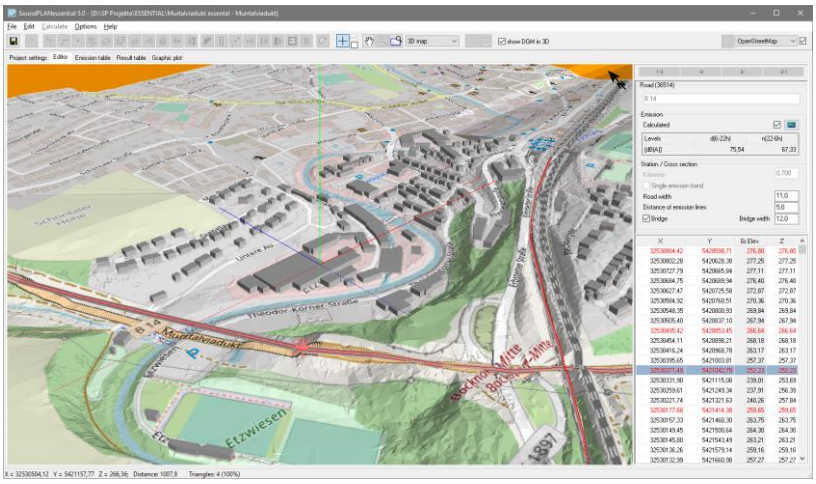
Manual

SoundPLANessential 5.1



SoundPLAN GmbH

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SoundPLANessential 5.1 - 2020

Contents

SoundPLANessential 5.1

SoundPLANessential was conceived for users who want to attain reliable tabular and graphical results of a standard case noise calculation with a minimum requirement of time.

All steps needed to complete a standard project are accessible via tabs on the main window. The project definition, with a project description and all needed settings, is on the opening page. Other tabs lead to the data editor, the calculations and the formatting of the output in tabular and graphical form.

Installation and initialization at the first call

The latest SoundPLANessential version can be installed parallel to earlier SoundPLANessential versions, older versions do not need to be un-installed.

You must have **administrator** rights for the installation. SoundPLANessential is protected by a HASP key and a customized license file (BABExxxx.007) sent by email. Double click on the installation file or insert the DVD and attach the HASP key to an USB port. The installation program will guide you through the installation.

At the end of the installation you will be asked to select the stored the license file. Make sure to use the license file supplied for the current main version of SoundPLANessential. License files are only valid for one main version number!

Select which program languages and which language versions of help file and manual should be installed.

When SoundPLANessential is called for the first time, demo projects for the various noise types are extracted into the directory „..Documents\SoundPLANessentialxx\ Demos“. Call one of the offered demo projects (SoundPLANessential always works in an open project). The next time you call SoundPLANessential, the last edited project is automatically active.

Intro to SoundPLANessential

- Create a new project using **FILE -> NEW PROJECT**.
- Select the project type (calculation of a single variant or calculation of before and after scenarios), the noise types and the time slots along with the noise limits.
- Switch to the tab index card "*Editor*." You can prepare the geometry data on the basis of a scanned and geo-referenced bitmap or by importing from DXF, ESRI Shapefile, ASCII files or OSM.

  Activate the objects in the symbol bar. Line and area type objects are finished with a double click. You can generate right-angled north oriented objects by pulling a frame with the left mouse button.

  For projects that require terrain it is advisable to produce the digital ground model (DGM) entering elevation lines and spot heights in a first step (click on the symbol button **ABACUS**  and press the start button.) All additional objects entered or imported in the future will be placed on the DGM.

  Define the properties of the objects: Building heights, receiver names, the emissions of roads and railways, or the sound power level for industrial sources as a sum level or via a frequency spectrum. When wall heights or traffic data change, enter the new values at the relevant coordinate.

  Pressing the right mouse button activates a popup menu with additional functions such as duplicate objects or insert coordinates.
- Click on the symbol button **ABACUS**  and select the desired calculation type (single points, limit lines or grid noise map).
- The source emissions are documented in the tab "*emission table*" for each noise type separately. The tab "*result table*" contains the assessment levels with the documentation of limit violations and, depending on the project type the differences between two scenarios, the contribution levels at the receivers, the spectra at the receivers for frequency dependent calculations as well as the mean propagation table for industrial sources. Use the menu **TABLES -> SETTINGS** to edit the frame widths and the fonts for all tables and to change the header and footer texts.
- The maps of the individual calculations are presented in the tab "*graphic plot*" in sub tab index cards. Single point results are displayed as small tables together with the limit lines for all time slices in one map; for grid noise maps each time slice is displayed in a separate tab.

  To zoom, rotate and move the view on your map, turn on the view selection mode with a right click and choose the appropriate option. After the operation is completed, click on the hand symbol in the top frame to deactivate the view selection mode.

With the finger-pointer symbol activated, click on the top of the map description field in order to enter the map title, on "signs and symbols" to customize the appearance of the objects, on the length scale to enter a numerical value for the scale and on the empty bottom section of the description field to select a bitmap with your company logo.

Project settings

A SoundPLANessential project consists of several files, which are stored jointly in one project folder. When you create a new task, you create a folder not a file.

Each folder that is recognized as a SoundPLANessential project is displayed with a white SoundPLAN logo and a blue background.


Select **FILE -> NEW PROJECT** to create a new project folder. Enter the name of the project folder. As a default the project title is automatically taken from the name of the project folder but can be changed. Use the fields project number, project engineer and customer to add information for the project. The description field may host e.g. the telephone numbers of the customer or other project notes.


When the program is started, it automatically loads the project last used. If you want to open another project, select it via **FILE -> OPEN** or pick it from the list of recently opened projects in the menu **FILE**.

Pressing the right mouse button activates a popup menu with additional functions such as copy, delete or pack.

Packing a project is also accessible via **FILE -> PACK**. If a program error occurs due to geometric peculiarities, you can send the project directly from here to the support via **PACK & SEND**.

Since data structures can change between two versions, projects created with an older version must be converted. Converted projects can no longer be opened with the older version.

Projects prepared with an older version are marked with a gray project folder. When you click on the project folder, you will be asked if you want to convert the project. Specify how you want to convert. Depending on the setting, the project is first packed or copied and then converted.

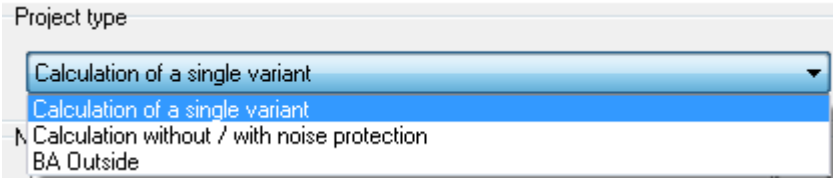
Select project type

SoundPLANessential has two project options:

- Calculation of a single variant,
- Calculation of 2 variants without and with noise control,
- [Separate module] BA-Outside - calculation of the required valued sound reduction index R'_w according to EN ISO 12354-3:2017.

If you select this project type, all other tab index cards disappear. Invoke BA-Outside via the symbol button „BA-Outside“.

Select the project type from the selection list:



When two variants are computed, an extra column with the differences of the variants is inserted in the result table. For both variants, maps are created in the graphics section.

Click on the double arrow or the button **STANDARD AND CALCULATION SETTINGS** for additional settings:

Country / Standards – to change country settings and to activate additional standards

Time slices – to toggle between two and three time slices and to change the beginning of the individual time slices.

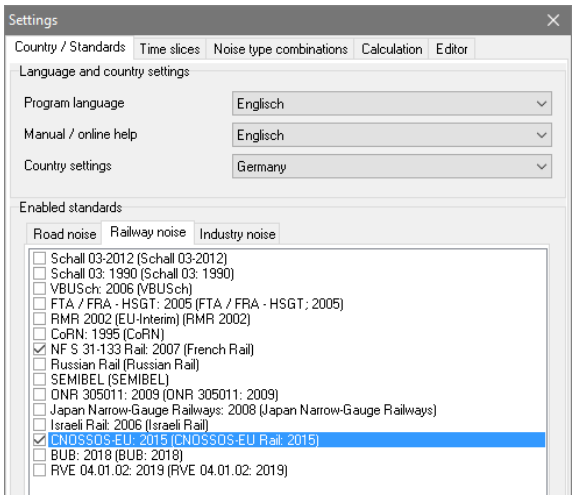
Noise type combinations – to select the noise types used in the project

Calculation settings – to check and change the settings for the calculation, see “Calculation settings” (page 50).

Editor – to define defaults for the entry of the model data

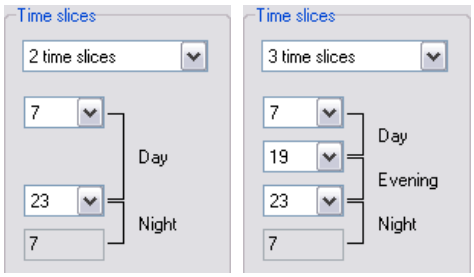
Change country settings and standards

Program language, language of help file and manual and the country settings for the standards and time slices are set to defaults according to the language of the operation system. You can change these settings if needed with the button **STANDARDS AND CALCULATION SETTINGS**, tab "*Country/standards*". The implemented standards are listed in the annex, see “Implemented standards” (page 73).



As soon as emission definitions or results are present, the settings for the noise type can only be changed, if you delete them using the buttons **DELETE EMISSION DEFINITION** or **DELETE RESULT FILES**.

Time slices and assessment



Select whether you need the emission definition and the assessment for 2 or 3 time slices and at which time the time slices day and night or day, evening, night begin. When selecting the assessment for three time slices for the noise index according to Lden additions are added for the evening (5 dB) and the night (10 dB).

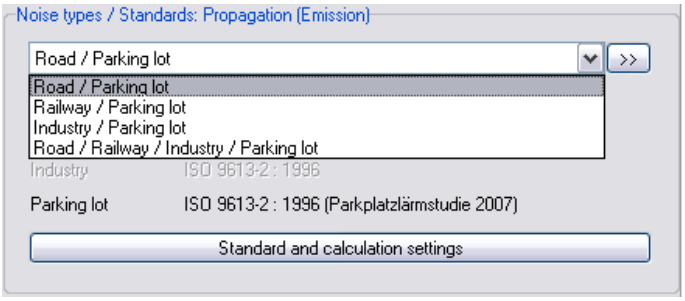
Calculations with only industrial sources (only industry / parking lot selected in the noise type combination) can be assessed according to the day/night levels, the Lden noise indices or according to user defined time slices. Additionally, the peak level Lmax can be calculated.

Noise type combinations

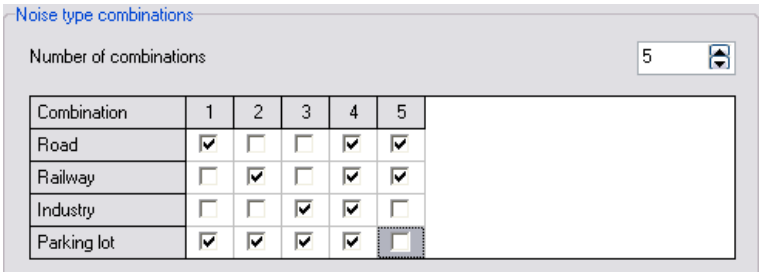
A project may contain several different noise sources (road, railway, industrial sources, parking lot), so that you can calculate and superimpose different noise

types using the same geometrical data. The combinations and calculation standards are set to defaults according to the selected country settings.

Select the noise type(s) you want to calculate in this project from the view list.



If you need others than the suggested combinations, click on the symbol button **DOUBLE ARROW** .



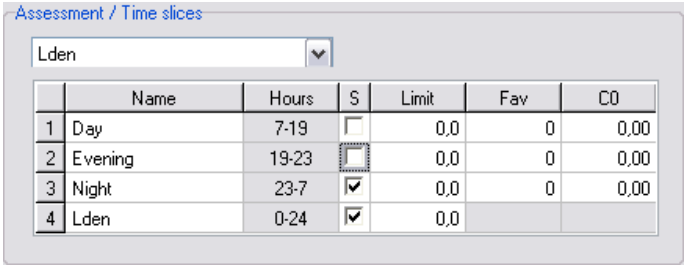
Create a new combination increasing the number of combinations or change one of the existing combinations. Use the checkboxes to activate or deactivate noise types.

Example: The investigation of the noise immissions of a road and a nearby railway line are subject of a project. The assessment levels must be calculated and documented for both noise types separately as well as superimposed for road and railway.

The SoundPLANessential project must contain the noise combinations "road", "railway" and "road/railway". Enter the geometry data and the noise sources with the combination "road/railway" and calculate the total noise levels. Switch to the combination "road" or "railway" and calculate each noise type separately. The tables and maps then only contain the results of road or railway.

Hint: If you want to use the same geometry data for different planning variants, store the project with **FILE -> SAVE AS** under a new name.

Limit values and standard dependent settings



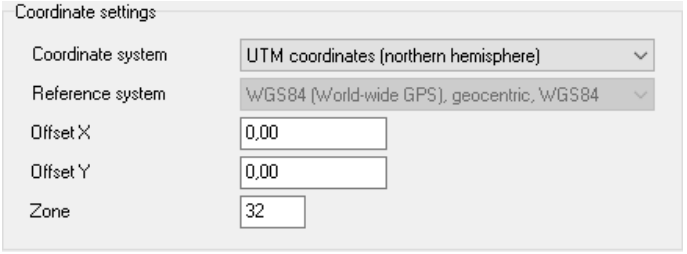
	Name	Hours	S	Limit	Fav	C0
1	Day	7-19	☐	0,0	0	0,00
2	Evening	19-23	☐	0,0	0	0,00
3	Night	23-7	☑	0,0	0	0,00
4	Lden	0-24	☑	0,0		

The project noise limits are used for the first receiver entered and are also used to draw the limit contour in the graphics display. A checkmark in the column labeled "**S**" determines, whether the time slice is displayed in the tables and in the graphics. This is useful if you calculate for example according to L_{den} and only want to show the noise indices L_{den} and L_{night} but not the intermediate products L_{day} and $L_{evening}$.

Standard depending settings: For calculations according to ISO 9613-2 enter the factor **C0** (for each of the time slice) for the calculation of the meteorological correction C_{met}.

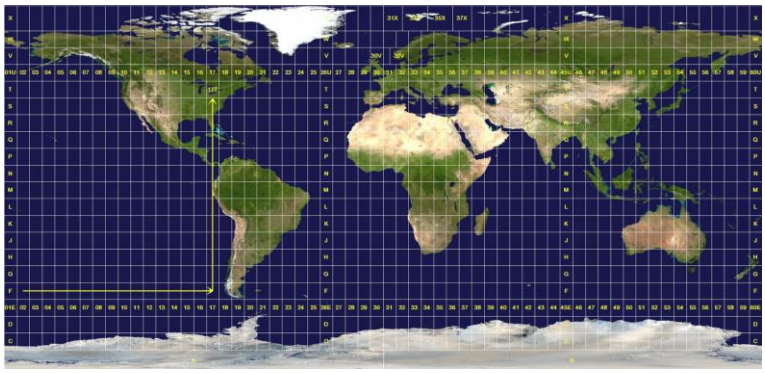
For calculation according to the French standards NMPB Routes 96, NMPB Routes 2008 and NFS 31-133 and according to CNOSSOS-EU the percentage of favorable propagation conditions is needed, enter the value in the column **FAV.**

Coordinate settings



If you want to use background images from Google Maps or OpenStreetMap in your project, you need a global coordinate system as a basis. Set UTM northern / southern hemisphere and enter the UTM zone.

For UTM coordinates, the earth is mapped in sixty 6 ° wide zones. Zone 1 is located between 180 ° and 174 ° west of Greenwich. The zones are numbered consecutively to the east. The polar regions are not covered by UTM.



Overview of the UTM zones

Photo credits: https://commons.wikimedia.org/wiki/File:Utm-zones.jpg#/media/File:Utm-zones.jpg

A missing zone or stripe specification may lead to distortions and incorrect transformations!

The website https://www.geoplaner.com/ offers a very helpful converter in different coordinate systems. For example, specify a location in your study area. The coordinates are displayed in different coordinate systems. This will allow you to quickly find out in which coordinate system the data is available.

Save as default

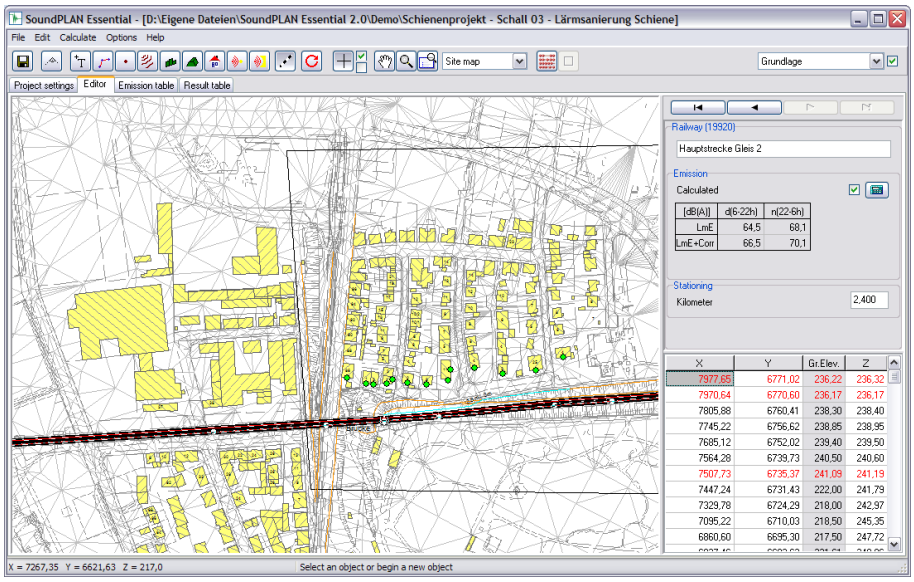
SAVE AS DEFAULT stores changes in the settings as default, so that new projects will have the correct settings and parameters.

Data entry and calculations (Editor)

Enter the noise relevant data and geometry for your project and start the calculation (single receivers, noise contour lines and grid noise maps) in the tab index card *Editor*. You can prepare the geometry data on the basis of a geo-referenced bitmap (also directly from the connection to Google Maps /OSM) or by importing from different formats.

The elevation supply works with a digital ground model (DGM) and places the objects on top of the triangulated surface.

SoundPLANessential works with global Cartesian coordinate systems or a user defined local coordinate system. The base unit is **meter**. Import data that use cm, inch or feet need to be converted. For the DXF import you can enter a conversion factor.



(1)

(2)

(1) The symbol bar on top of the graphical entry field contains symbols for entering the geometry, controls for zooming and editing, and symbols for selecting the background graphics.

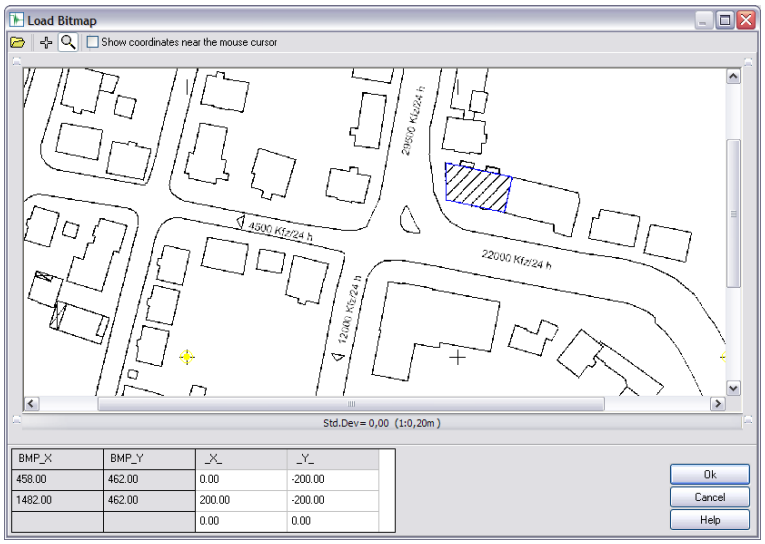
(2) In the block on the right side of the graphical entry field, the properties and coordinates of the currently active object are listed. In case an object (i.e. elevation lines) does not contain properties, only the coordinate list is displayed.

Digitizing on screen with background graphics

Digitizing on top of scanned background graphics is the most common mode of data entry unless the data are already present in a usable form in digital format. When scanning a map, the resolution and especially the color depth should not be selected too high as the operation will slow down. You can use any number of background bitmap graphics in any of the formats BMP, JPG, PNG or TIF.

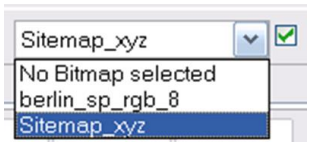
Background bitmaps must be used to establish the geo reference between the pixel formatted bitmap and the world or local coordinate system. If the bitmap already came with its geo-reference transformation, SoundPLANessential will detect it and read the geo-reference file as soon as the file is opened.

Open **EDIT -> INITIALIZE BITMAP** and open the scanned map.



The reference points should be as far apart as possible and should enclose the investigation area as much as possible. Enter world coordinates of the first reference point via the keyboard and then left click on the graphics to assign the location on the bitmap. To digitize more accurately, the first click opens an enlargement around the reference point so you can position the cursor more precisely and digitize again. Define the second reference point and click OK.

In the Editor you can switch between different background bitmaps or temporarily deactivate a bitmap. With the click box next to the active bitmap, the current bitmap can be displayed or suppressed.

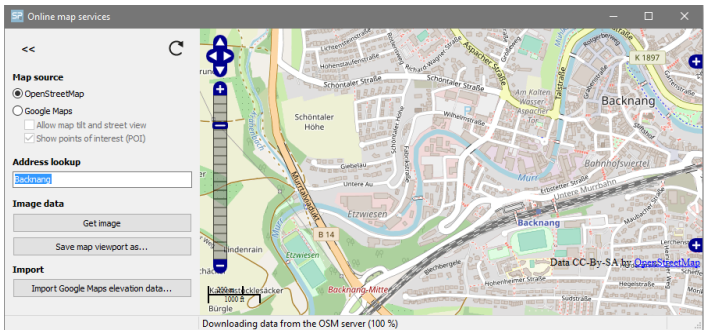


Google Maps / OSM bitmaps and Google Maps elevations

When using Google Maps, please observe their usage and licensing conditions. SoundPLAN supplies the tools but is not responsible for the licensing conditions. This is entirely the responsibility of the Google Maps user. As Google licensing may vary between countries, SoundPLAN can't even assist.

In the project settings select either UTM northern or southern hemisphere and the zone, see "Coordinate settings" (page 11).


Switch to the *Editor* and click on the icon at the top right or via **EDIT -> CONNECTION TO OSM & GOOGLE MAPS** to open Google Maps / OSM.



Zoom to the investigation area or enter the town name in the address lookup. With **GET IMAGE** the bitmap is stored in the editor. If geometry data in UTM coordinates are already available in the project, the online map services open automatically in the data area.

Elevations from Google Maps

Google Maps elevations are based on free SRTM elevation data. These have a resolution of approx. 90 m. This means that every 90 meters is a measured elevation point, between which a spline interpolation is performed. Changing topography cannot be reproduced with these elevations. For smaller, relatively flat areas, these elevations offer an alternative.

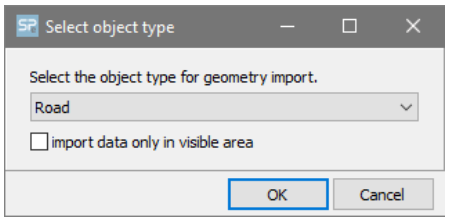
In the Online Map Services window, click **IMPORT GOOGLE MAPS ELEVATION DATA**; the elevations of the selected area will be imported and meshed directly into a digital ground model.

Import

The model geometry can be imported in the formats of DXF, ESRI Shape file, ASCII or OSM XML. The objects must be organized in individual files or layers (DXF).

Properties in Shape files, OSM XML or ASCII files will not be taken into account.

