



Modeler® Preparing SketchUp® Files

Introduction

Starting with version 6.6, Bose® Modeler® sound system software contains new features designed to facilitate the import of two and three-dimensional drawing files. These features allow you to leverage work performed outside the Modeler software environment within popular 2D and 3D drawing environments.

Two new import file types are now supported:

- Modeler Text Format files (.MTF)
created by the Bose Modeler Software Plugin for Google® SketchUp®.
- Drawing exchange format files (.DXF)
created by Autodesk® AutoCAD® and other compatible drafting applications.

SketchUp is a widely used program that allows the accurate creation of complex 3D shapes. A special plug-in, Bose Modeler Software Plugin for Google SketchUp, allows you to export the SketchUp model into a text file, the "Modeler Text File (.MTF)", which is then imported to Modeler software. The functionality of the plug-in allows the handling of Modeler software-specific model features already within the SketchUp program. Among these features are:

- Materials including absorption data
- Surface types
- Settings for occupancy
- Settings for reflection characteristics (scattering, specular)

Given this functionality, it is possible to build models of acoustic spaces including most of the relevant acoustical characteristics entirely in SketchUp, export the model and start with acoustic predictions or sound system design right after import into Modeler software.

NOTE: The plug-in is not intended for importing a Modeler room model (.MDR) into SketchUp.

SketchUp version 6 or 7 is required to properly run the plug-in. SketchUp is available from Google in both consumer and Pro versions. A demo-version is available as well.

The information in this application note is organized into two primary sections:

Section 1: Preparing a model in Google SketchUp software

Section 2: Importing a Modeler Text File (.MTF) into Modeler software

Associated Reading:

Modeler 6.6 Software User Manual

Bose Modeler Software Plugin for Google SketchUp User Guide

SketchUp Documentation

Section 1 - Preparing a model in Google SketchUp software

This section provides *basic* information about the use of the Bose® Modeler® Software Plugin for Google® SketchUp® and requires the user to be familiar with the use of SketchUp. Please refer to the *Plugin User Guide* for detailed information about the functionality of the plug-in and for further hints to proper modeling in SketchUp.

Scale (Units)

It is good practice to prepare SketchUp for acoustic modeling. First, make sure that your model is created with or converted to metric units because the .MTF defaults to geometry defined in metric units. You should also enable the length snapping and enter a reasonably small step for snapping. In order to adjust the precision of the **Length units**, select **Model Info** from the **Window menu** and then select **Units**. A precision of 1 cm is reasonable for most acoustic modeling and 10 cm may be used for large models. If length snapping is not enabled or the step for snapping is too small, errors during modeling are more likely to happen which are difficult to correct after import.

Layer assignment

The *Plugin* offers a dedicated *Layer browser* for layers that are used in the SketchUp model. In addition to the display of any custom layers as created for the current model, the main purpose of the *Layer browser* is to create a layer set that mirrors the standard set of surface types as they are used in Modeler software. When the .MTF file is written, these layer names become the surface types as defined for each surface. This way, *layer assignment in SketchUp* can be used to simplify or even omit the step of *surface type assignment in Modeler software* upon import. The *Layer browser* allows to automatically create 15 layers utilizing the names of standard Modeler surface types. Furthermore, empty layers can be deleted, and occupancy as used in Modeler software can be assigned to layers. The *Layer browser* is accessed via a dedicated toolbar button:

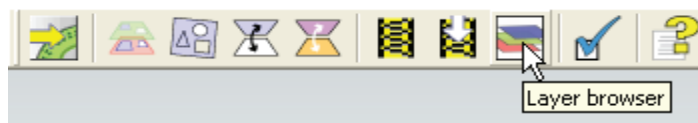


Figure 1: Button access to Layer browser

In Modeler software, **occupancy** (occupied or unoccupied) can be assigned to each individual *surface*. Such a surface property is not supported in SketchUp and thus also not available in the *Plugin*. Instead, occupancy can be assigned individual *layers*. This way, it is possible to move all surfaces intended to be occupied onto a dedicated layer and define this layer as occupied.

