

EDITION 2



Electromagnetic compatibility



Lightning protection



The technical Competence Centre
in energy processes and energy use.
From R&D to operational assistance.

Protection against lightning damage

It can happen to you

Proper lightning protection must be implemented at industrial sites to ensure people safety and equipment integrity. Lightning strikes tens of buildings in Belgium every year. And even a single strike can cause a fire on your premises, endangering your personnel. It can also severely damage your structures and equipment, often leading to long production stoppages. Well-designed and implemented lightning protection avoids all of these damages, saving you a great deal of money.

Right from the design phase

Integrating a lightning protection strategy into the design phase of your projects is the most efficient solution. Best practices can then easily be applied to every aspects of your building – type of steel in the concrete, tailor-made protection grids, etc. This is also much cheaper than modifying existing installations.

A complete protection concept

Laborelec can work out a total concept to protect your installations, both for existing sites as well as new building projects.

Our solutions protect you against all types of lightning damage:

■ Direct strikes

Many people think that a lightning rod is enough to avoid damages from direct lightning strikes. But efficient protection includes many other elements, such as a meshed grid on the roof and connections to the earthing grid. Laborelec designs a complete strategy for your building.

■ Indirect impacts on the ground

Even if the lightning strike does not hit your building directly, the resulting electromagnetic field and rise in earth potential can damage your electric equipment. Laborelec conceives intelligent equipotential grids avoiding such damage.

■ Indirect impacts on the electricity grid

A lightning strike on the electricity grid nearby can result in a voltage peak in your power supply, depriving your entire company of electricity. Laborelec dimensions over-voltage protections and gives cabling advice to efficiently protect your power supply and other devices.

Risk analysis avoids over-investment

If you are unsure that lightning protection measures are worth the cost, you can ask us for a risk analysis at your site. Based on geographical, meteorological, and architectural data, we calculate the probability of a lightning strike. By investigating your installation, we estimate possible financial losses and risks for your staff. With this analysis, you know how much to invest in protection.

Five reasons for you to choose Laborelec

1. You have one-stop shopping

Laborelec offers a total service to protect your installations against lightning. This includes:

■ Risk analysis

- Calculating the probability of a lightning strike at your site
- Estimating potential financial losses and risks for your staff

■ Working out of effective protection measures

- Lightning capture systems
- Earthing and bonding networks
- Cabling methods
- Over-voltage protections



2. You get access to more than 40 years of experience

Take advantage of Laborelec's decades of experience in lightning protection. Our experts keep abreast of the latest technical aspects and of legislation.

3. You increase the profitability of your installations

You make the best use of your electrical installations if experts implement the electromagnetic compatibility rules in your premises. With our lightning protection strategies, you improve the reliability of your vital installations and avoid equipment damage. This is paramount to avoid unplanned production stoppages.

4. You benefit from independent and confidential advice

Laborelec is not selling nor installing lightning protection equipment. This guarantees you neutral and independent advice.

5. You are supported by a recognized and accredited laboratory

Our lightning protection advices have proved themselves in numerous projects. They are recognized for their efficiency and reliability.

Have a look at our testimonials!

Testimonials

ELECTRABEL wind turbines

Tall wind turbines are particularly susceptible to direct lightning strikes. What is the best method for protecting them?

Lightning incidents can have serious consequences for various parts of a wind turbine. They can damage turbine blades, low voltage circuits, telecommunication instruments, generators, transformers, and gearboxes. Construction standards for medium-sized wind turbines are well established. However, the risk to higher structures is much greater, requiring extra protective measures. Electrabel asked Laborelec to conduct a comprehensive investigation of the lightning immunity of their tall wind turbines.

Laborelec EMC team studied the literature on blade lightning protection. For small and medium-sized turbines, an effective protection system guides



lightning strikes through several sensors distributed on the surface of the blade. For tall wind turbines with long blades, the probability that lightning strikes between the sensors is high. For the time being, no efficient solution has been found. Two research axes are being investigated: the development of new protective devices and the use of other building materials.