Select the object type for which you want to import geometry. In the property block, you can define properties that are valid for all imported objects. Call **FILE -> IMPORT** in the *Editor*. If necessary, you can change the object type again here - the standard properties used by SoundPLAN as default are transferred to the objects during import.



With the checkmark **IMPORT DATA ONLY IN VISIBLE AREA** you can restrict the import to the section selected in the editor.

Select the import file and click OK. Afterwards specify the properties for the different objects.

As **DXF files** contain different layer, an additional window is supplied to select the appropriate layers for import. Use the ***shift*** key or the ***control*** key to mark multiple layers of the same object type for import. The assignment to the different layers is lost.

When importing a DXF-file you can enter a conversion factor if the drawing was for example set in millimeter or feet.

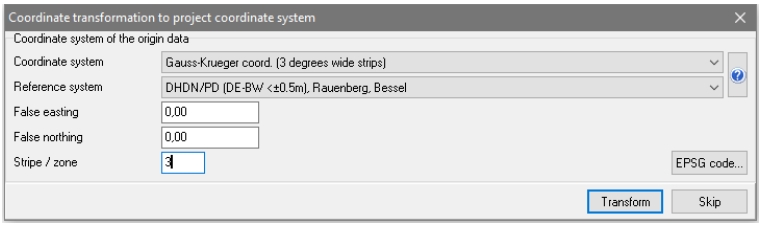
For the import of **OSM XML data** first go to the website www.openstreetmap.net or another page from which you can save OSM XML and select the section from which you want to import geometry data.

Be careful not to select a section that is too large, as the computing time and the processing time are greatly increased by unnecessary amounts of data!

During the import, **building facades** are filtered within a band width of 1 cm, in order not to get unnecessary façade parts.

Transformation during the import

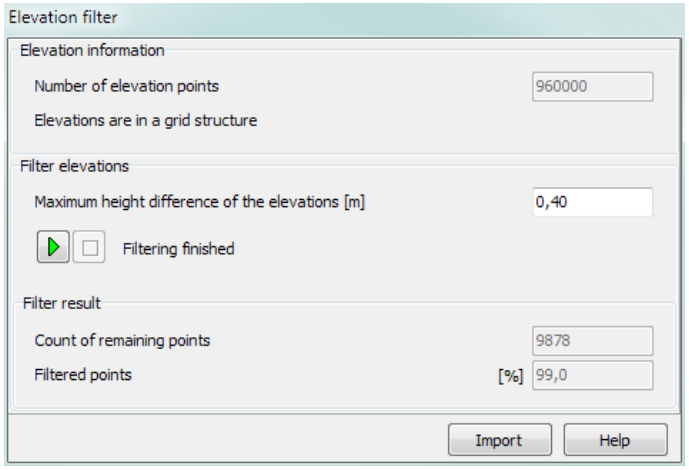
To make it possible to use data that is available in another coordinate system than UTM together with Google Maps or OSM bitmaps, you can transform these mostly country-specific coordinates to UTM if a coordinate system is selected in the project settings.



Enter the source coordinate and reference system and if needed the stripe or zone in the automatically opened dialog.

Filter elevation points prior to import

If you have elevation spot heights to be imported as ASCII or DXF data, they often are present as either a grid or a cloud with very small spacing (for example 1x1 [m] grid with little variance in elevations). The amount of elevation information far exceeds the need to correctly model the terrain. As the number of elevation coordinates has a big influence on the size of the DGM and also on the calculations, it becomes advantageous to filter the elevation information and thus minimize the number them.



In the dialog that opens after selecting the import file, the number of elevation points and the structure (grid or cloud) is presented as the file information. If you want to keep all spot heights 1:1, click on **IMPORT**. If you want to filter the data, you need to enter the maximum deviation between the elevation data given in the import file and the elevation model that will be used after filtering the data. Enter the max difference in [m]. With the pre-set max deviation of 40 cm a tolerance of ± 0.40 m is guaranteed between the raw data and the model to be created. Click on the green arrow to start the filtering and import. In the filter result you get the information how many elevation coordinates will remain and how many percent of the original data will remain.

Digital Ground Model

A Digital Ground Model (DGM) is the basis for creating a 3D noise model. If you haven't calculated a DGM, SoundPLANessential automatically generates a DGM from the geometry data and interpolated outside positioned spot heights and uses it for the calculation.

The DGM is generated from elevation lines and spot heights, optionally road and railway edges can be evaluated for the DGM. If you use this option, emission lines in changing terrain can no longer be spilled from the terrain. If railways are evaluated, the DGM parameters set in the calculation settings are used.

Enter the DGM relevant data and then invoke the calculation of the DGM via the "abacus" symbol button (**CALCULATE -> CALCULATIONS)** and click **START**.

All objects that are now entered or imported are automatically placed on top of the DGM. If the DGM triangles are visible in the background, objects moved to a new location will automatically adjust to the elevation at the new location.

Deactivate the DGM triangles via **EDIT -> USE DGM**, if, for example, you want to create a wall parallel to a road or railway line and want to keep it the height of the original object it was derived from.

The terrain elevation can be assigned manually via **EDIT -> SET CURRENT OBJECT ON DGM** or **EDIT -> SET ALL OBJECTS OF CURRENT OBJECT TYPE ON DGM**. Check the model data in the 3D-plan view.

Coordinate list

The coordinate list shows the x and y coordinates and depending on the object type the base height or the relative height. The terrain elevation of the objects is only displayed for information purposes but cannot be edited as it is either 0 or it is derived directly from the digital terrain model.

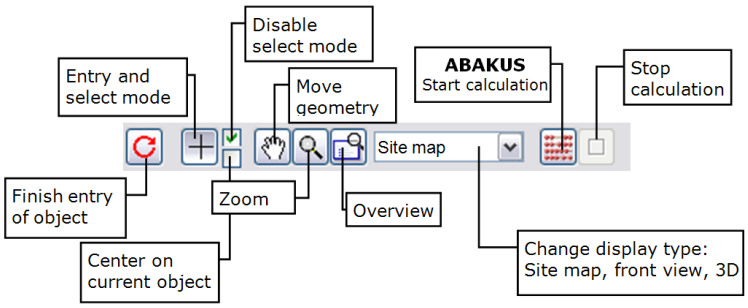
In the coordinate list you can:

- correct x and y coordinates
- Enter the z coordinate for several points. (Keep the Shift-key pressed, highlight the points with the arrow keys and enter the value.)
- Insert coordinates with the right mouse button **-> INSERT POINTS**. The point is inserted in the middle of the two coordinates, the elevation between both points is interpolated. (This is for example useful to divide a wall in smaller, regular sections.)
- Delete coordinates (***Del*** key)
- Delete changes in the property definition within roads, railways, walls and berms (right mouse button -> **DELETE PROPERTES**).

If a line contains only a single coordinate after deleting, then the entire object is deleted. This is the same for areas having only 2 coordinates.

Edit objects and object properties

The following symbol bar depicts the entry and edit functions in SoundPLANessential:



Enter objects clicking on the points describing the object with the left mouse button. North oriented, rectangular objects can be entered pulling open a frame with the left mouse button. You can also enter coordinates with the keyboard in the coordinate list or correct them afterwards. To enter objects, the mode „select object or create new object“ must be active.

End the data entry for the line and area objects by double clicking or use the symbol button **FINISH OBJECT** (F2). For buildings entered with the right-angle mode, you can close the building with a double click at the third coordinate; the fourth coordinate will be set by the program and the building will be closed.

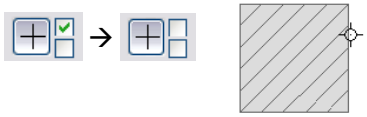

The **crosshair cursor** is visible when entering objects. If the crosshair cursor is close to another object …


… it will change its appearance into the **selection cursor** to select the object and display its coordinates and properties on the right side.

Hints:

- If you want to digitize new coordinates but other objects are too close and the cursor changes, disable the selection cursor in the checkbox "disable select mode".
- If objects are stacked on top of each other and the wrong object is activated, click on the symbol button of the desired object type in the symbol bar. The active object type is always found first.
- Use the navigation bar above the properties to move from object to object within the object type selected. Use this feature to check properties and coordinates of the objects.

- If you have started digitizing a new object but meant to activate an existing object, pressing the ESC key will delete the new object if it has not yet been finished.
- If you want to place an object directly at the edge of another (e.g. for terraced houses), disable the selection cursor in the checkbox "disable select mode". The cursor changes to a capture circuit and snaps the edge or the corner of the previous object:



- When entering new objects, points and lines of existing objects can be captured. If the cursor comes close to an existing point or line, the cursor changes to a capture cursor that captures the coordinate. If the first point of the new object is already to be captured, the selection mode must be switched off (upper check mark next to the input cross symbol).

The symbol button **OVERVIEW** zooms out to display all entered objects. The "hand" symbol moves the data; the "magnifying glass" with left click or right click zooms in and out.

Even if a large bitmap is active in the background, you can still use the symbol button **OVERVIEW** to zoom out to the entire size of your investigation area. The program will maximize the already entered model. If you want to enter data outside the area, click on the "hand" symbol to move the view port or use the "magnifying glass" and right click to decrease the scale of the plan and thus move the extended area into view.

The mouse wheel functions are available in addition to the symbol buttons: "Turn mouse wheel" zooms the data, "keep mouse wheel pressed" moves the geometry. Additionally, press the ***Ctrl***-key to rotate the data.

If the checkbox "center to current object" is checked, the geometry moves and the object is displayed in the middle of the screen.

Selection of multiple objects

With the pressed ***Ctrl*** key and a **left** click on the object, multiple objects are marked. As an alternative you can pull a frame with a pressed **right** mouse button around the objects – all objects that have at least one coordinate within the frame are marked. Marked objects can be deleted jointly (popup menu right mouse button or ***Ctrl+Del***), they can be moved (by moving the pink diamond with the left mouse button) or rotated (***Ctrl***+ left mouse button on pink diamond).

Keep the ***shift*** key pressed and pull open a frame with the **right** mouse button to only select the objects of the current object type. With pressed ***shift*** and ***Ctrl*** key additional objects of this object type can be selected (pull open a frame or left mouse click).

If multiple objects of the same type are marked, it is also possible to jointly modify the objects properties. This however is not possible for objects that have the ability to change properties within the object (road, railway, wall or berm).

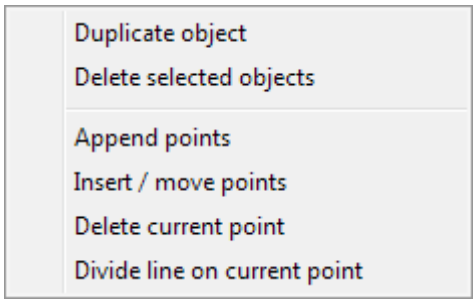
Modify and delete objects

Move object(s): The pink diamond appears as soon as at least one object is activated. Move the cursor to the diamond, the shape changes to the move cursor. Selected objects are moved with the left mouse button pressed.

Rotate object(s): The pink diamond appears as soon as at least one object is activated. Keep the ***Ctrl-key*** pressed and move the cursor to the diamond, the shape changes to the rotation cursor. Selected objects are rotated with Ctrl +left mouse button pressed.

When objects are moved or rotated, they are automatically re-referenced to the DGM. If the DGM is deactivated, the object elevation (z-coordinate) is not updated to conform to the new position.

The objects can be further edited with a right mouse click:



Duplicate object: Right click on the object you want to duplicate. **DUPLICATED OBJECTS** are positioned at a slight offset to help with placing it. The duplicated object is activated and can be moved with the left mouse button pressed.

Objects can be deleted using the popup menu **DELETE SELECTED OBJECTS** or the ***Ctrl+Del key***. Single coordinates are deleted in the graphics window by right clicking and selecting the option **-> DELETE CURRENT POINT**. It is faster, however, to delete a coordinate in the coordinate list using the **Del key**.

APPEND POINTS is only active for line type objects so additional coordinates can be digitized at the end of the object. Select **INSERT/MOVE POINTS** to move single coordinates or insert coordinates at the cursor position. The cursor will change to an arrow with a small „+“ sign.

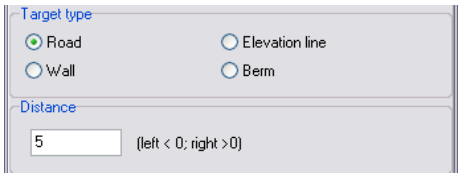
Divide line objects: Go to the coordinate, where you want to divide the line with the right mouse button and select from the popup menu **DIVIDE LINE AT THE CURRENT POINT**. The new object gets the properties that are valid at the point where the object is divided. Lines can only be divided if both line parts afterwards have more than 2 coordinates.

Tools for the data entry

Create receivers: EDITOR -> CREATE RECEIVERS AT SELECTED BUILDINGS automatically positions one receiver in the center of each façade with a length larger than 1 m.

The receiver name is generated with a consecutive number from the building name. The number of floors is calculated from the building height. If more than one building is selected, the receivers are only created for main buildings. If only one single building is active receivers can also be created for auxiliary buildings.

Parallel line object: Generating a parallel line object is useful to generate a wall or berm parallel to roads or railways, a parallel second road or railway axis or elevation lines parallel to a road or railway axis. Select the base object and select **EDIT -> PARALLEL LINE OBJECT**.



Select the target type (wall, berm, elevation line or the base object type) and enter the distance for the new object. Values >0 will create a parallel line object to the right of the original object and values <0 will create the parallel line object to the left of the original object as seen in the data entry direction.

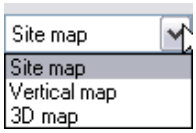
Parallel roads or railways inherit the object properties from the original object.

If a DGM was calculated, both the new object and its terrain elevation are adjusted to the DGM as soon as the DGM triangles are visible on screen. If you want to generate the parallel object with the same z-component of the coordinates as the original, deactivate the DGM display with **EDIT -> USE DGM**.

Take over limits to selected receivers: Select the receivers and invoke **EDITOR -> TAKE OVER LIMITS TO SELECTED RECEIVERS.** The limits you entered in the project settings are taken over to the receivers.

Display types: Site map, projection, 3D-Model

The geometry data is entered in the site map. It is always advisable to review the integrity of the data model in 3D or using the projection (vertical map) via the selection list.



To toggle between site map and 3D you can also use ***F10***.

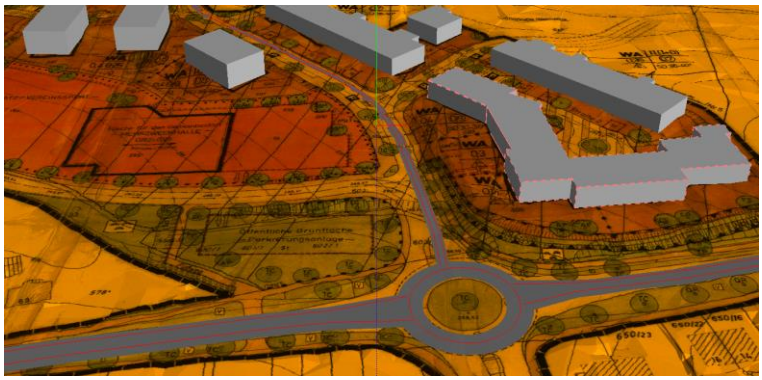
The object properties of a selected Object can be edited in all display types if the selection mode is active.

Use the **mouse wheel** to freely move and zoom in the model data:

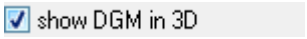
- Move mouse wheel: Move the world
- Rotate mouse wheel: zoom in and out

Only for the 3D map:

- ***Shift +*** move mouse wheel: change distance
- ***Ctrl +*** move mouse wheel: Rotate and tilt the world or light

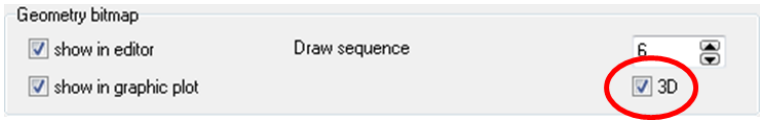


The **presentation of the DGM's and geometry bitmap** in the 3D-Plan can be activated or de-activated.

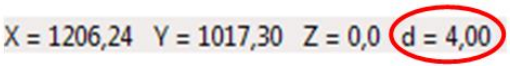


Hint: The color with which the DGM is painted is set in the object type „elevation line".

If a geometry bitmap is in the background in the *Editor,* it can also be displayed in the 3D map. Please activate the check box **SHOW IN 3D** in the menu bar of the 3D map and the check box **3D** in the object type geometry bitmap.



Distance indicator in the site map: The distance between the current cursor position (in world coordinates) and the coordinate last digitized is presented in the status bar in [m].

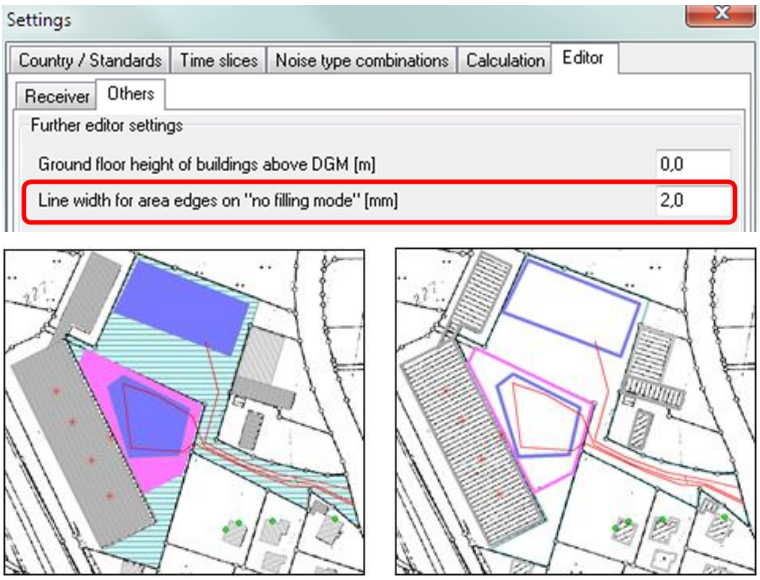


You can specify that the distance to the previous input point is displayed at the cursor (previously only in the status line). **OPTIONS -> SETTINGS**, tab index card *Editor*, sub tab *Other*, check box **DISPLAY DISTANCE AT CURSOR**.

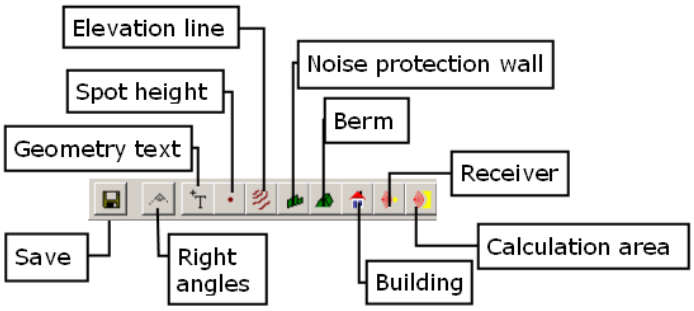
Hint: The more you zoom into the plan the more exact you can define the spacing.

In the symbol bar of the site map, the **display of the area fillings** can be switched on and off for all objects together. Suppressing the fill may be helpful when digitizing on top of a background bitmap.

Under **OPTIONS -> SETTINGS**, you can specify the line width to be drawn if the area fillings are not displayed in the tab index card *Editor -> Others*.



Objects for all noise types

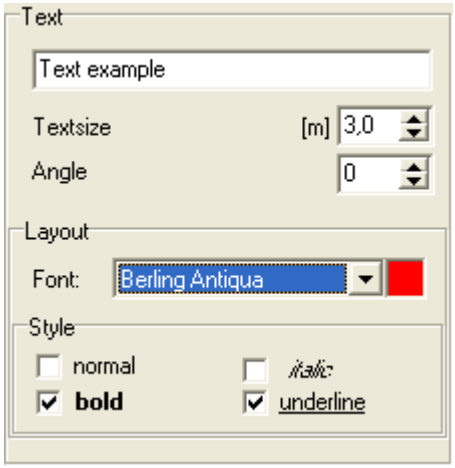


Click on the symbol button for the desired object and enter the coordinates.

Hint: Take advantage of the fact that the object properties are always taken from the object last entered and enter similar or identical objects one after the other. This speeds up generating the model.

Text

Texts are used to write descriptions or annotations for the graphical output (e.g. source name, house number). The texts are linked to the entry coordinate.



Enter the text, the text size and if needed an angle and the parameters for the layout and the style of the text.

General line

No properties. You can for example import all lines from a DXF file to the object type "general line" and digitize the needed objects similar to digitizing them from a background bitmap.

Deactivate the checkbox “select objects” when digitizing the objects.

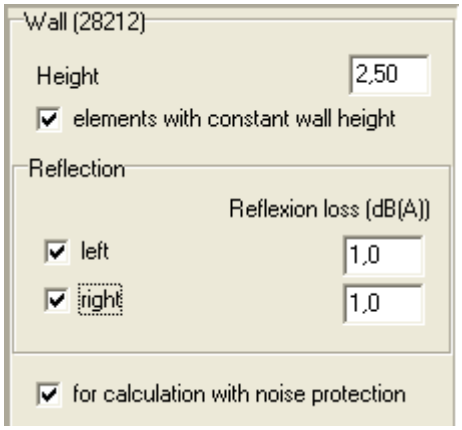
After finishing digitizing, you can hide the lines via **OPTIONS -> OBJECT TYPES.** Deselect **SHOW IN EDITOR** or use them as background data in the graphics plot as background data.

Elevation points, Elevation line

Elevation points and elevation lines supply the DGM with elevation information. The DGM is needed to calculate the mean height above ground (ground absorption) and the sound diffraction.

Noise protection wall

A noise protection wall is described with its base line, the wall height and the reflection loss depending on the material of the wall.



The screening edge results from the wall height above the base line. Walls with a wall height of 0.0 meters are already considered for screening (screening edge = base line).

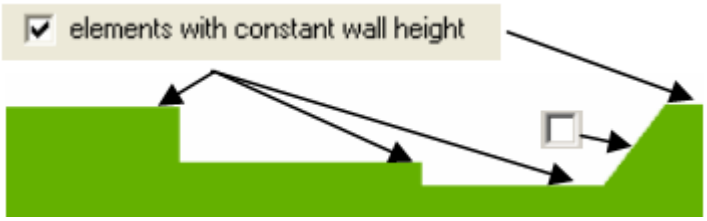
The reflection loss to the right and left is set in data entry direction. The following reflection losses can be taken as standard (the values come from the RLS-90):

Wall type	Reflection loss
Acoustically hard surfaces (concrete, glass)	1 dB(A)
Absorbent noise protection walls	4 dB(A)
Highly absorbent noise protection walls	8 - 11 dB(A)

If you do not want the wall to be calculated as a reflective object, uncheck the reflection marks for the left and the right side.

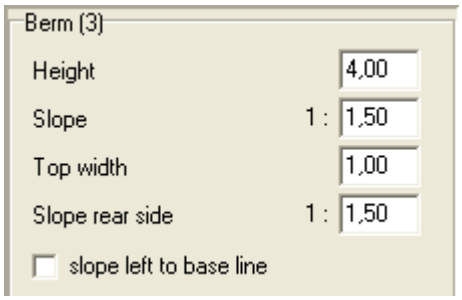
The height of the wall can change in the course of the wall. The coordinates in the coordinate list where the properties change are marked in red. In the editor-graphics, those coordinates are marked with small double circles.

Click on the mark for **CONSTANT WALL ELEMENT** if you want to set a height jump at a certain coordinate.



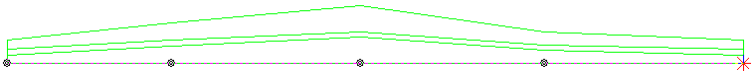
For the project type „Calculation without / with noise control“ you can also specify if the wall is a planned wall that is to be disregarded in the status quo calculation „without noise control.”

Berm



A berm is digitized at the base of the berm. The screening edges are generated from the properties slope, berm height and top width.

