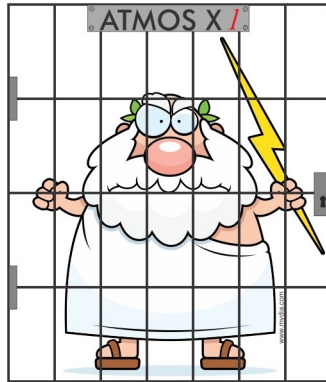


# Atmos Plus X1.1

*Volts and Bolts / Oficina de Mydia*



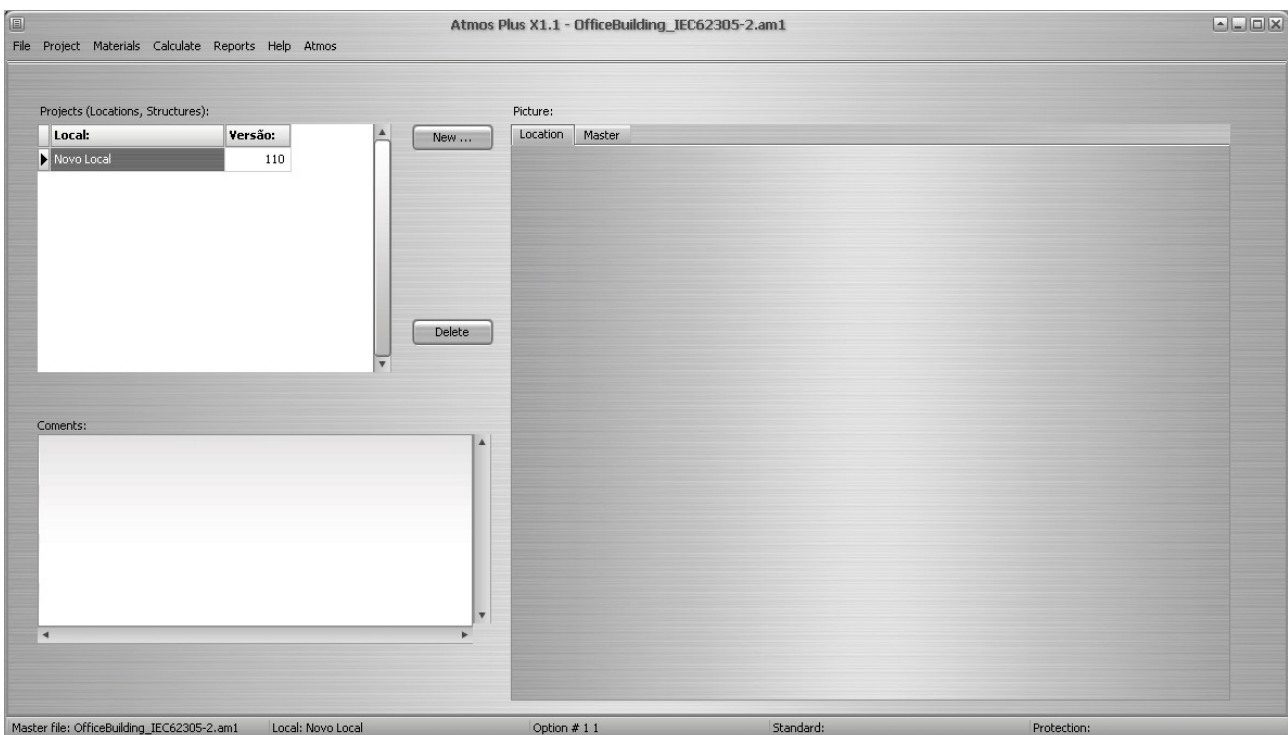
*Tutorial - IEC62305-2:2010*

## **Office Building**

Example from Annex E  
using Software **Atmos Plus X1.1**, update 11.1  
(1st ed. 06/07/2016)

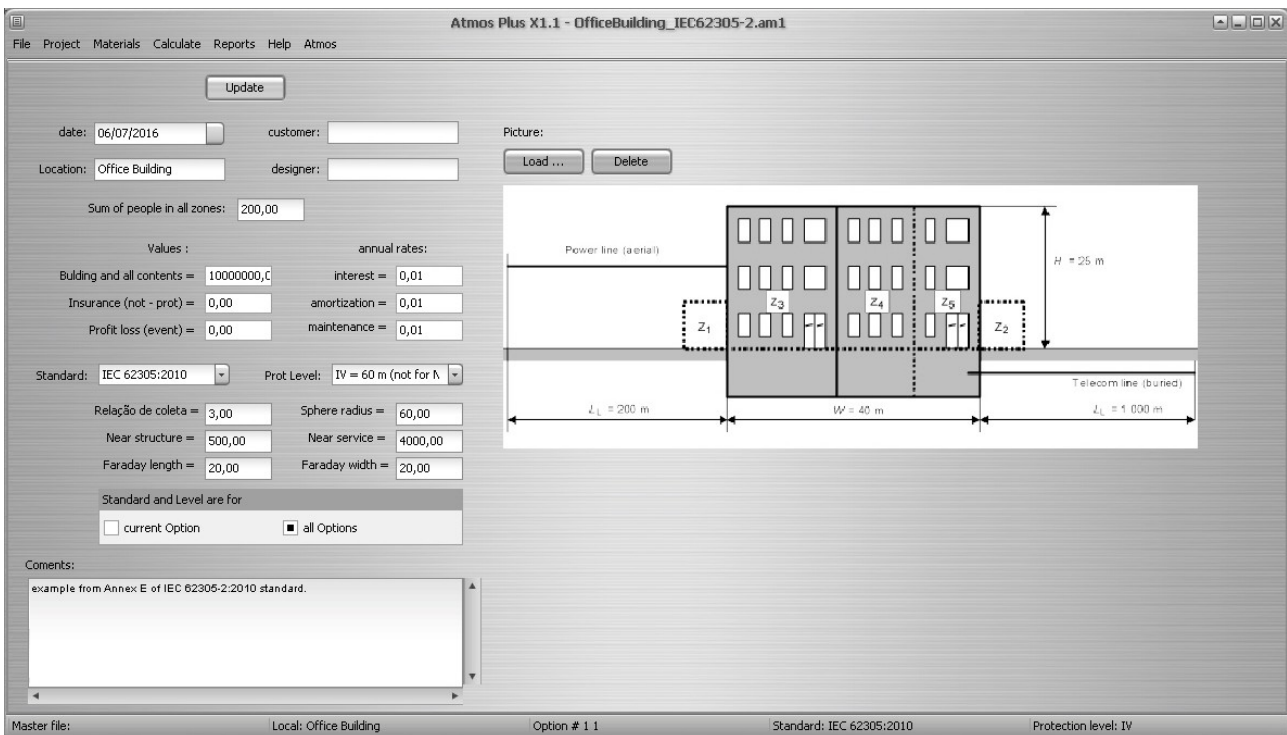
### **1. Creating a new file and entering basic data**

Create a new Master file, called “OfficeBuilding\_IEC62305-2.am1”:



Access ‘Project / Local data’ to enter some basic info: today’s date, a proper name for the Local,

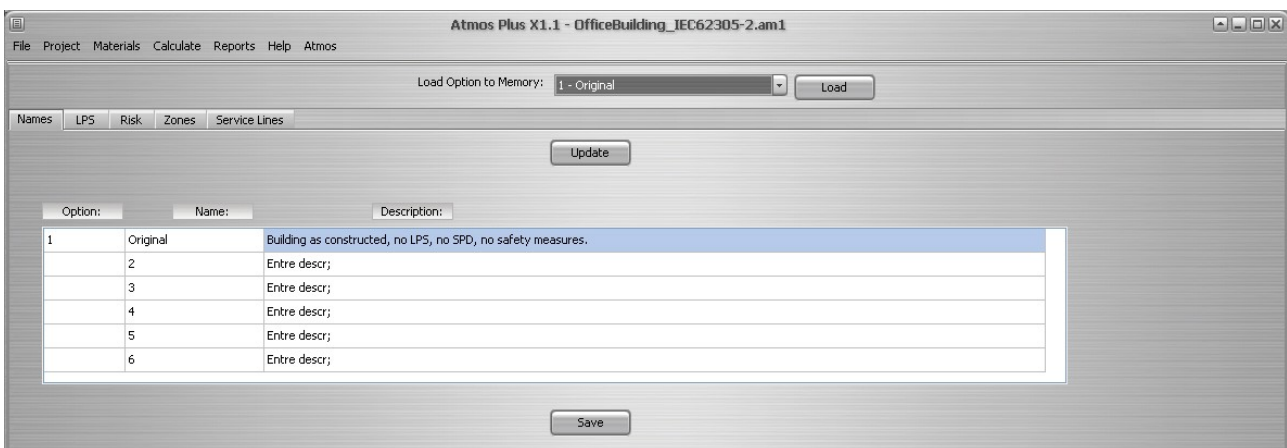
sum of people = 200 and total value = \$ 10,000,000.00. After click on Update, you can also Load some picture to illustrate the reports - in this case, we got the draw from the standard:



Notes:

- Don't worry now about 'Standard' and 'Protection Level', our first Option will be the original building, with no LPS installed, so we can have a base for comparison.
- We've chosen to set this data to 'all Options', then we can modify any Option later as needed.

Now we access 'Project/Options' and enter the name and description of our first Option:



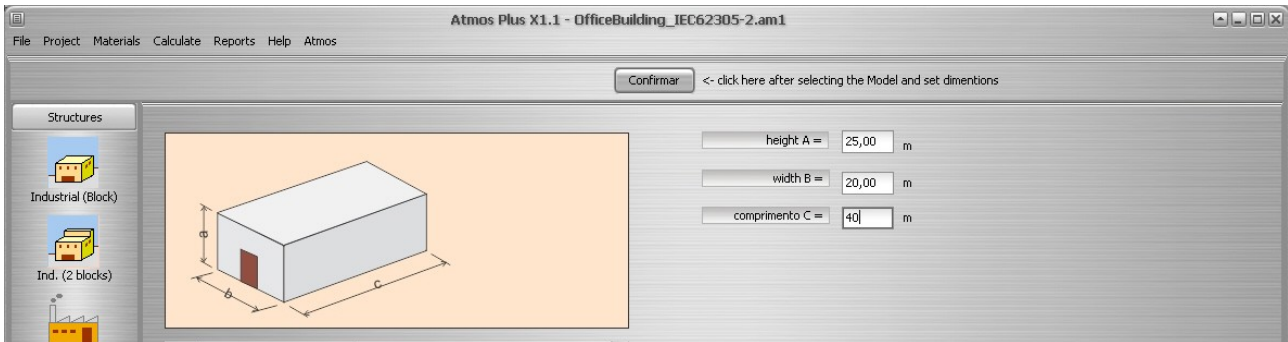
We don't have yet nothing to add to the other tabs: LPS, Risk, Zones, Service lines, we'll get back to them latter.

On the upper box, select the first Option: '1 - Original' and click Load; now all the operations and data will relate to this Option until we came back on this screen and change to another Option.

Now we set a 'Model' to our structure, the closest is 'Industrial (block)' - the name 'industrial' is only indicative, of course, anything that fits in this Model can be used here, like our Office

Building, or a residential building, shopping mall, and so on.

Enter the dimensions and click at Update:

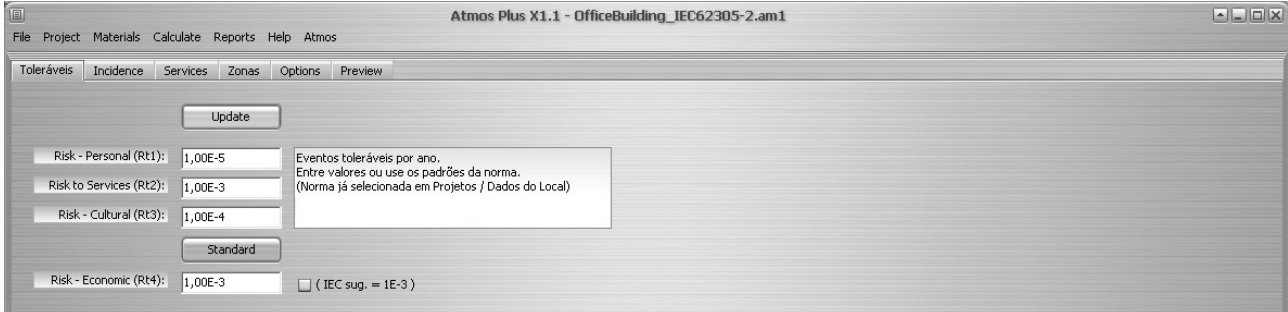


## 2. Risk assessment

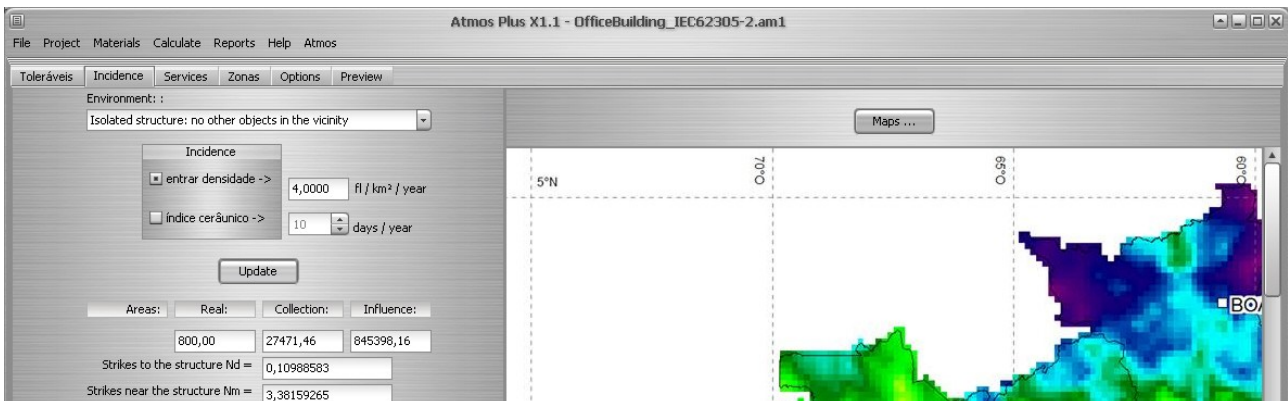
At the menu, we select 'Project / Risk (Complete)' - note that the 'Basic' risk assessment is currently valid only to NFPA 780:2014.

The first tab on this screen is the 'Tolerable' (or admissible) risk; here, also, IEC differs from NFPA, but next edition (2017) of NFPA 780 will probably align this (and several other parameters) with IEC 62305-2:2010.

