

Separation Distance calculation software
USER MANUAL

07/2017

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1. Introduction

The program intends to help in the calculation of the separation distance of various lightning protection systems according to the detailed method described in IEC 62305-3:2006-01, Annex E. With that, the simplified approach according to the chapter 6.3 of the standard is replaced. The simplified approach often leads to unrealistic high separation distances, especially in case of very tall and very extended structures.

As a result of the calculation, the separation distance is given for an earthing arrangement of type B and for an air gap. In case of solid material (concrete, bricks, etc.) the separation distance has to be doubled according to IEC 62305-3:2006-01.

This is also valid for an isolating path along a solid material's surface (e.g. along the surface of a roof).

We recommend in case of earthing arrangements of type A to add a safety factor of 5 % to the calculated separation distances. Although this is not required by IEC 62305-3:2006-01, with that the inequality of the partial lightning currents is taken into account conservatively, which occurs if the earthing resistances of the individual type A earth electrodes differ remarkably.

2. Installation

The version 2.0 from "Microsoft .Net" is necessary to use the program. If this program is not installed on your computer, download the suitable version :

- X64 System

<https://www.microsoft.com/fr-FR/download/details.aspx?id=6523>

- ia64 System:

<https://www.microsoft.com/fr-FR/download/details.aspx?id=5205>

Plug the USB key, open it and double click on the "TA_2_0.exe" file.

The "Project Data" window will directly open.

3. General

3.1. Project start

Beside the real calculation the master data are grasped in a window, which simplifies the allocation of the calculation to the project. It is recommended to give an unequivocal project name and - if desired - other master data put down on the mask and "save".

You can also change the master data in the main window. To do that, select "Master Data" under "Project". However, this change only applies to the current project.

If you wish to add a new project, click on "Add" in "Project Management". A new window opens, enter the project name then click on "OK" to continue. If you wish to delete a project, click on "Delete". You can import new projects by clicking on "Import". You can also export projects by clicking on "Export". Further information on importing and exporting a project are available in the section 11.

If you wish to work on one of the projects from the list, select the project and click on "Apply" or double click on the project's name.

The screenshot displays the 'Separation Distance 2.0 - Project Data' window. It features a 'Project Management' tab and a 'Standard Building' sub-tab. On the left, a tree view shows 'Projects' with a sub-entry 'Standard'. The main area is divided into three sections: 'Client', 'Construction Supervisor', and 'Object', each containing fields for Name, Street, Location, Country, Phone 1, Phone 2, Email, and Web Page. Below these is a 'Client Information' table with columns for Name, Street, Location, and Standard. An 'Address Input' dialog box is open, showing fields for Name, Street, Post Code, Location, Country, Phone 1, Phone 2, Fax, E-Mail, and Web Page. At the bottom, there are buttons for 'Apply', 'Save', 'Add', 'Export', 'Import', 'Delete', 'Set Default', and 'Delete'.

Figure 1 : Project Management

You can also create a project by providing given building forms. Further information are available in the section 10.

3.2. Main window – summary

Once you have opened the project, the main window appears.

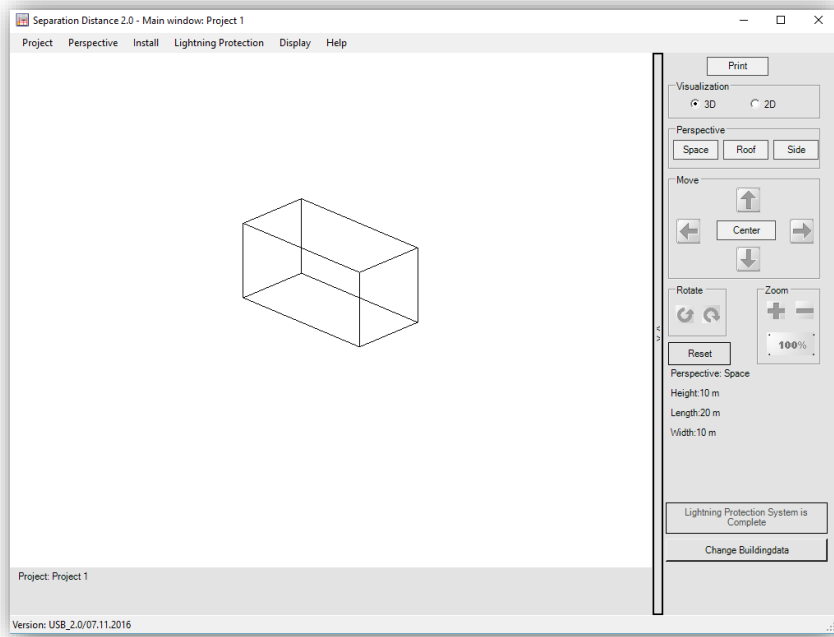


Figure 2 : Main window

On the right part of the main window, there are different view tab for changing the viewing angle. Most program functions are started via the menu.

4. Main window

4.1. Create a new building

To create a new building, select “Add” under “Install”, then select “Main building”. A new window opens.

4.2. Select building form

Four different building forms are available :

- Main Building ;
- Gable Roof ;
- Roof Protrusion ;
- Extension.

To create a gable roof, a roof protrusion or an extension, you need to create a main building first. Select “add” under “Install” and choose the building form you want to add. A new window opens with the new characteristics.

4.2.1. Enter Building Data

Main Building

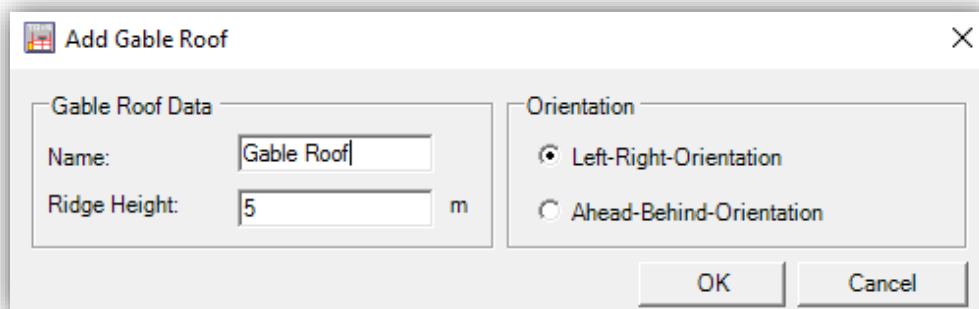
It is possible to add a gable roof while creating a main building. Click on “Gable roof” and enter the suitable characteristics.

The screenshot shows a software dialog box titled "Install Main Building". It is divided into several sections. The "Building Data" section contains four labeled input fields: "Name" (with the text "Project 1"), "Height" (with the value 10), "Length" (with the value 20), and "Width" (with the value 10). Each of these fields has a small "m" (meters) unit indicator to its right. Below this section is a button labeled "Gable roof". Underneath the button is the "Gable Roof" section, which is further divided into "Data" and "Orientation". The "Data" section has two input fields: "Name" (containing "Satteldach1") and "Ridge Height" (containing the value 5), with a unit "m" next to the latter. The "Orientation" section contains two radio button options: "Left-Right-Orientation" (which is selected, indicated by a filled circle) and "Ahead-Behind-Orientation" (which is unselected, indicated by an empty circle). At the bottom of the dialog are two buttons: "OK" and "Cancel".

Figure 3 : Gable Roof Data

Gable Roof

When adding a Gable Roof, only the ridge height and the orientation need to be filled.