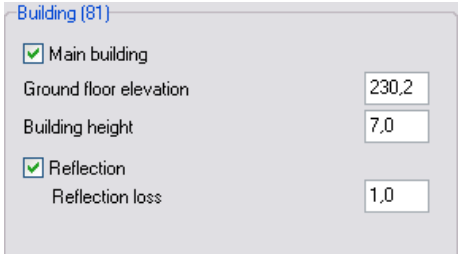
The height of the berm or other properties can vary; the screening edges are automatically adjusted. The coordinates in the coordinate list where the properties change are marked in red. In the editor-graphics, those coordinates are marked with small double circles.



For an entered berm base line (lowest line), the program calculates the screening lines and contours of the berm.

For the project type „Calculation without / with noise control“ you can also specify if the berm is a planned berm that is to be disregarded in the status quo calculation „without noise control.”

Buildings



A building is described with the height of the of the ground floor above sea level, the building height and the reflection loss. (Reflection loss = 1 for smooth facades, loss = 2 for structured facades). If you do not want reflections to occur on a building, deactivate the checkmark **REFLECTIONS**.

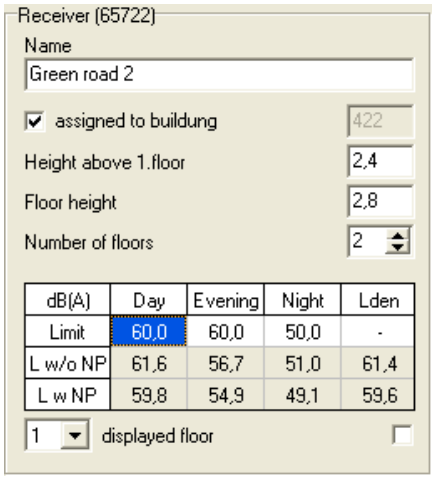
The checkmark **MAIN BUILDING** is to assign a layout for the graphic plot: "Main building" (e.g. residential) and "auxiliary building" (e.g. garages). Define the layout via **OPTIONS -> OBJECT TYPES**.

Receivers and point sources can be assigned to the buildings.


Corners of buildings form right angles and are calculated this way by default (Right angle mode (***F11***)) unless the right-angle mode is deactivated. When entering buildings, it is advisable to start digitizing with the longest side. The right-angle mode can be (de)-activated while entering a building.

Receiver

Receivers are entered to predict the noise level at a specific location, e.g. building, property border or measurement location. The receivers can be located in the free field or attached to buildings. For receivers attached to buildings, the last reflection on its own building is suppressed.

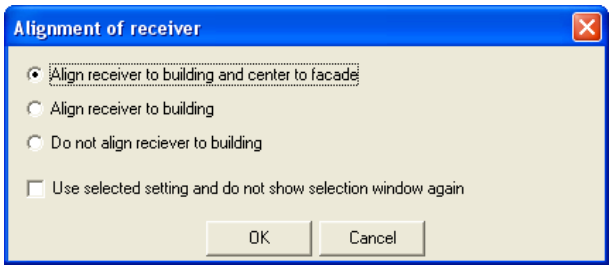


The height of the lowest calculation point for receivers attached to a building is entered in **HEIGHT ABOVE GROUND FLOOR**; for free field receivers in **HEIGHT ABOVE GROUND**. A receiver (both free field and attached to a building) can have several floors, i.e. the noise levels are calculated in different heights, depending on the **NUMBER OF FLOORS.** The spacing between the calculation points of a receiver is defined in **FLOOR HEIGHT**.

If a receiver is in the vicinity of a building, the cursor changes to the Capture Cursor.

Capture-Cursor

You can decide where to locate the receiver within the capture radius.



If a building was named with road name and house number, this name will be transferred to an assigned receiver, otherwise the name of the previously entered receiver plus a consecutive number is used as default name.

If a receiver is placed at a common façade of two buildings, the receiver will be assigned to the higher building.

Receivers can also be automated assigned to buildings with **EDIT -> CREATE RECEIVERS AT SELECTED BUILDINGS**.

After the calculation, the noise level for the selected floor is presented. For the project type „Calculation without / with Noise Control“ both levels are presented. If the box to the right is checked, a level chart is also presented in the editor.

Default settings for the receivers and the description of the floors can be changed via **OPTIONS -> SETTINGS**, tab "*receivers*".

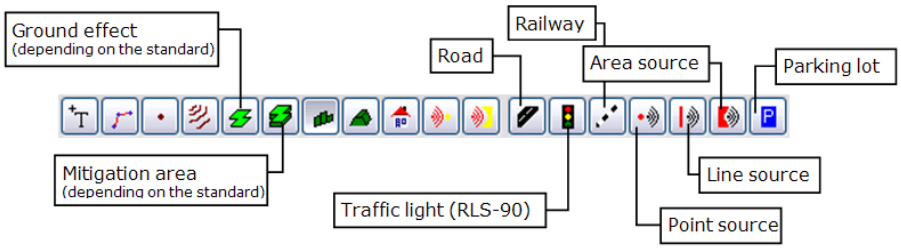
"Use rest hours" is a special checkbox for calculations according to the German TA Lärm.

Calculation area

The calculation area defines an area in which the noise levels for a receiver grid are calculated (calculation of limit contour lines and grid noise maps). If no calculation area is present, the area is set by the min/max coordinates of all objects. This may lead to longer calculation times because the area may be bigger than needed.

Objects for the different noise types

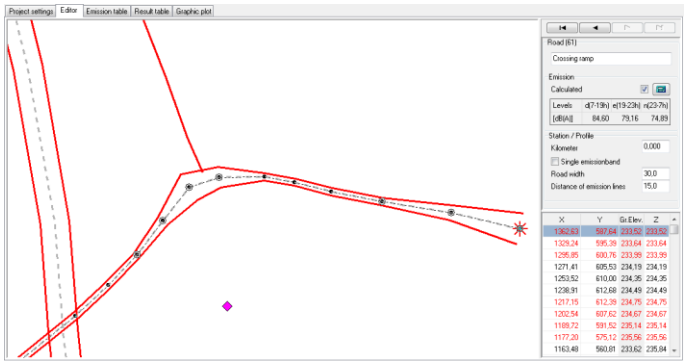
Depending on the noise type, there are different or additional objects at your disposal to create the acoustical model. (For example, ground effects for industrial noise.)



Road noise

Enter the road and define the emission. The reference elevation is the top of the roadway. The software automatically sets the elevation of the emission band according to the definition in the selected standard.

The road properties can change in the course of the road (width or emission level). The coordinates in the coordinate list where the properties change are marked in red. In the editor-graphics, those coordinates are marked with small double circles.



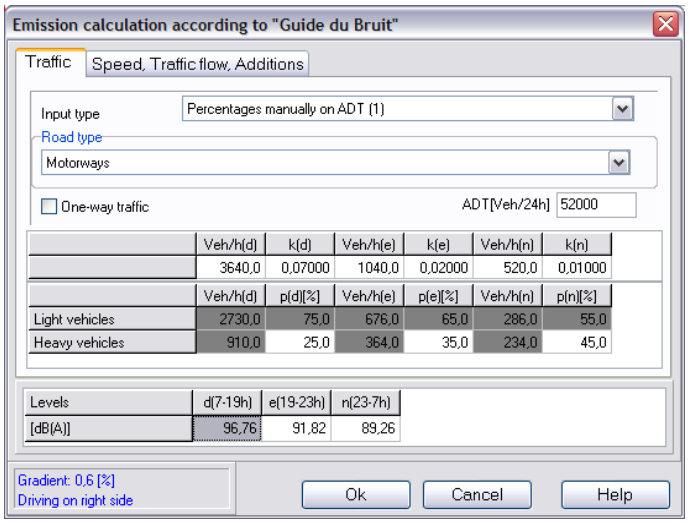
Enter the road width (for the graphical display and hard ground definition) and the distance of the emission bands so the program can distribute the emission between the 2 emission bands (for RLS-90 - for other regulations different positions apply). Click on **SINGLE EMISSION BAND** at the first coordinate if the entire emission is to be placed on a single source line (i.e. for one-way streets).

The **KILOMETER** marker is available to document the change in emissions related to the kilometer/mile post. The kilometer marker can only be assigned to the first coordinate of the road.

Bridge situations can also be taken into account in the propagation calculation., see “Bridges for roads and railways” (page 38).

Emission calculation road

Click on the symbol button "calculator" to compute the emissions from the parameters of traffic volume, road surface and speed. Some standards allow entering already known emission levels directly in the road properties.



The data for the composition of the traffic can be provided as an average daily traffic (ADT) and the percentages for each of the time slices (input type "percentages manually on ADT") or as traffic data per hour (input type "Veh/h direct entry").

Veh/h direct entry:

Vehicles/h: hourly traffic volume for each time slice and each vehicle type or the percentages of each vehicle type referring to the total traffic volume.

Percentages manually on ADT:

These entry fields must be filled in to calculate the emission level:

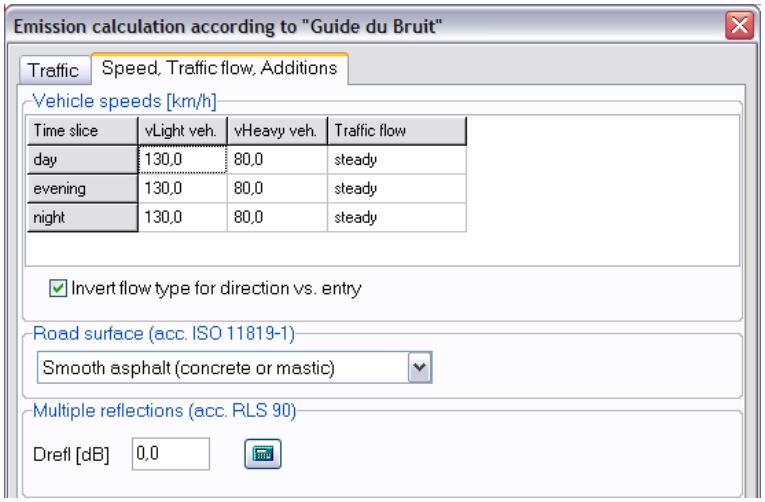
- ADT[vehicles/24h]: average daily traffic
- k: Factors to calculate the hourly traffic volume from the ADT: k*ADT=vehicles/h for the given time slice
- p[%]: Percentages of heavy vehicles referring to the total traffic volume in the given time slice.

For Germany default settings for the factors k and the percentage of heavy vehicles come from the road types of the RLS-90. Additional road types are derived from traffic censuses.

The checkmark **ONEWAY TRAFFIC** is only relevant for standards that have different values for the incline addition for vehicles going uphill/downhill.

Speeds and road surface addition

Enter other components of the emission level in the tab "*Speed, surface …*" which are different depending on the used standard.



Enter the **SPEED** for the different vehicle types and time slices in [km/h].

For most of the standards this is the permissible speed (e.g. RLS-90, NMPB, Russian road), but it can also be the average speed (CRTN) or the actual speed (RTN Nordic 1996, ASJ).

The **TRAFFIC FLOW** is considered differently, in most standards with the conditions accelerated, decelerated, and steady. TNM uses the kind of measure (stop sign or traffic light) and the percentage of affected vehicles. CNOSSOS based standards and the RLS-90 use separate signal points at traffic lights or roundabouts, see "Traffic light addition RLS-90" (page 33) and "Junction CNOSSOS" (page 33).

The **ADDITIONS FOR THE ROAD SURFACE** are different for each standard, too. Additions that are dependent on speed are automatically tallied. You can also define a road surface with a corresponding addition not listed with the selection **OWN SETTINGS**. The NMPB additionally takes the age of the road surface into account.

In the RLS-90 **MULTIPLE REFLECTIONS** in street canyons are accounted for by means of an addition to the emission noise level (Drefl). The propagation calculation then must be limited to the first reflection. Enter the mean height of the walls on the lower side of the street canyon (hBldg[m])), the distance between the left and the right side and a reflection factor to accommodate for the hardness of the walls (absorbent for absorbing walls and reflecting for walls with little absorption).

The **INCLINE** itself is normally calculated from the geometry, but you can manually set an incline value. The incline addition is evaluated automatically at calculation time. It depends on the standard from which percentage on an addition for the incline is evaluated (according to RLS-90 for example only if the incline is bigger than 5%). Some standards distinguish between the uphill and downhill direction for the incline addition (e.g. CRTN, TNM). For your information the incline in [%] is displayed on the lower left-hand side in blue writing.

The emission level of the roads is documented in the tab "*Emission table*".

Traffic light addition RLS-90

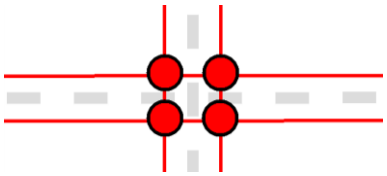
The traffic light addition is a regulatory penalty for the increased disturbance due to acceleration and deceleration close to traffic lights (only for RLS-90). This addition is given for the entire road depending on the distance to the traffic light. It is not an addition to the emission level.

Depending on the distance of the receiver to the traffic signal, the contribution of the section of road is increased by a margin of 1 to 3 dB(A).

The addition is given when the receiver is located at certain distances from the intersection of roads crossing each other. The nearside lanes of both roads must be less than the distance given in the table below:

	0 m	to	40 m	=>	+ 3.0 dB(A)
from	40 m	to	70 m	=>	+ 2.0 dB(A)
from	70 m	to	100 m	=>	+ 1.0 dB(A)

Define the signal markers at the intersections of the outer lanes (emission lines) of both roads. From these positions, the 3D distance to the receivers is calculated and the signal addition allocated.

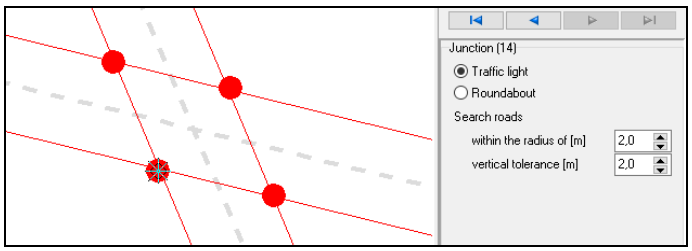


For T-type junctions you should mark the area with 4 signal markers.

Junction CNOSSOS

The junction correction accounts for the increased annoyance of traffic noise caused by starting and braking at traffic light-controlled junctions and roundabouts. The correction is added to the emission level of the road depending on the distance to the junction. The junction objects must be entered at each intersection of intersecting or merging emission lines.

Set the junctions **at the same elevation as the road** at the intersections of the road emission lines.



The **KIND OF JUNCTION** determines the distance-dependent surcharge KKT.

Change the values for searching the emission lines **WITHIN A RADIUS** / **WITHIN A VERTICAL TOLERANCE**, to influence the automatically found emission lines, for example if

- the junction is not exactly at the intersection of the emission lines,
- the emission lines do not intersect,
- the height of the intersecting / merging emission lines is different,
- the bypass of a roundabout or a parallel road must not be considered,
- emission lines of an overpass or underpass are not to be considered.

Parking lots

Parking lots are regarded as uniformly radiating area sources. Enter the border line at the height of the asphalt surface. Parking lots can also be defined as following the terrain, see section "Line and area sources following the terrain". The emission height is automatically set 0.5 m higher. During the calculation, parking lots are divided into triangles.

The parking lot according to RLS-90 is only used for public parking lots. All other parking lots are calculated according to the Bavarian parking lot study.

Parking lot - RLS-90

Enter the corners of the parking lot and define the traffic volume. The reference elevation is the elevation of the parking lot. The emission default is 50 cm above the parking lot surface.

The traffic volume of the parking lot is entered with the number of moves per parking bay (in and out are each considered a single move), the hour (for the time slices day and night) and the number of parking bays.

Via the **PARKING LOT TYPE ADDITION** different emissions for different parking lot types are accounted for:

Car parking lot	0 dB
Motorcycle parking lot	5 dB
Truck- and bus parking lot	10 dB

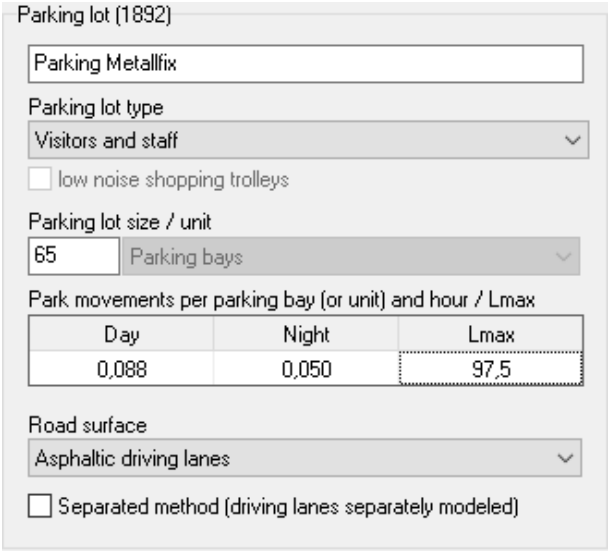
The emission level of a parking lot is automatically increased by the values set in the parking lot type. Additionally, "own values" allows the entry of custom declared corrections.

The result of the emission calculation is the LmE, the total noise level of the entire parking lot with a reference distance of 25 meters. The emission calculation of the parking lot is documented under the tab "*Emission table*".

Parking lot - Parking Lot Study 2007

The 6th revised edition of the parking lot study "Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar Centers and Bus Stations as well as of Multi-Storey Car Parks and Underground Car Parks" published by the Bavarian Landesamt für Umwelt provides calculation methods to determine the emissions of parking lots.

The emissions depend on the types of vehicles, the number of parking movements, the behavior of the parking users and other noise on the parking lot (e.g. rattling of the shopping trolleys/carts).



Parking lot type and parking lot size

The study paper distinguishes between different parking lot types, taking into account the different uses and vehicles; details can be found in the study paper.

Parking lots at shopping centers, restaurants and hotels are defined with the reference units "net sales area", "net restaurant area" or "number of beds". The number of parking bays is calculated according to a formula from the parking lot study. If you have a more accurate knowledge about the parking moves, you can change to the reference unit "number of parking bays". For shopping centers, the usage of low noise shopping trolleys/carts can be taken into account.

The traffic volume of the parking lot is entered with the number of moves. ***Into a parking bay and out of a parking bay = 2 parking moves***

The values for the number of parking moves for each time slice is the number of parking moves per reference unit (most often per parking bay), averaged for the hour.

Example (from the screen shot above):

Time slice day: 92 moves on the overall parking lot / 65 bays / 16 hour = 0.088 moves

Time slice night: 26 moves on the overall parking lot / 65 bays / 8 hours = 0.05 moves

Sum 0-24 o'clock: 118 moves, i.e. 59 vehicles come and go.

Reference level

The parking lot emission table documents the reference level ($L_{w,ref}$) from the parking lot study.

$$L_{w,\,ref} = L_{w0} + K_{PA} + K_I + K_D + K_{StrO} + 10\log(B)\ [dB(A)]$$

With the following parameters:

L_{w0} = Basic sound power, sound power level of one motion /h on P+R areas = 63 dB(A)

K_{PA} = Surcharge parking lot type

K_I = Surcharge for impulse character

K_D = Surcharge for the traffic passaging and searching for parking bays in the driving lanes

= 2,5 * lg (f * B - 9)
f = Parking bays per unit of the reference value
B = Reference value

K_{StrO} = Surcharge for the road surface

B = Reference value

Road surface

The selection of the road surface (surface of the lanes not of the parking bays) determines the addition K_{StrO}. These are different from the additions of the RLS-90.

Separate method (driving lanes separately modeled)

With the lane addition KD, the traffic within the parking lot is calculated using the number of parking bays and moves as long as you use the normal case "integrated method".

The emission calculation of the separated method (special case) doesn't include the traffic on the parking lot. Therefore, it must be modeled separately as a line source or a road using the emission calculation of the RLS-90. This method should only be used for very big parking lots or if the total parking lot is separated into several parts.

Addition for KI (impulse addition - German regulatory assessment)

An impulse addition is evaluated, if the checkbox **USE KI FOR PARKING LOT** is checked in **OPTIONS -> SETTINGS**, tab "*calculation settings*" (default only for Germany). The

addition depends on the parking lot type and if the lanes within the parking lot are included.

Railway noise

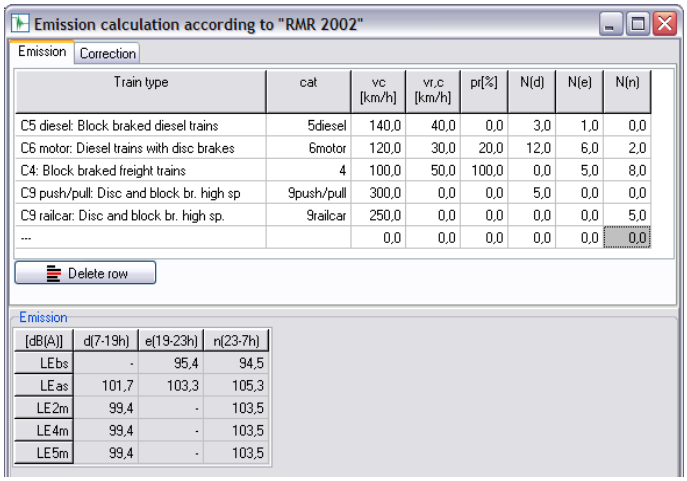
Enter the railway axis and define the emissions. The reference elevation is the railhead (the upper part of a railway rail, on which the traffic wheels run). The emission heights are calculated automatically based on the standards.

The properties of railways (train numbers and types, corrections) can vary along the train line. The coordinates in the coordinate list where the properties change are marked in red. In the editor graphics, those coordinates are marked with small double circles when the railway line is activated.

Bridge situations can also be taken into account in the propagation calculation., see “Bridges for roads and railways” (page 38).

Emission calculation for RMR 2002


Click on the symbol button "calculator" to calculate the emission from the trains or engines and wagons and track specific corrections.



Double click on the cell "train type", select a train category, suitable for the train type from the selection list and enter the mean speed non-braking trains vc [km/h]. Please look at the RMR for further information on the train categories.

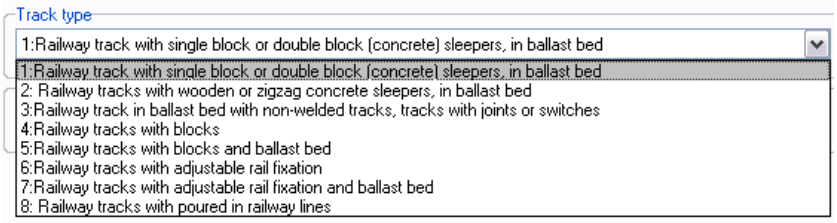
Enter the percentage of braking trains in train stations (pr [%]) and the mean speed of the braking trains vr,c[km/h]. To finish the emission entries, enter the number of train units N, i.e. carriages or engines for the time slices day, evening and night.

The emission table shows the emission level (mean sound power per meter) for all frequencies, emission heights and time slices. The RMR distinguishes between five emission heights above rail head: 0 m (bs), 0.5m (as), 2m, 4m, 5m

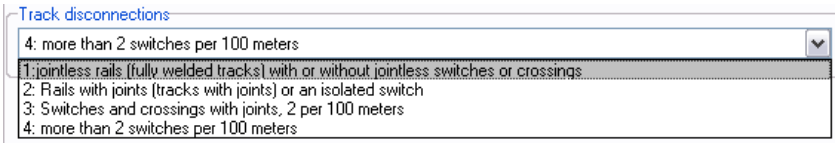
Depending on the train category, the emission is not defined for all emission heights.

Track data

Definitions for the track type (bed, sleepers)

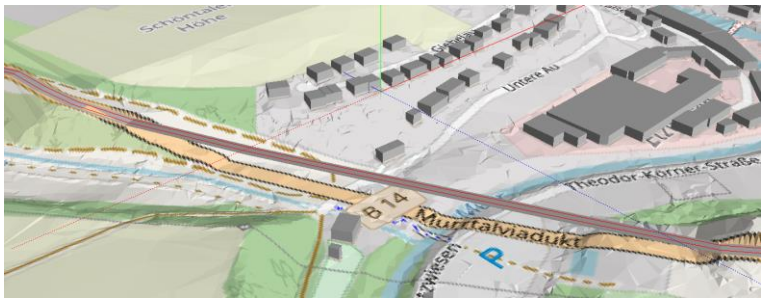


and track disconnections (switches, crossings) are necessary.