Material assignment

With this new *Plugin*, it is possible to assign acoustic properties (sound absorption and scattering characteristics) to materials. For this purpose, the *Plugin* provides its own *Model material browser* which is independent from the SketchUp material browser. The *Model material browser* is not only used to pick materials directly for their assignment to surfaces in the model but also to display and edit absorption coefficients, and to display and edit reflection properties (scattering/specular as used in Modeler software) for each material currently used.

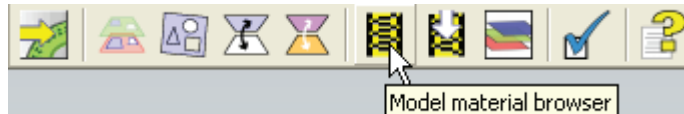


Figure 2: Button access to Model material browser

Once the *Model material browser* has been invoked by clicking the button depicted in the figure above, a window like shown below will open. Material assignment is performed by clicking on the color field of the desired material which will change the cursor to the "bucket" symbol.

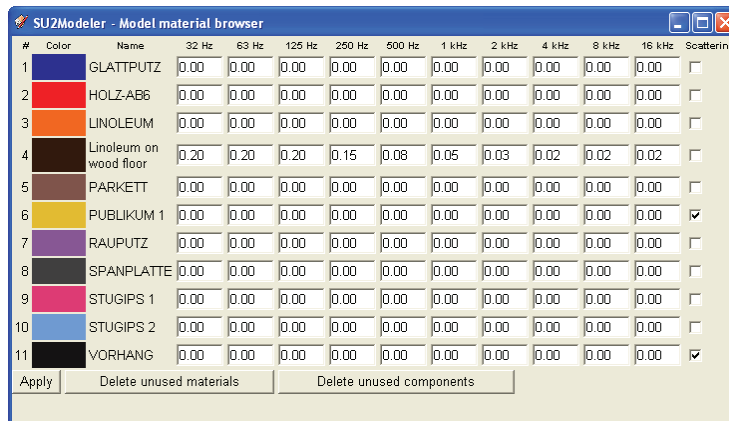


Figure 3: Model material browser

Next to the color and name of a material, absorption data can be entered for the octave bands from 31 Hz to 16 kHz. Also, each material can be assigned to have scattering reflection properties. From within the *Model material browser* it is also possible to remove all materials that are currently not used in the model.

In addition, the *Plugin* also allows the import of Modeler material files (.MAT) directly from Modeler program folder. The *Material database* is accessed via a dedicated toolbar button:

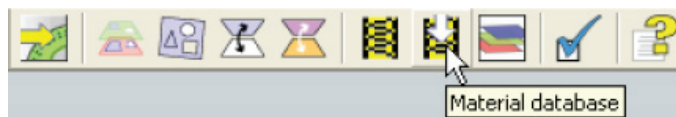


Figure 4: Button access to Material database

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Materials may also be imported into the *Material database* by clicking the *Read .mat file* or *Read all .mat files* button, respectively.

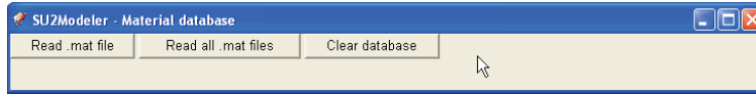


Figure 5: Material database

Once materials have been imported into the *Material database*, they can be assigned to surfaces the same way as from within the *Model material browser*. Note that it is not possible to alter the absorption properties or assign scattering reflection properties inside the *Material database*.

In Modeler® software, the **reflection characteristics** (specular or scattering) can be assigned to each individual *surface*. In SketchUp®, this is not possible and reflection characteristics, i.e., scattering, can only be assigned to a *material*. Thus, all surfaces with the same material also share identical reflection characteristics. Should you wish to assign the same material (in terms of sound absorption characteristics) to a number of surfaces from which only a subset is supposed to be declared scattering, you will need to generate a copy of this material, make only one of the pair scattering and assign the different two materials as desired.