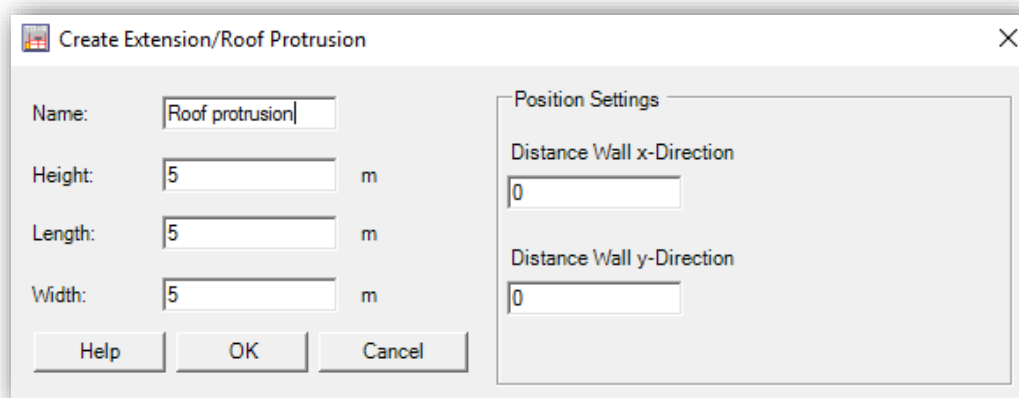
The 'Add Gable Roof' dialog box contains two main sections. The 'Gable Roof Data' section on the left has a 'Name' field with the text 'Gable Roof' and a 'Ridge Height' field with the value '5' followed by a unit 'm'. The 'Orientation' section on the right has two radio buttons: 'Left-Right-Orientation' (which is selected) and 'Ahead-Behind-Orientation'. At the bottom right are 'OK' and 'Cancel' buttons.

Figure 4 : Gable Roof Data

Note : If there is a gable roof, a roof protrusion cannot be added.

Roof Protrusion

When adding a roof protrusion, you need to enter the name, the dimensions and also the distance wall in x and y direction.



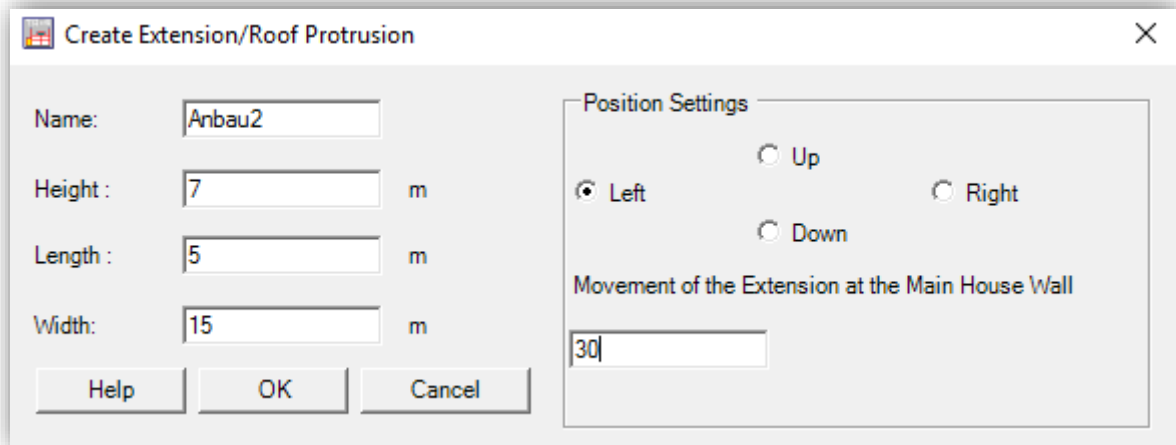
The 'Create Extension/Roof Protrusion' dialog box has two main sections. The left section contains four input fields: 'Name' (with 'Roof protrusion'), 'Height' (with '5'), 'Length' (with '5'), and 'Width' (with '5'), each followed by a unit 'm'. Below these fields are 'Help', 'OK', and 'Cancel' buttons. The right section, titled 'Position Settings', contains two input fields: 'Distance Wall x-Direction' (with '0') and 'Distance Wall y-Direction' (with '0').

Figure 5 : Roof Protrusion

Note : If there is a roof protrusion, a gable roof cannot be added.

Extension

When adding an extension, the position settings need to be filled.



The dialog box is titled "Create Extension/Roof Protrusion". It contains the following fields and controls:

- Name:** A text box containing "Anbau2".
- Height:** A text box containing "7", followed by a unit "m".
- Length:** A text box containing "5", followed by a unit "m".
- Width:** A text box containing "15", followed by a unit "m".
- Position Settings:** A section with four radio buttons: "Left" (selected), "Up", "Right", and "Down".
- Movement of the Extension at the Main House Wall:** A text box containing "30".
- Buttons:** "Help", "OK", and "Cancel" at the bottom left.

Figure 6 : Roof Protrusion

4.2.2. End selection

Once you have added a gable roof, an extension or a protrusion roof, the building and the extension are displayed.

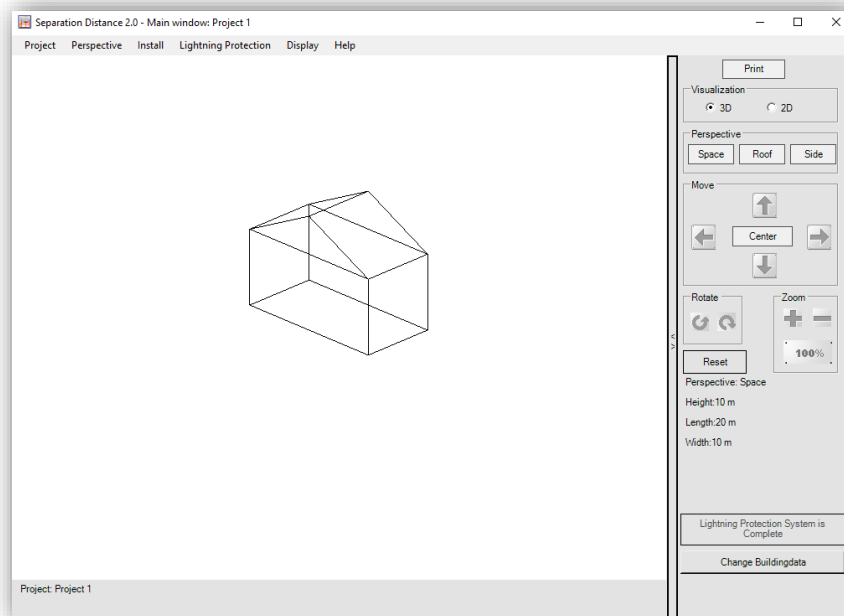


Figure 7 : Building with a gable roof

4.3. Installing a Lightning Protection System (LPS)

If you created a building, you can add a Lightning Protection System. Select the level of protection (Class IV to I) under “Lightning Protection”. The lightning protection appears in red.

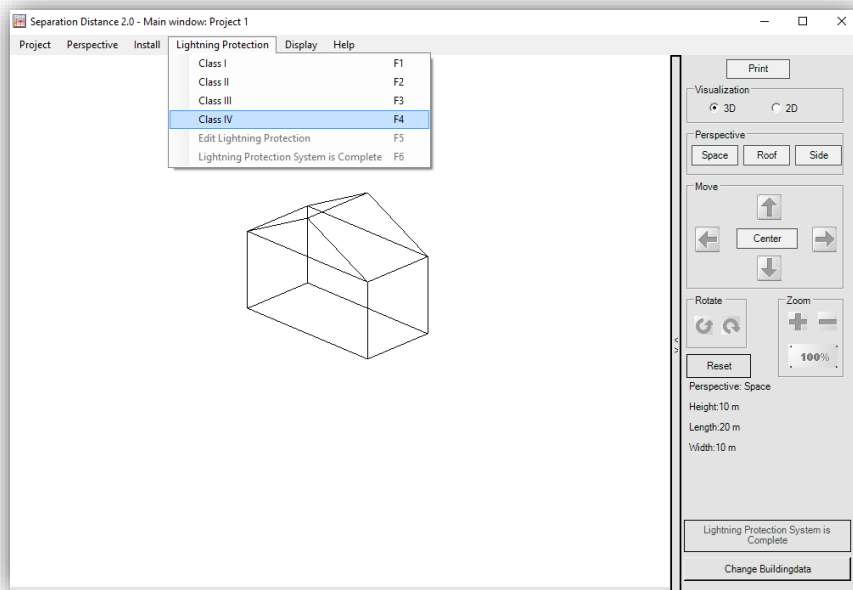


Figure 8 : Add a Lightning Protection System

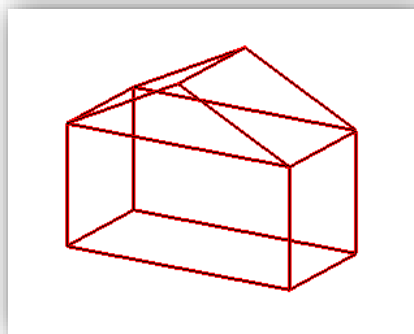


Figure 9 : Lightning protection system in red

To delete the LPS, deselect the level of protection chosen under “Lightning Protection”.