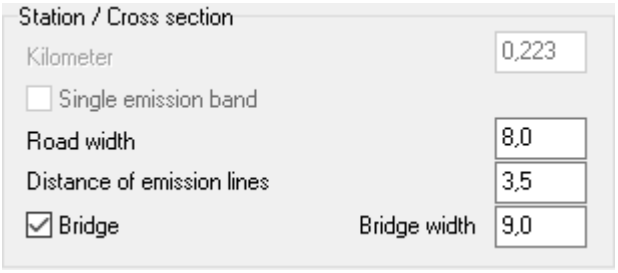


Bridges for roads and railways

For roads and railways, bridge situations can be taken into account in the propagation calculation.



In the property block for roads and railways, click on the **BRIDGE** checkbox at the corresponding coordinate.



The bridge width is preset to road width + 1 m or 4 m for railways. Turn off the check mark at the last bridge coordinate. The bridge is visualized in the editor with a dark band. The bridge edges have a shielding effect. For rail bridges, the bridge addition must be entered in addition to the bridge checkbox.

Recalculate the DGM. Roads and railways within the bridge areas are not included in the DGM; the elevation points are meshed at the bottom of the valley. Then select the road / railway with bridge and place the objects on the DGM. The heights within the beginning and the end of the bridge are interpolated. It is best to check the bridge situation using the 3D plan.

Industry noise (point, line and area sources) and stages

Calculation satandard ISO 9613-2

General mode:

- Noise sources must be entered with the sound power in octave or third octave bands.
- A ground absorption area must be defined (otherwise the program will assume soft ground).

Alternate mode:

- No ground absorption area is needed.
- Calculation for a single mean frequency (for example 500 Hz) or with a spectrum.
- The **ALTERNATIVE GROUND EFFECT (FOR ISO 9613-2)** must be checked in the tab "calculation settings" (**OPTIONS -> SETTINGS**).
- Sources entered with a single value sum level are automatically calculated according to the alternate calculation mode. The program dispatches a warning message if the alternate mode of calculation is used.

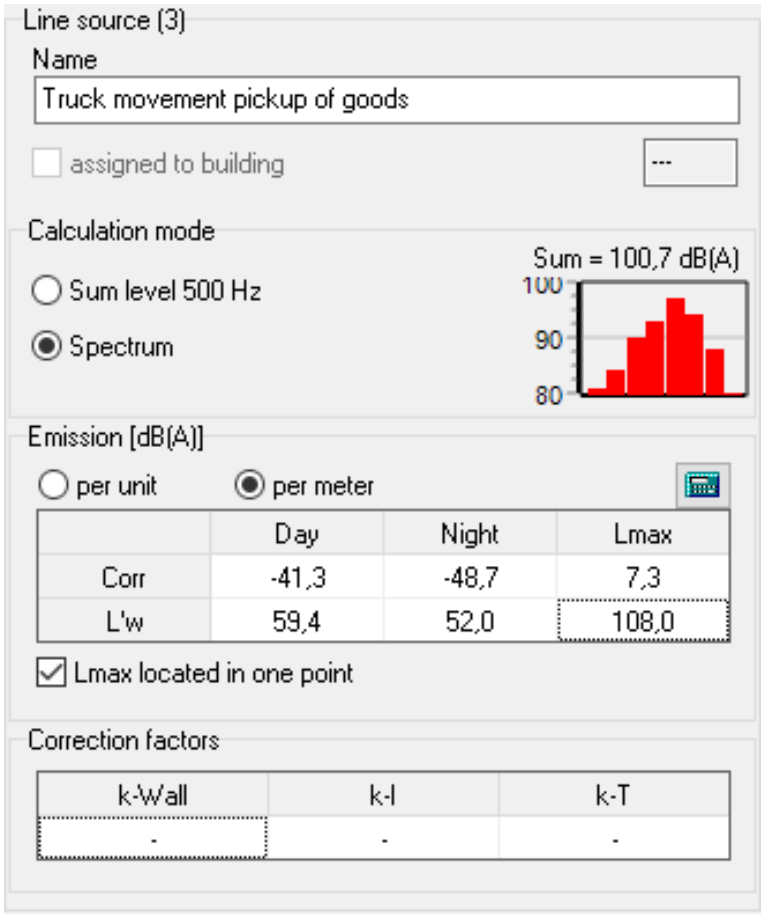
Properties of the sources

The sources of industry noise represent point, line and area type emitters. The sources are described with coordinates x, y, and a relative height above the terrain. The ground effect depends on the height of the source above the terrain.

Area sources may have any orientation in space. The only requirement is that they form a single plane. However, small deviations from the plane are adjusted by the triangulation process. If sources do not form a plane, you must subdivide the area sources. Define a horizontal, vertical or angled surface.

The sound power can be entered as a **single value A-weighted sum level** (mean frequency 500 Hz) or as a **spectrum**. If you enter a spectrum, the program will treat this as a **reference spectrum**. The sound power of the source needs to be entered

into the table for the individual time slices. You can use the spectra from the SoundPLAN library, see "Frequency spectrum from the emission library" (page 42).

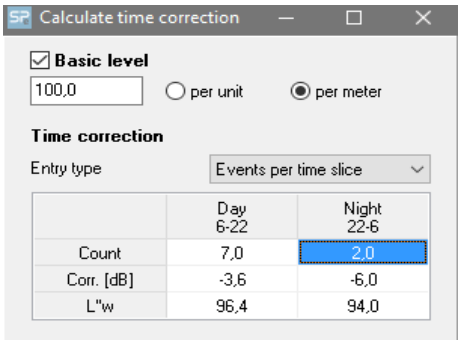


For line and area sources, the sound power can be defined per **METER** or **UNIT**. If the **UNIT** setting is used, the emission is set as the total sound power. This results in an even distribution of the sound power over the entire line/area of the source.

If the level entry per **METER** is used, the emission level is defined as the sound power level per dB/m (line source) or dB/m² (area source). The longer the line source or bigger the area source, the bigger the magnitude of the total sound power. The total sound power level of the source is the defined emission level plus 10*log(size of the source).

Time correction calculator for industrial noise sources

Sound sources rarely run at 100% per time slice. To calculate the time correction, click on the calculator symbol in the emission definition for the industrial sources.



Activate the selection of the basic level and enter the base sound power level; if a spectrum was previously selected, the base level is taken from the spectrum.

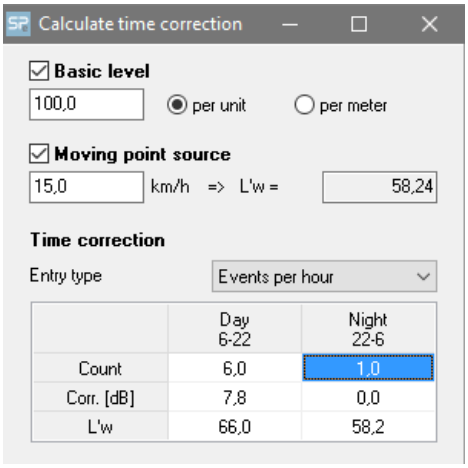
From the selection list, select the **ENTRY TYPE** you want to use to calculate the time correction:

- Events per hour
- Events per time slice
- Minutes per hour
- Minutes per time slice
- Hours per time slice

Enter the number of events (**COUNT**) for the individual time slices.

For assessments that take into account the loudest night hour (e.g. TA noise, ÖAL3), the night period is interpreted as the loudest night hour. This means that the number you enter is not distributed over the night period.

For line sources, tick **MOVING POINT SOURCE** to calculate the length-related sound power level L'w per meter at a certain speed from the sound power level of a vehicle.



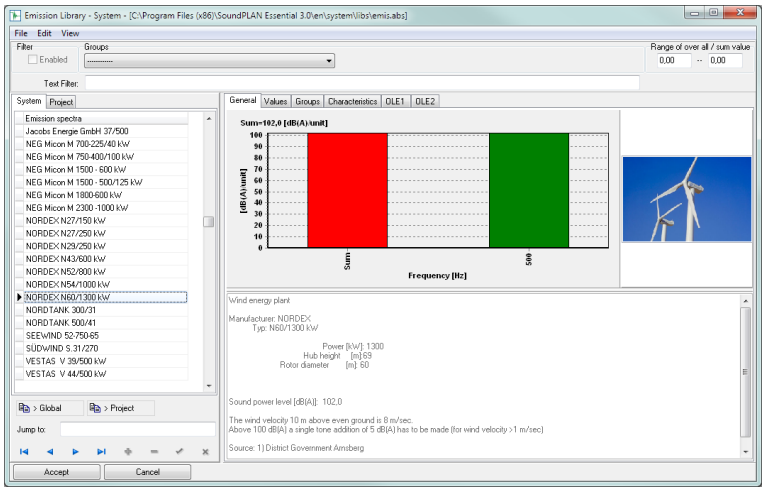
Enter the basic level per unit and the speed of the vehicle.

Correction factors

Enter the correction factor **KΩ WALL** for sources attached to walls and if necessary, the additions for impulse and tonality. The value for the influence of the ground effect (kΩ ground, Agr) is automatically accounted in accordance with the standards for industrial noise.

For sources attached to walls (quarter sphere) an addition of 3 dB is given. The reflections are suppressed on the wall where the source is located. For point sources assigned to buildings, the kΩ wall is set to 3 dB. The restriction of transmission into an eighth sphere can be simulated by assigning a kΩ wall of 6 dB if the source is located directly in the corner. SoundPLANessential assigns sources in the eighth sphere, not exactly located in the corner to the wall where they are located (kΩ wall = 3 dB, the reflection of the assigned wall is suppressed). The higher sound radiation of the eighth sphere results from the contribution level of the reflected sound at the other wall.

Frequency spectrum from the emission library



When you select the option **SPEKTRUM** from the noise source objects, you open a library with over 500 sound source spectra in third octaves and octaves. These spectra were compiled from various sources (handbooks, literature…).

You cannot modify the spectra in the system library! Own spectra must be hosted in the project library or in your own global library.

The library is split into two sections: on the left side you can find the emissions spectra, on the right-hand side details are listed for various details.

The tab *General* delivers an overview of the spectrum with the information where the data came from and optionally a picture. In the tab *Values* the values in octaves or third octaves can be found along with facilities to toggle between different dB-

weightings and the possibility to convert a sound pressure level to a sound power level.

You can find the right emission spectrum by using the group definition or by using a text as a filter to narrow down the number of spectra presented.

Copy a spectrum from the system library via the button **>PROJECT** to the project library to use it in this project. For a new spectrum, select whether the values are available as **OCTAVE** or **THIRD OCTAVE SPECTRUM** or as **CENTER FREQUENCY** and determine the lower and upper boundary of the frequency range respectively the center frequency. Enter the values in the table or use copy & paste if values are available e.g. in an Excel sheet.

Check your data to see if it is linear or weighted with an A..D filter, and select the dB-weighting accordingly.

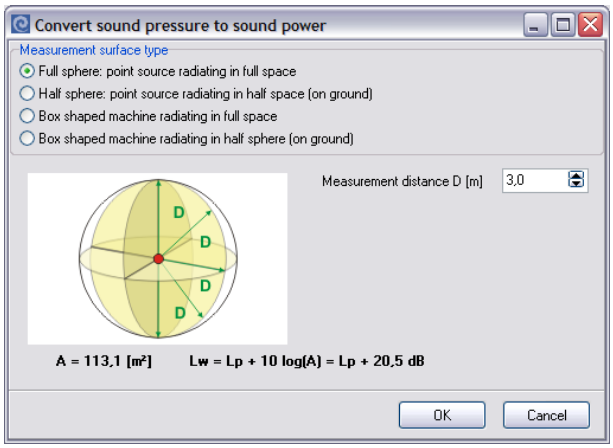
Above the emission spectrum with the selected frequency filter the spectrum is shown with a linear filter. The user defined spectrum and the selected filter are displayed in blue. You can modify values in the filtered or the linear spectrum. Either way, the values of the other spectrum are immediately calculated to reflect the modification.

If your data is available in [dB] but you want to keep it in the library as an A weighted spectrum, enter the data as a linear spectrum and change the weighting to [dB(A)] after the data is typed in. SoundPLAN will ask you whether you want to convert the spectrum. Click "yes" to convert the spectrum. "No" only changes the display, the linear spectrum remains unchanged.

Select whether the spectrum is a total sound power level (Lw/unit) or a length- / area-related sound power level (Lw/m,m²).

The frequency spectra in the library are often measured sound pressure levels (Lp/level). For the propagation calculation, sound power levels are needed. Therefore, you can convert sound pressure spectra into sound power spectra. It is important that you know the measurement distance.

Open **EDIT -> CONVERT SOUND PRESSURE TO SOUND POWER** (or click right mouse button while the cursor is on the spectrum).

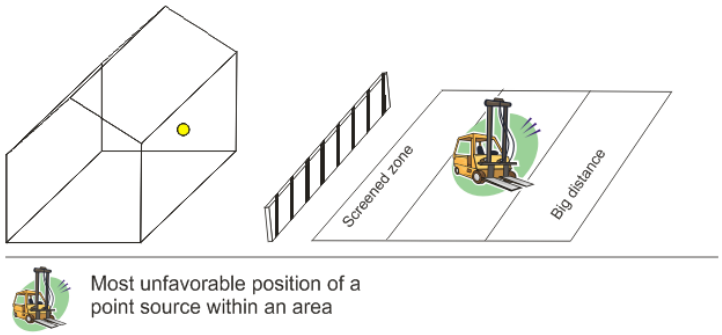


Select the surface type that was the basis of your measurement of the sound pressure level. Enter the distance D in meters at which the measurement was taken and enter the width, length and height in meters for machines the equivalent size of a box. By clicking the OK button, the sound pressure spectrum is converted into a sound power spectrum and the reference is set to per Lw/unit.

Maximum level Lmax

SoundPLANessential can calculate the maximum noise level caused by one or more sources at the receiver. If multiple sources are present in the calculation, the contribution level of the loudest source at the receiver is regarded as the maximum level.

The program will use the same emission spectrum as for the Leq calculation. For point sources, the Lmax depends only on which source produces the highest noise level within the time slice. For line and area sources you can also calculate a spatial maximum level if the checkmark **LMAX LOCATED IN ONE POINT** is activated.

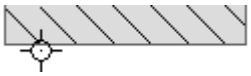


As shown in the sketch above, the maximum noise level of an area source is caused by moving the entire sound power to the spot on the line/area that produces the highest noise levels. SoundPLANessential determines the worst possible position and the corresponding maximum level.

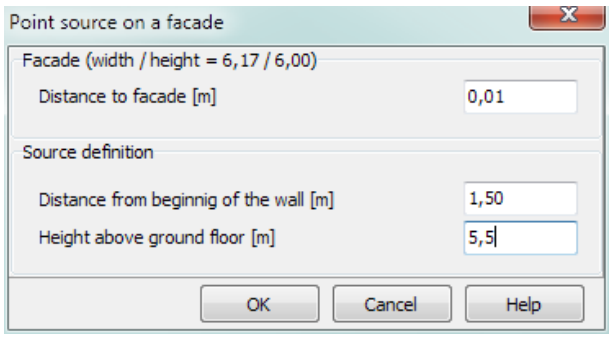
Assignment of noise sources to buildings

Point, line and area sources can be attached to buildings (for example fans, pipes and window openings).

Set the first coordinate of the source in the vicinity of the building as soon as the cursor changes into the capture cursor.



A dialog opens where you can set the position of the source relative to the facade. The entries have different provisions depending if the source is a point, line or area source.



Assignment dialog, example point source

For your information, the width and height of the facade is presented. Enter the distance of the source to the facade. With **DISTANCE FROM BEGINNING OF THE WALL** and the **HEIGHT ABOVE THE GROUND FLOOR SLAB** enter the location of the first coordinate for the line or area source or the point source. The correction k-wall is automatically set to 3 dB(A) and the first reflection on the „own“ facade is suppressed.

For line source in addition you can select if the line source is horizontal or vertical and how long the source line is, for area source enter the width and height.

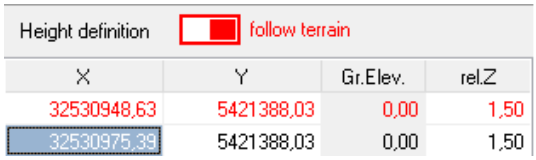
For area sources it is also possible to select the **TOTAL FACADE** if the total facade is radiating.

To later view the source definition or modify it, click on the field with the building ID.

The automatic assignment is only covering the standard cases for line and area sources. More complex sources – for example line sources at any angle or area sources that are not rectangular, need to be defined via the coordinate list. After defining the coordinates activate the checkbox **ASSIGNED TO BUILDING** and enter the **DISTANCE TO FAÇADE.**

Line and area sources following the terrain

For line and area sound sources as well as for parking lots, the height definition can be following the terrain. This ensures that the emission of each segment or partial area of the sources generated by the decomposition during the calculation is always at the specified relative height above the DGM, even in changing topography.



To change the height definition, switch the slider from absolute to following terrain.

The relative height above ground is the same for all coordinates. If the relative height at one coordinate is changed, it also changes for all other coordinates.

Even if sources in the 3D view look partially buried in the editor, they are calculated correctly over terrain, because the exact determination of the source height is only done during the calculation.

d&b audiotechnik stages

The environmental noise at a festival created by one or multiple stages can be calculated in accordance with either the Nord2000 or ISO 9613-2.

Calculations with the Nord2000 offer higher accuracy because the formulae used in the propagation are closer to the propagation of a wave that what the ISO 9613-2 offers. The ground effect is using Fresnel zones to calculate the reflection of the wave on the ground, the ISO 9613 only regards a single reflection point. The ISO 9613-2 also calculates the scenario as a downwind case which automatically means that you are assessing the worst-case scenario with downwind in all directions. The Nord2000 allows for more detailed modeling of the meteorological conditions with wind velocity, wind direction or alternatively with downwind conditions.

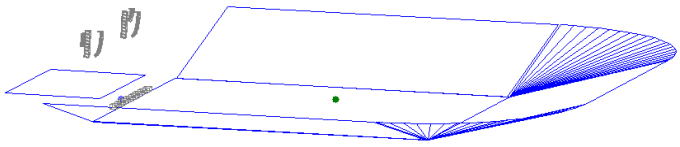
A stage is a combination of the position of the noise sources, the properties of the loudspeaker array and the area for the spectators. The data are defined in the ArrayCalc file.

ArrayCalc is a software product from d&b audiotechnik GmbH, in which all properties and settings of the d&b speaker arrays. For example, the number of arrays, the directivity and the tilt of individual speakers as well as the location of the concert attendees.

You can download the software for free from the website of d&b audiotechnik under

http://www.dbaudio.com/en/support/downloads/category/detail/software/simulation.html

In SoundPLANessential the entire stage from the ArrayCalc file is defined as a point object.



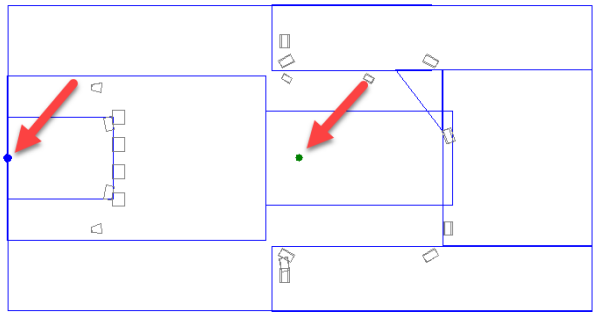
ArrayCalc must be installed, in order that the object type stage is visible.

Select the symbol stage from the object bar and with the mouse place the stage on the screen. The entry point is the zero point of the stage. Open the ArrayCalc file. Depending on the complexity of the stage this may take some time. With the ArrayCalc symbol you can open ArrayCalc to if needed change the stage in ArrayCalc or adjust the “NoizCalc reference point” see below.

Customize the **DIRECTION** of the venue.

Via the library symbol select a frequency spectrum. As the spectra often are relative spectra with the sound power of LAeq =0 dB, use the field for **LEVEL CORRECTION** to set the level selected at the sound mixing booth. A non-normalized spectrum that was measured with a sound level meter can also be set to the level defined at the sound mixing booth.

Calibrate the stage



In the picture above, you see the venue with the loudspeakers and additionally a blue and a green dot. The blue dot represents the position that you see in SoundPLANessential, the green dot is the green dot is the position of the sound mixing booth or respectively the location used to calibrate the stage to, this point is called the “NoizCalc reference point”.

In ArrayCalc under “settings -> advanced features”, the „NoizCalc reference point” must be activated for SoundPLAN to be able to calculate the stage. You can customize the “NoizCalc reference point” in ArrayCalc in the “3D plot”. SoundPLAN

uses this location to calibrate the noise level to the total sound pressure of all loudspeakers. Usually this calibration point is positioned at ear level at the sound mixing booth. The calibration point must be at least 0.1 meters above the ground. The calibration is done in a pre-calculation of the SoundPLAN calculation core.

Ground effect

Ground effect areas describe the acoustic ground properties (absorbing - reflecting). They are important for the acoustic model because they influence the sound propagation particularly near the source and the receiver.

Nearly all standards evaluate different ground properties of acoustically hard or soft ground for the propagation calculation; most of them use the ground factor. TNM (USA), ASJ (Japan) and Nord2000 describe the ground effect by the "effective flow resistivity", Nord2000 additionally uses the parameter "roughness class".

Below is a list of the settings of the different standards, with the default values used when no ground absorption area has been entered, highlighted in gray. So, you only need to enter ground absorption areas where the ground properties deviate from the default values.

The ground factor G is accordingly defined:

G = 0: 100 % hard ground. Asphalt, concrete, pavement, water, rough scattering area, industry site.
G = 1: 100 % soft ground. All with possible or present growth (agricultural, forest, grass, garden).
G = p/100: Partially soft and hard ground. Percentage p of soft to total ground.

The effective flow resistivity has the following selection possibilities:

ASJ: Concrete, asphalt
ASJ: Hard ground surface such as sports ground
ASJ: Soft ground surface: farmland, cultivated rice field
ASJ: Lawn, rice field, grass
TNM: Field grass
TNM: Granular snow
TNM: Hard soil
TNM: Lawn
TNM: Loose soil
TNM: Pavement, water
TNM: Powder snow
N2k: A: very soft (snow, moss-like)
N2k: B: soft forest floor (short, dense heather like or thick moss)
N2k: C: uncompacted, loose ground (turf, grass, loose soil)
N2k: D: normal uncompacted ground (forest floors, pasture field)
N2k: E: compacted field and gravel (compacted lawns, park area)
N2k: F: compacted dense ground (gravel road, parking lot)

N2k: G: hard surface (most normal asphalt, concrete)
N2k: H: very hard and dense surface (dense asphalt, concrete, water)

Roughness class Nord2000:

N: Nil ± 0.25 m
S: Small ± 0. 5 m
M: Medium ± 1 m
L: Large ± 2 m

The ground factor G and the effective flow resistivity are not linked, that is, for ASJ, TNM and Nord2000 calculations, the input of the ground factor is not relevant.

Volume attenuation areas

The first row of buildings should always be simulated with buildings so the reflective properties from the other side can be simulated properly. Areas behind the first row can be simulated either by entering the buildings or by volume attenuation areas. Stacking different areas with different heights is also a possibility.

The attenuation D is evaluated according to the formula:

$$D = f \times S_G$$

SG Distance the noise travels within the v. attenuation area [m]
f Mitigation factor [dB/m]

The distance SG used for the calculation is measured along an arc of 5 km radius stretched between source and receiver. If there are solid objects like buildings and screens between the source and the receiver, the parts between the top of the screens/buildings are also simulated with an arc.

If a search beam passes through multiple volume attenuation areas, the total attenuation by multiple volume attenuation areas is calculated as:

$$D_G = \sum_{i=1}^{n} f_i \times S_{Gi}$$

DG Total attenuation
fi x SGi Attenuation area i

Select the area type from the area type industrial site, forest or building attenuation. The effective height is the height of the buildings or forest. The ISO 9613 uses an attenuation spectrum depending on the area type.