Enter your numbers or click at Standard to get the default values and click on Update:



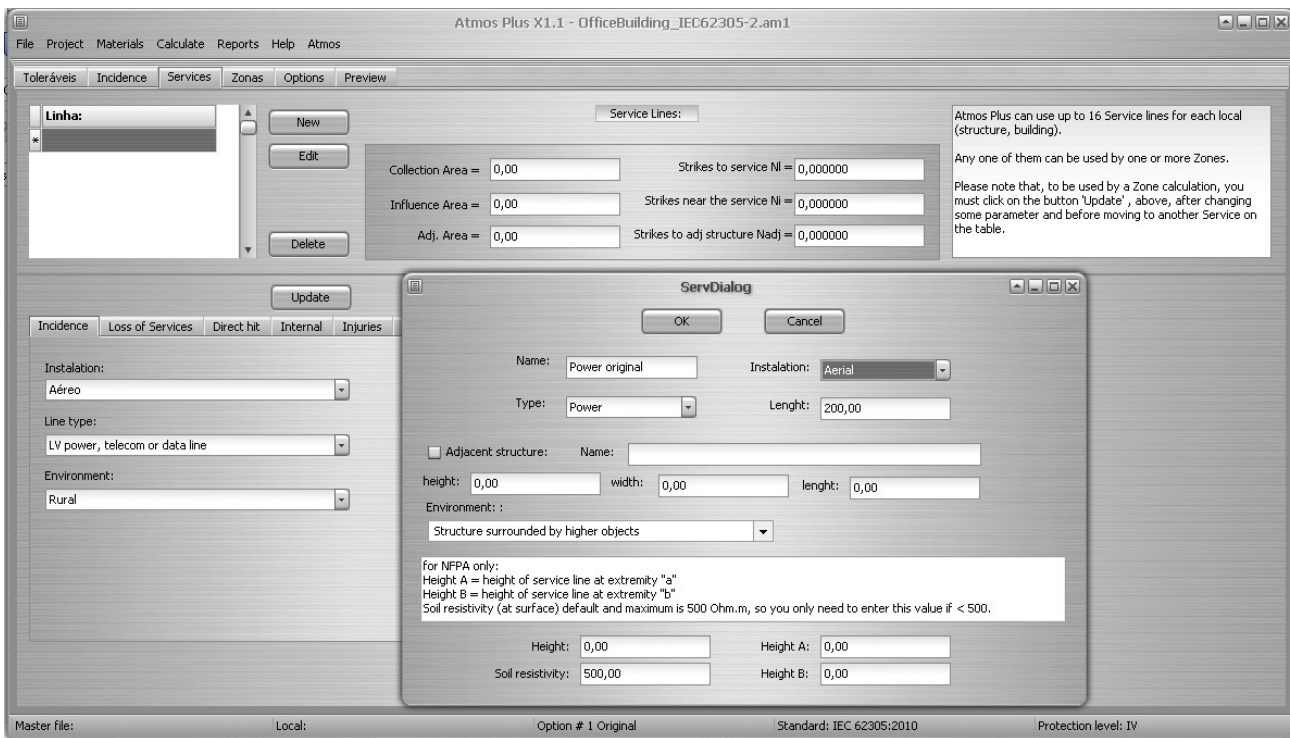
Second tab is for Incidence data: on this example we have 4 flashes / km<sup>2</sup> / year of density - when you click at Update, Atmos will use the dimensions of the Model and the environment factor to calculate the areas of collection and influence and the expected number of events per year:



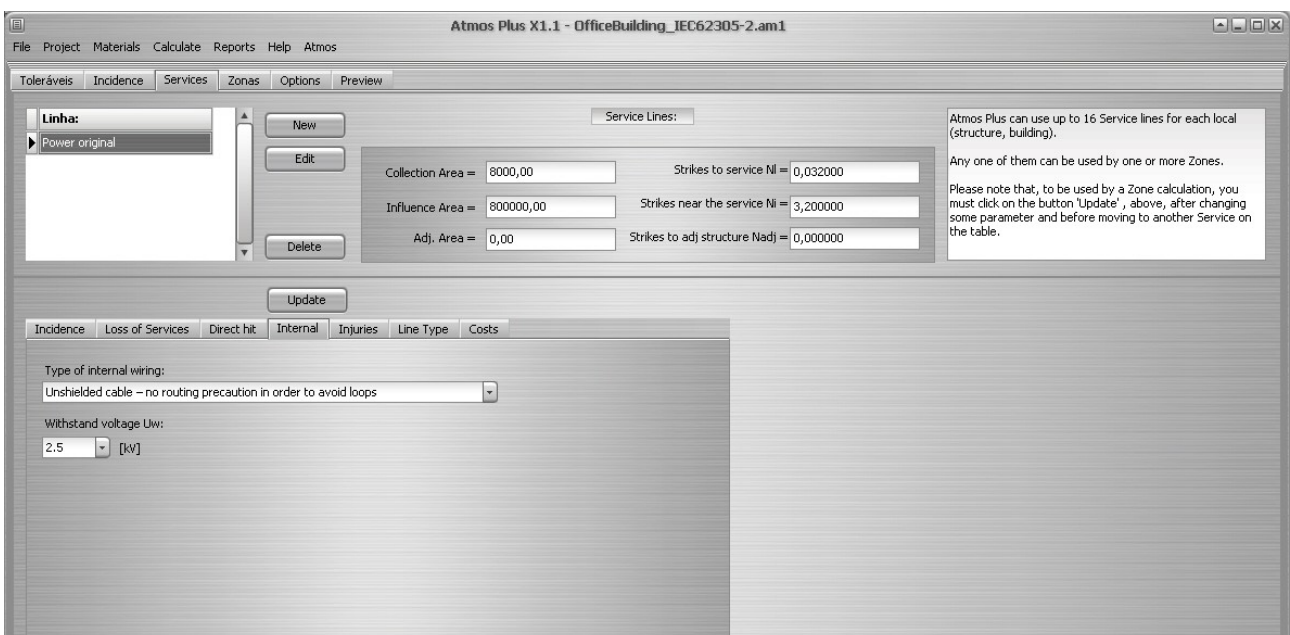
## Services:

At the tab 'Services' we'll enter the data for the Service lines that enter the building; Atmos can have up to 16 lines - of course you won't have all that on a building but, to be able to do some comparisons between the Options, we'll set one Service line for the original power line, than other for the same power line with some SPD and so on.

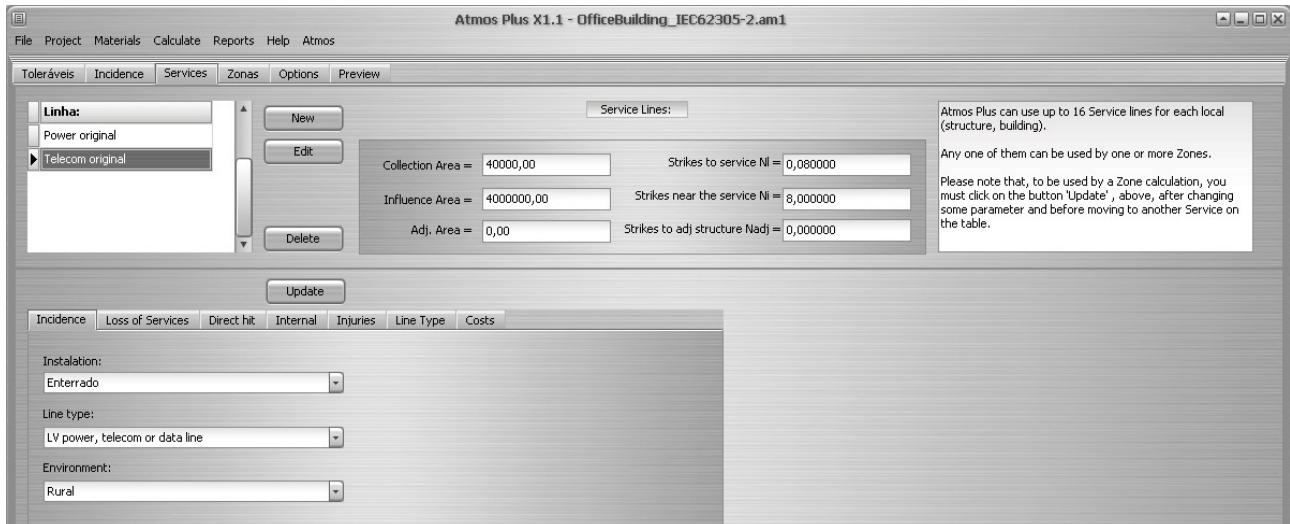
Click at 'New' to create a new Service line:



At the tabs on the lower part of the screen, enter the relevant parameters and click the Update button to get the areas and incidence of the line:

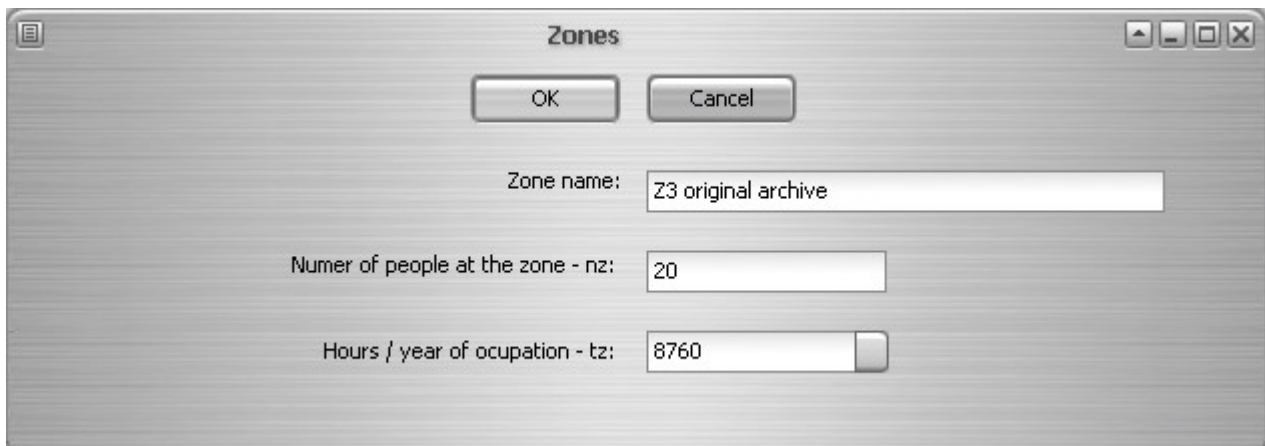


Repeat the procedure for the Telecom line:

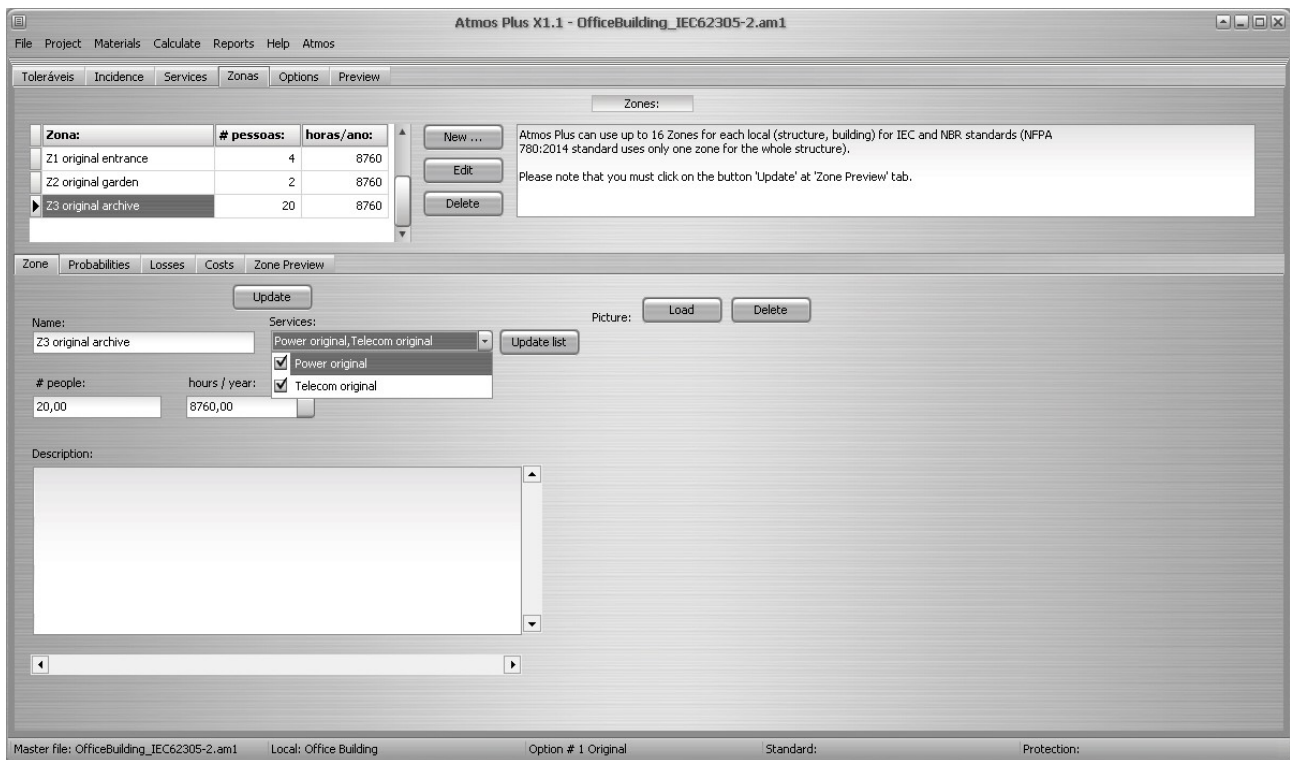


## Zones:

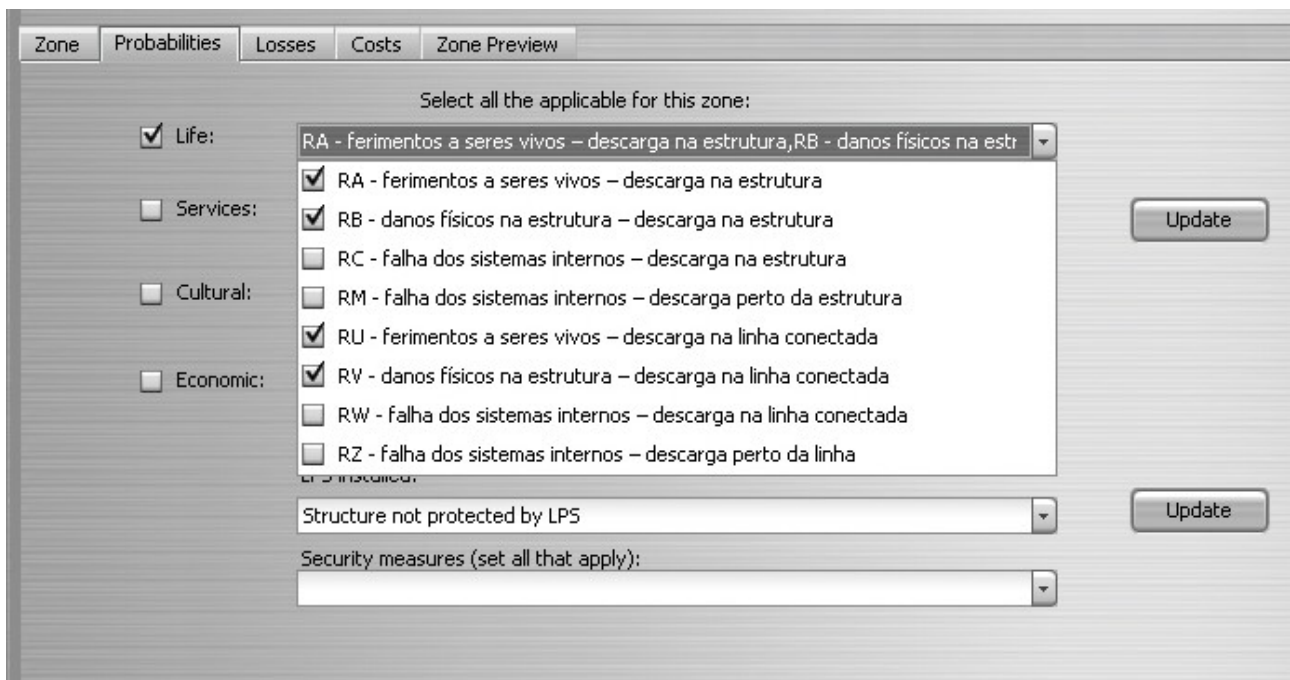
The zones 1 and 2 have very small risk, so let's use zone 3 to illustrate the procedure. The archive has 20 people inside, with low level of panic, high risk of fire and so on, but first you need to create the zone: at the Zones tab, click on New and enter the basic data:



Then, on the first of the lower tabs, select the service lines that enter the zone:



At the next tab, Probabilities, select the relevant risk components:



At the Losses tab, select the parameters:

Zone Probabilities Losses Costs Zone Preview

Update

Life Services Cultural Economic

Physical damages: Industrial, commercial

Life: IEC, NBR - unique value

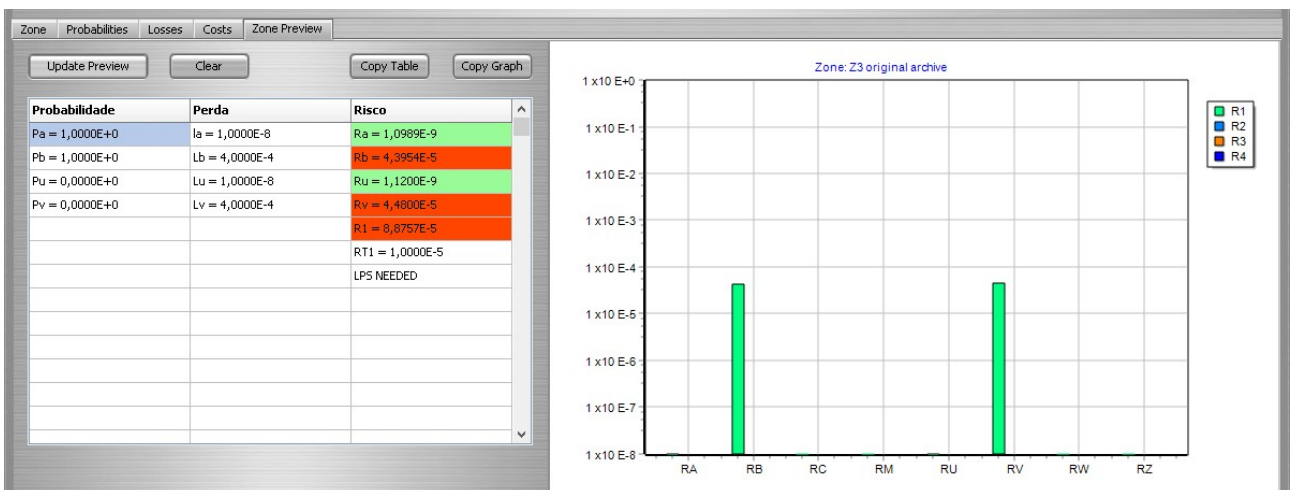
Type of surface: Asphalt, linoleum, wood / >= 100

Provisions taken:

Risk of fire / amount: fire / high

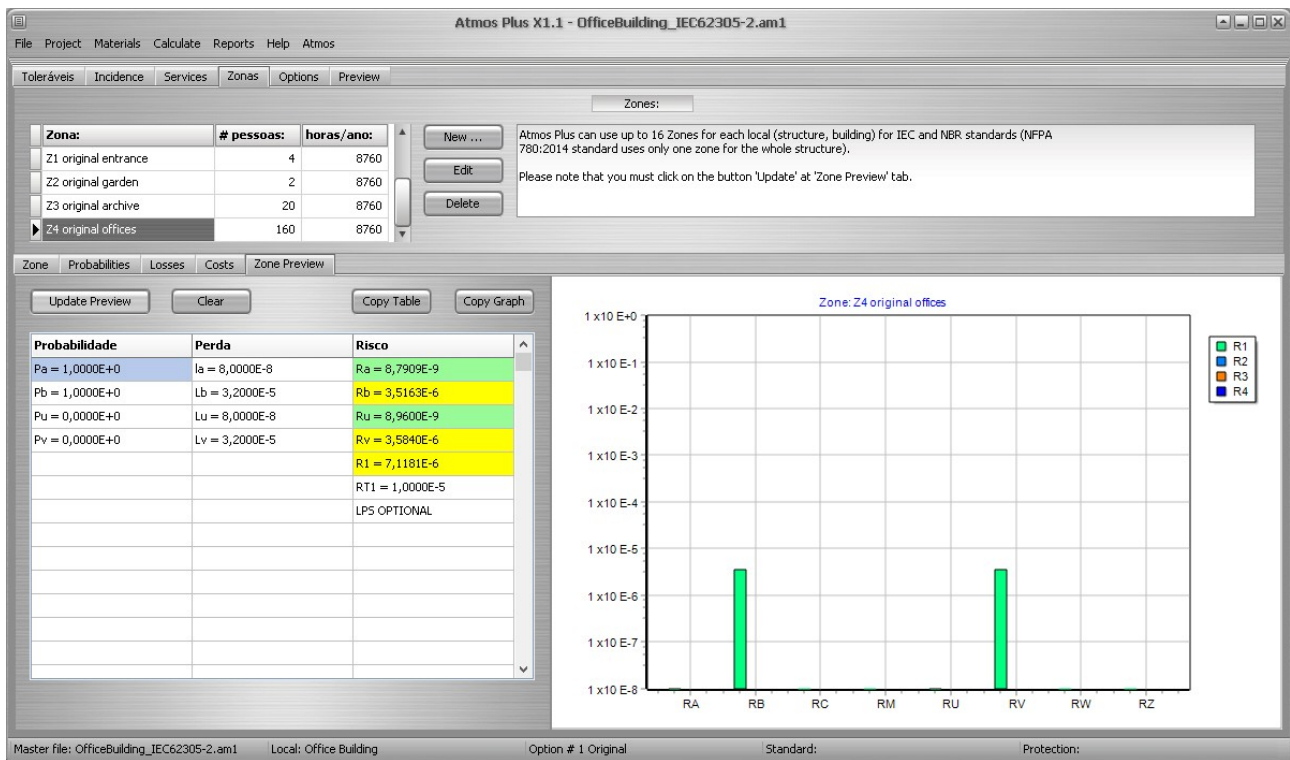
Special hazard: Low level of panic (e.g. a structure limited to two floors and the number of persons nc

As we're not considering the costs yet, we can go to the Zone Preview tab:



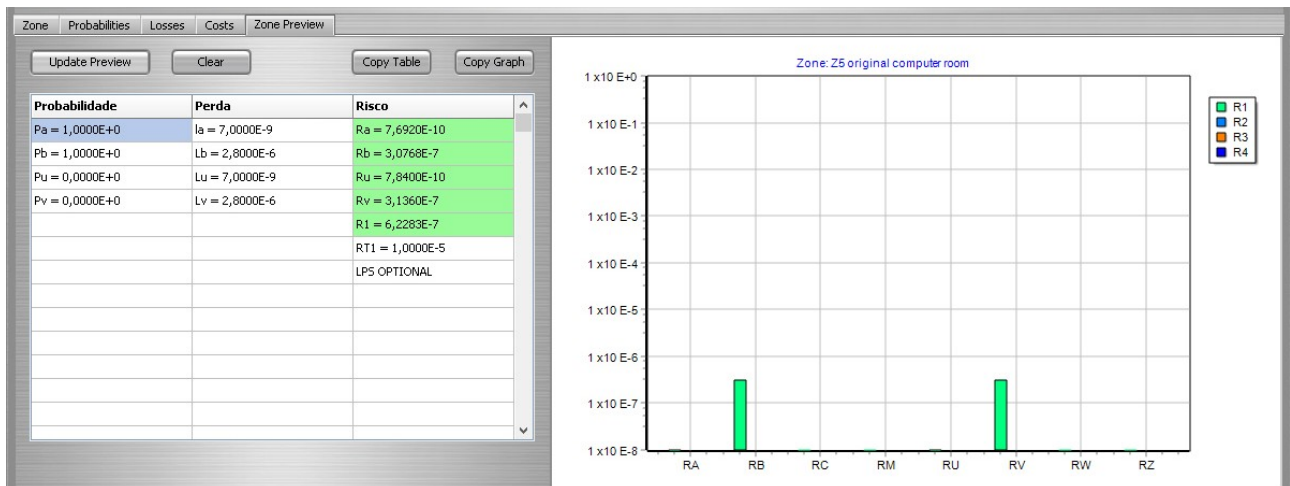
Risk components RA and RU are close to zero, but components RB and RV are both over  $10^{-5}$ , so the zone 3 is clearly over tolerable level and will need lightning protection and/or other safety measures for the zone itself or the service lines.

Repeating the process for zone 4 - offices - we get:



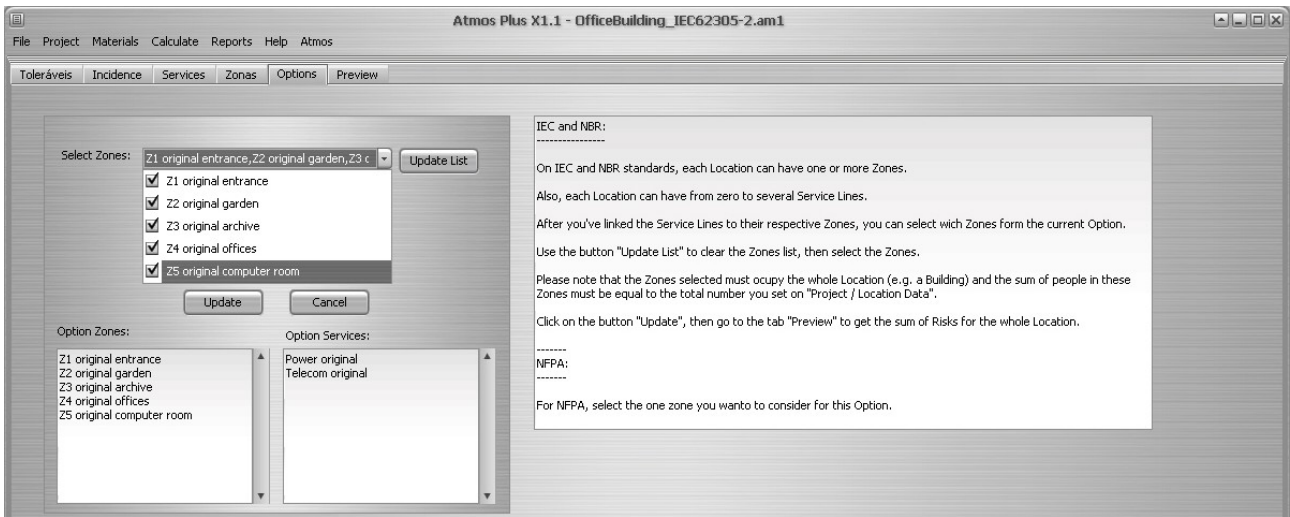
The sum of Risk components RB and RV has the value of  $7 \times 10^{-6}$ , so it's below - but not by much - the tolerable level and, of course, when you add the risks from the other zones, the total will be over  $10^{-5}$ ; as a result, we'll probably need protection measures also for zone 4.

For the last zone, the Computer Centre, we get a low risk, as shown below:

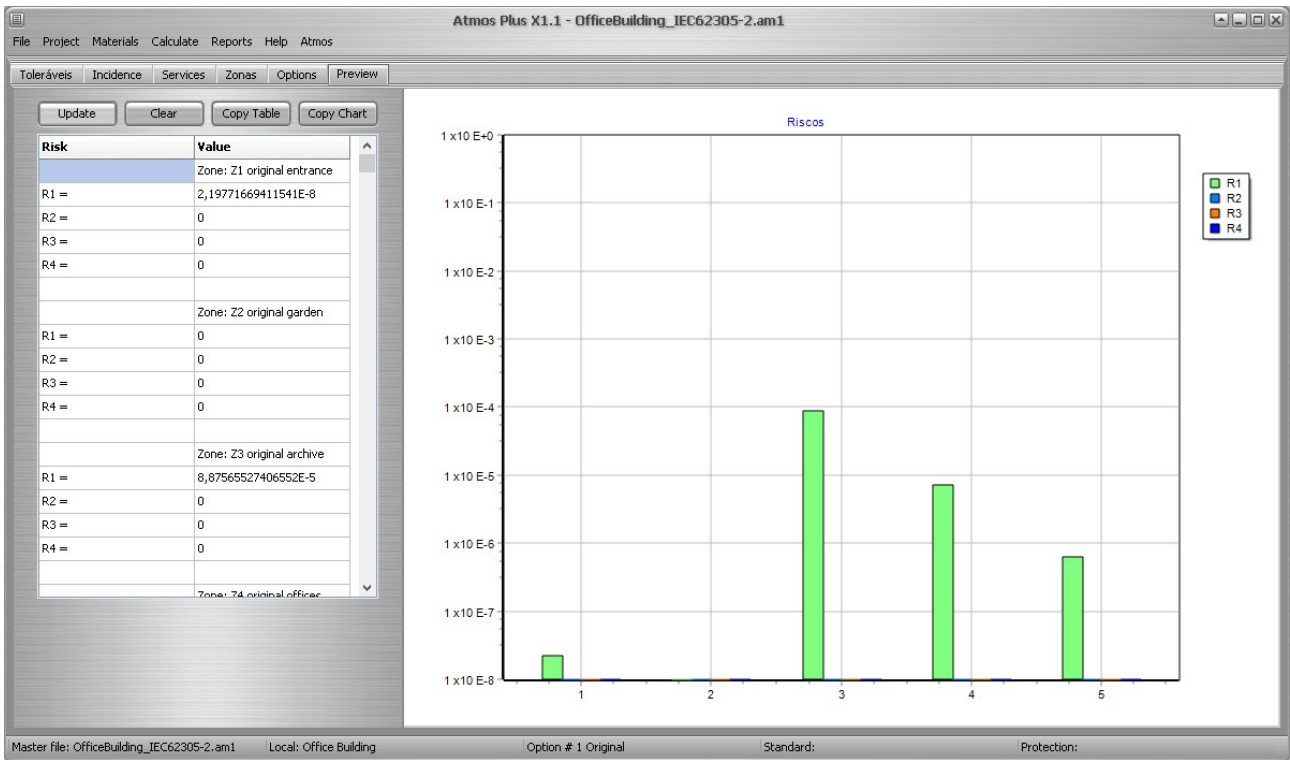


To obtain the total Risk for the building, select the tab Options, then select the zones wanted for this Option; note that, as we're entering the original building, all the zones defined so far will be counted:

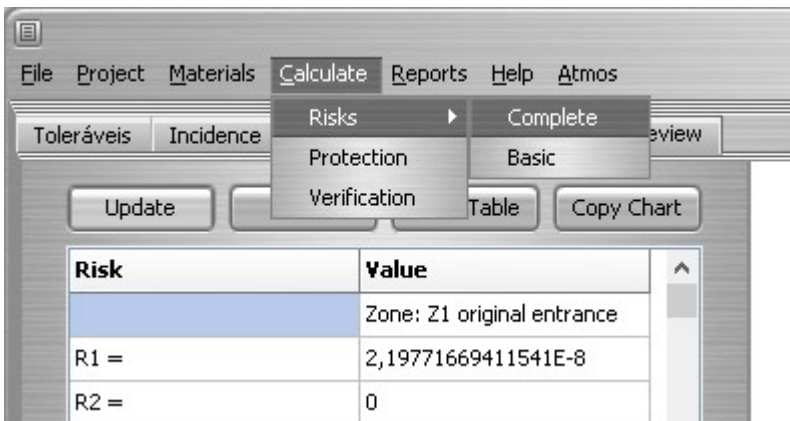




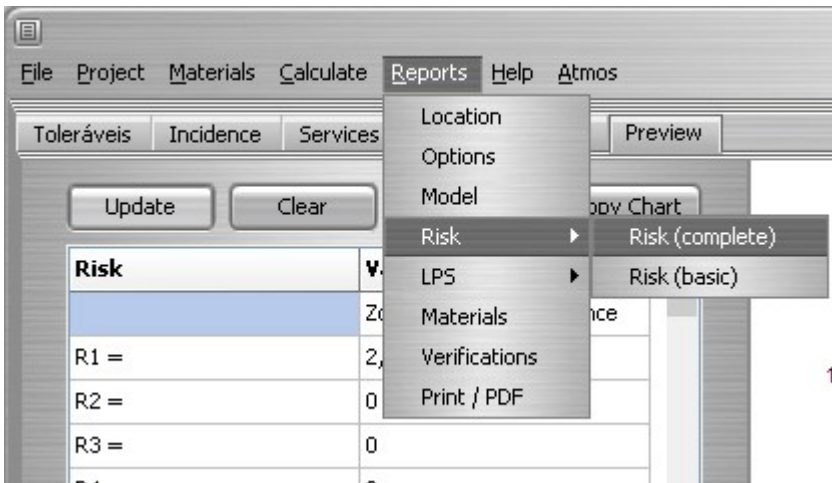
At the Preview tab for the Option:



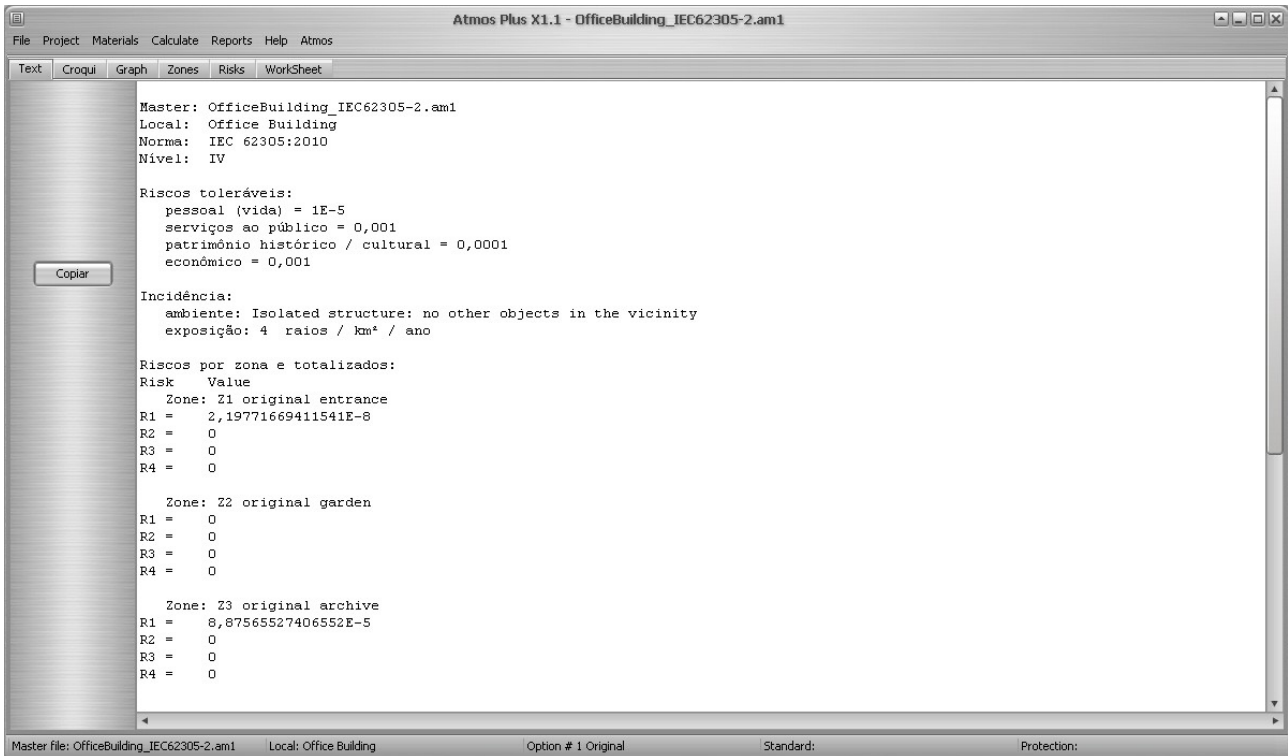
To get more comparative reports, select Calculate / Risk / Complete:



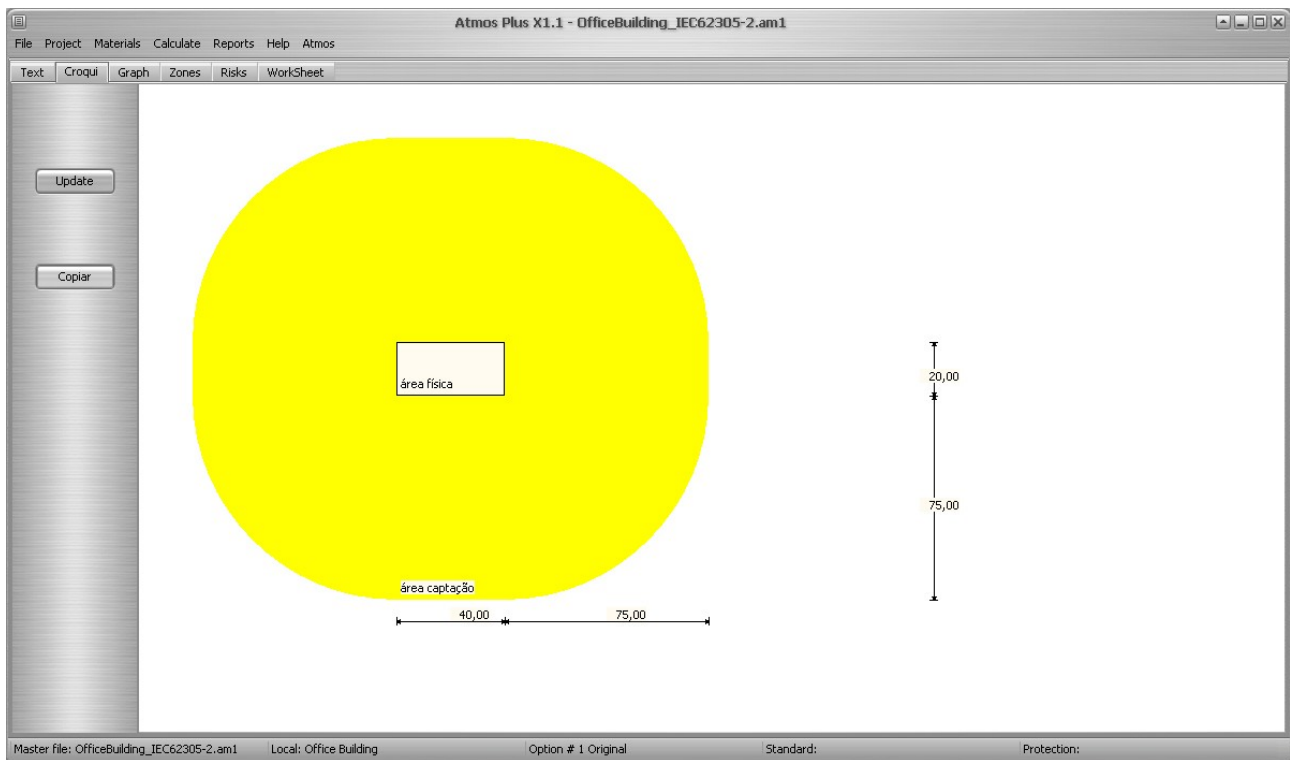
Now, select Reports / Risk / Complete:



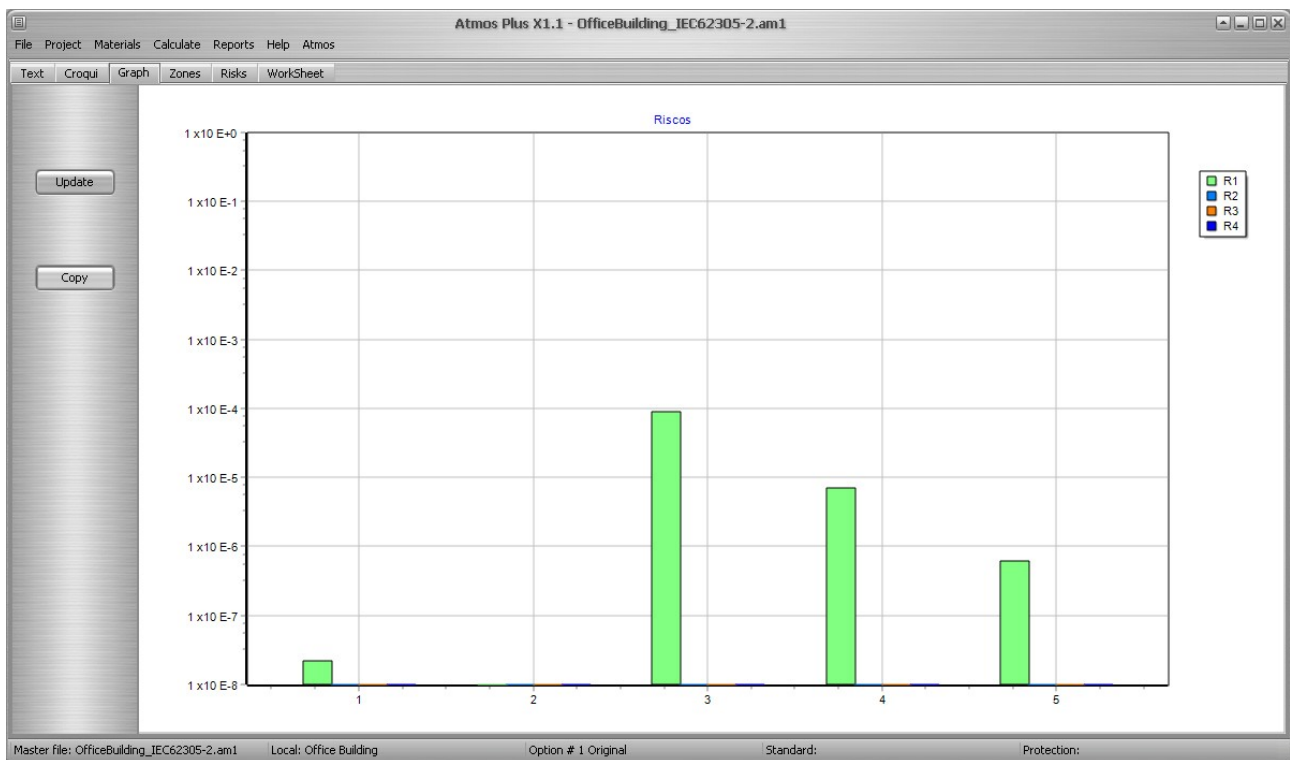
At the first tab, Text, we have the data for standard used, tolerable levels and incidence, then the table from the Options Preview:



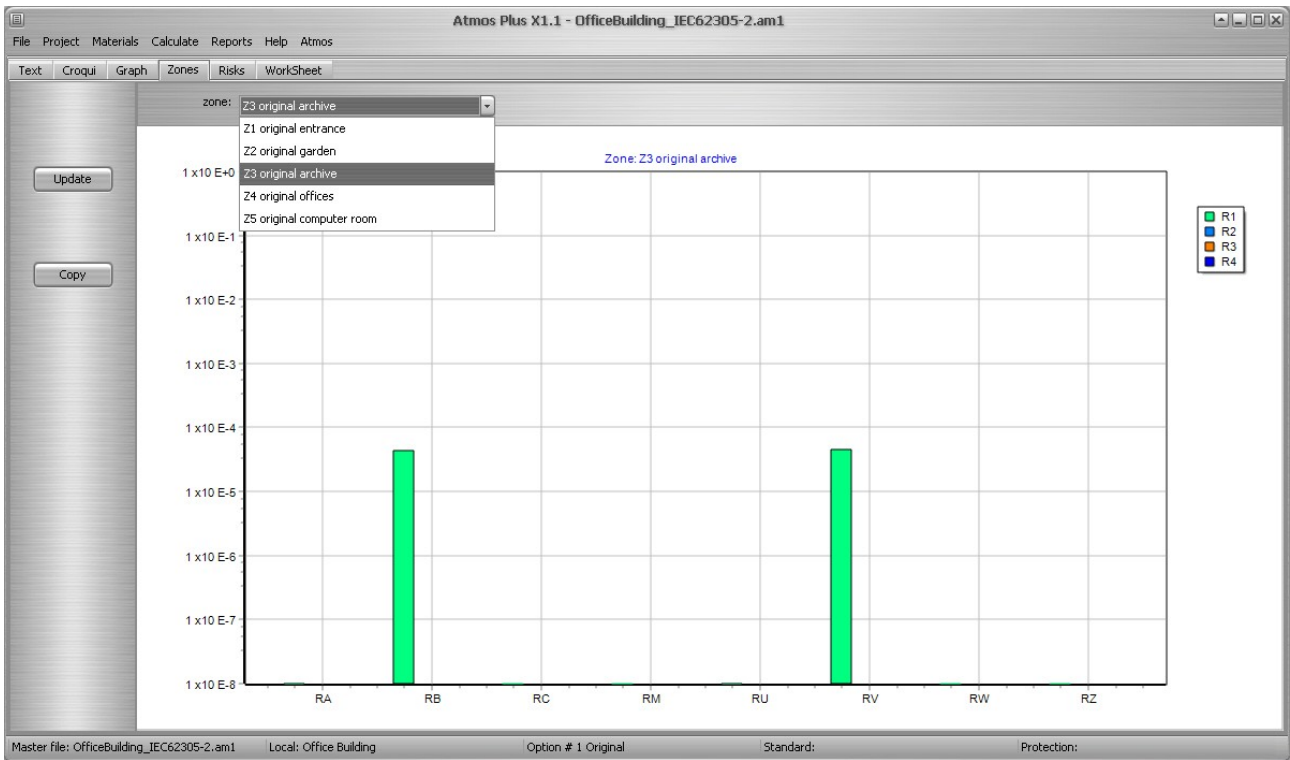
The Croquis tab presents a plant view of the building and the collection area:



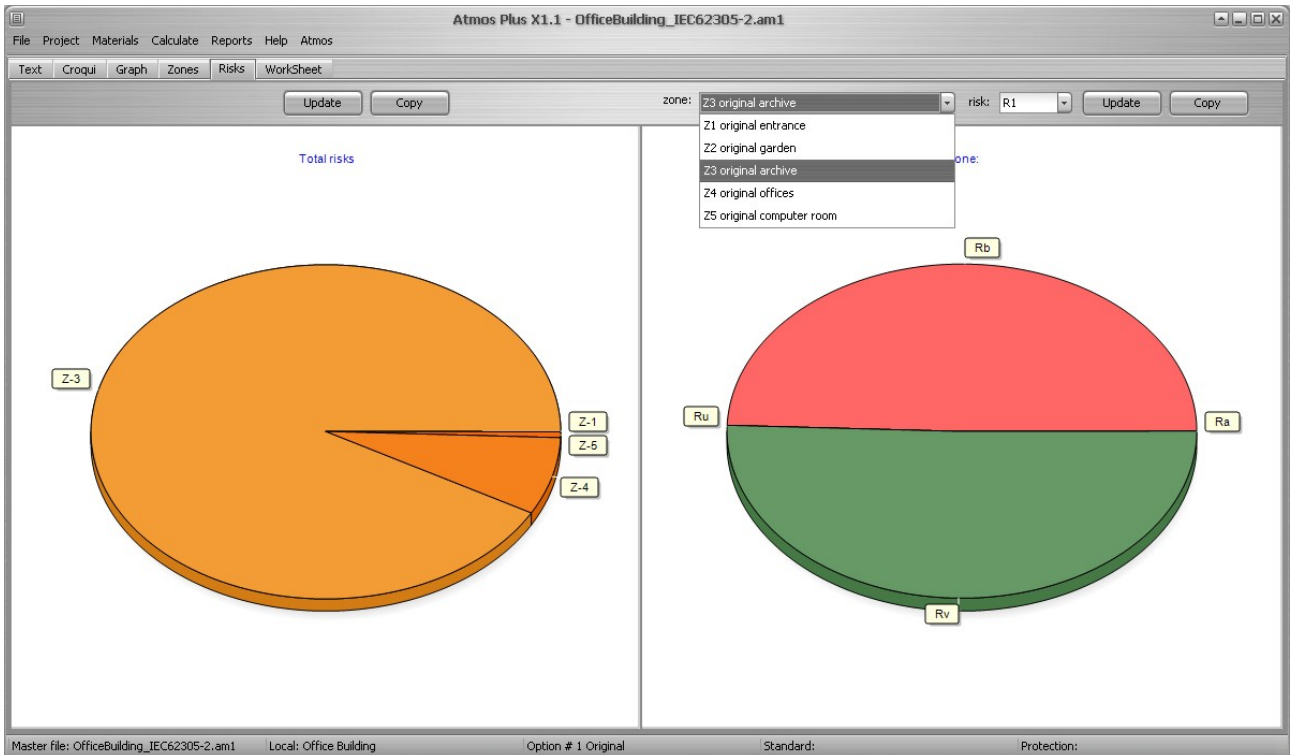
The tab Graph repeats the chart from the Option Preview:



Now, at the Zones tab, we can select the zones one by one to get the chart of their risk components (save chart as each zone preview):



At the Risks tab, we can see all this on pie charts, that don't give numbers but are more suitable for the comparison task:



Note that here, as the pie chart scale is linear and not logarithmic, the smaller risks disappear so we can see more clearly where the danger really is!

The final tab, Worksheet, gives the report on table form as suggested by the NFPA 780:2014 standard (for now, it's available only when there's only one zone for the whole building, as by NFPA 780 Risk assessment).

Atmos Plus X1.1 - OfficeBuilding\_IEC62305-2.am1

File Project Materials Calculate Reports Help Atmos

Text Croqui Graph Zones Risks Worksheet

NFPA 780:2014 - Worksheet according to Annex L  Only selected risk components

Incidence Probabilities Losses Risks

Update Clear Copy

Areas and Incidence			
<b>Equivalent Collective Area</b>			
L =		4,000E+1	m
W =		2,000E+1	m
H =		2,500E+1	m
Ae =		2,7471E+4	m <sup>2</sup>
<b>Annual Threat of Occurrence</b>			
<b>Direct Strikes to Structure</b>			
Ng =		4,000E+0	events/year
Ae =		2,7471E+4	m <sup>2</sup>
Cl =		1,000E+0	
Nd =		1,0989E-1	
<b>Strikes Near Structure</b>			
Ng =		4,000E+0	
Am =		8,4540E+5	m <sup>2</sup>
Ae =		2,7471E+4	m <sup>2</sup>
Cl =		1,000E+0	
Nm =		3,3816E+0	

Master file: OfficeBuilding\_IEC62305-2.am1 Local: Office Building Option # 1 Original Standard: Protection:

If your need is only to get the original Risk status of the building, the above reports is all you need and you can jump to the PDF report generation.

We'll now continue the Risk assessment with the solutions proposed by the IEC 62305-2:2010, then the cost analysis (not on the standard example) to make the decision on what measures to adopt.

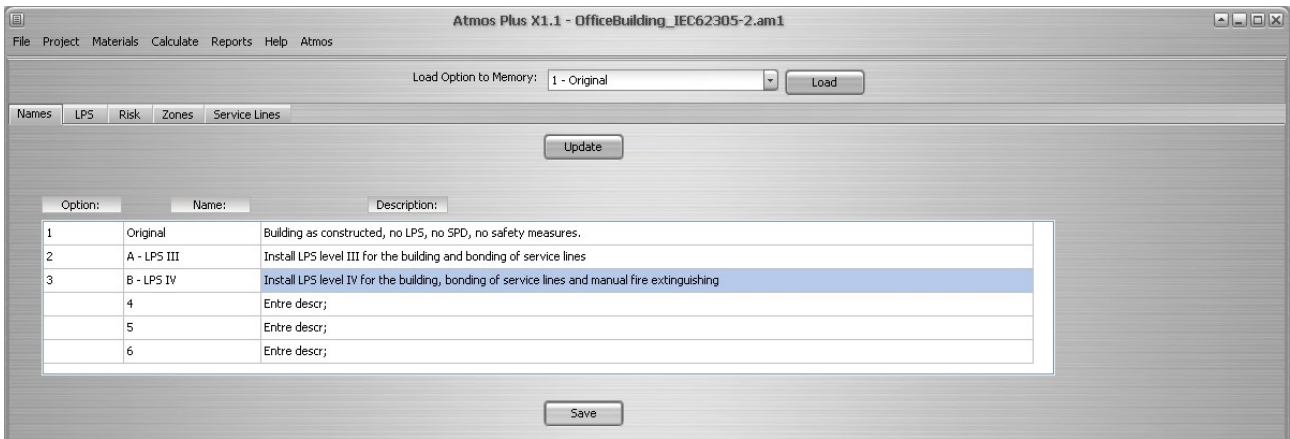
### 3. Solutions as by 62305-2 example

There are several possible measures to apply to reduce the risk, some more effective, some more expensive and some could be impracticable to implement in some cases. For this example, the standard suggest two solutions:

A) protect the building with a level III LPS, with the required bonding of the service lines - the RB risk would be reduced by 90% and RV for both service lines reduced by 95%

B) protect the building with a level IV LPS, wich gives a 80% reduction on RB risk (with the same bonding and 95% reduction of RV as in solution A) and, additionally, install some fire extinguishing or alarm

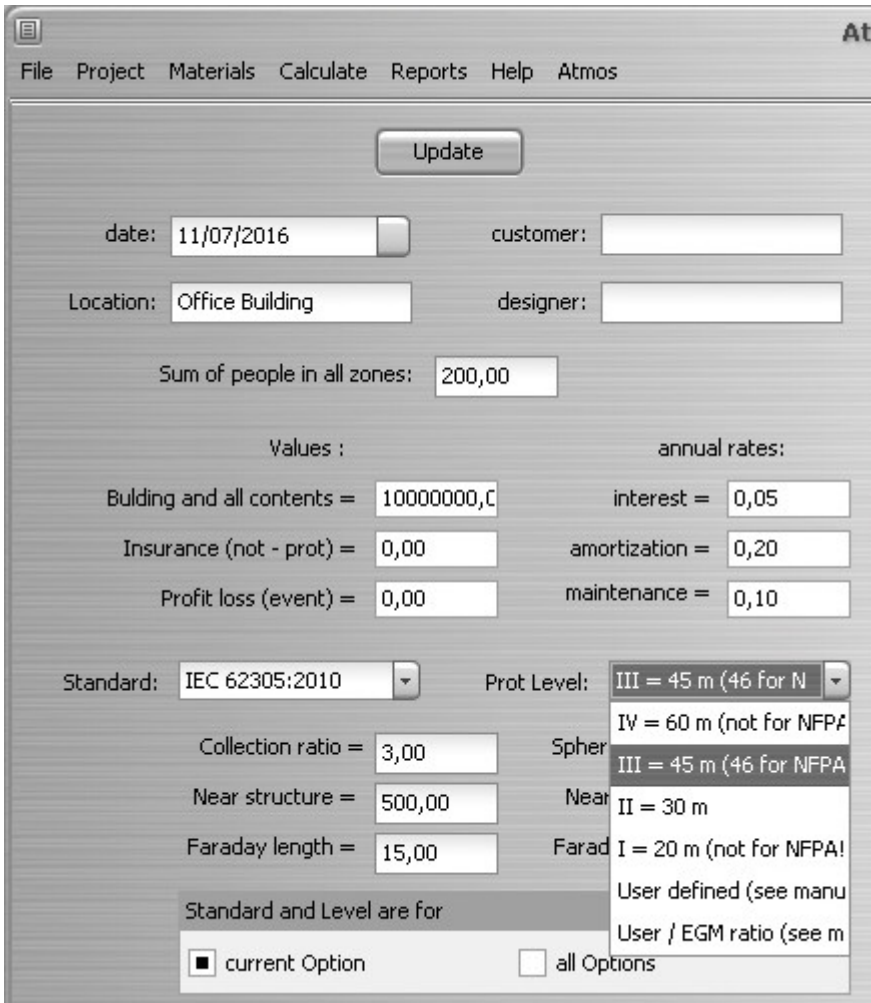
To be able to compare graphically both solutions, lets separate them on different Options; we do that on Project / Options :



Now we select option 2 on the box “Load Option to memory” and click at Load. Then we’ll do the following:

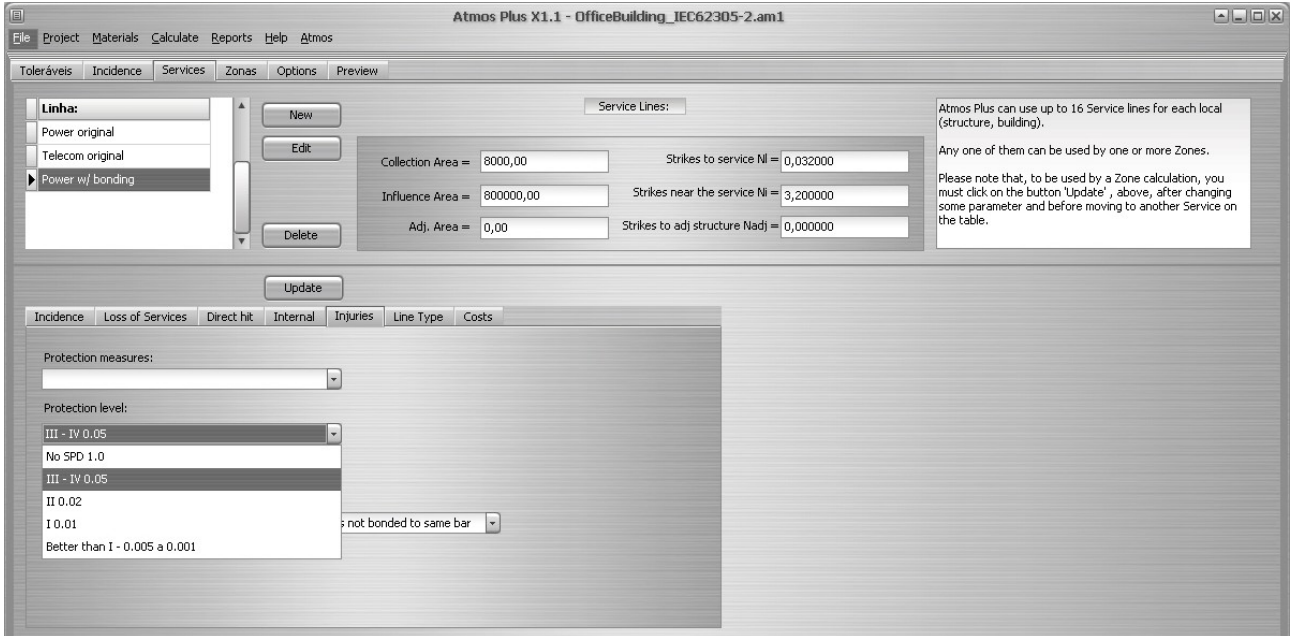
- Confirm the Options data: level of protection and Model
- Create new Service lines with the bonding parameter set to level III-IV (it’s the same for both)
- Create new Zones 3 and 4 using these new lines instead of the originals, and using LPS
- We could enter new Zones 1, 2 and 5, but their risk is very low, so we can use the original values
- Besides calculating the Risks, will also enter the data and calculate the LPS protection for both level III and IV levels and get the corresponding drafts

