94300 VINCENNES - FRANCE
SAS AU CAPITAL DE 155 000 € – RCS CRETEIL B 316 719 855
SIRET 316 719 855 00025 – CODE APE 7112B - TVA : FR54 316719855
TEL. : 33 - (0)1.43.28.10.43 – FAX : 33 – (0)1.43.65.43.37

Lightning Protection - EMC

Mobile phone antennas

Mobile phone antennas are often located on host structures (silos in agricultural areas, residential building, buildings open to the public or hospitals in urban areas). Lightning Protection of mobile phone facilities is usually necessary to protect costly and essentials facilities that are essential to our modern life. In addition, the position of the antennas at the highest point automatically increases the risk of lightning for the host structure where are located the antennas (the risk is proportional to 3 times the height of installations).
In addition, the electromagnetic emissions of the antennas can disrupt nearby installations in or on the host structure or even, in the worst case, cause an explosion in the case of silos. The grain storage facilities, seed, food or other organic product emitting flammable dust are potentially subject to these constraints. For these structures the most important thing is not only to perform a lightning protection study but also **a safety survey** to validate that electromagnetic disturbances generated by the antennas will not create any damage (ElectroMagnetic Compatibility).
Silos must be effectively protected against the risks generated by electrostatic discharges and lightning effects. The silo must not have relays, collective transmission or reception antennas on roofs unless a technical study justifies that devices installed are not a source of sparkover, fire or risk of dust ignition. This report must obviously also take into account the lightning study conclusions.
Similar constraints (disturbance of sensitive systems or of residents ...) may occur for buildings and hospitals and a specific analysis is also necessary.
SEFTIM has performed safety surveys where main target was to show that antenna installation does not increase the lightning risk nor the risk of electromagnetic interference (dust ignition, disturbance of sensitive systems etc.). When it was necessary, specific antenna implantation rules have been established before installation..
There are basically three issues :

- **Can Electromagnetic waves emitted by the antennas create overheating or ignition sources?**
- **Can telecommunications devices disturb electrical safety device?**
- **Is the Lightning Protection System adapted to the new antenna installation?**

Mobile phone antennas on Silo
Dreamstime.com

1. Influence of electromagnetic waves on explosive areas

The grain storage silos emit flammable dust that generate hazardous explosive (ATEX) zones. Telecommunications antennas transmit radio frequency waves generating an electric field able to ignite in a given range of distance a few of gases or dust.
SEFTIM skill is to assess the risk of ignition of dust generated by grains stored in the silos, integrating the specific characteristics of the antennas, and therefore determine the areas where an ignition risk exists, to finally set a safety distance between the antennas and ATEX areas existing in the silo.

2. Influence of electromagnetic waves on electrical device

Electromagnetic radiation may disturb the good operation of safety devices installed on or in the structure. It is sometimes necessary to keep antennas away from such devices to ensure that the level of the radiated field remains below the threshold susceptibility of these devices (determined for all electrical and electronic devices by EMC Directive 2004/108 / EC). As a matter of fact these devices must operate normally in the presence of an electric field with a maximum value fixed to 10 V/m.

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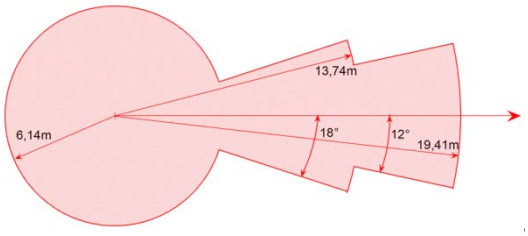
It is therefore necessary to ensure that the field magnitude where are located sensitive devices installed in or on the structure does not exceed this level.
In the same way than for safety distance necessary for ATEX zones, SEFTIM skill is to define the minimum distance above which devices are no more disturbed by antenna radiations .

3. Lightning protection system adapted to the mobile phone antennas



Areas with potential electromagnetic disturbances around antennas

Generally, during installation of radio antennas, SEFTIM performs a lightning protection study to ensure that there is no additional risk to the structure, following new installations setting up. In this case, SEFTIM does not perform a complete study of the whole structure (the need of protection for the structure must be established through a dedicated study), but a study to ensure that there is no increased lightning risk due to antenna installation. If this is not the case, SEFTIM define a dedicated Lightning Protection System to reduce the risk.
However, mobile operators generally want to protect their installations against lightning due to investment and maintenance cost and potential operating losses. SEFTIM define then a Lightning Protection System suitable for that purpose and compliant with applicable standards.

➢ **For protection against direct lightning effects**, the installation of the lightning protection system (mesh system, striking or lightning rod etc.) already present on site is evaluated based on the height of new antennas that will be installed.
The protection zones are redefined according to the new needs due to the presence of the antennas. The equipotentiality network is also defined, and checked for existing parts especially regarding the roof (separation distance concept) It is the same for the lightning earthing system that needs to be created or is already existing. The use of an isolated lightning protection system is generally a good practice, since it allows electrical separation, even for the high voltages generated by lightning impulse, between the hos structure and the mobile telephone installations.

➢**For protection against indirect effects of lightning,** installation of Type 1+2 (Surge Protective Devices able to support a partial direct lightning shock and also able to protect low sensitive circuits) was recommended for the protection of the power lines and the various devices related to mobile phone installations. Type 1 SPDs are also recommended for protection of signal cables combined with earthing kits on coaxial cables. Alternative solutions (shielding, cable trays etc.) are also proposed to optimize costs.

Lightning strike nearby a silo *maximumwallhd.com*