According to Nord2000 the attenuation A is calculated using the path length through the volume attenuation area d [m]:

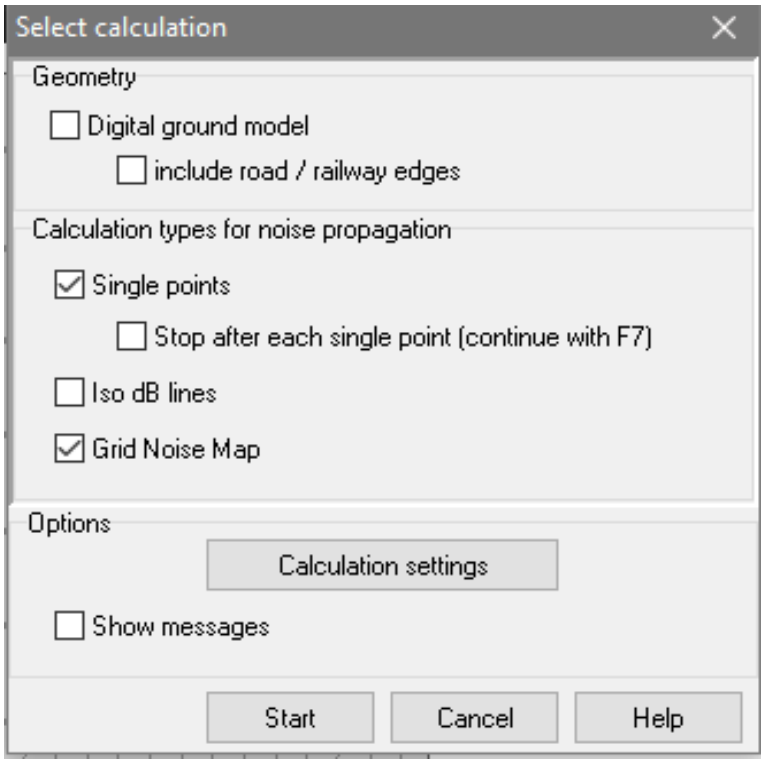
$A = d \cdot a(f)$

a(f) is calculated from the mean tree density, mean stem radius, factor kp and mean absorption coefficient.

Calculation

SoundPLANessential calculates single receivers, noise limit contour lines and grid noise maps.

 Click on the abacus symbol (or **CALCULATE -> CALCULATIONS**) and select the calculation.

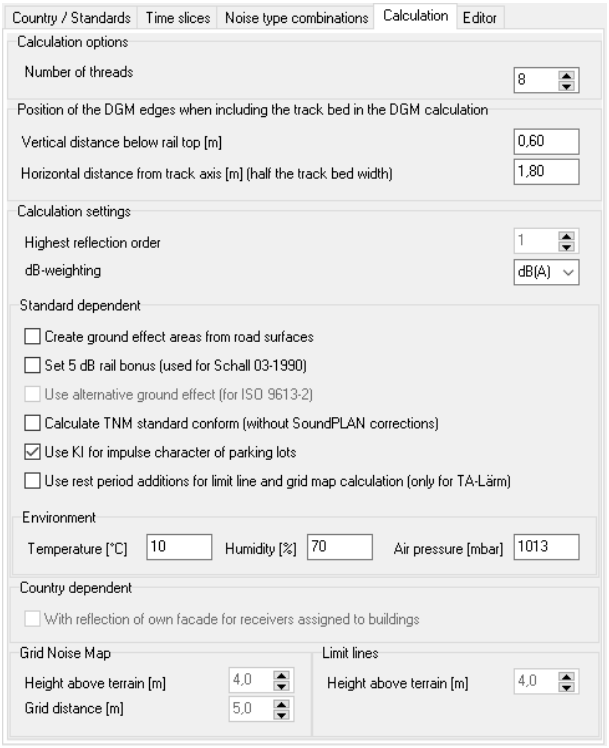


Calculation types are active only when data are present. If no single receivers are defined, for example, this calculation type is not available.

For the project type without / with noise control, select the variant you want to calculate.

Calculation settings

The default for the calculation settings depends on the selected country. Click on **CALCULATION SETTINGS** and check the standard and country depending settings.



The number of threads controls how many threads of a multi-core computer are used for the calculation. As default SoundPLANessential calculates with all available cores.

The **MAXIMUM REFLECTION ORDER** determines how many reflections shall be calculated.

Single points and grid noise maps can be calculated with other **dB-WEIGHTINGS** than dB(A). For example in dB(C).

CREATE GROUND EFFECT AREAS FROM ROAD SURFACES automatically generates hard ground areas according to road width. Activate this check box for all standards that use this option (e.g. NMPB 86 und 2008).

For Schall 03-1990 railway noise can be assessed as being less annoying so there is the possibility to set a **RAIL BONUS** that subtracts 5 dB to compensate for this difference.

ALTERNATIVE GROUND EFFECT: If you select this option, the ground effect of ISO 9613-2 is not going to be calculated by the frequency dependent regular method, but by the in chapter 7.3.2 described alternative method.

For sources which do not have a spectrum the calculation according to the regular method doesn't make sense. Therefore, SoundPLAN always uses the alternative method for these sources.

The **CORRECTION KI** is used in Germany for parking lots according to the Bavarian parking lot study.

The check box **REST HOURS** is used in Germany for grid map and contour line calculations according to TA Lärm.

HUMIDITY, AIR PRESSURE, TEMPERATURE: The environment parameters are important to calculate the air absorption. Furthermore, is the sound speed a function of temperature, influencing the wave length and therefore the screening calculation.

The **REFLECTION OF THE OWN FAÇADE** is to be calculated in some countries also for receivers that are assigned to a building.

Side diffraction is automatically calculated if a standard defines algorithms for side diffraction.

Contour lines and grid noise maps are calculated in a specified **HEIGHT ABOVE GROUND**. For the grid noise map you can select the **GRID DISTANCE**, contour lines are always calculated in a 5 m grid.

For Nord2000 there are additional meteorology parameters:

The Beaufort scale classifies wind speeds from 0 (calm) to 12 (hurricane). Typically, events are evacuated at wind classes higher than 4 or 5.

The **DOWNWIND** option enables a hypothetical and non-physical worst-case scenario, which is quite commonly used for calculations of environmental noise such as traffic noise and industry noise: The calculation includes downwind in every direction form the source to the receiver (like a vortex)! For open-air events this is not very fitting due to the short duration of the event. Different specific scenarios should be considered, e.g. two different wind directions or no wind.

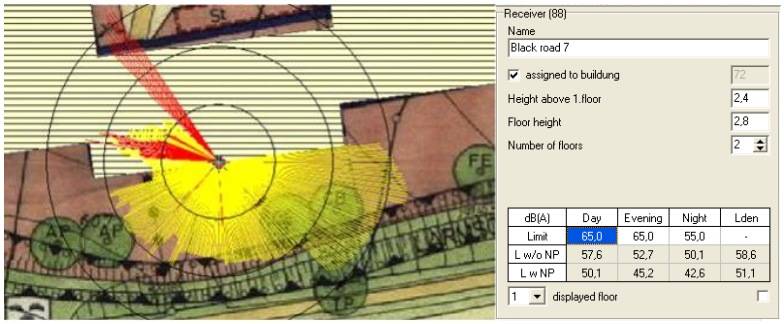
The temperature gradient defines the vertical temperature change. It affects distant receivers.

Calculation types

Digital Ground Model -> see Digital Ground Model (page 15).

The calculation type **single receivers** calculates the assessment levels for all receivers and floors and saves the results for each receiver. During the calculation, a level chart is presented depicting the magnitude of the noise received from each angular segment. Via the checkbox at the receiver, the level chart can appear later on, so you can check the geometry and noise intake.

The level chart enables you to graphically check the single receiver calculation. The rays in the diagram depict the noise coming to the receiver from a certain direction (red rays show reflected noise). The length depicts the magnitude. The total noise level can be derived by adding the contributions of all depicted rays.



When **STOP AFTER EACH SINGLE POINT** is checked, level chart and result are visible on screen for validation purposes. Click **F7** to calculate the next receiver.

The results of single receiver calculations are located in the receiver table and can be presented in the site map in the graphics display as a little table for each receiver.

You can also calculate a single receiver in the free-field or attached to a building using **Ctrl + right mouse button**. The receiver is not entered in the receiver table. The main purpose for this shortcut is to find the area where infringements of the noise limits can be expected, which means a grid noise map needs to be calculated.

The calculation type **noise limit contour line** is based on a grid noise calculation with a grid spacing of 5 meters and presents the noise limit contour line for all time slices. The noise limit is defined in the project settings. Reflections in close proximity to the receivers are suppressed so the contour lines coincide with the single receiver calculation. The limit contour line is presented in the graphics section on top of the site map. The formatting is via **GRAPHICS -> OBJECT TYPES**.

The calculation type **Grid Noise Map** shows all noise contours and fills the areas between contour lines. Open the calculation settings to enter the grid spacing and the calculation elevation above the terrain. The grid noise maps are presented on their own maps in the graphics according to a user defined scale.

The limit noise contour line and the grid noise map are calculated for the entire calculation area or if you have not defined a calculation area, they are calculated for a rectangle covering the entire geometry.

During the calculation of limit contour line and grid noise maps, the calculation progress is displayed graphically via a color scale.

A statistics shows how long the calculation will take. The statistics can be deactivated via the menu **CALCULATIONS -> SHOW GRID STATISTICS**.

Abort calculation: Click on the button “Abort calculation” to stop a running calculation, if necessary.

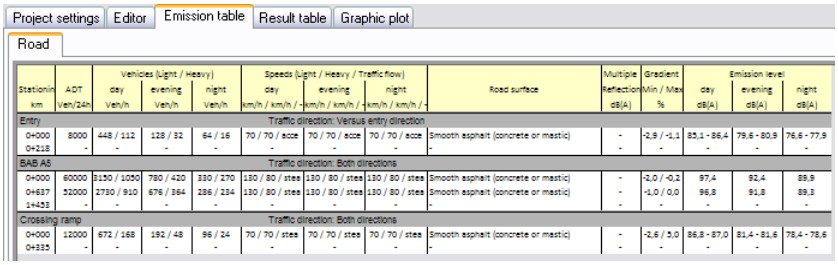
Calculation messages

During the calculation, the editor dispatches messages in the lower portion of the screen. Errors and warning messages are presented in red. Double clicking on a message will open and activate the object in question so an error in the definition of the object or the geometry can be fixed easily.

Tables - Documentation of emissions and results

The emission level calculations and the results of the noise propagation are both presented in tabular form in predefined tables. Click on the tab for Emission Tables and Result Tables.

The **emission table** documents the emission of the particular sources, depending on the type of noise source.

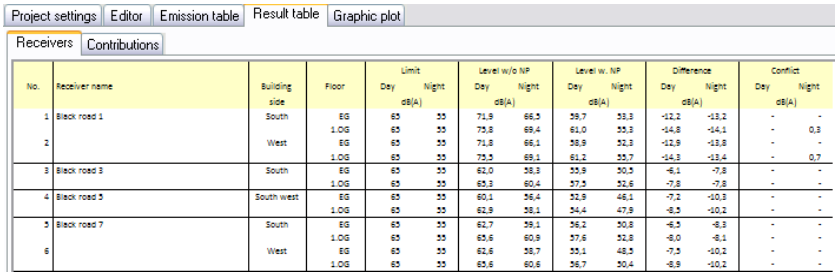

Project settings | Editor | Emission table | Result table | Graphic plot

Road

Station in km	ADT Veh/24h	Vehicles (Light / Heavy) day Veh/h	evening Veh/h	night Veh/h	Speeds (Light / Heavy / Traffic flow) day km/h / km/h / -	evening km/h / km/h / -	night km/h / km/h / -	Road surface	Multiple Reflection dB(A)	Gradient Min / Max %	Emission level day dB(A)	evening dB(A)	night dB(A)
Entry					Traffic direction: Versus entry direction								
0+000	8000	448 / 112	128 / 32	64 / 16	70 / 70 / acce	70 / 70 / acce	70 / 70 / acce	Smooth asphalt (concrete or mastic)	-	-2,9 / -1,1	85,1 - 86,4	79,6 - 80,9	76,6 - 77,9
0+218	-	-	-	-	-	-	-		-	-	-	-	-
BAB A5					Traffic direction: Both directions								
0+000	60000	3150 / 1050	780 / 420	330 / 270	130 / 80 / stea	130 / 80 / stea	130 / 80 / stea	Smooth asphalt (concrete or mastic)	-	-2,0 / -0,2	97,4	92,4	88,9
0+837	52000	2730 / 910	676 / 364	286 / 234	130 / 80 / stea	130 / 80 / stea	130 / 80 / stea	Smooth asphalt (concrete or mastic)	-	-1,0 / 0,0	96,8	91,8	88,3
1+453	-	-	-	-	-	-	-		-	-	-	-	-
Crossing ramp					Traffic direction: Both directions								
0+000	12000	672 / 168	192 / 48	96 / 24	70 / 70 / stea	70 / 70 / stea	70 / 70 / stea	Smooth asphalt (concrete or mastic)	-	-2,6 / 5,0	86,8 - 87,0	81,4 - 81,6	78,4 - 78,6
0+335	-	-	-	-	-	-	-		-	-	-	-	-

For point, line and area sources the emission can be converted to another dB-weighting. Additionally, you can activate a column for the source size.

The **result table** contains the results of the propagation of single receiver calculations. In addition to the predicted noise levels, the limit infringement is presented in the columns labeled “conflict,” and for 2 variants (without/with noise control) also the difference between them is shown. Under the tab *Contributions*, the contributions of each source object are listed. The receiver spectra are documented in the tab *Receiver spectra* for industry sources defined with a spectrum. For industry project additionally a *Mean propagation table* is added (see below).


Project settings | Editor | Emission table | Result table | Graphic plot

Receivers | Contributions

No.	Receiver name	Building side	Floor	Limit Day dB(A)	Limit Night dB(A)	Level w/o NP Day dB(A)	Level w/o NP Night dB(A)	Level w. NP Day dB(A)	Level w. NP Night dB(A)	Difference Day dB(A)	Difference Night dB(A)	Conflict Day dB(A)	Conflict Night dB(A)
1	Black road 1	South	EG	65	55	71,9	66,5	59,7	53,3	-12,2	-13,2	-	-
			1.OG	65	55	75,8	69,4	61,0	55,3	-14,8	-14,1	-	0,3
2		West	EG	65	55	71,8	66,1	58,9	52,3	-12,9	-13,8	-	-
			1.OG	65	55	75,5	69,1	61,2	55,7	-14,3	-13,4	-	0,7
3	Black road 3	South	EG	65	55	62,0	58,3	55,9	50,5	-6,1	-7,8	-	-
			1.OG	65	55	65,3	60,4	57,5	52,6	-7,8	-7,8	-	-
4	Black road 5	South west	EG	65	55	60,1	56,4	52,9	46,1	-7,2	-10,3	-	-
			1.OG	65	55	62,9	58,1	54,4	47,9	-8,5	-10,2	-	-
5	Black road 7	South	EG	65	55	62,7	59,1	56,2	50,8	-6,5	-8,3	-	-
			1.OG	65	55	65,6	60,9	57,6	52,8	-8,0	-8,1	-	-
6		West	EG	65	55	62,6	58,7	55,1	48,5	-7,5	-10,2	-	-
			1.OG	65	55	65,6	60,6	56,7	50,4	-8,9	-10,2	-	-

In the tab *Receiver* you can add columns for the x and y coordinates as well as a column for the elevation of the receivers.

If the source emissions or results change, the table will be updated when it is opened. If the geometry was altered or new receivers digitized, the table will no longer represent the model and thus the table section will report that the table is not accurate. To correct this, a new calculation run is required.

If the module BA-Outside is licensed, you can invoke it here with the symbol button „BA-Outside“. This way you can generate a new room book for the calculation of measures to keep the required indoor level according to the with SoundPLANessential calculation result.

Mean propagation table for industrial projects

For industry noise calculations the mean propagation table documents the various influences on the propagation path (air absorption, Cmet, ground effect, ...) for

each receiver point. The propagation parameters are interdependent and cannot be considered separately.

The sound pressure at the receiver from a source is the sum over the contributions from any reflected paths from source to receiver and the direct sound.

$$p_{tot} = p_{Dir} + p_{\mathrm{Re}\,fl}$$

Area and line sources will be dissected in a number of sub-sources due to geometry etc. Each sub-source contributes with its sub-sound power and the corresponding propagation losses (m1..mn) to the sound pressure at the receiver. Therefore, the direct sound is the sum over all sub sources i and frequencies f:

$$p_{Dir} = \sum_i \sum_f dPw(i,f) \cdot m_1(i,f) \cdot m_2(i,f) \cdot\cdot m_n(i,f)$$

where

$dPw(i,f)$:Sub sound power of sub source i at frequency f

$m_1(i,f) \cdot m_2(i,f) \cdot\cdot m_n(i,f)$: Propagation losses 1..n in the propagation path e.g. due to geometrical spreading, screening, ground effect, air absorption, etc.

During the calculation the following intermediate values are calculated:

$$P_{w0} = \sum_{i,f} dP_w(i,f)$$

$$P_{w1} = \sum_{i,f} dP_w(i,f) \cdot m_1(i,f)$$

$$P_{w2} = \sum_{i,f} dP_w(i,f) \cdot m_1(i,f) \cdot m_2(i,f)$$

..

$$P_{wn} = \sum_{i,f} dP_w(i,f) \cdot m_1(i,f) \cdot m_2(i,f) \cdot\cdot m_n(i,f)$$

The sound pressure at the receiver can therefore be expressed as:

$$p_{tot} = \overline{P_w} \cdot \overline{M_1} \cdot\cdot \overline{M_n} + p_{\mathrm{Re}fl}$$

with

$$\overline{P_w} = P_{w0}$$

$$\overline{M_1} = P_{w1} / P_{w0}$$

$$\overline{M_2} = P_{w2} / P_{w1}$$

..

$$\overline{M_n} = P_{wn} / P_{wn-1}$$

The Mi depend therefore on each other and cannot be viewed independently.

In SoundPLAN holds:

$10\lg(\overline{P_w}) = \overline{L_w}$: mean sound power

$10\lg(\overline{M_1}) = \overline{A_{div}}$: mean geometrical propagation loss

$10\lg(\overline{M_2}) = \overline{k0}$: mean k0 (ISO 9613 - 2 alternative)

$10\lg(\overline{M_3}) = \overline{A_{gnd}}$: mean ground effect

$10\lg(\overline{M_4}) = \overline{A_{scn}}$: mean screening effect

$10\lg(\overline{M_5}) = \overline{A_{air}}$: mean air absorption

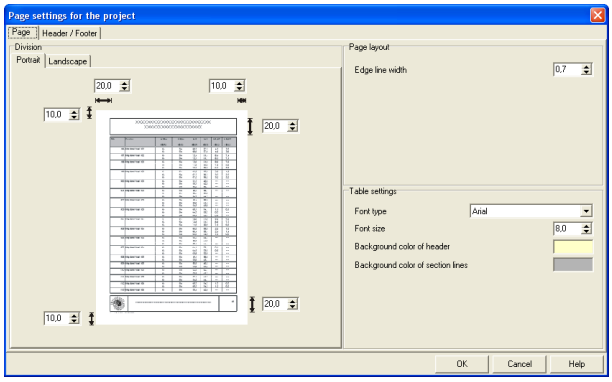
$10\lg(\overline{M_6}) = \overline{A_{miti}}$: mean mitigation loss

$10\lg(\overline{M_7}) = \overline{A_{met}}$: mean wind effect

By means of a reverse function the mean acoustical distance is calculated from the mean geometrical propagation loss.

Table settings

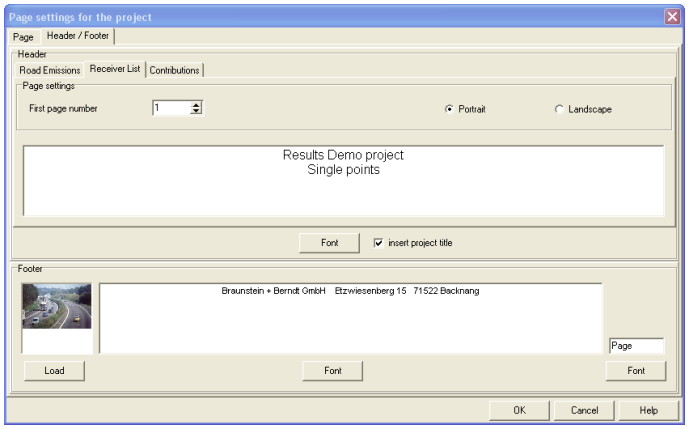
Enter **TABLE -> SETTINGS** to define the border width, headlines and character width. The settings are valid for all tables in the project.



The table consists of the body, the header and the footer. Enter the frame width, the height of the table header and footer sections, the landscape and portrait in [mm].

The individual areas are separated by border lines. The width of these lines can be defined.

Under the tab for header/footer, assign a headline for each of the tables that will be printed in the header.



Select if the table is to be printed in portrait or landscape format and set the page number for the first page of the table.

You can show your company logo in the footer section. Click on the „load“ button to select the file for the logo (bitmaps or metafiles). If the logo is not present in the project folder, you can move it there, copy it, or set a link to the file.

The logo, the font settings for header and footer, and the page numbering are valid for all tables in the project.

Print the table via **FILE -> PRINT**.

Export emission and result Tables

You can export the emission and result tables to ASCII files. Click **TABLE -> EXPORT** or the symbol button “Export”, select where to store the data and enter the file name. It is also possible to use the clipboard (**TABLE -> COPY TO CLIPBOARD**) to paste the result data to another program e.g. Excel, Word, ….

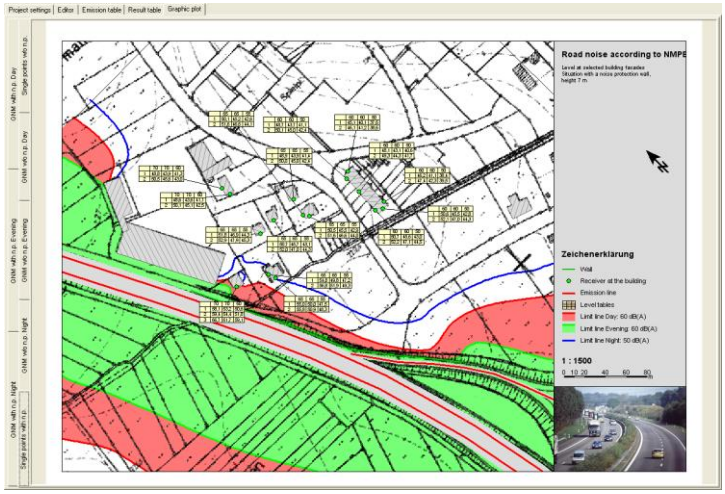
Graphic plot

The calculation results are presented under the tab Graphic plot together with the model geometry in preformatted maps.

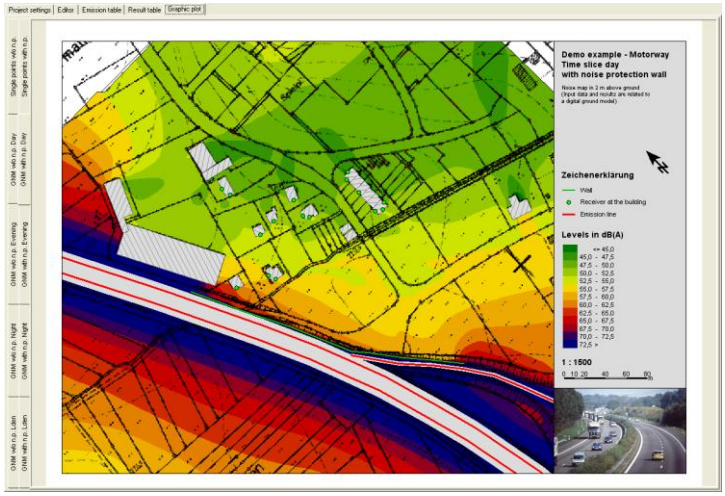
The single receiver map not only shows the results from single receiver calculations but also presents the noise limit contour lines for the calculated time slices (if calculated). If the geometry was entered on top of scanned bitmaps, the bitmap also is presented on the graphics sheet.

