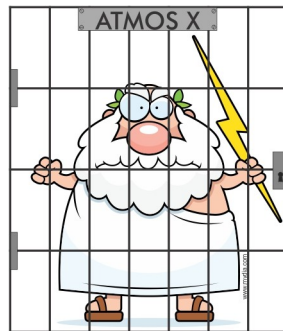


The **Atmos Plus X1**

approach to Lightning Protection design

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Atmos Plus X1 is a complete solution for designing Lightning Protection Systems according to the main world standards and with several options and alternatives; this document intends to clarify the approach we recommend to get an optimized solution for your LPS particular project.



With Atmos Plus X1 you'll get:

- Risk assessment with multiple zones and service lines support
- LPS design with vertical rods (EGM model) or Faraday cage for several configurations
- Materials list with prices and time to build
- Tables and graphics for comparing multiple options combining several alternatives for risk parameters and LPS alternatives
- Auxiliary calculations like safety distances, protection outside the building and others

Reports ⁽¹⁾ available:

- Options selected for each Location (structure)
- Risk assessment:
 - text report
 - collection area draft
 - risk components (RA, RB, ...) for each zone - table, bar chart and pie chart
 - each zone contribution for the whole risk - table, bar chart and pie chart
 - worksheet (NFPA 780 style) report
- LPS:
 - text report with list of materials
 - drafts for air terminals, down conductors and grounding grid
 - safety distances
 - protection that the building gives to its surroundings

⁽¹⁾ - all reports elements can be copied to paste on another program (like MS Word^(R)), most can be directly exported as PDF and most of the tables can also be exported as XLS file; a full project with external LPS and some Options / Zones / Services will generate a PDF report with 30 up to more than 50 pages.

Standards supported (as of February 2016⁽²⁾):

- IEC 62305:2010
- NFPA 780:2014 (soon: 2017 second draft)
- NBR 5419:2015 (and some parts of old 2005 edition for checking old projects)
- User defined - yes, you can define your own parameters! (at your own risk, use with care)

⁽²⁾ - Currently considering implement some Spanish country standard together with Spanish support for the program interface; we're also following the revision of NFPA 780, expected for late 2016 or early 2017.

Contents:

Master file and it's Locations:

Each Atmos Plus X1 file is called a 'Master File' because it contains (one or) several different Locations; a Location is defined as 'some volume' that will have its lightning protection determined, as a building, a parking lot, an isolated structure, a sports field and others. Of course, you can use one file for each structure if you want to, but grouping them is more logical.

For example, the Master file "Chemical plant" will have the Locations: 'Office building', 'Storage 1', 'Storage 2', 'Fabrication', 'Parking lot', 'Utilities' and so on, grouped on the same file.

Options:

To compare several alternatives for protection performance, price and time to build, each Location can have several Options, so each Option can have its own LPS protection level, materials chosen (for example, using concrete rebars or external down conductors), Service lines attached and protection Zones.

Service lines:

Each Location can have several Service lines defined, then you select the desired ones for the Zones of each Option; for example, a Power line can be defined as 'Power Line original' with no DPS, then also defined as 'Power line with Level-II DPS' - then you set the first to one Option and the second to another Option, run both calculations and get the comparative reports between the two Options.

Zones of protection:

Zones are not explicitly defined on NFPA 780:2014, but they are extensively used on IEC 62305-2:2010 and other standards based on IEC (like the Brazilian NBR 5419:2015). The advantage of using the Zones concept - instead of considering all the building as one homogeneous volume - is that you can have the Risk proportionally divided according to the number of people (or cost) of differently parts of the same building.

For example, let's say you have, on the same building, one smaller area with offices and tens of people and expensive equipment installed, and one big storage area with no inflammable material and few personal: if you don't use Zones, you'll need to consider all the people and equipment as occupying the whole building, while, with zones, you get the Risk proportionally divided.

How to use Zones in Atmos Plus X1:

As with Service Lines, you define one to several Zones for each Location, then select the desired one for each Option; say, you define one Zone for the whole building and run the calculation for one Option using this Zone; then you divide the building in three Zones, enter the corresponding

parameters for each one, then select the three for another Option, run the calculation and then you can compare both solutions to check the advantage (or not) of using these Zones.

For learning how to use Options, we prepared some tutorials using the examples from IEC 62305-2 standard (on Annex E), please download them on our site - see "Contacts" at the end of this document.

How to select the relevant Risk components:

Initially, you should select which categories of Risks are relevant: R1 (Life), R2 (Public services), R3 (Cultural) and R4 (Economic); then comes the tricky part: select the components (RA, RB, ..., RZ) that need to be considered. We are developing a guide to assist the user on selecting them, although they aren't always "on or off" and the project responsible may need to make some decisions.

How to compare the Risk assessment results:

Unless the structure is very small, metallic, unconnected to any Service line or located in some place with very low flash density, the Risk assessment with no LPS, no SPD and without any safety measures will present a Risk bigger than the maximum tolerable: 10^{-6} for NFPA and 10^{-5} for IEC (for Life Risk R1).

The most efficient safety measures are the ones that will give a good compromise between cost and Risk attenuation. Some trial-and-error will be necessary, but Atmos Plus X1 can give a good idea of where to begin. With the results tables and bar charts you have the numbers to analyze and, with the pie charts, you can identify visually the proportion, both between Risk Components of one Zone or between total Risks of all the Zones.

How to select a structural LPS Model for each Location

Atmos Plus X1 has several (and more are being added) Models of Locations, for structures: Industrial building (4 different geometries/roof formats), Residential or Commercial building (2 or 3 geometries), House (3 types), then others for open Areas and, finally, Isolated structures.

These names are only indicative, the user just selects the one that can occupy all the volume to protect without too much empty spaces - for example, if you have a house with an "L" shape (superior view), you select the 'L-shaped House' and not the 'Rectangular House' - of course, sometimes it's not that obvious, but that's the general idea.

Please see our guide of Atmos models for LPS and Verifications, available at our site.

How to compare structural LPS options:

On some of the Models, Atmos Plus X1 gives you additional alternatives, like comparing 3 different vertical air terminals heights and also a Faraday cage for the same building. You, then, select one of them to be considered as the cost of the LPS for this Option, and it will be added to eventual costs of safety measures for the Service lines and Zones so you can compare it with other

Options' costs.

Typical design sequence:

If you just want a quick estimate of number of air terminals, down conductors and costs, you can skip the Risk assessment and run the LPS dimensioning with a Level III (IEC, equivalent to 46 meter sphere on NFPA): just select standard and level, go to the Model and enter the overall dimensions, then go to the components to select the probable ones, calculate and check the LPS results - you can do all of that in less than 10 minutes.

For a complete project, you'll want to use the Options feature to compare alternatives: the first will be the structure and zones (for IEC) and service lines without any protection or safety measure, then you can set additional service lines with some SPD protection (at least level IV) and run the external LPS for level III for one more Option. If Risks are still higher than tolerable levels, set other Options with some safety measures and stronger SPD and LPS to see how they compare.

What reports to present? Getting it all together:

If even the design engineer can get confused with so many options, one can imagine the customer (or a C-level executive) when confronted with a 27-page report with tons of tables and graphs and some options, all fully compliant with the applicable standard...

Of course your mileage will vary, but, what we have seen in some decades of consulting and support for software users, is that the customer wants, first, to have one clear (and clearly presented) answer and then some data to support your decision. Optionally, add the data for the other Options you have considered, but normally only if your selected answer costs more than the expected budget.

Some (small) pictures are nice too, so Atmos Plus X1 has support for including one picture for the Location exterior and one picture for each Zone interior.

Contacts:

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