4.3.1. Add a ring conductor

To add a ring conductor, select “Add” under “Install”, then click on “Ring conductor”. Enter the height of the ring conductor. Several ring conductor can be added.

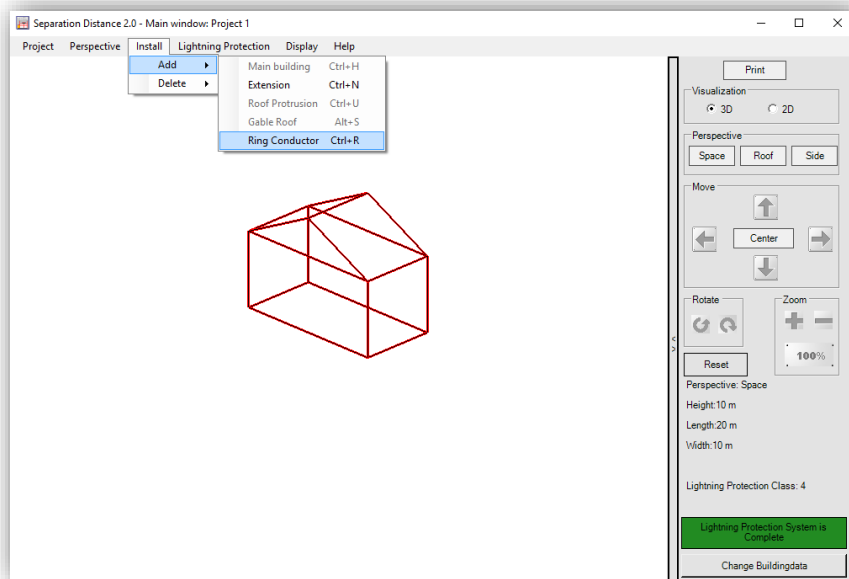


Figure 10 : Add a ring conductor

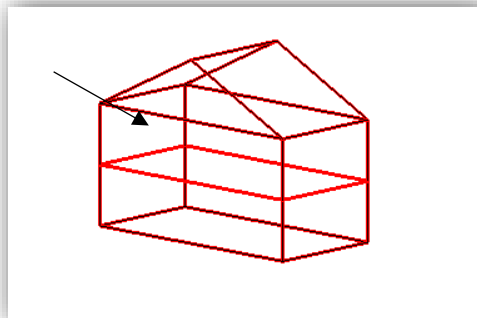


Figure 11 : Ring conductor

Note : A ring conductor is always drawn around all extensions and roof protrusions.

4.4. Change Building Data

You can change the building data if errors were made. On the right bottom side of the window, click “Change Building Data”. The “Building Data” window opens.

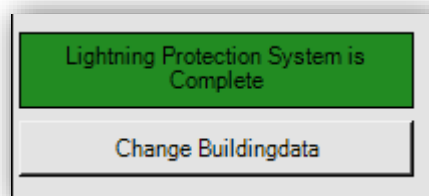


Figure 12 : Change building data

In “Section of the Building”, you can choose what you want to modify. Under “Collisions”, all the errors that could cause a conflict appear.

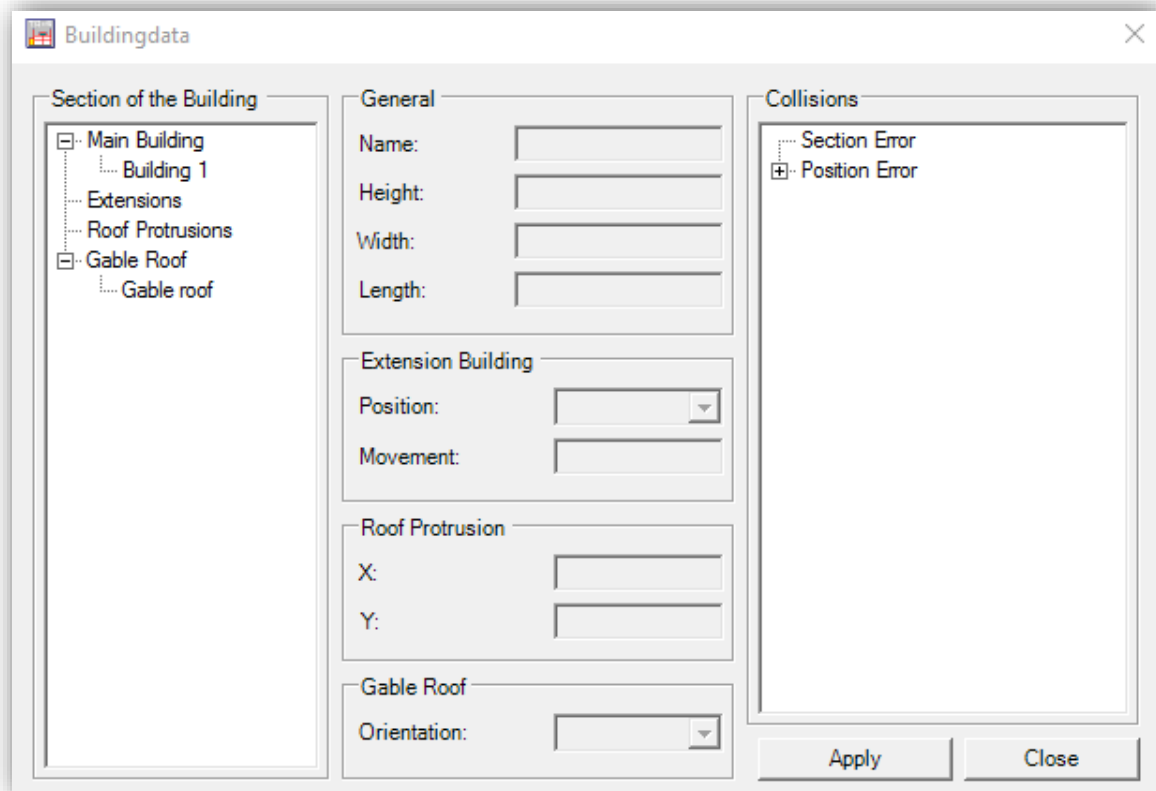


Figure 13 : Building data window

There are two types of errors :

- **Position error** : An extension does not affect the main building or a roof protrusion is hanging in the air ;
- **Section error**: Extension or roof protrusion overlap.

Note : By changing the building's data, the LPS will be deleted. Only data with values greater than zero are allowed for the dimensions.

4.4.1. Correction – Main building

It is possible to change the dimensions and the name of the building.