All objects and results can be formatted individually and selected/deselected in the graphics plot.

Example of a single receiver map:



Example of a grid noise map:



The description block contains the headers with an additional description, legend, scale bar and a company logo. For grid noise maps, the color scale is added in the description.

All formatting (font, company logo, length scale …) is valid for all maps in the project. Only the content of the description text is set individually for each map.

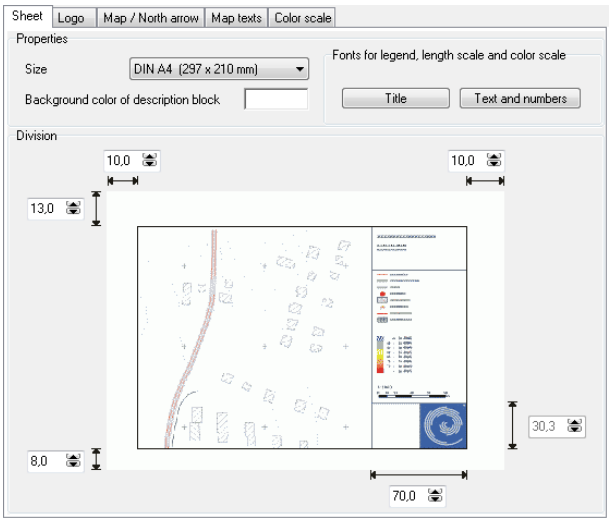
The element sequencing in the description block is fixed and cannot be altered.

The top right hosts the map header and an additional descriptive text, followed by the legend and the color scale for grid noise maps. The bottom of the description block includes a scale bar and the company logo.

Set sheet size and border size

Before you determine the viewport of your map, select the sheet size and frame width so the program knows the active drawing area and can determine the scale.

Open **GRAPHICS -> SHEET SETTINGS** or click on the white frame of the sheet to define the settings.



Select the sheet size and adjust the frame width, description block width and the height of the box for the company logo. If the company logo is placed to fill the width of the description block, the height is no longer user controllable but determined by the dimensions of the logo.

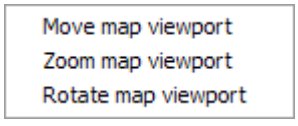
When setting the frame width, please consider the maximum width the printer is capable of printing.

In the sheet settings, additional controls define the background color of the description block and the font settings for title, legend, scale bar and color scale.

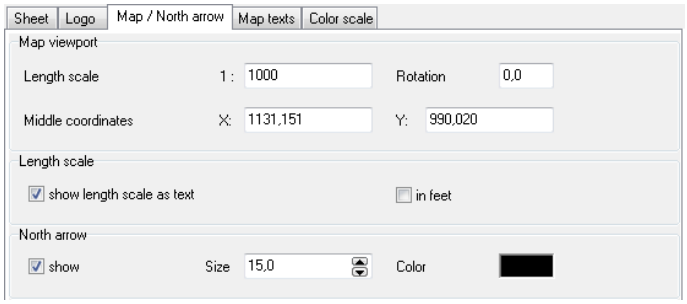
You can control the map elements using the additional tabs. You can reach the elements with the respective tabs via the graphics menu or by clicking on the element.

Set viewport and scale

As default the map will be scaled to present the entire project area. Use the right mouse button or the graphics menu to select the proper viewport for your map.



Click on the scale bar in the description block (or **GRAPHICS -> EDIT MAP VIEPORT**) to numerically set the scale, rotation and center coordinates, and to format the north arrow.



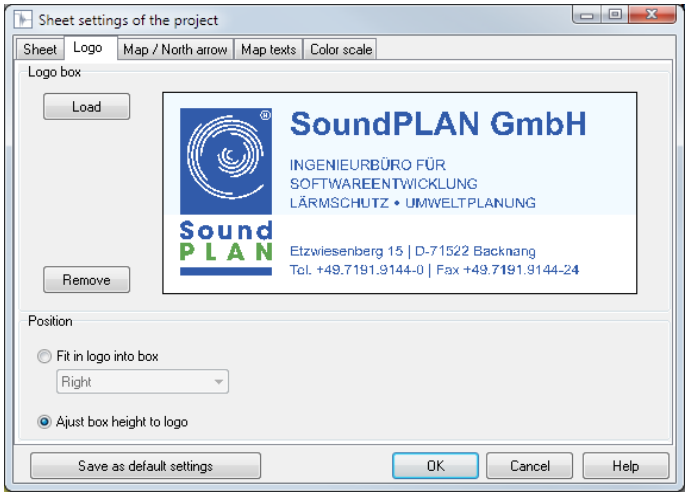
The **MAP LENGTH SCALE** is automatically adjusted when zooming. When rotating the map, the north arrow and the background graphics are also rotated. The length scale can be displayed in meters or feet.

Ratio: 1:1000 = 1 meter represents 1000 meters (no mixture of units)

The **NORTH ARROW** can be moved to a new position pressing the left mouse button while moving the arrow to its new position.

Load company logo

Click on the lower right side of the description block or invoke this action with **GRAPHICS -> EDIT COMPANY LOGO**.

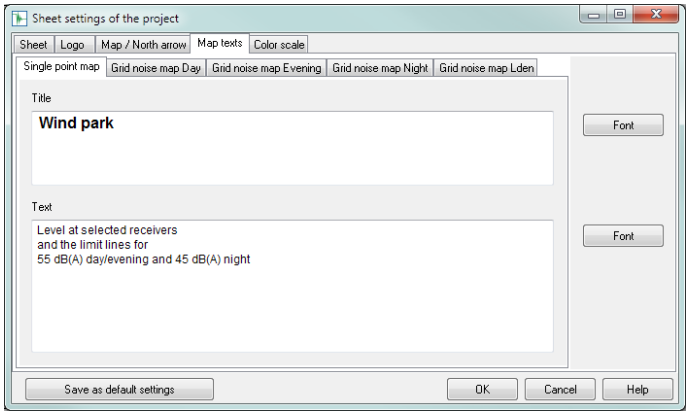


Click on **LOAD**. Select whether the logo should be fit in the sheet description box according to the box height (recommended for square logos) or if the description block box should be adjusted to the logo size. After defining the box height here, it is no longer possible to control it from the sheet settings.

Hint: As the program only supplies a single graphics box for the company logo, you must use an external graphics program if you want to combine your logo with your company's address or web location.

Edit map texts

The descriptive texts of the maps are administered separately for each of the maps contained in the project. Click on the top right section of the description block or open the map texts via the menu **GRAPHICS -> EDIT MAP TEXTS**.

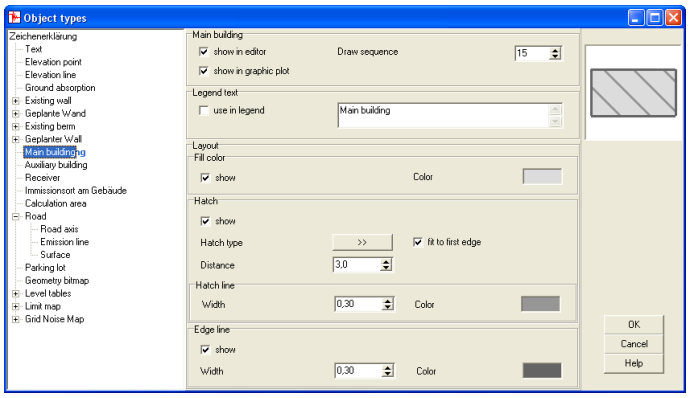


You can also move texts from one map to another using the familiar copy and paste commands. The font information is stored separately for the title and the descriptive text. The font settings are valid for all maps in the project.

Edit legend, format objects

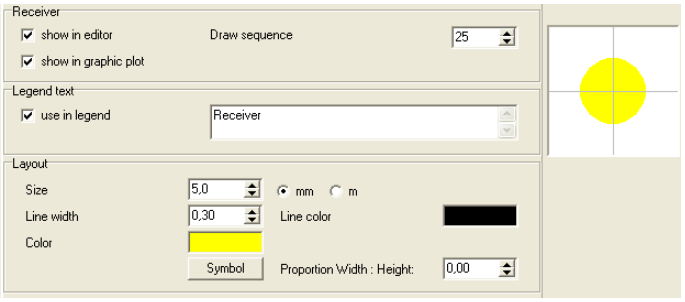
Open **OPTIONS -> OBJECT TYPES** or click on the legend and select the object type you want to customize.

The layout for all drawable data is controlled via the object type file: Geometry object types (i.e. buildings and roads), result object types (level tables, grid noise maps and noise limit contour lines), as well as geometry bitmaps. A set of default definitions for all object types is delivered with the program. You may customize these as you like.



For each object type, select if this particular object type shall be visible on the editor and in the graphics display. You can alter the object name that appears in the legend in the section **LEGEND TEXT**. The higher the **DRAW SEQUENCE**, the later the object is drawn (and may hide objects of a lower sequence number).

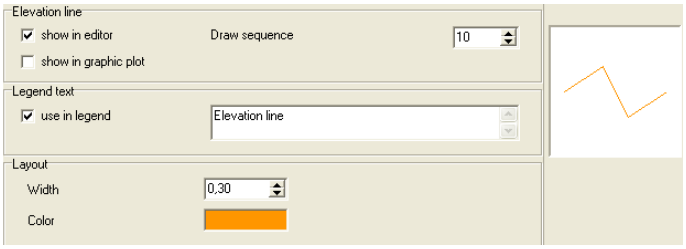
Point type object types



Define the size in [mm] (plan size) or in [m] (world coordinates). If selecting millimeters, the object will be drawn regardless of the scale of the drawing. If "meters" is selected, the size of the sign depends on the scale. The sign will be as large as the selected number of meters in the world coordinate scale. For the symbol size, an imaginary rectangle is drawn around the symbol. The longest side will determine the symbol size.

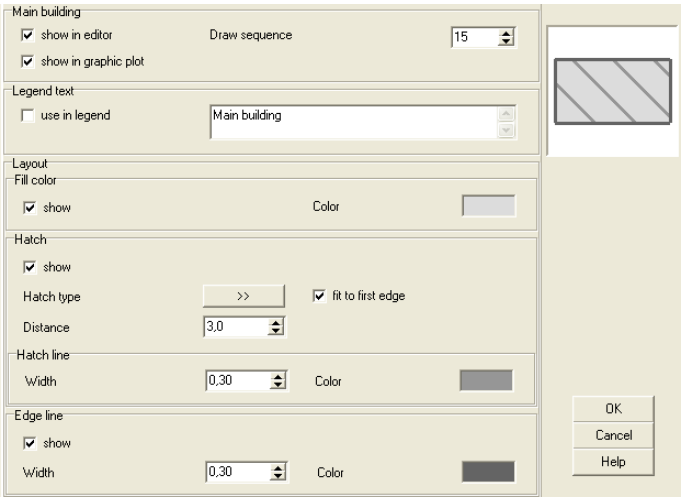
Click on the **SYMBOL** button to select a different symbol than the one proposed. Also select the symbol line width and border lines.

Line type object types



Enter line width and line color for the line.

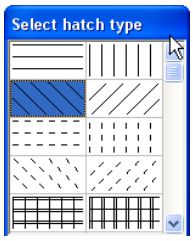
Area type object types



For area object types, define the fill color and border and hatch pattern independently of each other.

Hatch pattern

With the double arrow, select the hatch pattern and confirm it with OK.



If **FIT TO FIRST LINE** is marked, the hatch pattern will be parallel to a line through the first 2 coordinates of the object.

Geometry texts

The text layout is set in the editor. All settings (color, font type) in the graphics are taken from the definitions made in the editor. In the object types, you can adjust the sizes of all texts using the parameter **SIZE AS FACTOR** of the sizes selected in the editor.

Composite object types

Some of the object types consist of multiple sub-types (for example, roads, railways and noise protection walls). The layout of the sub-object types is defined independently of each other. Select which of these sub-objects shall be drawn in the editor, map and legend.

Single receiver maps

The single receiver map depicts all results of the single point calculation for all available time slices and floors in small tables. In addition to the single receiver tables, it is also possible to display the noise limit contour line for all time slices (if the contours have been calculated). As receivers might cluster in one location, you can move the level tables. When the cursor is close to the level table, its shape changes to the movement cursor. Press the left mouse button and move the table to its new location.

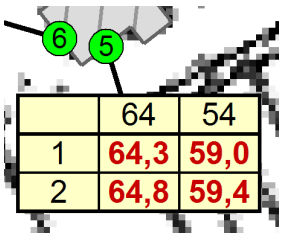
When the noise limit is exceeded on a receiver attached to a building, the facade where the receiver is located is marked with a red bar.

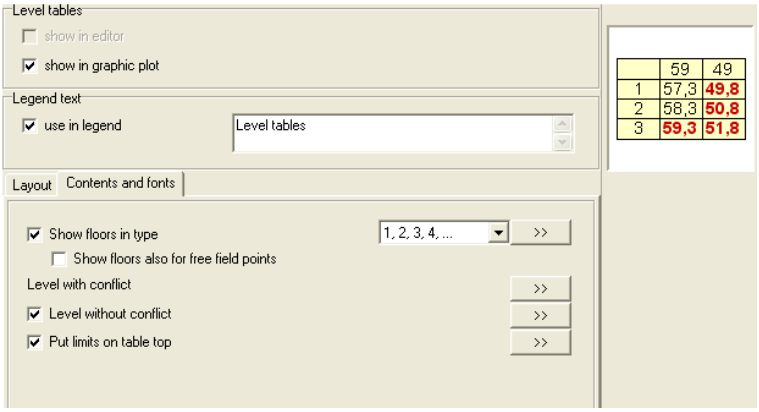
Edit the settings of the level tables

Open **OPTIONS -> OBJECT TYPES** or click on the legend and select the object type for level tables.

The level tables can be presented for all calculated receivers or only for those where the noise limit is exceeded.

By default, the point number of a receiver is displayed in the reference point.





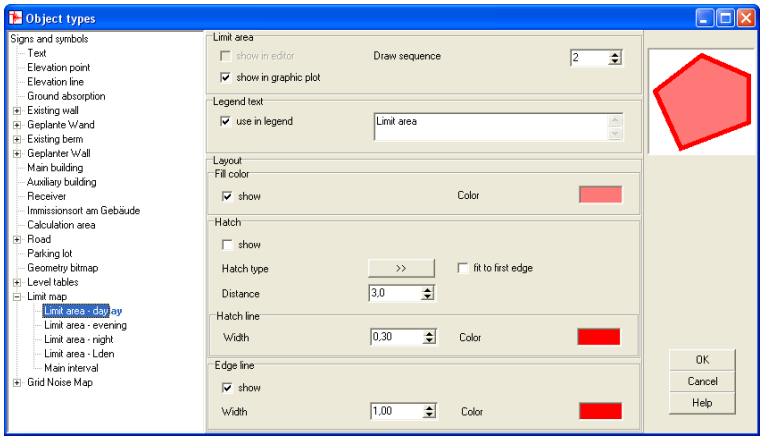
The sub-object type **LEVEL TABLE** is structured in the tabs for "*layout*" and "*content + fonts*".

Under the tab layout, set the line thickness and color of the separating lines, and define the placement of the floors. Under the tab content and fonts, you can mark what shall be printed in the table. The receivers exceeding the noise limit are always presented. Use the double arrow to move to the font layout.

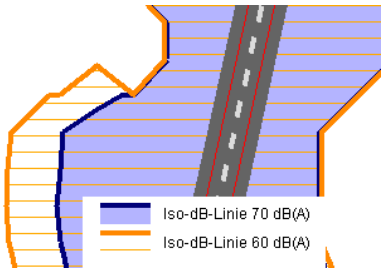
The **FACADE WITH NOISE LIMIT VIOLATION** is formatted in the second sub-object type.

Process the noise limit contour lines

For each time slice you assigned a noise limit value in the project settings and activated it for display, the noise limit contour lines are presented on the single receiver maps. The appearance of the noise limit contour lines is edited under **OPTIONS -> OBJECT TYPES** in limit contour line.



The contour line is displayed in the border color. You can also fill the areas with a solid color or select a hatch pattern if multiple contour lines overlap.

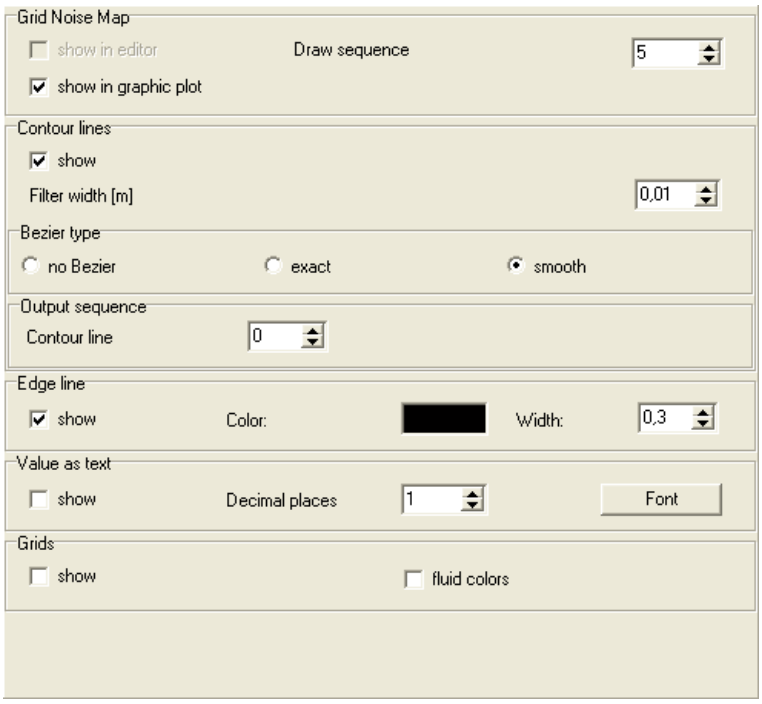


Grid noise map

The Grid Noise Map presents noise contour areas or the grid values filled with a user controlled color scale. The appearance of the noise map can be edited (contour lines and color scale).

Edit the appearance of contour lines

Call **OPTIONS -> OBJECT TYPES** and select the object type grid noise map.



SHOW CONTOUR LINES should always be set to „show“ except when you want to present the grid cells. When the switch is deactivated, even for the main interval, no contour lines and contour fills are drawn.

The **FILTER BAND WIDTH** [m] sets a band width within which points controlling the contour lines are deleted; this procedure smoothes the contour lines.

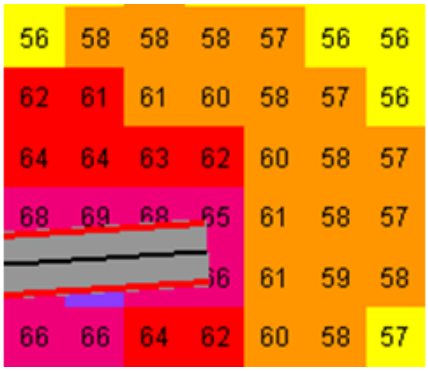
The **BEZIER TYPE** sets the form accuracy of the contour lines. With exact Bezier curves, the contour lines will move through the calculated interception points. The smooth Bezier option means the interception points are only used to pull the curve in its direction but will not force the curve to go through it.

The exact Bezier curve moves through the calculated points of the contour lines. However, when the lines have strong and changing curvature, this option will make the line less accurate.

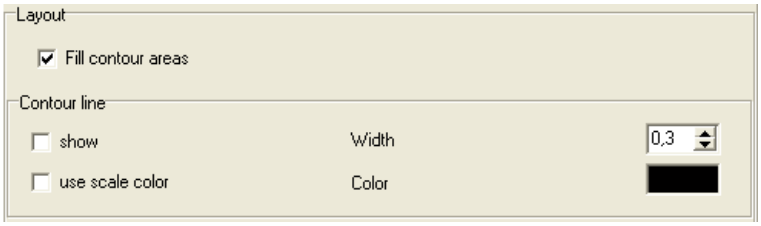
The **EDGE LINE** displays the calculation area border. This option provides how this line will be presented. Please specify the color and line width.

If you want to present the raw grid, activate the checkmark **DISPLAY GRID** and deactivate **DISPLAY CONTOURS**. You can also have the program interpolate the colors of the scale to more closely represent the colors of the grid cells by requesting a **FLUID SCALE**.

The option **VALUES AS TEXT** will display the predicted noise level as a text. The text is centered in each grid cell.



Definition of intervals



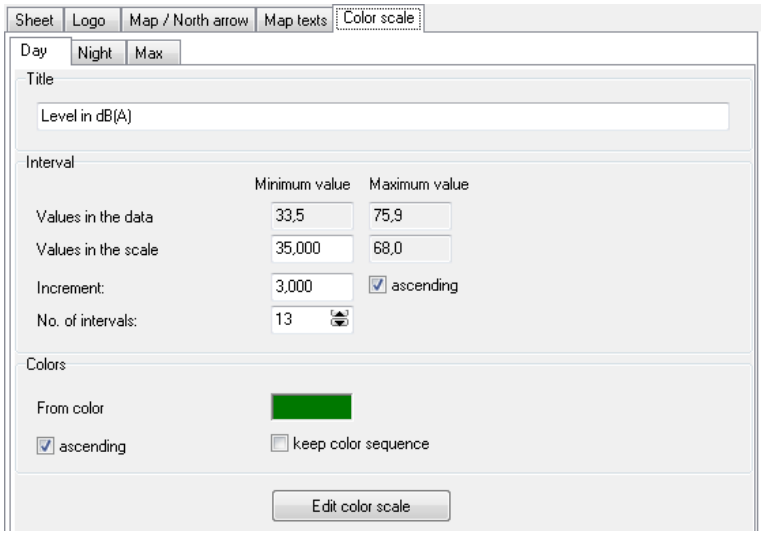
FILL CONTOURS fills the areas between the contour lines according to the scale colors. You can also choose to have the contours themselves presented as lines, and choose the color and line width.

Additionally, you can disable the **FILL CONTOURS** and display the contour lines according to the scale colors.

Edit the colored scale

When the grid noise map is loaded, the program determines the minimum and maximum values of the grid noise map levels and suggests a sensible scale covering the value range of the map. The color sequences are chosen from the color palette.

Click on the color scale in the description block or invoke **GRAPHICS -> EDIT COLOR SCALE**.



Enter the value of the smallest interval, the magnitude of the intervals (in dB(A)) and the number of intervals. **ASCENDING** defines if the lowest noise levels are on the top or the bottom of the scale.

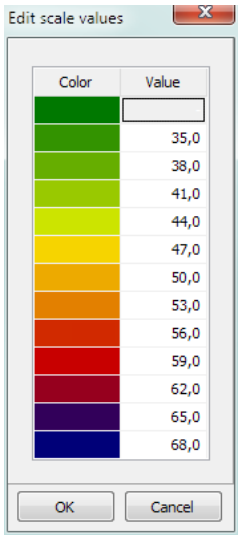
For the **COLOR SELECTION**, a color palette is used. A line in the palette has 16 color fields so you can manage your scales and store the color sequences properly. SoundPLANessential is delivered with a default color scale. You can define your own scale color progressions any time via **OPTIONS -> COLORS,** see "Color palette" (page 70).

The scale uses the colors starting from the field marked **FROM COLOR**. **ASCENDING** defines if the colors start from the marked field to the left or right (with „ascending“ deactivated).

If less than 16 intervals are used, SoundPLANessential selects a color sequence from the following 16 colors. Select **KEEP COLOR SEQUENCE** to disable the automatic assignment of colors.