### Options data for the location:

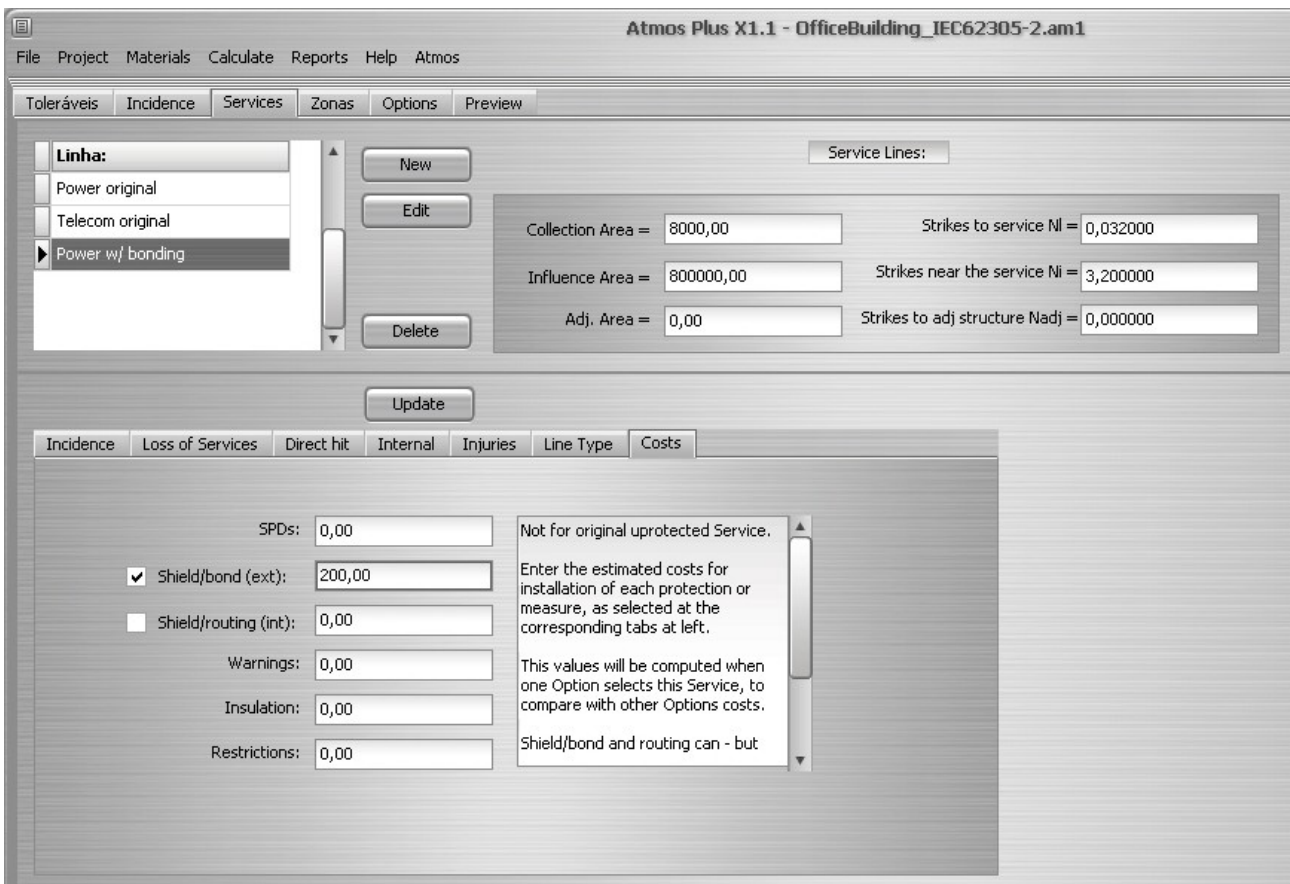


## Service Lines with bonding:

Create new Power and Telecom lines with the same data as the originals, but with protection level III-IV:



Let's also enter some cost for the bonding; probably it will be much cheaper than the LPS, but let's enter it anyway so it appears on the reports:



Note: when modifying any line parameter, don't forget to click on the Update button before moving to another line on the table.

Zones 3 and 4 with LPS level III:

Let's create new zones 3 and 4 with solution A (LPS level III); we now need to enter the LPS:

Zone | Probabilities | Losses | Costs | Zone Preview

Select all the applicable for this zone:

Life: RA - ferimentos a seres vivos - descarga na estrutura, RB - danos físicos na estr

Services:

Cultural:

Economic:

Update

Protection and measures:

LPS installed:

Structure protected by LPS III

Structure not protected by LPS

Structure protected by LPS IV (no NFPA)

Structure protected by LPS III

Structure protected by LPS II

Structure protected by LPS I (no NFPA)

LPS I + Framework (no NFPA)

Metal roof + complete prot. Framework

Update

Master file: Local: Office Building Option # 2 A - LPS III

And select the new service lines with bonding:

Z3 sol. A | 20 | 8760

Zone | Probabilities | Losses | Costs | Zone Preview

Update

Name: Z3 sol. A

# people: 20,00 hours / year: 8760,00

Services:

Power w/ bonding, Telecom w/ bonding

Power original

Telecom original

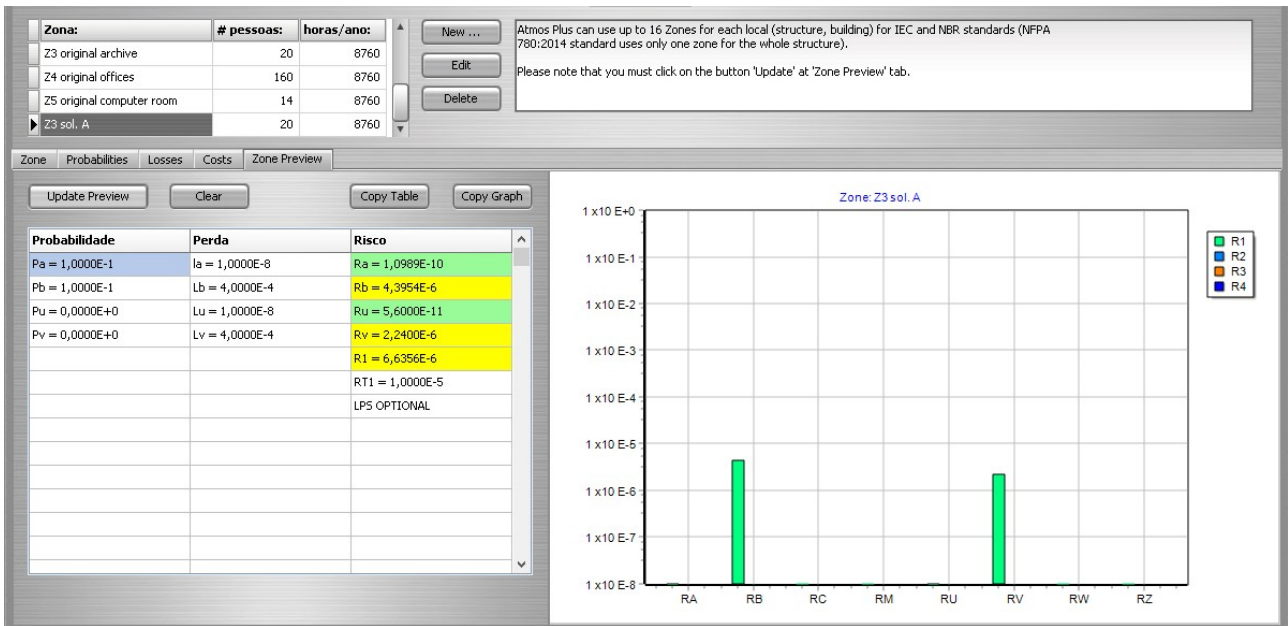
Power w/ bonding

Telecom w/ bonding

Update list

This new Zone 3 A has the Preview:



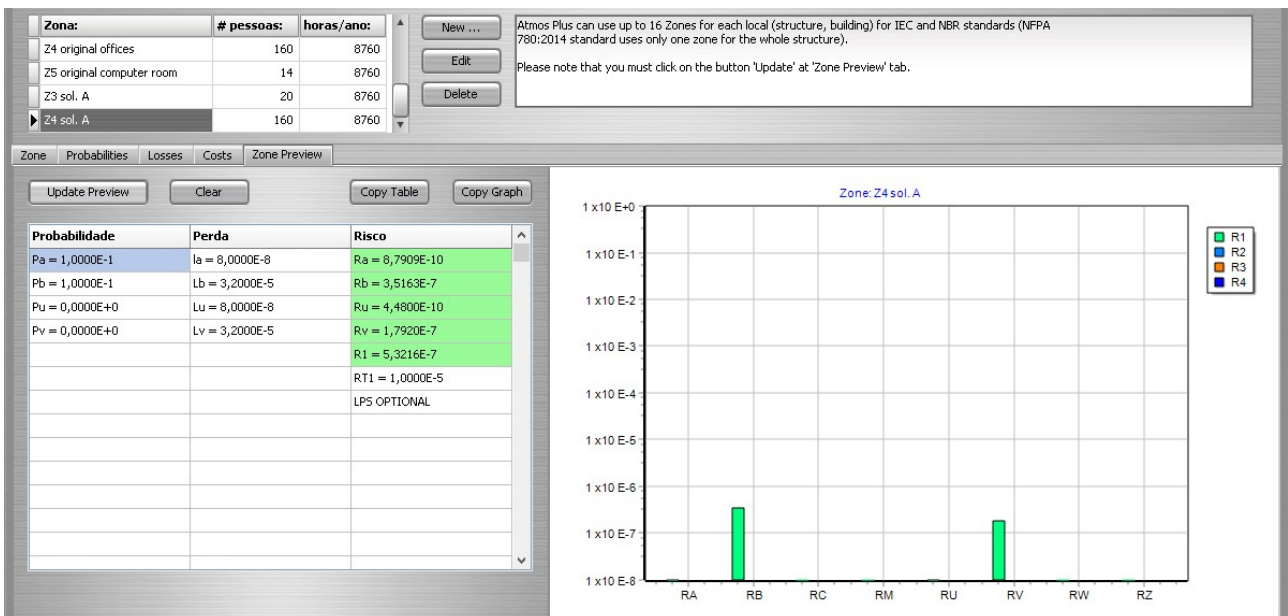


Note that it's now below the tolerable level but not by much, so Atmos labels it with the yellow color; the table color code is:

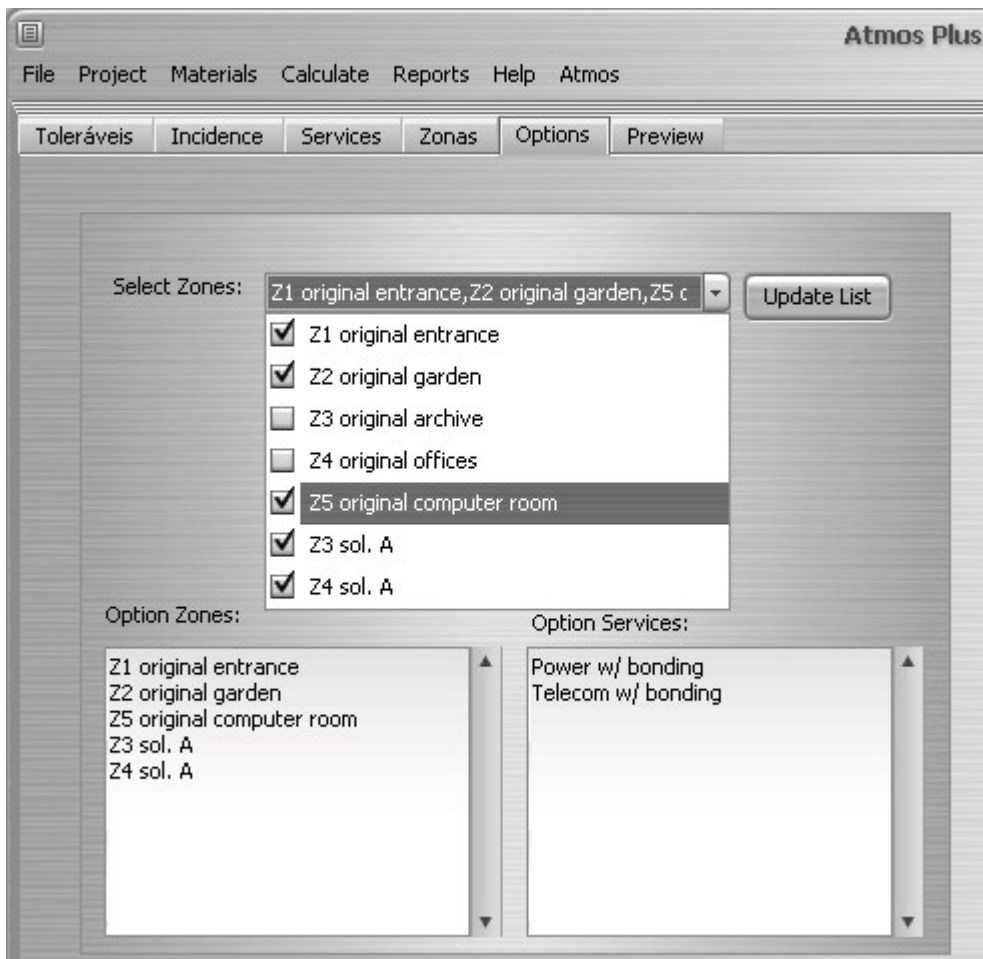
- Red = over tolerable level, must protect better
- Yellow = over 10% of tolerable level, so it's OK but, when added to other components and zones, can produce a red risk
- Green = below 10% of tolerable level, probably it's OK even when added to others.

Please note that the chart color isn't related to the table, the colors on the chart are related to risks R1, R2, R3 and R4.