The screenshot shows the 'Buildingdata' dialog box with the 'Main Building' selected in the 'Section of the Building' tree. The 'General' tab is active, showing fields for Name (Building 1), Height (10), Width (10), and Length (20). The 'Extension Building' section has Position and Movement dropdowns. The 'Roof Protrusion' section has X and Y input fields. The 'Gable Roof' section has an Orientation dropdown. The 'Collisions' panel on the right shows a tree with 'Section Error', 'Position Error', 'Extensions', and 'Roof Protrusions'. 'Apply' and 'Close' buttons are at the bottom right.

Figure 14 : Building Data

It is important to note that the reduction of the main building may lead to conflicts on extensions and roof protrusions. In case of roof protrusions, the main building can be reduced as long as the roof protrusions is not hanging in the air. It is not possible to reduce the size of the main building as long as the extension do not touch the main building.

Note : You can only apply the new data if there are not any errors.

4.4.2. Correction – Extensions

In case of the correction of an extension, it is possible to change the dimensions, the name and the position.

The screenshot shows the 'Buildingdata' dialog box with 'Extension 1' selected in the 'Section of the Building' tree. The 'General' tab is active, showing fields for Name (Extension 1), Height (5), Width (5), and Length (5). The 'Extension Building' section has Position (Left) and Movement (0) dropdowns. The 'Roof Protrusion' section has X and Y input fields. The 'Gable Roof' section has an Orientation dropdown. The 'Collisions' panel on the right shows a tree with 'Section Error', 'Position Error', 'Extensions', and 'Roof Protrusions'. 'Apply' and 'Close' buttons are at the bottom right.

Figure 15 : Extension data

It is not possible to overlap two or more extensions.

Note : You can only apply the new data if there are not any errors.

4.4.3. Correction – Roof Protrusion

In case of the correction of the roof protrusion, it is possible to change the dimensions, the name and the position.

The screenshot shows the 'Buildingdata' dialog box with the 'Roof Protrusion' section selected in the left-hand tree. The 'General' tab is active, showing fields for Name (Roof Protrusion), Height (5), Width (5), and Length (5). The 'Extension Building' section has a Position dropdown and a Movement field. The 'Roof Protrusion' section has X and Y coordinates set to 0. The 'Gable Roof' section has an Orientation dropdown. The 'Collisions' section on the right shows a tree with 'Section Error', 'Position Error', 'Extensions', and 'Roof Protrusions'. The 'Apply' and 'Close' buttons are at the bottom right.

Figure 16 : Roof Protrusion data

Note : You can only apply the new data if there are not any errors.

4.4.4. Correction – Gable Roof

In case of the correction of the gable roof, it is only possible to change the height, the orientation and the name.

The screenshot shows the 'Buildingdata' dialog box with the 'Gable Roof' section selected in the left-hand tree. The 'General' tab is active, showing fields for Name (Gable roof), Height (5), Width, and Length. The 'Extension Building' section has a Position dropdown and a Movement field. The 'Roof Protrusion' section has X and Y coordinates. The 'Gable Roof' section has an Orientation dropdown set to 'Left - Right'. The 'Collisions' section on the right shows a tree with 'Section Error', 'Position Error', 'Extensions', and 'Roof Protrusions'. The 'Apply' and 'Close' buttons are at the bottom right.

Figure 17 : Gable roof data

Note : You can only apply the new data if there are not any errors.

5. Building's display

5.1. Modify the LPS

You can modify the LPS by adding, removing or shifting conductors.

To do this, select “Edit Lightning Protection” under “Lightning Protection” or press F5. The “Edit Building” window opens.

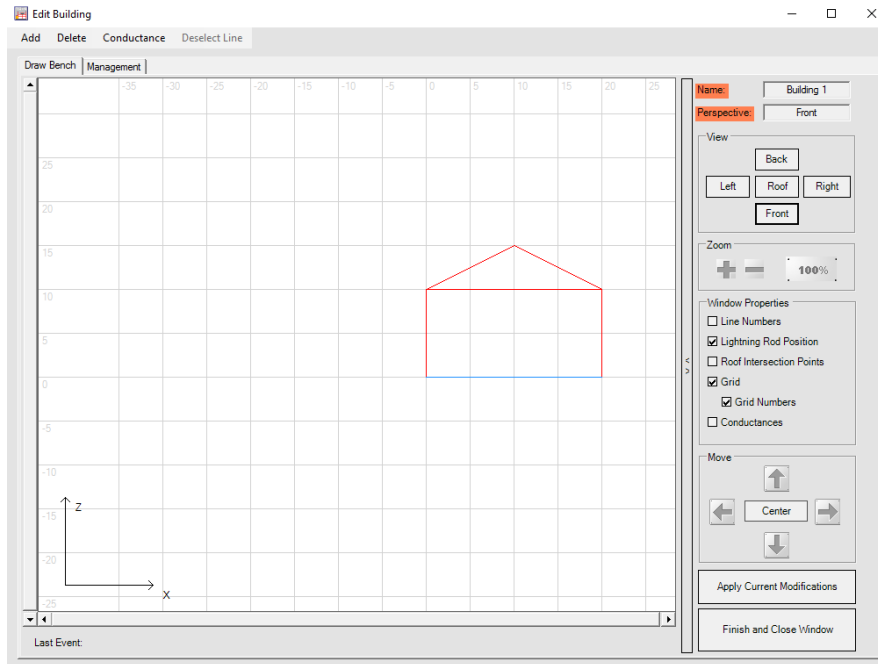


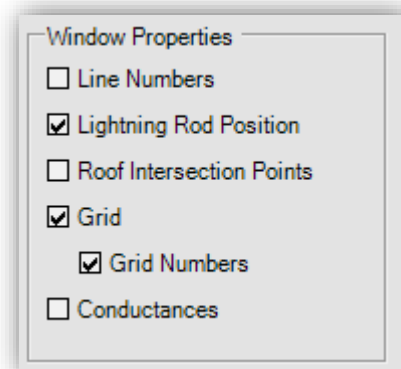
Figure 18 : Edit building window

Note : The ring conductors appear in light blue and cannot be modified.

5.1.1. Correction – Gable Roof

On the right side of the window, in “Window Properties” you can show :

- The line numbers ;
- The Lightning rod position ;
- The roof intersection points ;
- The grid and the grid numbers ;
- The conductances.



You can also use the zoom just like in the main window.

Click “Apply current modifications” to apply the changes. The changes are now displayed in the main window and in “Management” tab (see also 5.9).

5.2. Select conductor

To modify a conductor (wire), both ends of the conductor need to be selected. The selected ends are marked in blue.

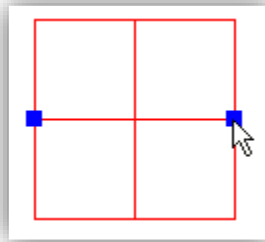


Figure 19 : Select a conductor

5.3. Delete conductor

To delete the selected conductor (wire), select “Conductor” under “Delete” or press “Delete” on the keyboard.

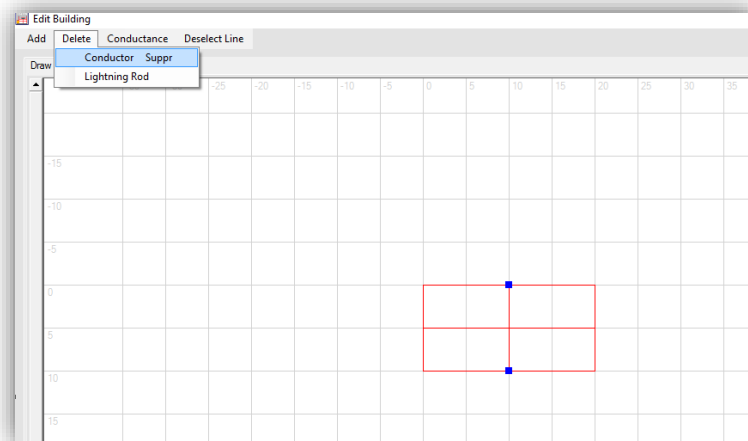


Figure 20 : Delete conductor

5.4. Shift conductor

To shift the selected conductor (wire), hold the left mouse button down and drag the conductor to the new position.