Manually modify scale intervals of the color scale

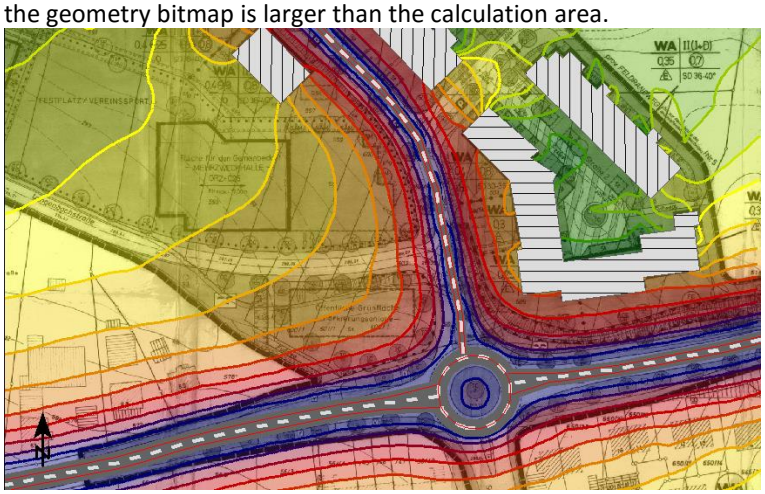
The interval size of the color scale is still pre-set according to the noise values found in the grid noise map, however it is possible to manually customize the scale. Click on the color scale and set the colors in the dialog **EDIT SCALE VALUES**.



In the color scale value column, you can change the upper interval boundary. The intervals do not have to be constant in their size.

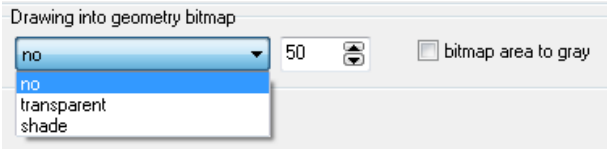
Transparent grid maps

If a geometry bitmap is in the background of the editor, the display of the grid map can be included in the geometry bitmap either transparent or shaded provided that the geometry bitmap is larger than the calculation area.



The contour lines are drawn on top of the bitmap in the selected color or in scale color.

Go to the object types (mouse click on the legend), select **TRANSPARENT** or **SHADE** in the settings for the grid noise map and enter the percentage for shaded or transparent.



You can additionally select whether the colors of the bitmap should be taken into account or only the gray values (check box **BITMAP AREA TO GRAY**).

TRANSPARENT is suitable for fully colored darker geometry bitmaps (aerial photos). **SHADED** is suitable for digital base maps in which only lines and bright colors (e.g. light gray for built-up areas or light green for forests) are included. If the result colors are too falsified, you can change the settings in the object type geometry bitmap for the options **BRIGHTEN** (useful for aerial photos) or **CONTRAST** (useful for base maps).

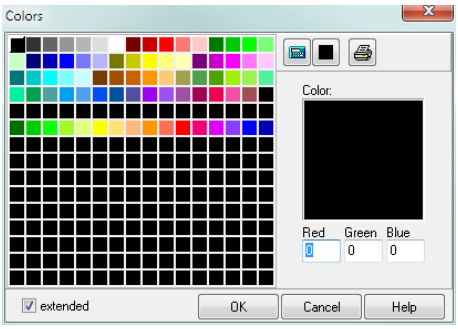
Hint: In the background the geometry bitmap is automatically set to "normal" in the object type settings and the output sequence of the contour lines is set to higher than the output sequence of the grid noise map.

Color palette

The color palette is used to control the color of the objects and elements and the scale colors. 16 consecutive colors are used for the scale colors.

Open the colors via the menu **OPTIONS -> COLORS**. The values are defined as RGB values.

RGB = Red-Green-Blue-components for each color range from 0 to 255.



The extended color dialog is opened automatically when you click on a color field that is not using a color previously set as favorite.

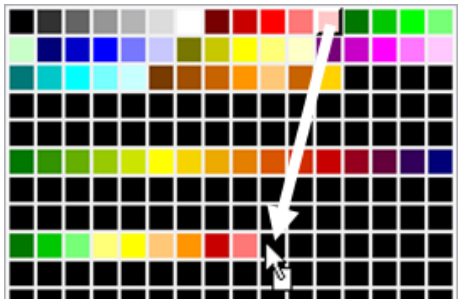
Define colors / compile scale colors

Click on **EXTENDED**. Enter the numerical value for the RGB components click on an existing color, move it with Drag&Drop to the extended color field and m to modify it.

Rotating the color wheel in a color field will proportionally vary all RGB components while rotating the mouse wheel in one of the components will only vary the individual component.

Move the new color with Drag&Drop to the desired position.

You can compose color sequences for a colored scale the same way. Move the colors in the desired sequence to free (black) fields in the matrix.



Interpolate colors


To generate color gradients for scales or to detail color settings for objects, SoundPLAN interpolates colors between 2 given color values. Click on **EXTENDED**. Select the first color and place it into an empty black field. Select the second color and place it to the right of the first color, leaving as many black spaces as you want to have interpolated in between. To fill the gap with interpolated colors, click on the pocket calculator icon.

For a gray scale, the first value cannot be black (0,0,0). The program would ignore this. Set a very dark gray for the first color, for example, 5,5,5.

Set colors to black


Click on the symbol „set black“. It remains active as long as you keep the left mouse button pressed. This allows you to quickly erase no longer desired color favorites with the left mouse button.

Print color values

The entire palette can be printed using the **PRINT** button. The colors are shown with RGB values. The colors on the printer depend on the saturation, resolution and the printer paper.

Export and print graphics sheets


Click on the button “print” to print the map on the printer or to save it in a pdf file. If the margin of the sheet is cut, the selected margin width of the sheet is

too small for the maximum print size of your printer. In this case call **GRAPHICS -> SHEET SETTINGS** and correct the margin width.

Ctrl+C copies the current graphic sheet to the clipboard, ***Shift+Ctrl+C*** copies only the plan without legend block.


You can save graphics sheets as bitmap or Windows Metafile using the button "Save as". The sheet displayed on the screen is exported.

Use **GRAPHICS -> EXPORT GRID VALUES** to save the grid values of the displayed map in a text file.

You can save the contour lines of the displayed map in the formats ASCII, DXF and ESRI Shape file with **GRAPHICS -> EXPORT CONTOUR LINES**.

Annex

Implemented standards

Road

ASJ-RTN Model 2013 · BUB:2018 · CNOSSOS-EU Road:2015 · CoRTN:1988 · EMPA StL 86+ · HJ2.Road:2009 · NMPB 96 · NMPB 2008 · RLS-90 · Russian Road · RVS 4.02 · RVS 4.02.11:2019 · TNM 3.0 · VBUS:2006

Railway

BUB:2018 · CNOSSOS-EU Rail:2015 · CoRN:1995 · FTA / FRA-HSGT: 2005 · Israeli Rail:2006 · Japan Narrow Gauge Railways:2008 · NFS 31-133 Rail:2007 · ONR 305011:2009 · RMR:2002 (EU Interim) · Russian Rail · RVE 04.01.02:2019 · Schall 03:1990 · Schall 03:2012 · SEMIBEL · VBUSch:2006

Industry

ASJ CN-Model:2007 · BS 5228-1:2009 · BUB: 2018 · CNOSSOS-EU Industry:2015 · HJ 2.4: 2009 · ISO 9613-2:1996 · Nord2000 · ÖAL 28:2019 · ÖNORM ISO 9613-2:2008

Parking lot

RLS-90 · Bavarian parking lot study:2007

Files in SoundPLANessential projects

The geometry data are stored in different files in the project folder with the following names:

GeoRoad.geo	Roads
GeoRail.geo	Railways
GeoIndu.geo	Industrial sources
GeoPlot.geo	Parking lots

GeoObjs.geo	All other geometry objects for projects with one variant
GeoWand.geo	Noise protection wall for projects with the variant "with noise protection"
Geo*.~ge	Backup copy of the last saved file.

The results are stored under the following numbers:

1	DGM
11	Single point calculation (one variant)
12	Limit contour lines (one variant)
13	Grid noise map calculation (one variant)
21	Single point calculation (two variants)
22	Limit contour lines (two variants)
23	Grid noise map calculation (two variants)

When different noise types are combined in one project, the numbers for each calculation are increased by 100.

Convert projects to SoundPLANnoise

Projects edited in SoundPLANessential can be transferred to SoundPLANnoise, for example to continue them with SoundPLANnoise and forward them to another office using SoundPLANnoise. Select the SoundPLANessential project in SoundPLANnoise via **PROJECT -> OPEN**.

Situations are automatically created during conversion.

- DGM.sit contains the elevation data and, if applicable, roads and railways.
- Objects.sit contains all objects for calculation and display.
- All objects.sit contains all objects entered in SoundPLANessential.
- Objects with Wall.sit additionally contains the planned walls for a calculation without and with a noise barrier.

The corresponding evaluation is automatically created; in addition, the SoundPLANessential calculations are converted into run file lines.

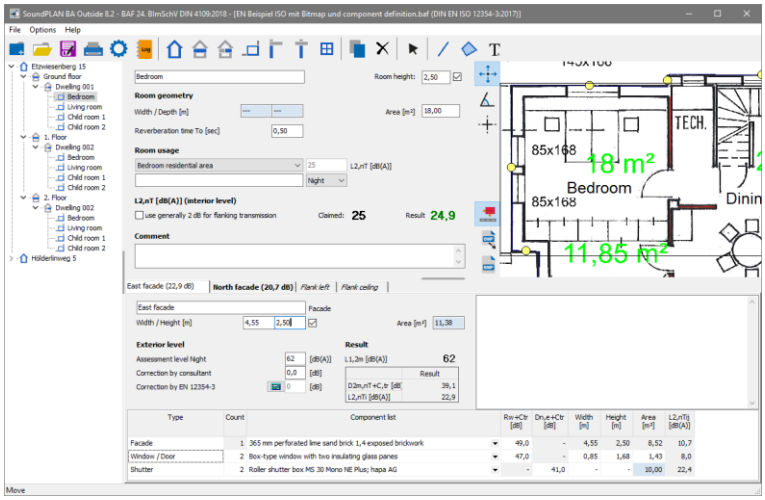
The graphic sheets are not generated automatically, save them in the *Graphics plot* tab index card via **GRAPHICS -> SAVE SHEETS AS SOUNDPLAN NOISE SHEETS** before you convert the project**.**

2

BA-Outside

The scope of the module Building Acoustics-Outside

BA-Outside assesses the required valued sound reduction index R'$_w$ of the outside shell of a building subjected to noise from outside sources in accordance with the EN ISO 12354-3:2017 and other (German) standards. This description only covers the calculation according to EN ISO 12354-3:2017.



The sound reduction index of the used windows, windows or shuttters comes from a project specific component definition or from the extensive transmission library.

From the outside level EN ISO 12354-3:2017 calculates the required sound reduction index of the façade components on the basis of different room types defined in the room assessment library. Depending on the use of the room, the day or night assessment level is decisive. The room assessment is selected from the room assessment library when you create a room book.

2

The permissible interior level L2,nT is the energetic sum of the partial levels L2,nTi of all facades. The partial level L2,nTi of a façade is obtained by the energetic summation of all partial levels L2,nTij of the components of this façade.

General overview

BA-Outside module is the program of choice for small and big projects alike hereby the SoundPLAN module offers the following possibilities:

- A hierarchically structured presentation with the object types building, floor, Dwelling and Room with specific data for each layer.
- SoundPLAN-results of the outside noise calculation can - in case they are present - be used for the noise assessment of the BA-Outside. In this case the buildings used in the calculation are created for BA-Outside together with the information road name, house number and limit. The noise levels from a Façade Noise Map are later on assigned to each façade of the building.
- A room can be exposed to the outside via one or multiple façades. For the room the inside noise level is calculated that is presented in red color as soon as the noise limit has been exceeded.
- The elements making up the façade are made up of the size in square meters and the valued sound reduction index R'_w. Inserted façade elements are automatically accounted for in the tally remaining wall area with the exception of the openings of the forced ventilation pipes where the pipe diameter is neglected.
- The hierarchical structure makes it easy to transfer data from the higher level to the next level. Subsequent, general changes can thus be easily transferred to the rooms without having to change each value individually.
- The sound reduction index is set manually or is taken from the SoundPLAN transmission library or via a façade element calculator. For each element it is possible to host values describing the current status as well as values after possible improvements to the situation.
- On all object layers, you can enter and save comments and graphics. Graphics are either pixel graphics (bmp, jpg, png, tif), a pdf file or simple drawings and texts created with a built-in tool (or both). If present SoundPLAN model data can also be used.
- The result printout is either for a selected element or the entire BA-Outside project. Customize the scope of the printout with options menus, select to include comments and pictures.
- When selecting the noise improvement measure list, only the elements are printed that during the BA-Outside process had been changed.

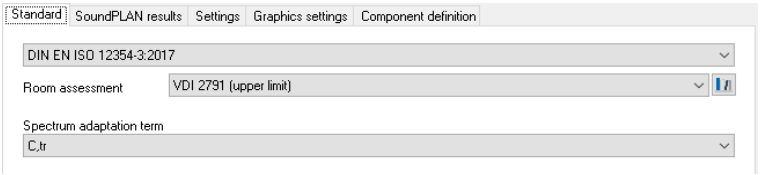
Generation of a new room book

Start a new project or select an existing project and start BA Façade with the symbol button BA-Outside in the main menu area of the SoundPLAN Manager.

With **FILE -> NEW** or via the symbol **NEW** you get to the dialog to start a new room book.

Standard

First select the standard you want to use for the calculation.



EN ISO 12354-3:2017 requires a room assessment from the room assessment library. Click on the library symbol to open it. The system library contains two room assessment elements from the German VDI 2719. To select one of these elements, go to the system library and copy the element to the project library. You create your own room assessment elements directly in the project library. You can change the room assessment later under **OPTIONS -> SETTINGS** by clicking on the library icon.

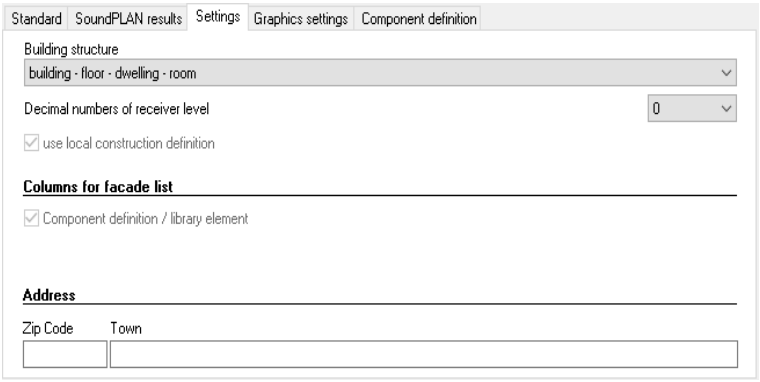
Select the default spectrum adaption term C or Ctr.

SoundPLAN results

Go to the next tab index card. Here you select, if desired a SoundPLAN result, see “Using SoundPLAN calculation results” (page 78).

If you don’t want to use SoundPLAN results, a room book with one building is generated.

Settings



2

With the **BUILDING STRUCTURE** you define which hierarchical steps you want to include as a default into the tree structure of the room book and for the import of SoundPLAN data, see “Building structure” (page 82).

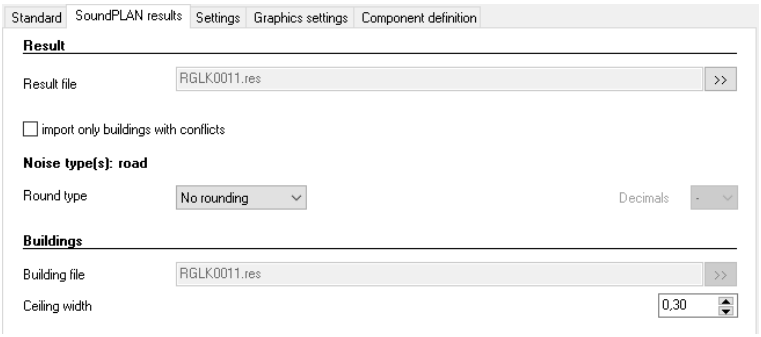
For the **FAÇADE LIST**, the column with the elements entered in the component definition is inserted by default. It can be deactivated later with a right click on the header of the façade list or with the short cut ***Strg+L***.

The component definition, see “Component definition” (page 86) should already be generated when you start working on a new room book.

You can define defaults for the **ZIP-CODE** and the **TOWN** of the buildings, so that together with the street name and house number properties the address is already completely available after the import.

Click on the green tick to start a new room book. The buildings will be presented in tree structure in accordance with the selection of the building structure. On the right side the data of the selected sub element are displayed.

Using SoundPLAN calculation results



In order to generate a clear building structure, you should only import buildings where the noise limits at least in one of the time slices or for one of the floors are exceeded (**ONLY IMPORT WITH CONFLICT**).

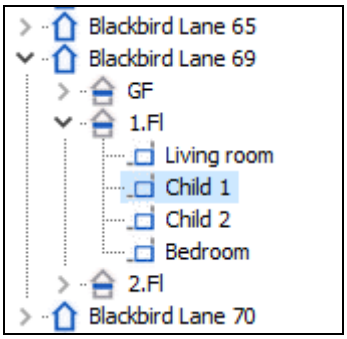
Select the result file with the double arrow to use an existing calculation result – receivers are imported along with the road name and house number. The usage and the assessment levels are assigned to the receivers. If the floor was selected for building structure, the number of floors present in the building properties the correct number of floors will be present in BA-Outside.

With the **ROUNDING TYPE** the noise levels are rounded at import time in accordance with your settings.

The **FLOOR THICKNESS** is used in combination with the height of the floor to calculate the mean inside room height, which is important for the noise level inside.

In the field address you can pre-set the defaults for zip code and city of the buildings so that along with the road name and house number every building contains a complete postal address.

After importing the SoundPLAN results the receivers will be presented in the tree. Road name and house number are entered as the building name.



If the results change in the course of the project work, you can use **FILE -> UPDATE SOUNDPLAN RESULTS** to exchange the assigned levels in the facades from the calculation result or the immission location table.

You receive a message about the number of updated facade levels. If not all facades can be updated, these facades are entered in the logbook. Double-click on the entry in the logbook to call them up directly.

To retain the building and facade structure for different variants that refer to the same room geometry, the result can be exchanged using the double arrow.

Each element a graphic or pdf file can be assigned to document the project. You can take for example a picture of the outside or the building and assign it to the building, you may want to assign a drawing of the floor plan to a floor or a dwelling or a construction drawing to show the construction of the roof to the top floor. These graphics can be incorporated in the printout.

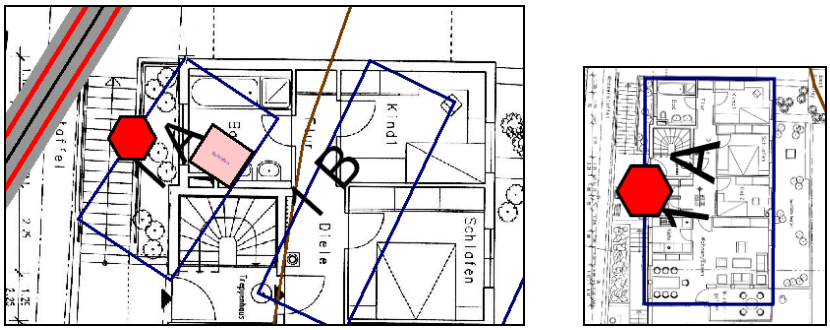
Fit the graphics to SoundPLAN data

If you work with SoundPLAN geometry data, you can adjust size and position of the floor plan to the geometry.

Load the graphics by clicking on the symbol **BITPAP** symbol. If the graphics file is not located in the project, the program will copy it there.

The cursor will change its appearance to a little cross. Click on a corner of the building and pull it with the with the mouse button pressed onto the appropriate corner in the bitmap (picture on the left). Now grab a second corner of the building. With the mouse button pressed fit the data to the bitmap (moving the mouse left/right will rotate the geometry, moving up/down will zoom in/out). As soon as you release the mouse button the cursor will again change into a hand.

2



Inserted graphics can be placed easily for multiple rooms (for example for multiple floors with the same floor plan). With the symbol **COPY BITMAP**, you can for example transfer the graphics viewport of a dwelling to a room.

In the selection mode (arrow symbol) the graphics can be transferred with Drag&Drop to another element in the tree, for example to another room. Simply drag the graphics with the left mouse button pressed to the desired element in the tree.

In order to prevent accidental zooming, the mouse wheel in the selection mode is deactivated.

To remove a bitmap from a layer, click on the **BITMAP** symbol and press the Delete key (the graphics itself will not be deleted).

Add drawing objects

If you work with SoundPLAN results or a bitmap is assigned you can add simple drawing objects for example to highlight a specific room. The following drawing objects are to your disposal:

- **Line** – enter successive the points of the polyline, finish with a double click
- **Area**– pull open with or click on successive points, finish with a double click
- **Text** – click on the position and enter the text in the edit field

You can activate the drawing objects with the left mouse button (several equal objects with the ***Ctrl key*** pressed or by pulling open a frame around the objects) to add points on the line edge or move individual points. On the pink diamond you can move the entire object, rotate it (hold down the ***Ctrl key***) or enlarge / reduce it (hold down the ***Shift key***).

Use the uppermost icon on the left side of the graphics window to move (hold down the left mouse button), zoom (turn mouse wheel or ***Shift*** + left mouse button or rotate (***Ctrl*** + left mouse button) the SoundPLAN geometry data. For your own drawing objects, you can define a fixed angle step size (**OPTIONS -> SETTINGS**, Tab *Graphics settings*) and optionally display a crosshair at the cursor.

Object types

The drawing objects and if used the SoundPLAN geometry data and results are formatted with **OPTIONS -> OBJECT TYPES**.

To display drawing objects with different attributes, duplicate the general objects lines, areas and texts and customize their layout.

Use the right mouse button to assign the layout to the activated object -> **CHANGE LAYOUT TYPE**.

Structure the room book

Duplicate and move elements

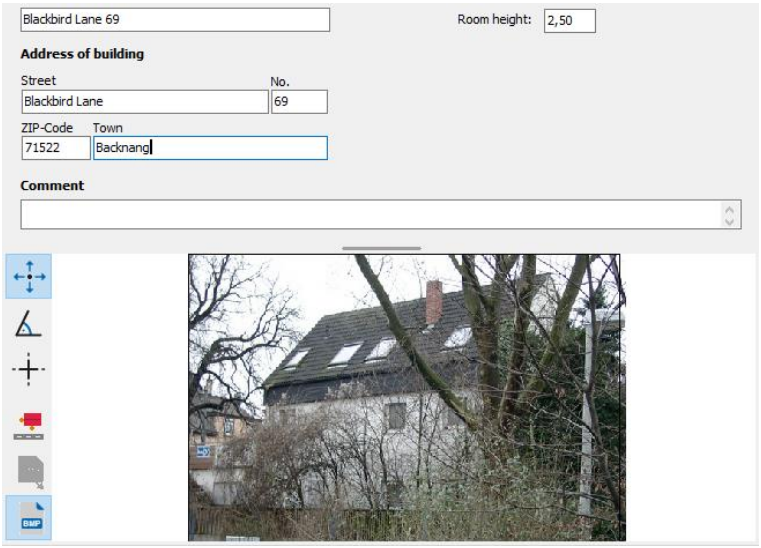
The program allows duplicating elements, so it might be advantageous to first enter an element and completely define it and then duplicate the entire branch.

Click on the symbol **DUPLICATE ELEMENT** on the branch that you want to re-use. All elements in the hierarchy below this base element are also duplicated. When you duplicate dwelling 1 to become dwelling 1 and 2, all rooms and façades belonging to dwelling 1 are duplicated. In case dwelling 2 is located in a different building as dwelling 1 (if you have multiple, identical dwelling buildings) mark the dwelling and use the mouse to drag it to the new building you want to assign it to.

Buildings

The room book must contain at least one building (rooms can only be generated when a building already exists, therefore buildings are required). Depending on the scope of investigation and the type of building, floors and dwellings may require further structuring.

2



Building structure

You can define a building structure in the settings when you create a new room book.

- Only buildings
- Building - dwelling (= apartment or flat)
- Buildings - dwelling - room
- Buildings - floor - dwelling - room

If the structure with floors is selected, using SoundPLAN results will automatically create the number of floors from the receivers.