Laborelec also studied the protection of low voltage and telecommunication circuits. Based on its experience and on onsite damage observations, it suggested several measures to minimize damage and ensure electrical safety. Some of them have already been tested and approved. The results will be passed to developers at engineering offices, to ensure a better lightning immunity starting in the design phase.

Testimonials

ADB

Damages occurred to the runway light system at a major European airport. It underlines the fact that inadequate lightning protection measures can have important consequences.

Many airports equip their runway with a computer driven lighting system. The electrical power supply for these systems is complex and both the power supply and the lighting system must be immunized against lightning strikes.

At one major European airport, thunderstorms repeatedly destroyed the electronic modules controlling individual runway lights. Having to pay the claim of the airport, the insurer started proceedings against the Original Equipment Manufacturer (OEM) in order to recover it. Laborelec was called in by the OEM as an independent investigator to help determining the responsibilities.



EMC experts determined that the runway lights and their electronic cards were well designed and built, and that they complied to the strictest lightning immunity standards. These conclusions helped the OEM to reject any responsibility.

However, the study also revealed that the design and realization of the lightning protection measures for the runway needed to be improved. Laborelec provided a number of suggestions, including a redesign of the bonding and earthing grids, and better over-voltage protection.

‘The collaboration with Laborelec has been smooth and effective,’ says Jean-Claude Vandevoorde of ADB, supplier of the lighting system. ‘What struck me most about the expert of Laborelec was his flexibility to adapt to difficult circumstances and to think out of the box. He even travelled to Norway to sit at my side when the case appeared before the Norwegian court, which really inspired confidence.’

Jean-Claude Vandevoorde

ADB

Testimonials

Drogenbos power station

Does the lightning protection of our building meet the legal standards? And if it does, how high is the remaining risk of damage due to lightning strikes?

The Drogenbos power station asked these questions to Laborelec after receiving comments from an external inspection body. It wanted to know whether the building needed the installation of an external lightning protection system to be compliant with legislation.

The Laborelec expert studied the standards (NBN-C 18-100 and NBN-S 21-202), the legal documents (RGIE/AREI), and the Royal Decree (KB 12.12.97). He concluded that no extra measures were obliged since it concerned an industrial building constructed before 1990.

Apart from studying compliance with the standards, he also executed a lightning risk analysis, taking the situation of the power plant, the geometry of the building, and the presence of the nearby cooling tower into account. The expert concluded that some places of the building have a significant risk of being struck by lightning. As no damage is permissible for a power plant, he recommended the installation of a lightning protection system in spite of the absence of any legal obligation.

For Marc Cardoen, manager of the Drogenbos power station, the professionalism of this service stands out. 'Many people know something about lightning protection,' he says, 'but that is simply not enough. The experts at Laborelec can go much



further. They are real specialists. This means that you can trust their advice; it will be taken seriously by regulatory bodies.'

Marc Cardoen

Manager of the Drogenbos power station

Testimonials

SNCB - NMBS

The Belgian National Railway Company and Siemens are setting up a new mobile communication system: GSM-R. Laborelec looked at ways to protect the future GSM-R installations against lightning.

The GSM-R system will handle both traffic regulation and communications between trains and main stations. For example, it will enable to warn train drivers of problems on the track much more quickly. GSM-R will also be used to regulate signals. This new communication technique will enable the rail network to be managed more efficiently and increase security level, which is why the reliability of the system must be guaranteed at all times.

GSM-R installations mainly consist of pylons, antennas and base stations, and are naturally very vulnerable to lightning. Laborelec studied their protection against direct and indirect lightning strikes. Together with SNCB-NMBS and Siemens, EMC



experts divided the sites into four categories. They differentiated between pylons located far from or near to a base station; or base stations that are enclosed in shelters or uncovered. The team designed protection systems for each of these four categories applying the EMC rules of good practice in each specific case. Among other things, it designed carefully thought-out bonding and earthing grids for each site as well as an over-voltage protection for their electrical supply. The same study was then performed for installations covering tunnels.



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What is the meaning of «Electromagnetic compatibility» (EMC)?

Electromagnetic compatibility is the ability of a device or system to function satisfactorily in its electromagnetic environment without introducing any electromagnetic disturbances into that environment that might lead to any inefficiencies or malfunctions.

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