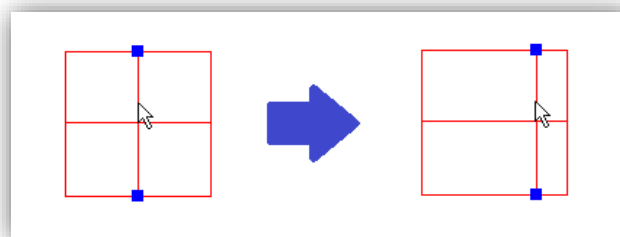


Figure 21 : Shift conductor

5.5. Shift conductor's End

To shift only one end of the selected conductor (wire), move the mouse pointer over the end that needs to be shifted, and hold the left mouse button down and drag the end to the new position.

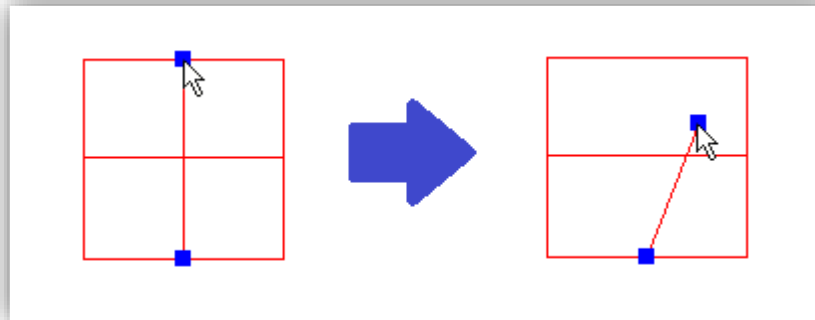


Figure 22 : Shift conductor's end

5.6. Shift conductor precisely

To precisely shift a conductor, select the conductor and click on the right mouse button. The “Line Properties” window opens.

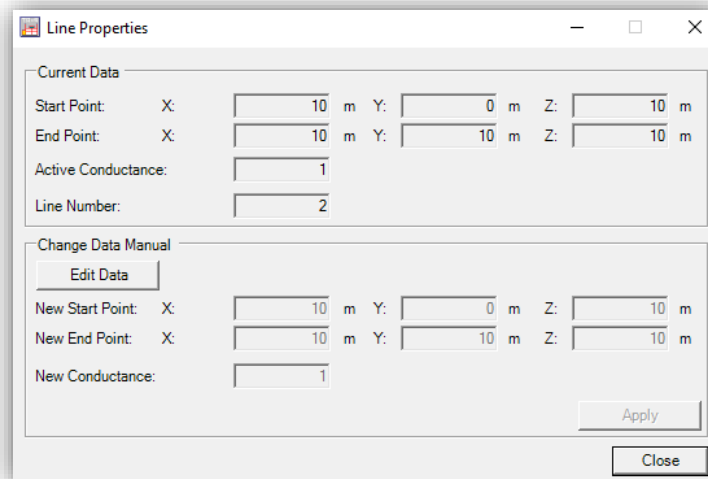


Figure 23 : Line properties window

The upper area shows the current data. Changes can be done in the lower area. If you wish to correct the data, click “Edit Data” and enter the right details then click “Apply”.

You can also change the conductance of the selected conductor.

5.7. Add a conductor

New conductors can be added either vertically or horizontally. Select “vertical conductor” or “horizontal conductor” under “Add”.

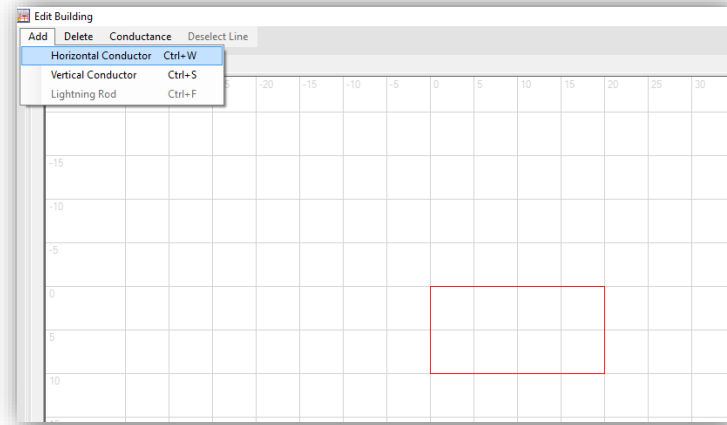


Figure 24 : Add a conductor

The “conductance” window opens. Enter the conductance.

The new conductor is now added in the middle of the current side- or roof-display. Then it can be shifted to any new position.

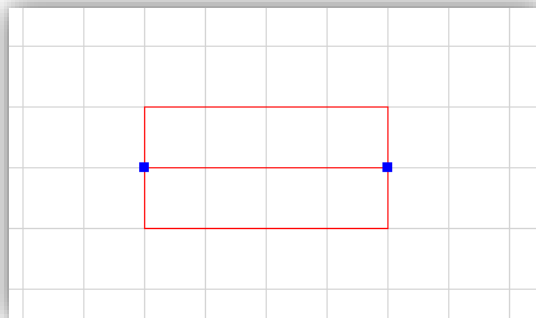


Figure 25 : Conductor added

5.8. Add a lightning rod

To be able to add a lightning rod, select the roof view.

Select the intersection where you want to add the lightning rod. Once you have selected the intersection, select “Lightning rod” under “Add”. The “Lightning Rod” window opens. Enter the height and the conductance of the lightning rod.

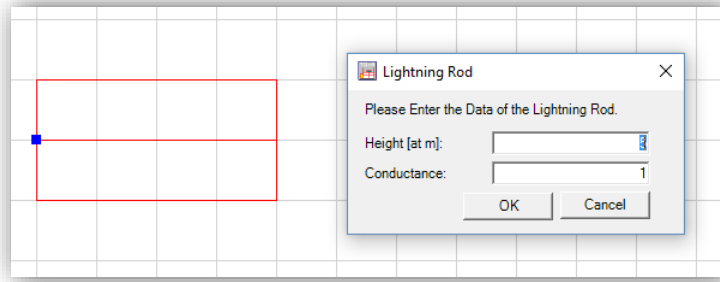


Figure 26 : Add a lightning rod

Click “OK” to continue.

Note : The lightning rod will appear in the main window once you will have clicked on “Apply Current Modifications” and “Finish and Close Window”. It can also be seen in the “Management” tab (see 5.9).

5.9. Change extensions and roof protrusions

If you wish to edit another part of the building of the same project, select the part that needs to be modified in the “Management” tab and click “Start Editing”.

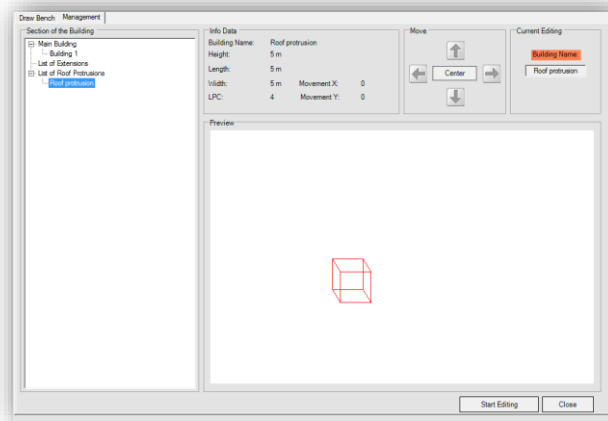


Figure 27 : Edit another part of the building

6. Output – General

In the main window, you can see the building in 3D or 2D and from different perspectives (Space, Roof and Side). You can also switch the view in the “Edit Building” window.

6.1. Rotate

It is also possible to rotate the building.



Figure 28 : Rotate

6.2. Move

It is also possible to move the building with the “Move” icons.