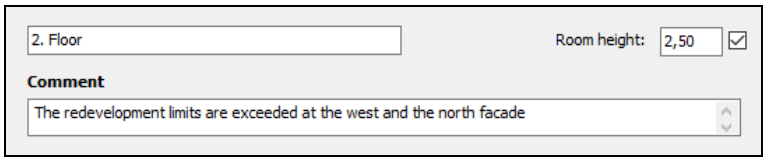
Which building type to select as the pre-set for BA-Outside depends on the scope of the investigation, the national (and local) legislative framework and the structure of the borough to be investigated. If the area is predominantly built up with multi-family residential buildings then the structure "building, floor, dwelling, room" is suggested, if is structured with a mixed of single family and multi-family buildings, it may be better to activate the setting for “only buildings”.

Regardless of the building type you selected at the beginning, you can always add floors, dwellings and rooms to individual buildings, just as your work requires.

Floor

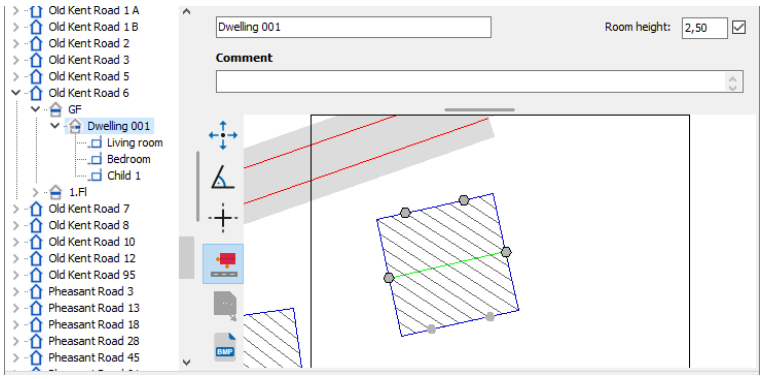
A floor can only be inserted in the hierarchy below the building. This element is only used to structure the data, aside from the floor height it does not contain any data of its own required in the calculation. A floor can have additional textual and

graphical information. If the check mark behind the room height is active, the room height is taken from the building.



Dwelling

Dwellings can be generated directly below the building or as part of the floor. A dwelling can contain multiple rooms and floors.



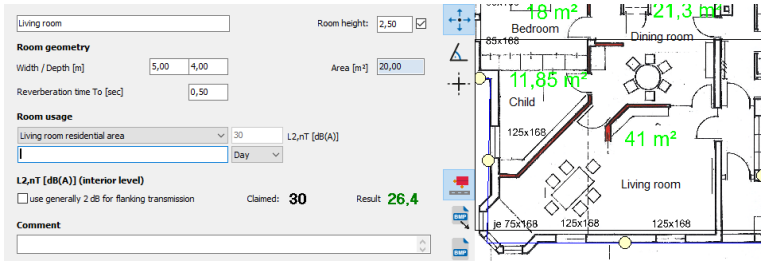
If the check mark behind the room height is active, the room height is taken from the superior element.

Façade calculation

After the rough structure has been specified or the receivers of the investigated area have been read in, the rooms and facades to be considered are created.

Room

The room itself is the core of interest for BA-Outside.



2

The **ROOM HEIGHT** is set as a pre-set value when you create a new façade. If the check box behind the room height is checked, the room height is taken from the superior element. Changing the room height at a later time will only change the height of the facade element if the check box behind the façade height is set.

The room usage is important for the evaluation of the required interior level and comes for EN ISO 12354-3:2017 from the room assessment library with the corresponding required indoor level L2,nT. The room assessment library is selected when defining a new room book. It is possible to change it under **OPTIONS -> SETTINGS** with a click on the library symbol. This is only sensible in very rare cases as the assignment of existing room types gets lost! The room usage is also used to select whether the day or night level is assigned when working with SoundPLAN results.

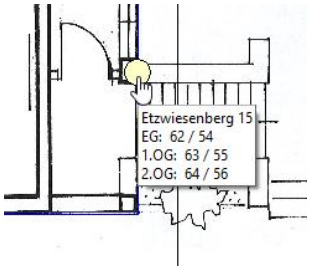
The reverberation time is standardized in the ISO to 0,5 s but can be customized if necessary.

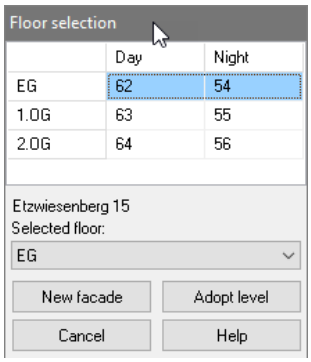
The result of the facade calculations with an indication of whether the permissible values are complied with is displayed in the room.

Façade(s)

You can assign several facades to each room. The label on the tab is taken from the field “façade”. Behind the name in brackets you can see the partial noise level associated with this façade. Each façade can be assigned a comment.

If you work directly with SoundPLAN results, click on the respective receiver to insert a facade and take over the noise level.



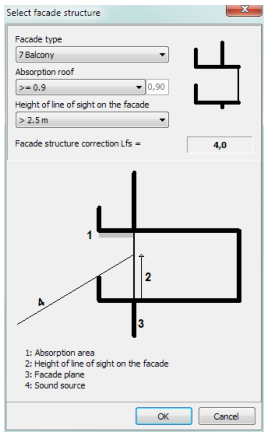


Select the floor and click on **NEW FACADE** to generate a new facade. Taking levels from other facades can only be done if the receiver already contains a façade. This procedure has the advantage that outdoor calculations can update the values while maintaining the object tree of building components (all levels are updated via **FILE -> UPDATE SOUNDPLAN RESULTS**).

If the assessment level is printed on gray background, the value came from a SoundPLAN calculation. With a right click the reference to the calculation.

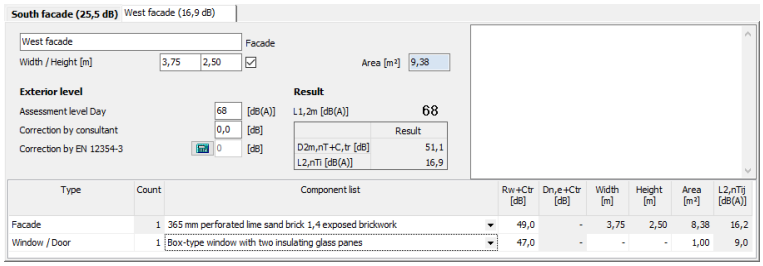
Below the facade description the dimensions of the facade are entered. With a double click on the gray field **AREA** the size of the facade can be entered directly. The labels for **WIDTH** and **HEIGHT** assume the standard case of vertical walls. By directly entering the area it is possible to accommodate the bigger sizes of slanting roofs and to add the area for a flat roof. However, an outside level adapted to the location should be used for this case.

The outdoor level used for the calculation according to EN ISO 12354-3:2017 uses the assessment level day/night as the base level. This can be adjusted with a **CORRECTION CONSULTANT** and/or a facade correction of the EN 12354-3.



The resulting total noise level is presented as the result L1,2m.

Façade list and components



In the facade list, the room components (wall, windows, doors, shutter boxes, fans, ...) intended for the room are entered or optimized. The area is specified by width x height or directly as area. You can print the used components as a facade component list, see “Print room book“ (page 88).

If necessary, here you also insert inner walls (flanking elements) for the flanking transmission, see “Flanking transmission EN ISO 12354-3:2017” (page 87).

When creating a new facade, the components wall and window/door are automatically inserted. Additional components can be added via the symbol

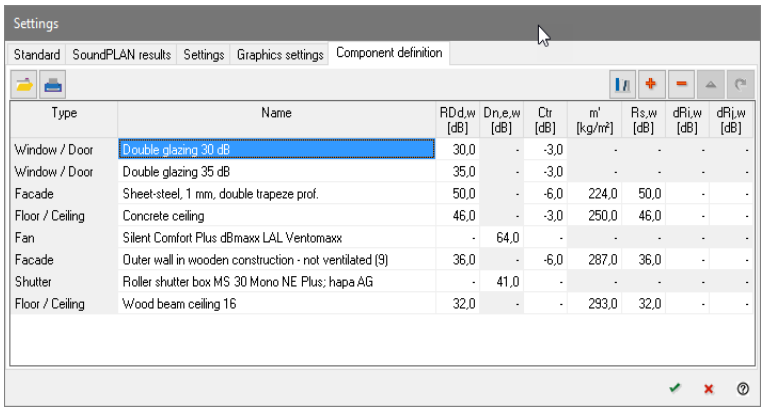
2

COMPONENT or ***Ctrl***+'+' obsolete components can be deleted with the symbol **DELETE** or ***Ctrl***+'-'.

The first line always hosts the main element, the wall. The area is calculated from the total façade area minus all other inserted façade components. The area of a component is not subtracted from the main element if the component is defined with the normalized level difference Dn,e,w, for example fans or shutters.

Component definition

When you create a new room book for EN ISO 12354-3:2017, you get into the tab index card *component list*.



Type	Name	RDd,w [dB]	Dn,e,w [dB]	Ctr [dB]	m' [kg/m²]	Rs,w [dB]	dRi,w [dB]	dRj,w [dB]
Window / Door	Double glazing 30 dB	30,0	-	-3,0	-	-	-	-
Window / Door	Double glazing 35 dB	35,0	-	-3,0	-	-	-	-
Facade	Sheet-steel, 1 mm, double trapeze prof.	50,0	-	-6,0	224,0	50,0	-	-
Floor / Ceiling	Concrete ceiling	46,0	-	-3,0	250,0	46,0	-	-
Fan	Silent Comfort Plus dBmaxx LAL Ventomaxx	-	64,0	-	-	-	-	-
Facade	Outer wall in wooden construction - not ventilated (9)	36,0	-	-6,0	287,0	36,0	-	-
Shutter	Roller shutter box MS 30 Mono NE Plus; hapa AG	-	41,0	-	-	-	-	-
Floor / Ceiling	Wood beam ceiling 16	32,0	-	-	293,0	32,0	-	-

The component list in the **SETTINGS** dialog is initially empty. Create the required components when you create the room book or later using the gearwheel. The component list is filled by either defining free components via the red "Plus" button or transferring components from the transmission library via the library button. If no suitable component is available in the system library, you can also create your own components in the project library or the global library, which you can then transfer to the component definition.

Components from the component definition can be assigned to several different rooms, allowing central changes to individual components.

You can use the **OPEN** button to transfer a component definition from another room book to the current room book, for example, if the same components are used for another order.

Excursus: Creating an element in the transmission library for use in BA-Outside:

In the transmission library, the tab "Characteristic values" is particularly important in addition to the input of the evaluated sound insulation value Rw or the evaluated standard sound level difference Dn,e,w. Each element to be used in BA-Outside must be assigned an element type (façade / wall inside / window, etc.). For solid

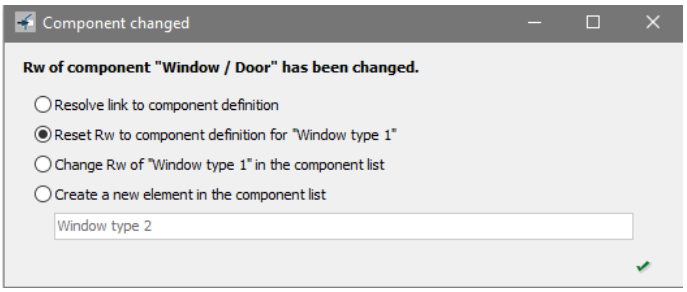
components, the area-related mass and, if applicable, the improvement of the sound insulation coefficient for facing shells must also be specified.

Press the "Accept" button to transfer all marked elements of the transmission library to the component list. If you want to edit an entry again, use the blue arrow to return to the library entry.

Components entered directly in the component list without library reference can be recognized by the grayed-out library symbol.

Via the **PRINT** button the component list can be printed out or copied to the clipboard.

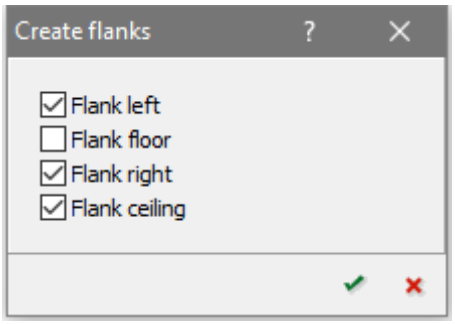
If the characteristic value of a component is changed during facade processing by scrolling with the mouse wheel or direct input, a query is made as to how the changed characteristic value is to be handled.



Flanking transmission EN ISO 12354-3:2017

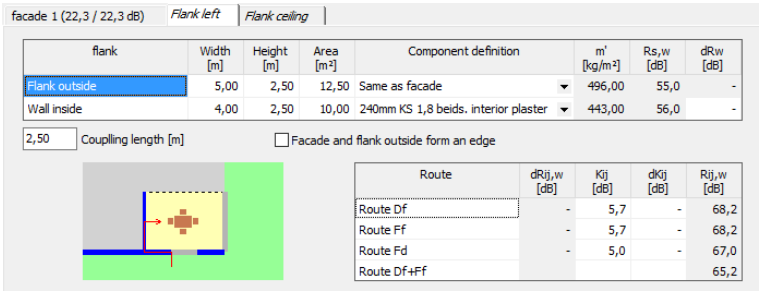
EN ISO 12354-3:2017 allows a generalized reduction of the sound reduction index of 2 dB for flanking transmission. For some noise and component situations, it may be necessary to take a detailed flanking transmission into account.

Once you have defined all the components, you can create the flanks using the "wall inside" symbol. The flanks to be considered always refer to the loudest façade; the title of which is written in **bold.** In principle 4 flanks are available for selection (left flank, floor flank, right flank, ceiling flank), whereby the direction designations refer to the direction of view from the outside to the loudest facade.



By deactivating the checkmarks, individual flanks can be switched off. This can be relevant, for example, if a flank is already an external facade or if a flank can be neglected.

A separate flank tab index card is created for each flank next to the facade tab index cards. The headings of the flank tab index cards are in *italics*.



On the left and right flank, the plan view and on the ceiling and floor flank, it is the side view explains the position of the considered components and the individual flank paths.

The component definition, the geometry, the area-related mass m' of the flank components, the sound insulation dimensions of the solid flank components Rs,w as well as the improvement of the flank sound insulation dimensions due to room-side attachment constructions dRw are listed here.

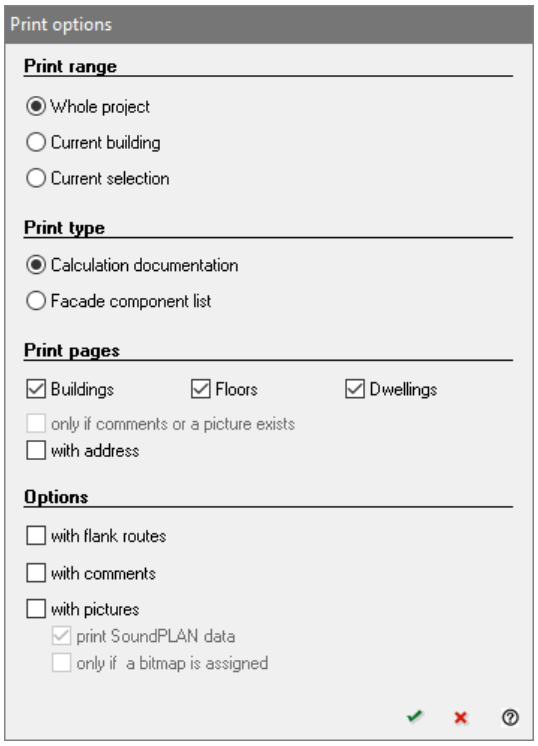
In the comment field on the right there is enough space for the documentation of expert adjustments.

If facade and flank outside form a corner, the check mark **FACADE AND FLANK OUTSIDE FORM A CORNER** must be activated under the component list of the flank. This results in a different calculation of the joints.

The **COUPLING LENGTH** is determined by default from the room geometry but can be adjusted if necessary.

Print room book

Via **FILE -> PRINT** the results of the interior level calculations are printed. Define how much in depth you want your printed documentation.



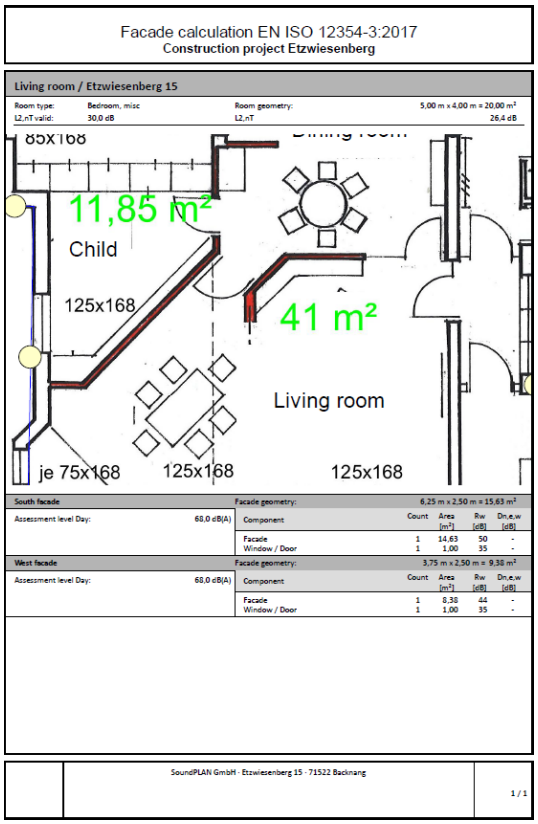
The selected printout either can print the data for all objects in the room book (**ENTIRE PROJECT**), the **CURRENT BUILDING** or the **CURRENT SELECTION** a selected element. Aside from this the building, floor and dwelling pages can be suppressed.

You can select between two fix formatted printouts:

- The detailed **CALCULATION DOCUMENTATION**
- The façade components used in this project (**FAÇADE COMPONENT LIST**)

With additional options you can define if the pictures that were created within BA Outside, assigned bitmaps and comments are printed.

2



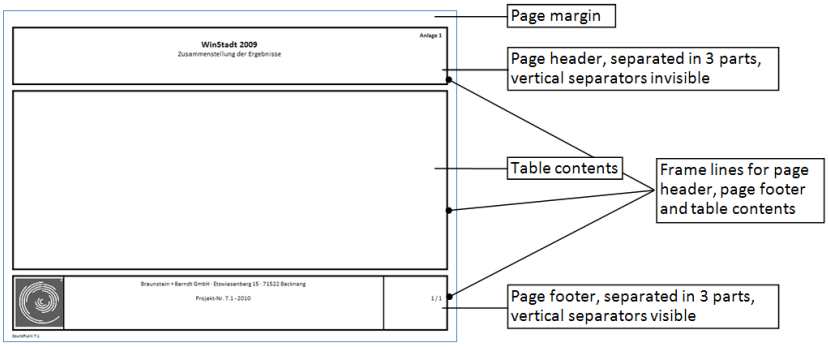
The printout is fixed in its formatting, headers and footers can be defined in the page layout **FILE -> PAGE LAYOUT**.

Page Layout

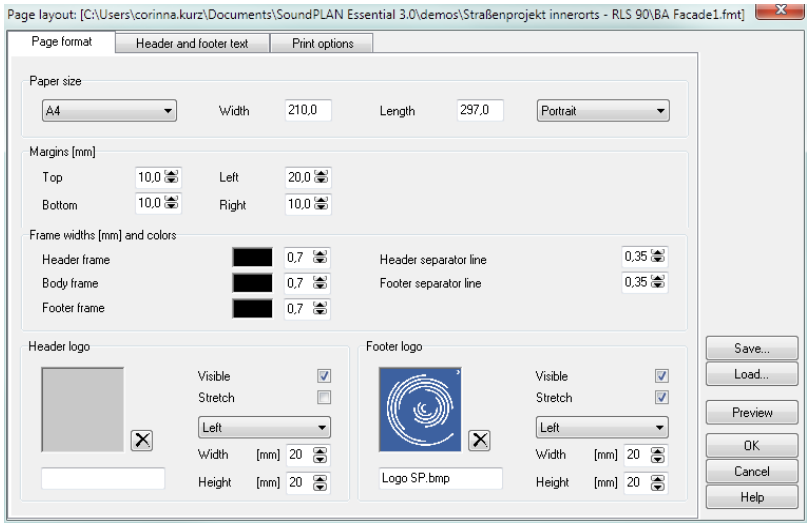
The page layout in SoundPLAN not only includes the paper size and the frames, but also the contents and layout of the headers and footers so that all enclosures of an investigation report look the same.

Open the page layout with **TABLE -> PAGE LAYOUT.**

Define the format of the page in the tab index card *"page format"*.



The different parts of the printout



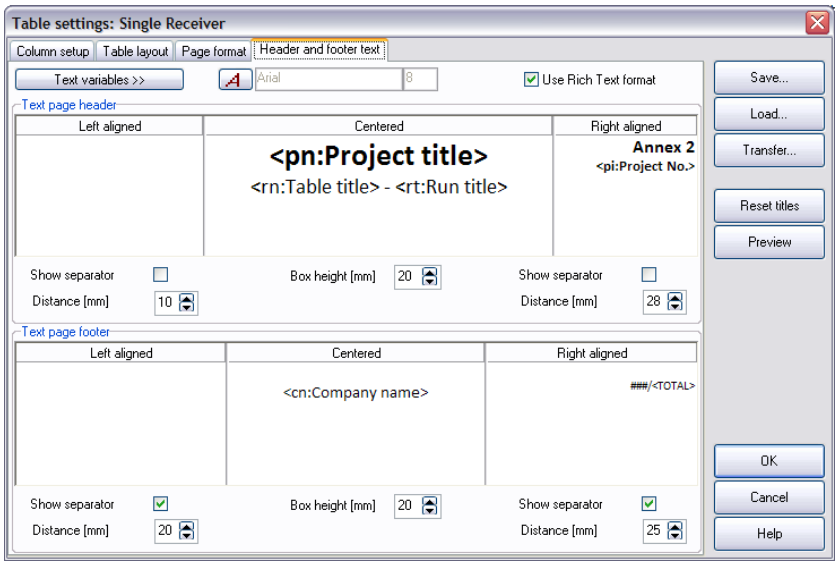
Define the print sheet size and the margins. The line widths and the colors of the frames and the separator lines can be defined for each section separately.

The header and footer sections have three partitions: Left, middle, right. Texts or logos in the left partition are left aligned, in the middle partition centered and in the right partition right aligned.

A graphics can be inserted in the header as well as the footer, for example your company logo or the logo of the customer. Click on the gray field to select the graphics file. Define the position (left, middle, right partition) the height and the width of the graphics. When you check the logo justification button ("**STRETCH**"), the logo is fitted into the allocated space. The print preview however will decrease its speed because of it and therefore it is advisable to select a logo of proper size.

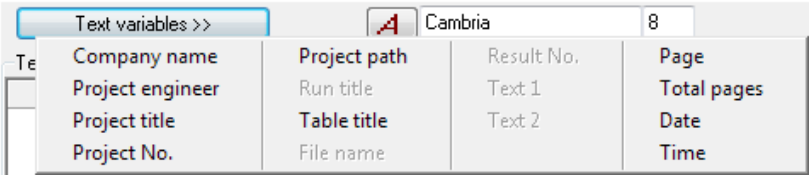
Format the content and the size of the page frame in the tab index card "*header and footer texts*". The texts can be text variables, automatically updated with information stored in the project or own texts.

2



Page header and page footer are printed on all pages of the table as well as for the legend. To format the texts, highlight the text or text variable and click on the button **FONT**. Define the width of the left and right partition and the height of the frame. The three sections can be partitioned with vertical **SEPARATOR LINES.**

For the entry the following **TEXT VARIABLES** are prepared for you and will automatically be updated in case the information changes. Click the cursor to the partition where the text should be displayed and select the variable to be displayed:



In the tab index card "*print options*" you can select the first page number for the printout. Additionally, the table font and size and the colors for the column headers and heading lines are defined.

Click on the button **PREVIEW** to check the page layout.

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