Repeating the process to create a new Zone 4 with solution A, we get:

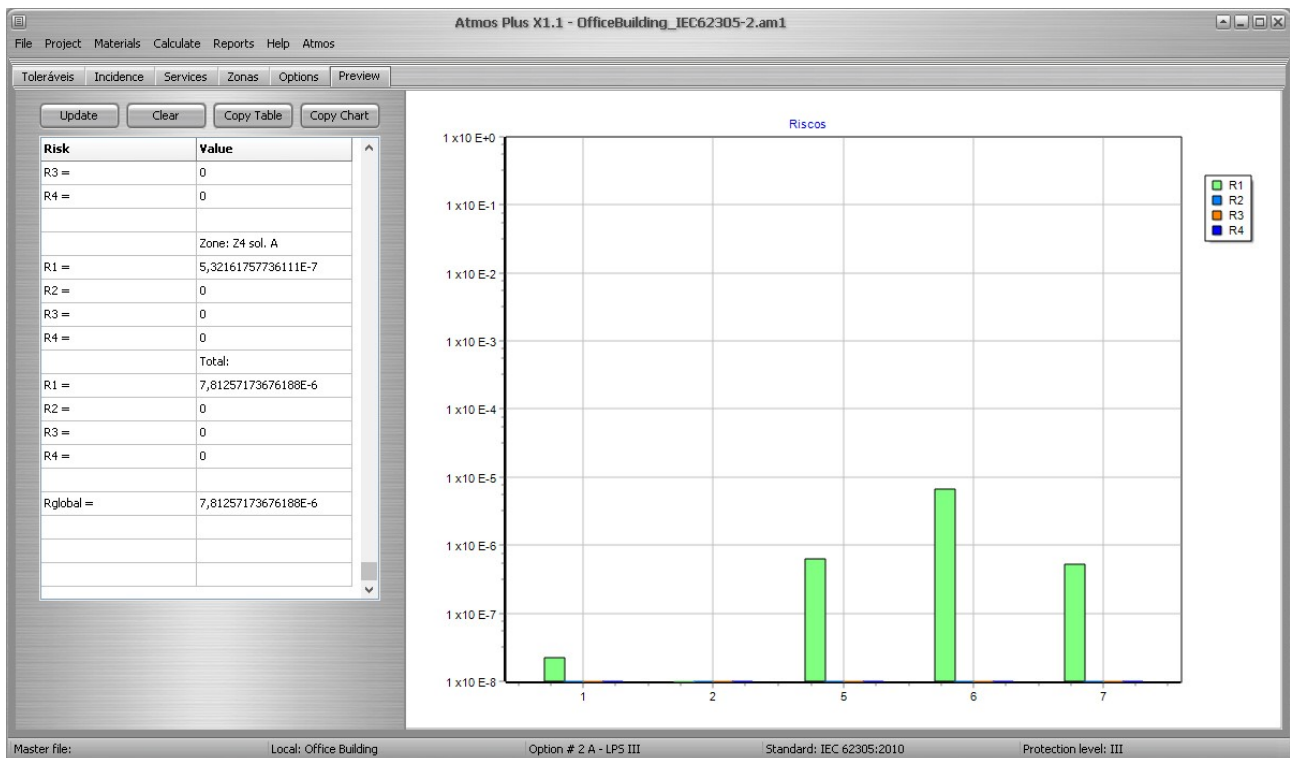


Considering the new zones Z3A and Z4A for Option 2:



Note that we're using "old" zones Z1, Z2 and Z5 because their risk is already very low, but you could easily add new ones with solution A.

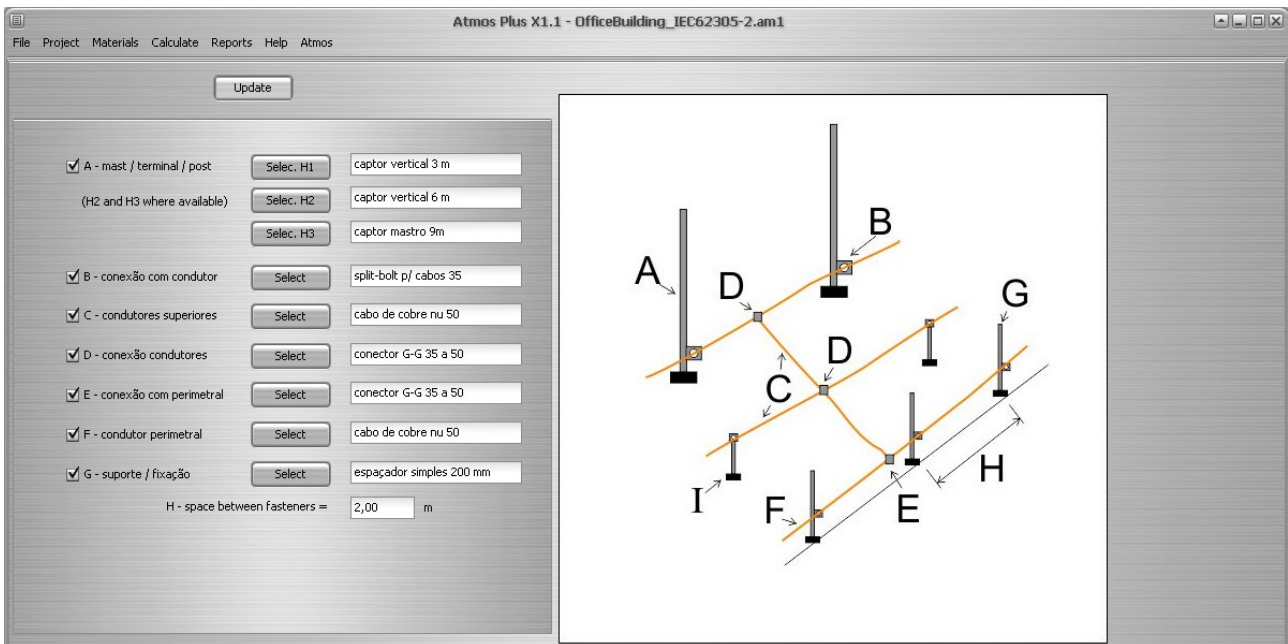
The Options preview:



## LPS design:

The standard doesn't present the cost comparison, but we can do it here; for that, besides the bonding costs for the Service lines, we need to design the LPS level III protection for the whole building.

Select Materials / Air Terminals; check each used component (see note below) then click on the corresponding Select button to access the materials database and choose the material - for example, select a compression connector or an exothermic welding for the connections:

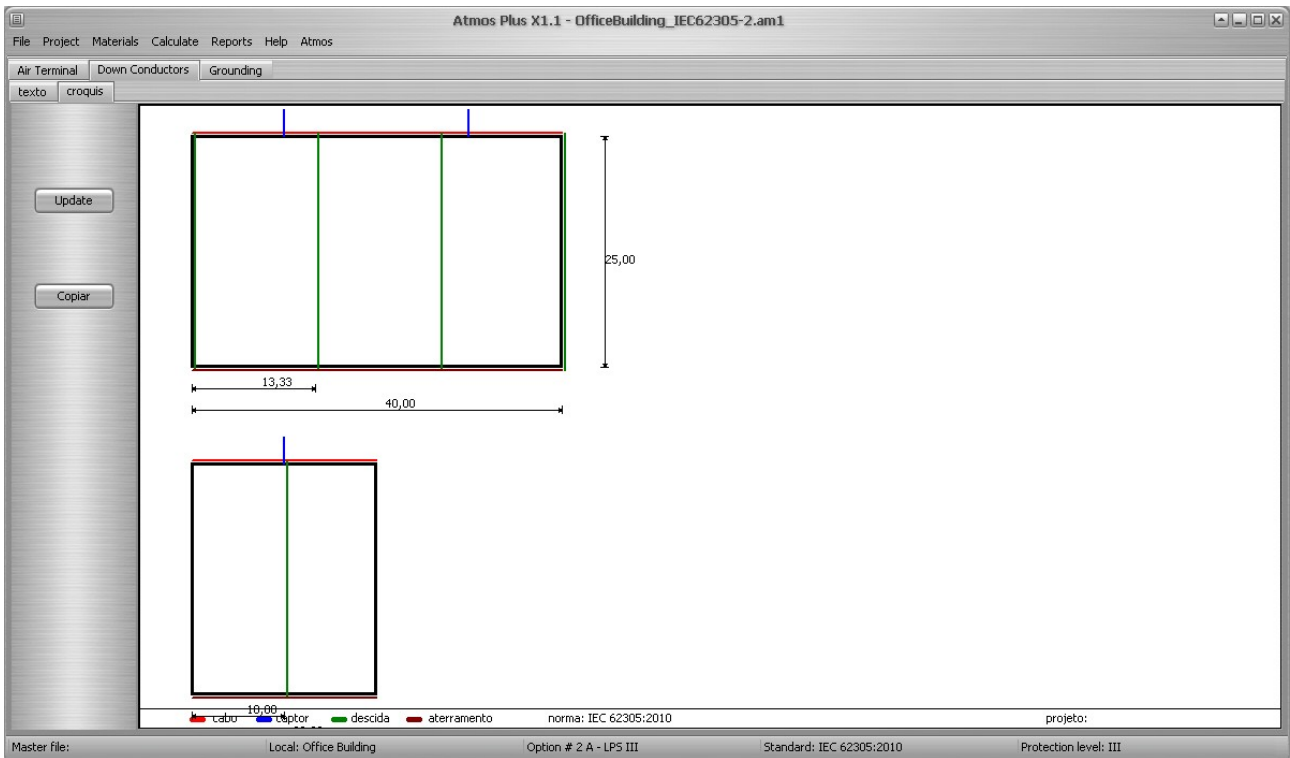


Note: you can freely turn on and off each component: for example, if you have a metallic structure under the roof tiles, you can use it for conducting the lightning current from the air terminal to the perimeter conductor, so you won't need components B, C, D and I above.

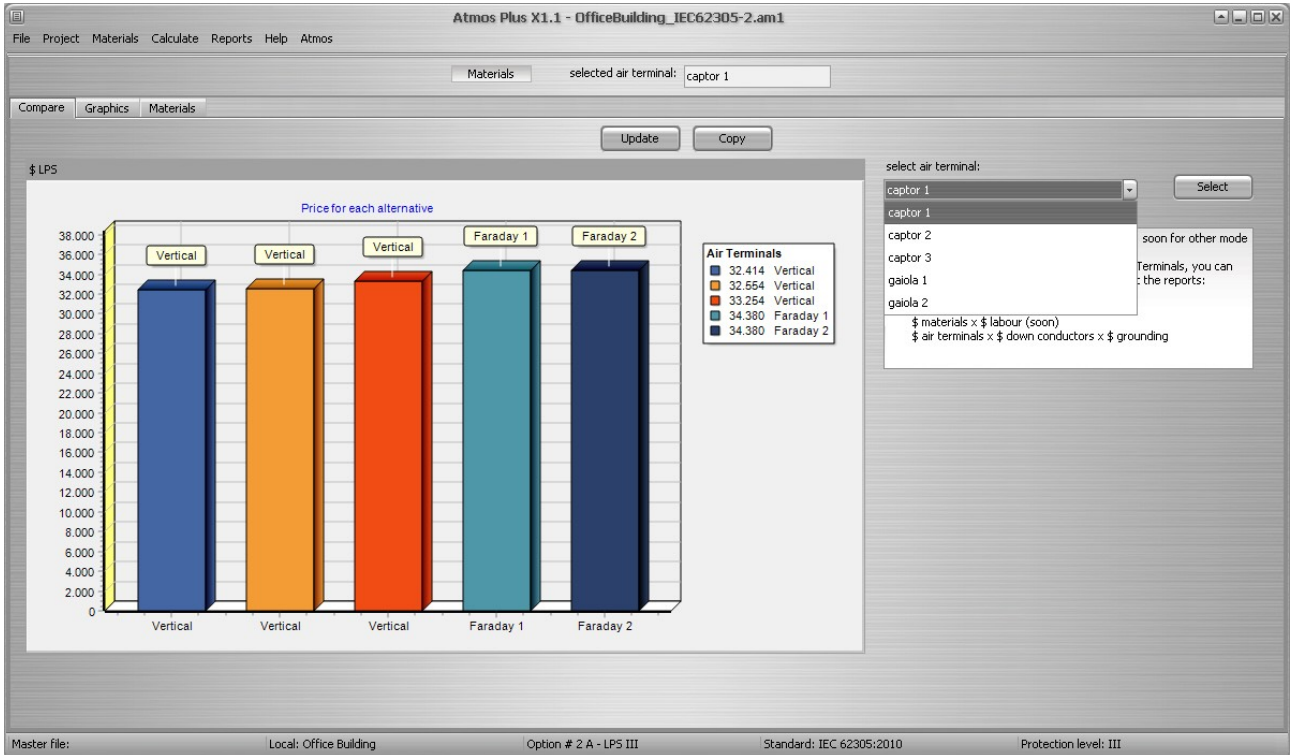
Repeat the procedure to set the Down Conductors and Grounding materials, then select Calculate / Protection:



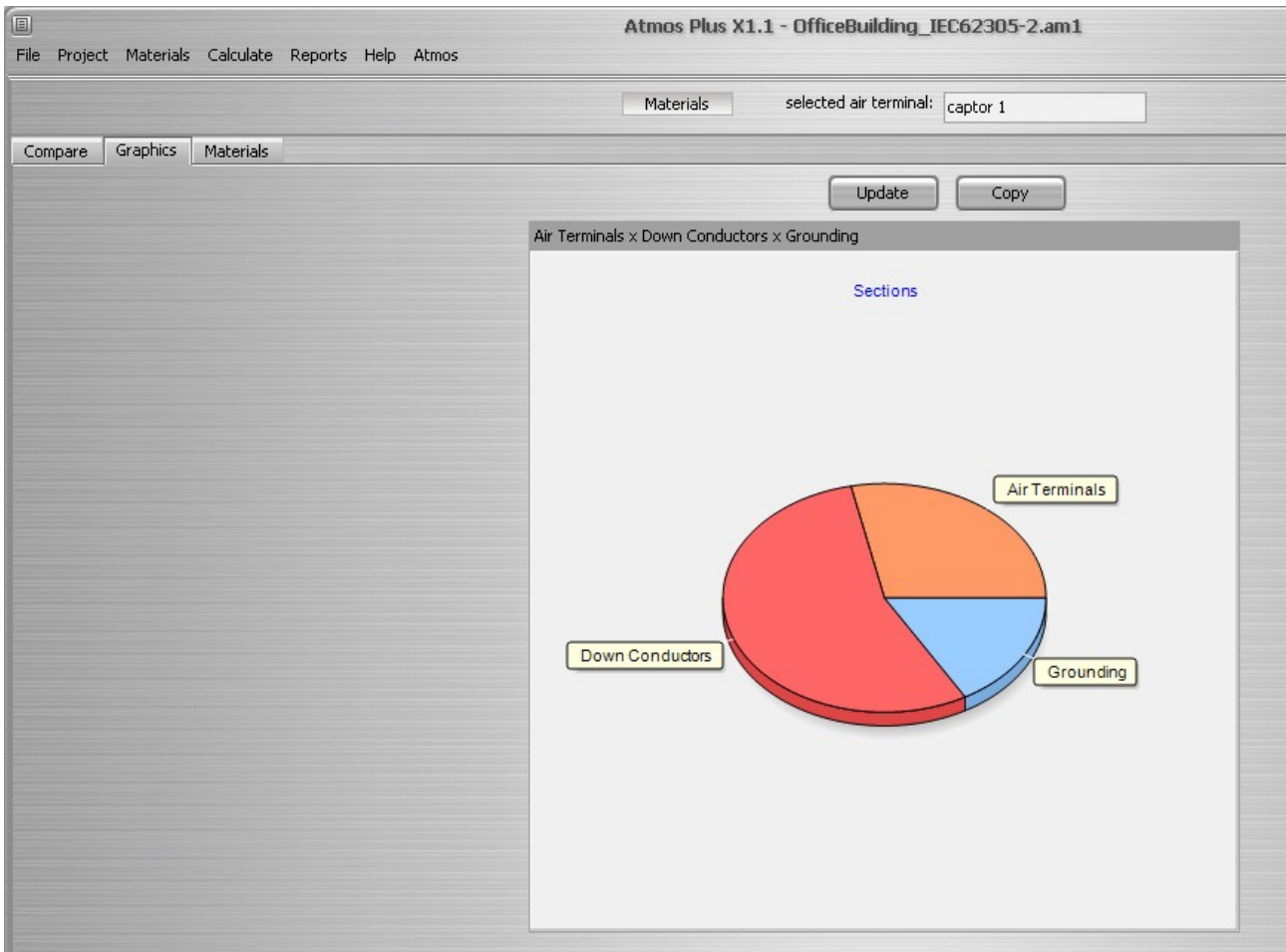
Now select Reports / LPS to get the Air Terminals, Down Conductors and Grounding reports - lists of materials and drafts; this is the Down Conductors draft:



The Model used has 5 alternatives for Air Terminals: 3 heights of rods plus Faraday cages oriented on both directions. To chose one, go to Reports / Materials and click at the Update button to get the comparative chart of costs for the Air Terminal alternatives; at the right, select the option you want and click on Select:



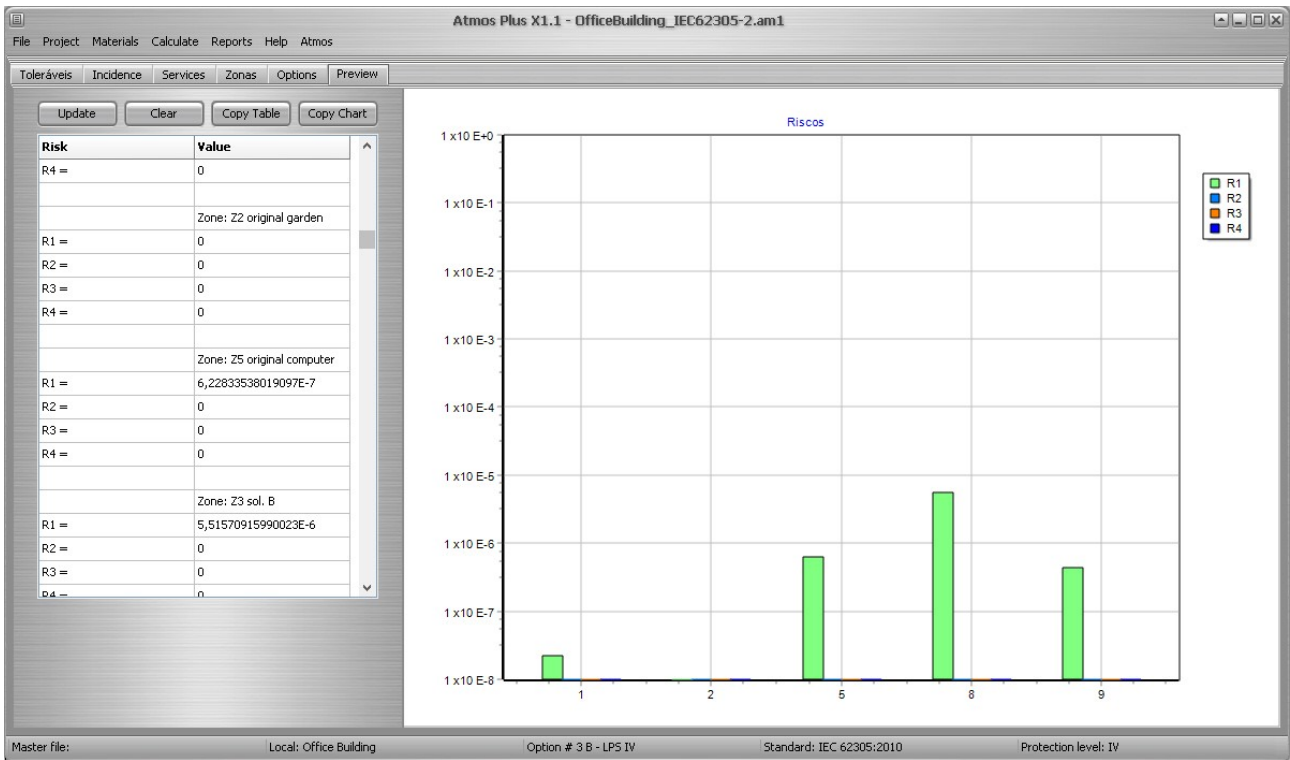
At the next tab, Graphics, you can get a comparative chart between costs for the selected alternative:



And, at Materials tab, there's a list of all materials used:

cod	quant	unid	descr	custoun	custoquant
8	2	un	captor vertical 3 m	80	160
20	2	un	split-bolt p/ cabos 35	12	24
1	40	m	cabo de cobre nu 50	20	800
6	0	un	conector G-G 35 a 50	10	0
6	4	un	conector G-G 35 a 50	10	40
1	120	m	cabo de cobre nu 50	20	2400
4	80	un	espaçador simples 200 mm	10	800
6	10	un	conector G-G 35 a 50	10	100
1	250	m	cabo de cobre nu 50	20	5000
4	251	un	espaçador simples 200 mm	10	2510
5	10	un	conector desmontável 4 paraf	10	100
1	0	m	cabo de cobre nu 50	20	0
26	10	un	solda T 50 x 50	10	100
1	120	m	cabo de cobre nu 50	20	2400
21	0	un	captor vertical 6 m	0	0
10	0	un	captor mastro 9m	0	0
			Consolidating:		

We won't show all the screens here because it's just a repetition with slightly different data or parameters, but this is the result Options Preview for the solution B:



There are too many reports available to show here, let's present the more important ones; if you select Reports / Options, the second tab - LPS - will give you this table:

The screenshot shows the 'LPS' tab in the Atmos Plus X1.1 software. A menu is open over the 'Reports' button, showing options like Location, Options, Model, Risk, LPS, Materials, Verifications, and Print / PDF. The main table displays LPS components for different options. The table has columns for Option, Name, and various LPS components (3, 4, 5, 6).

Option:	1	3	4	5	6	
Name	Origin	- LPS III	B - LPS IV	4	5	6
A - mast / termin	--	captor vertical 3	captor vertical 3	--	--	--
H2	--	captor vertical 6	captor vertical 6	--	--	--
H3	--	captor mastro 9m	captor mastro 9m	--	--	--
B - conexão com c	--	split-bolt p/ cab	split-bolt p/ cab	--	--	--
C - condutores su	--	cabo de cobre nu	cabo de cobre nu	--	--	--
D - conexão condut	--	conector G-G 35 a	conector G-G 35 a	--	--	--
E - conexão com p	--	conector G-G 35 a	conector G-G 35 a	--	--	--
F - condutor perli	--	cabo de cobre nu	cabo de cobre nu	--	--	--
G - suporte / fixa	--	espaçador simples	espaçador simples	--	--	--
H - space between	0	2	2	0	0	0
Down conductors:						
A - connection wit	--	conector G-G 35 a	conector G-G 35 a	--	--	--
B - condutor	--	cabo de cobre nu	cabo de cobre nu	--	--	--
C - fixação	--	espaçador simples	espaçador simples	--	--	--
D - Espaçamento f:						
force down conduct						

It shows, for each Option, the LPS components that were used.

On the Risk tab, you get, for each Option, which zones were considered:

Atmos Plus X1.1 - OfficeBuilding\_IEC62305-2.am1

Select to copy:  Copy

Names LPS Risk Zones Service Lines Costs Compare data Compare Charts

Update

Option:	1	2	3	4	5	6
Name:	Original	A - LPS III	B - LPS IV	4	5	6
Zone 1:	Z1 original e	Z1 original e	Z1 original e	--	--	--
Zone 2:	Z2 original g	Z2 original g	Z2 original g	--	--	--
Zone 3:	Z3 original s	--	--	--	--	--
Zone 4:	Z4 original o	--	--	--	--	--
Zone 5:	Z5 original c	Z5 original c	Z5 original c	--	--	--
Zone 6:	--	Z3 sol. A	--	--	--	--
Zone 7:	--	Z4 sol. A	--	--	--	--
Zone 8:	--	--	Z3 sol. B	--	--	--
Zone 9:	--	--	Z4 sol. B	--	--	--

At the Zones tab, you have the parameters for all zones created for this Location, the same for the Services tab; here's the Zones table:

Atmos Plus X1.1 - OfficeBuilding\_IEC62305-2.am1

Select to copy:  Copy

Names LPS Risk Zones Service Lines Costs Compare data Compare Charts

Clear Update

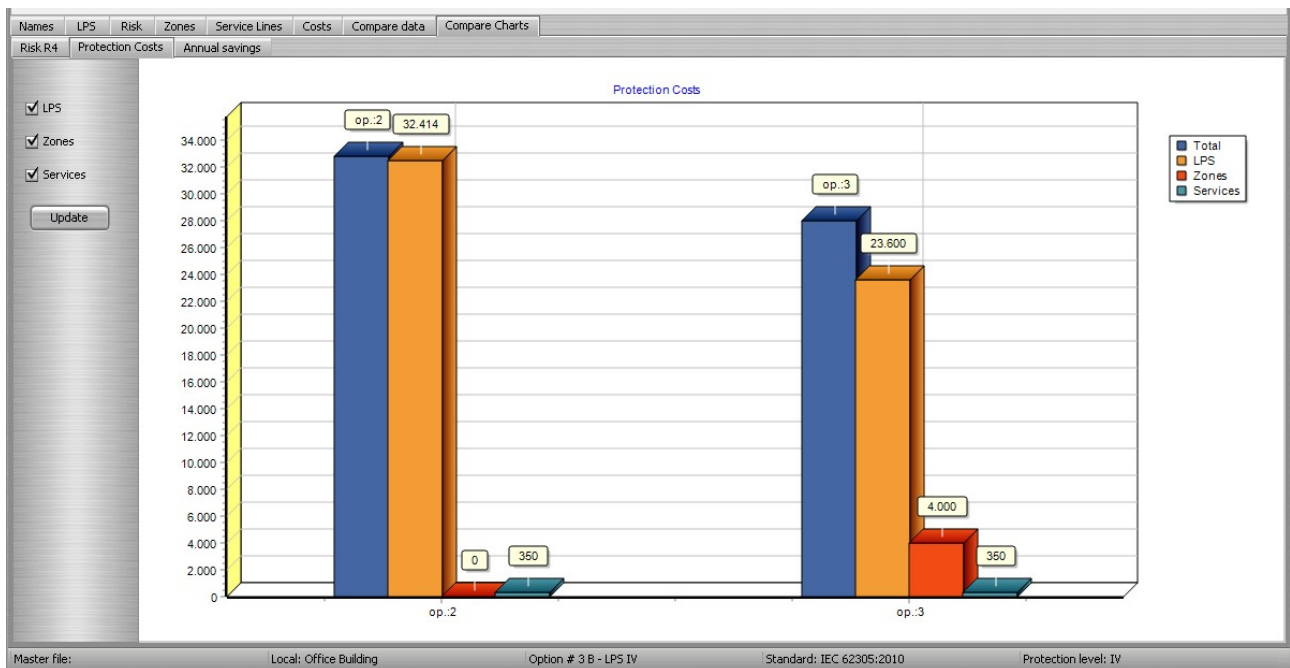
Zone:	1	2	3	4	5	6	7	8	9
Name:	Z1 original e	Z2 original g	Z3 original s	Z4 original o	Z5 original c	Z3 sol. A	Z4 sol. A	Z3 sol. B	Z4 sol. B
Nz	4	2	20	160	14	20	160	20	160
Tz	8760	8760	8760	8760	8760	8760	8760	8760	8760
LPS installed:	Structure not	Structure not	Structure not	Structure not	Structure not	Structure pro	Structure pro	Structure pro	Structure pro
Security measures									
Physical damages:	Industrial, c	others	Industrial, c	Industrial, c	Industrial, c	Industrial, c	Industrial, c	Industrial, c	Industrial, c
Internal systems:	risk of explo	risk of explo	risk of explo	risk of explo	risk of explo	risk of explo	risk of explo	risk of explo	risk of explo
Type of surface:	Marble, ceram	Agricultural,	Asphalt, lino	Asphalt, lino	Asphalt, lino	Asphalt, lino	Asphalt, lino	Asphalt, lino	Asphalt, lino
Provisions taken:									
Risk of fire / amount:	none	none	fire / high	fire / low	fire / low	fire / high	fire / low	fire / high	fire / low
Special hazard:	no special ha	no special ha	Low level of	Low level of	Low level of	Low level of	Low level of	Low level of	Low level of
Cultural value:	0	0	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Animals value:	0	0	0	0	0	0	0	0	0
Building value:	0	0	0	0	0	0	0	0	0
Content:	0	0	0	0	0	0	0	0	0

Master file: Local: Office Building Option # 3B - LPS IV Standard: IEC 62305:2010 Protection level: IV

At the Compare data tab, a concise view of the costs for each Option; note the costs added: 200 for the Power line bonding, 150 for the Telecom line bonding, and 2000 for the fire extinguishing system for Zone Z3 B and Z4 B (4000 total):

Option:	1	2	3
Name:	Original	A - LPS III	B - LPS IV
Ext LPS [\$]:	0,00	32414,00	23600,00
measures Servs [\$]:	0,00	350,00	350,00
measures Zones [\$]:	0,00	0,00	4000,00
total [\$]:	0,00	32764,00	27950,00
Risk econ R4:	0,0000E+0	0,0000E+0	0,0000E+0
Cost loss [\$]:	0,00	0,00	0,00
Resid loss [\$]:	0,00	0,00	0,00
Annual cost [\$]:	0,00	11467,40	9782,50

Finally, on this chart we have the visual comparative between costs of solutions for both Options 2 (solution A) and 3 (solution B):



On this case, the economy of using LPS level IV instead of III gives a cheaper result for solution B, even with the added costs of the fire extinguishing system - of course, those are specific for the data used here, in other cases the cheaper solution could be another one - for example, here we used cable for the Down Conductors, if we had used rebars (or metallic columns), the cost for the “cables” would be zero. Atmos allows 6 Options for each Location, so we could have 3 more here for comparison - that’s enough for even the most complex case, as if you add too many options, you’ll lose too much time for small increases in cost reduction.

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