Figure 29 : Move

6.3. Zoom

You can zoom in or out with the “+” and “-” buttons. If you want to go back to the original size, click “100%”. This can also be done by selecting “Zoom” under “Perspective”.

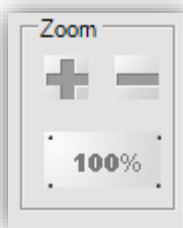


Figure 30 : Zoom

The same can be done in the “Edit Building” window.

6.4. Reset Output

To reset the settings (zoom, rotation and shift), click “Reset”. The last selected view is restored.

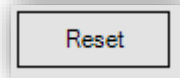


Figure 31 : Reset

6.5. 3D/2D Visualization

To change the view, select the 3D or 2D visualization.

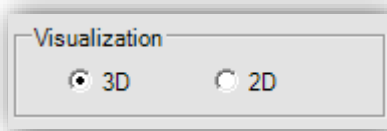


Figure 32 : Visualization

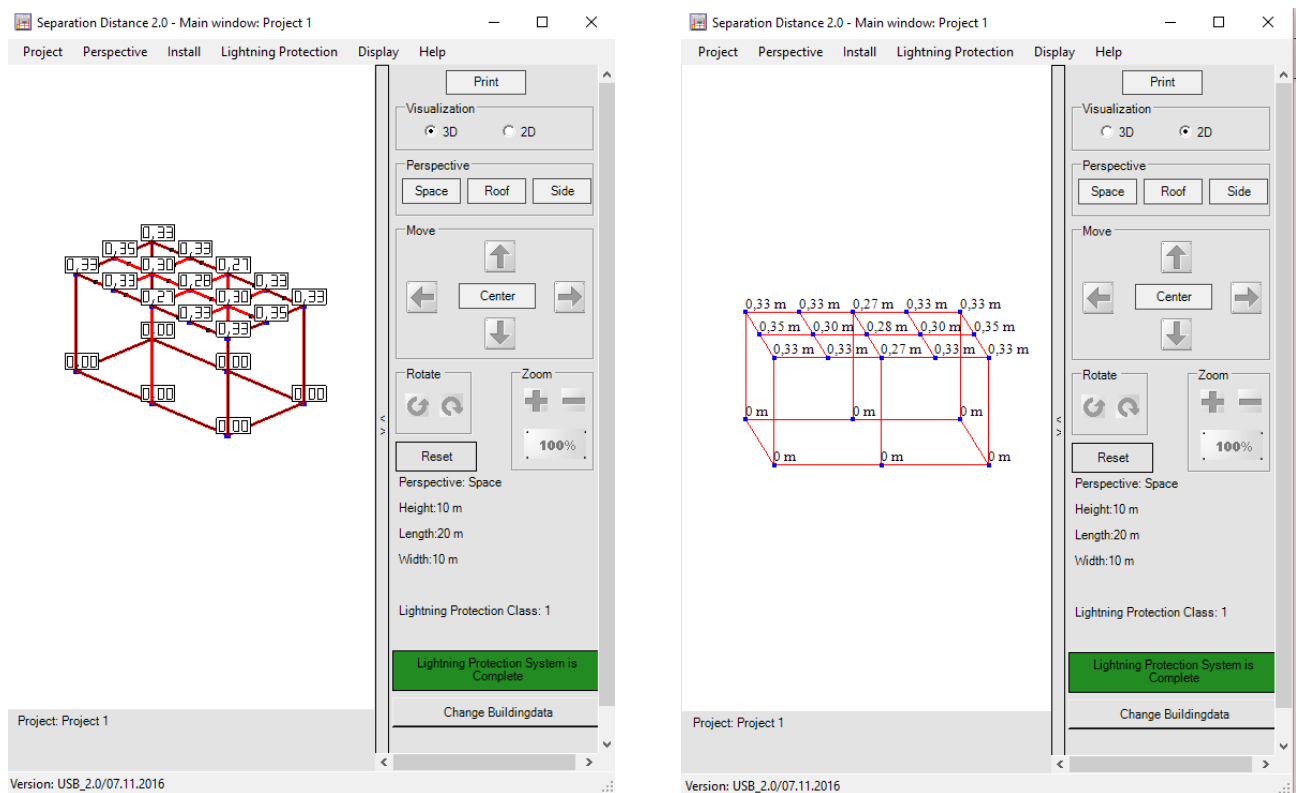


Figure 33 : Switching between 3D and 2D

6.6. Perspectives

Six perspectives are available in “Specific perspectives” under “Perspective” :

- space,
- roof,
- left,
- right,
- front,
- back.

On the right side of the window, there are three choices of perspective (Space, Roof and Side).

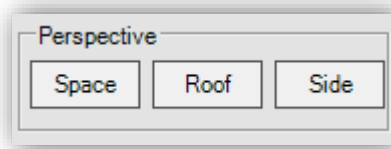


Figure 34 : Perspective icons

Note : In 2D, only the three perspectives (Space, Roof and Side) are available.

6.7. 3D - Control

As mentioned, it is possible to select any perspective in 3D visualization. It is also possible to change the angle of visualization by holding the left button down of the mouse.

7. Separation Distance Calculation

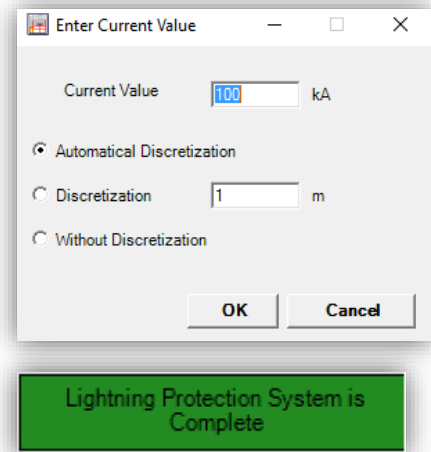
7.1. Start a calculation

7.1.1. Complete the Lightning Protection System

If you have already added a Lightning Protection System, select “Lightning Protection System is Complete” under Lightning Protection. The “Enter Current Value” window opens.

Enter the current value and choose the type of discretization, then click “OK” to continue. The program calculates all the intersection points of the LPS.

***Note :** You can only use “Lightning Protection System is complete” when there is a LPS on the building. In this case the button “LPS is complete” is green.*



7.1.2. Current Input

In the “Enter Current Value” you can choose the type of discretization :

- Automatic discretization ;
- Discretization with any distance ;
- Without discretization.

Once you have chosen the type of discretization, click “OK” to continue.

***Note :** The current value is automatically put independently to the lightning protection class. However, this can be changed if required.*

7.2. Discretization

The calculation of the separation distances do not give any information about the separation distances between two intersection points. That is why the discretization is used. It generates points between the intersection points to simulate lightning strokes.

7.2.1. Discretization with given distance

With this method discrete points on the roof are generated with the help of the discretization distance given by the user. The separation distances are calculated in all points. Now if you choose a very fine discretization, the calculation can strongly stretch in the length, because a high number have to be executed in separation distance calculations.

7.2.2. Automatic discretization

The separation distances between two intersection points always have a comparable shaped course. Hence, with the automatic discretization no more points need to be calculated.

Therefore, the automatic discretization is clearly efficient while locating the maximum separation distances between two intersection points as a fine discretization after 7.2.1.

8. Output – separation distance

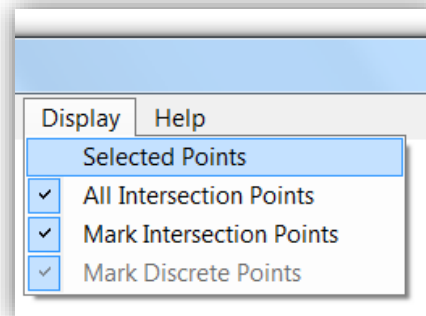
In the default setting all separation distances are given after the end of the calculation. In addition, all intersections- and discrete points are marked.

