

Simplified Lightning Risk Analysis

■ Introduction :

The objective of a Lightning Risk Analysis is the research of the risks which can generate a human loss, a lack of service or cultural heritage.

The risk of exploitation loss or material loss can also be evaluated.

The mathematical model follows a probabilistic method, taking into account those parameters:

- Lightning density
- Building dimensions
- The environment of the building
- The characteristics, the location and environment of the entering services
- The level of panic risk
- The level of fire or explosion risk
- The nature of the protections to consider
- The number of persons occupying the site

Two types of Lightning Risk Analysis are mainly used worldwide. On the one hand, the Lightning Risk Analysis called « complete » as described in NF EN 62305-2 standard and in Annex A of NF C 17-102 standard.

On the other hand, the Lightning Risk Analysis called « simplified » which considers only limited parameters. (FD C 17-108 of January 2017).

■ Evolution of the NF EN 62305-2 of 2012



The first international standard for complete Lightning Risk Analysis was published in 2006. After a period of application of this standard, the TC81 experts (International Lightning commission) proposed a document to improve the first version. In that way, in 2012, the 2nd edition of NF EN 62305-2 was published in France.

In France, the modified decree of October 4th 2010 (prevention for accidental risks in ICPE buildings (with environmental risk) under authorization) imposes that the lightning risk analysis shall be realized with edition 1 (NF EN 62305-2: 2006) For other sites, the second version must be used. (NF EN 62305-2: 2012)

The EN 62305-2: 2012 includes the following important technical modifications compared to EN 62305-2: 2006 :

- 1) The evaluation of the risks for the services connected to the structure is not taken into account;
- 2) the injuries due to electrical chock in the structure are taken into account ;
- 3) the tolerable risk of loss cultural heritage is reduced from 10^{-3} to 10^{-4} ;
- 4) the damages until the neighboring structures or the environment are taken into account ;
- 5) improved equations are supplied for the following elements :

- Equivalent exposure surfaces for impacts
 - o Near the structure
 - o On and in a service,
- Probabilities of damages after an impact
- Loss factors (structure with explosion risk) valid for an area in the structure,
- Cost of losses

6) tables are supplied to select the relative cost of the losses, in any case ;

7) voltage level of resistance to shocks of the materials, has reached 1 kV.

The 2nd edition of the 62305-2 standard better takes into account the conducted or induced phenomenoms, after an impact near the structure. The wounds of the living being in the structure are also considered. Moreover, the importance for cultural heritage protection is reinforced.

■ UTE C 17-108 Guide, of January 2017:

The complete lightning risk analysis method can be considered heavy and tedious for its implementation. In 2006, France proposed a guide for simplified lightning risk analysis. This guide is now often used worldwide.



For harmonization of the simplified analysis guide with international standard, it has been updated, and FD C 17-108 guide was published in 2017 by the AFNOR.

Limits of simplified analysis guide:

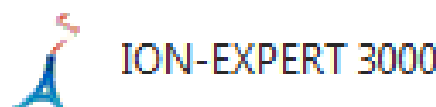
As the number of parameters considered is limited, this guide only applies for structures:

- With low or ordinary fire risk ;
- With high fire risk but low panic risk level ;
- Without any explosive product or atmosphere ;
- Without any risk for the environment.

- o AI coefficient for air service moves from 14 400m² to 40 000m²
- o AI coefficient for an underground service moves from 6 600m² to 20 000m²
- The coefficient of protection by SPDs moves from 0.03 to 0.05. => **more realistic coefficient**

■ **IONEXPERT 3000**

The last update (version 2.00Cq) of Lightning Risk Analysis software IONEXPERT 3000 developed by France Paratonnerres integrates these updates and modifications.



The main modifications realized in this new guide are:

- Tolerable risk of cultural heritage loss, reduced from 10⁻³ à 10⁻⁴ => **Better consideration of cultural heritage**
- The former map of lightning density (Ng) has been replaced by lightning density map supplied by Météorage in 2014 (Nsg) => **Higher precision**
- Equivalent area of lightning exposure on services has been increased => **Higher Influence area**