8.1. Display of the separation distances

You can display :

- The selected points ;
- All intersections points ;
- Marked Intersection points ;
- Marked Discrete points.

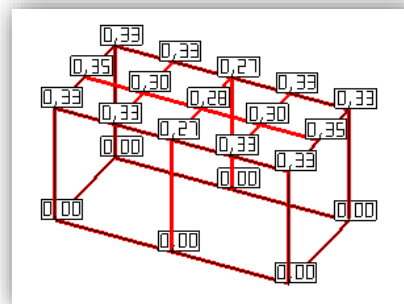
Click on “Display” and choose the points you want display.



to

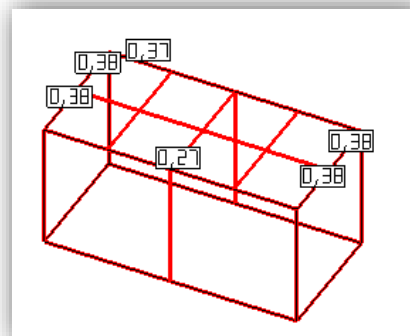
“All intersection points”

Means that all the separation distances of the intersection points are displayed.



“Selected points”

means that the 5 greatest values are displayed as standard. To select the points, click with the left button of the mouse on the discrete points or the intersection points. The separation distances of these points will be displayed. To remove the separation distance, click on the point. As long as the lightning protection does not change and no calculation is executed, the choices will be kept.



8.2. Display marked intersections

To mark all the intersections, select “Mark Intersection Points” under “Display”. Deselect to remove.

Note : Intersection points are marked as big blue rectangles.

8.3. Display discretization

In addition, it is possible to display the discrete points. First, you need to calculate the discretization (see 7.2), select “Automatic Discretization” or “Discretization”. Once the calculation is done, click on the points and the values of the separation distance appear. You can also select “Mark Discrete Points” under “Display”.

Note : Discrete points are marked as small blue rectangles.

9. Options

If you need to change the program settings, click on “Settings” under “Project”. The “Settings” window opens.

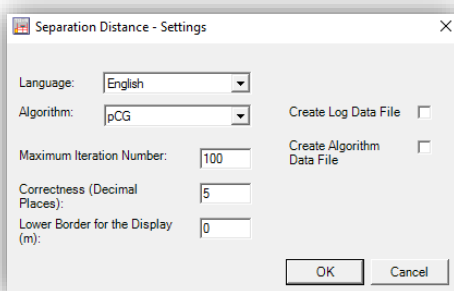


Figure 35 : Settings window

9.1. Languages

Five languages are available :

- Chinese.
- English ;
- French ;
- Portugese ;
- Spanish.

Click “OK” to apply the changes.

9.2. Algorithm

If you wish to change the algorithm of the calculation of the separation distances, select the desired algorithm and click “OK”. The iteration number and the correctness can also be modified.

Note : *Nevertheless, we recommend you to leave the settings*

9.3. Output

It is possible to give a lower border to the calculation of the separation distance. For example, if you enter a lower border for the display of 0.02, only the calculated separation distances which are greater than 2 cm are given.

9.4. Log-Files

It is possible to write all the carried out actions in a log-file. The same can be done for the calculation (algorithm-file). To do that select “Create Log Data File” or “Create Algorithm Data File”. These files will be saved in the directory of the program. They ends with x_log and _x.txt (x is a number between 0 and 10). If more than 10 files were already created, the first file will be overwritten.

10. Standard projects

There are 5 standard buildings (select “New” under “Project”). These standard buildings can be modified.

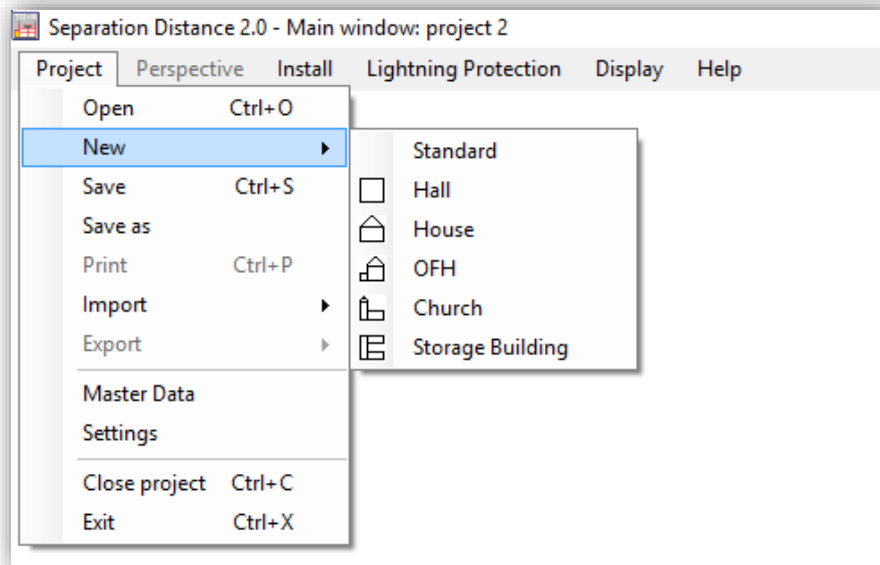


Figure 36 : Standard buildings

10.1. Standard building hall

Select “New” under “Project”, then click “Hall”. The “Example Building – Data Entry” window opens. Enter the project name, the building name and the dimensions. You can choose a Lightning Protection System. Click “OK” to continue.

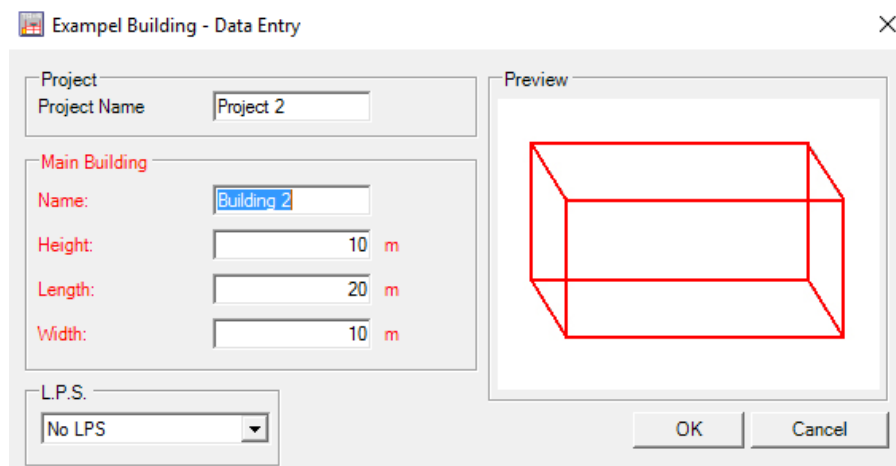


Figure 37 : Standard building hall data

10.2. Other standard buildings

The other standard buildings are not much described here, because these only differ by additional parts of the building. That's why only the input windows are introduced here.

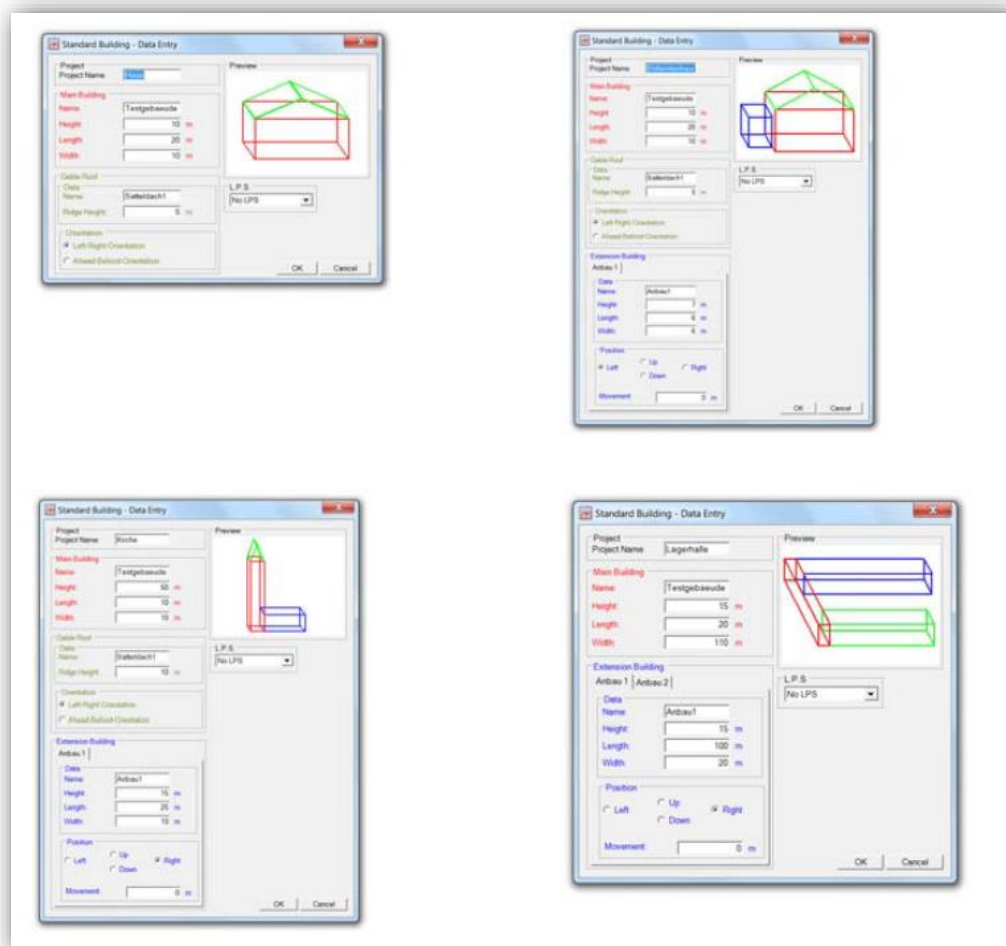


Figure 38 : Other standard buildings

11. Import/Export

11.1. In the main window

11.1.1. Export

The program offers several possibilities to export. Select “Export” under “Project”, then choose between “Figure”, “Figure with Data” or “Project”.

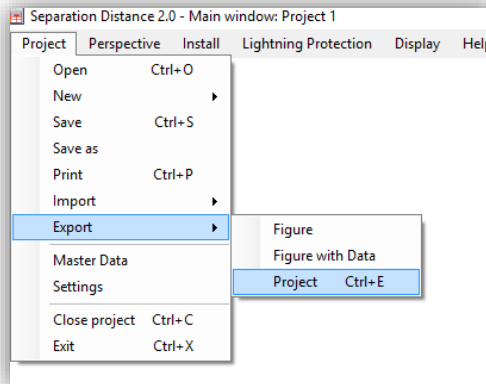


Figure 39 : Export a project

Figure : You export the current cutting of the sign area.

Figure with data : You export the current cutting of the sign area with the data.

Note : The data are stored in the picture and it includes :

- Project name + Date ;
- Client/Construction Supervisor/Object ;
- Main Building Data and ;
- Lightning Protection Class.

Project : You export the current project as a “.bli” file export. Then, it can be imported on another system.

11.1.2. Import

Select “Import” under “Project”, then click “Project”.

Note : Imported projects ends with “.bli”

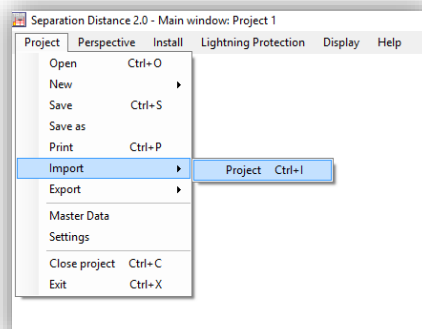


Figure 40 : Import a project

11.2. Main window

11.2.1. Export

You can export a project. The exported file ends with “.bli” and it can be imported on another system.

11.2.2. Import

The program offers the possibility to import a project in the main window. Select “Import” under “Project”, and click “Project”.

Note : *Imported project files ends with “.bli”*

11.3. Important tip to import

It is possible to import projects from older program version, however, they may not be importable. Nevertheless, it is safe to try to import an incompatible project”

12. Printing

To print, click “Print” on the upper right side of the window. The “printing” window opens.

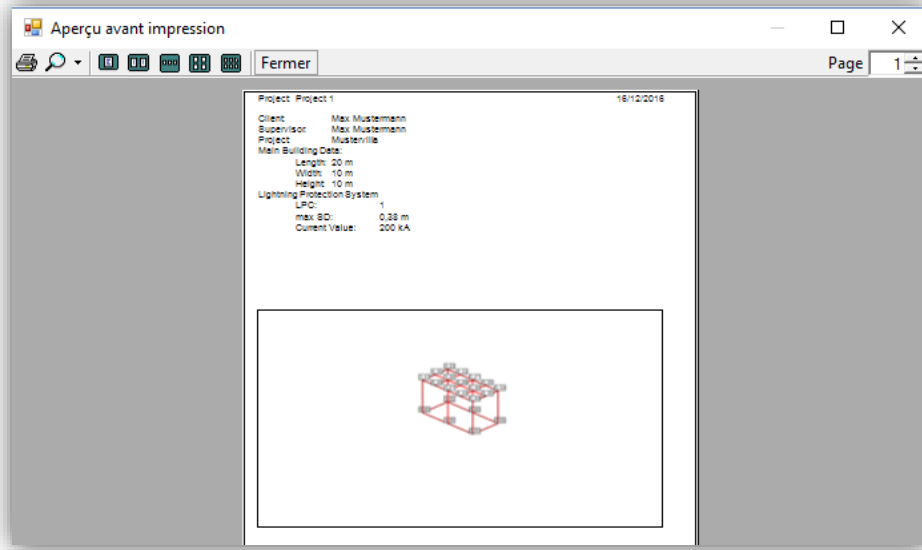


Figure 41 : Printing window

Note : The current screen window from the main window is printed out. It can be printed only if there is at least a building.

13. Appendix

13.1. Shortcuts

13.1.1. Edit building

Add :

- **Ctrl + W**: Add a horizontal conductor
- **Ctrl + S**: Add a vertical conductor
- **Ctrl + F**: Add a lightning rod

Delete :

- **Del** : Delete a conductor

13.1.2. Main window

Project :

- **Ctrl + O**: Open a project
- **Ctrl + S**: Save a project
- **Ctrl + P**: Print
- **Ctrl + I**: Import a project
- **Ctrl + E**: Export a project
- **Ctrl + C**: Close the current project
- **Ctrl + X**: Exit

Zoom :

- **Ctrl+ Add key**: Zoom in
- **Ctrl+ Minus key** : Zoom out

Move :

- **Alt + R** : Move the building to the right
- **Alt + L** : Move the building to the left
- **Alt + O** : Move the building up
- **Alt + U** : Move the building down
- **Alt + Z** : Move the building to the centre

Add :

- **Ctrl + H**: Add a Main Building
- **Ctrl + N**: Add an Extension
- **Ctrl + U**: Add a Roof Protrusion
- **Alt + S**: Add a Gable Roof
- **Ctrl + R**: Add a Ring Conductor

Lightning Protection :

- F1: Lightning protection class 1 is chosen
- F2: Lightning protection class 2 is chosen
- F3: Lightning protection class 3 is chosen
- F4: Lightning protection class 4 is chosen
- F5: Treatment begins
- F6: Lightning Protection System is complete