Double-sided surfaces

SketchUp provides the opportunity to assign different materials to the front and back side of a surface. For the .MTF file, only one material can be exported with each surface. Therefore, this *Plugin* has an built-in debugging function to check for such surfaces. It can be accessed via a dedicated toolbar button:

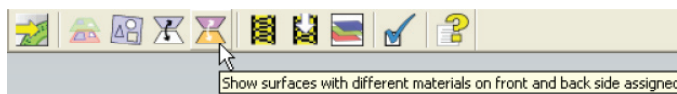


Figure 6: Button access to check for different materials on front and back

Once the button is selected, the display of the model is reduced to only those surfaces that carry different materials on the front and back side. All other surfaces will disappear. You now have two choices for handling these surfaces, depending on the intended acoustic properties of the surface:

- If it is acoustically correct that the surface has *identical* absorption properties on both sides, then one of the two materials assigned needs to be replaced by the other one, such that both sides are identical. This way, you can make sure that the export routine will export the right material.
- If it is acoustically correct that the absorption properties are *different* on both sides (e.g., a floating ceiling reflector that is absorptive on the upper side), then you need to replace the single surface in question by a 3D object with dedicated front and back surfaces which are spaced by a small amount, e.g., 0.1 meters. Of course, the openings on the edges need to be closed with appropriate surfaces. On the other hand you may also decide to perform this modification in Modeler software *after* you have imported the .MTF file, e.g., by using the Extrusion tools.

Surfaces with holes

In SketchUp®, a surface can be defined with both an outer and an inner circumference, i.e., it is allowed that the surface contains one (or multiple) cut-outs or holes. Typical examples of such situations are windows or doors within a wall or columns and beams that pierce through bounding surfaces. Such kinds of surfaces are not allowed in Modeler® software and modifications need to be made to the model in order to properly export the complete geometry as intended. This *Plugin* has a debugging function to check for surfaces with holes. It can be accessed via a dedicated toolbar button:

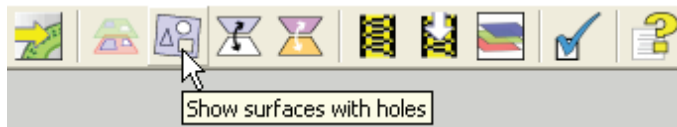


Figure 7: Button access to check for different materials on front and back

Once the button is selected, the display of the model is reduced to only those surfaces that contain one or multiple holes. All other surfaces will disappear and you may modify the surfaces in question. The *Plugin* User Guide contains further information about the recommended steps to make the necessary adjustments.

Components:

SketchUp allows the use of so-called components, e.g., to add furniture or people to a model. Components will not be exported into the .MTF file unless they have been exploded first. Should you wish to delete them from your room model, note that the component will remain a part of the model (as can be verified in the SketchUp "Components Browser"). Thus, even if a component is not used in your model, its materials will still show up in the *Model material browser*.

The button *Delete unused components* in the *Model material browser* will delete components which are not used in the model, but still inside the component browser.

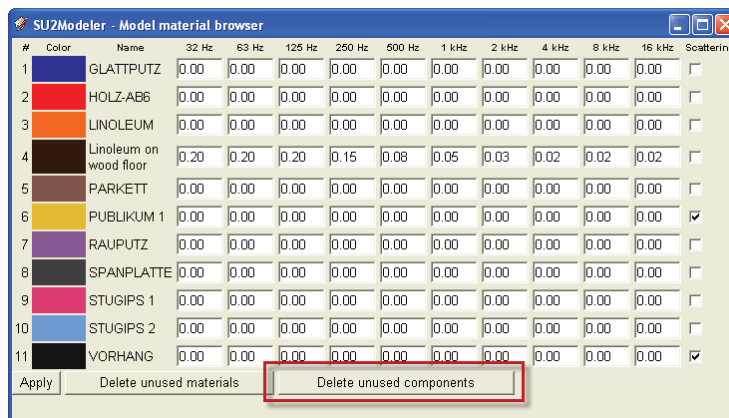


Figure 8: Model material browser

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Export

In order to export your SketchUp® model, simply select the *Export to MTF...* button.

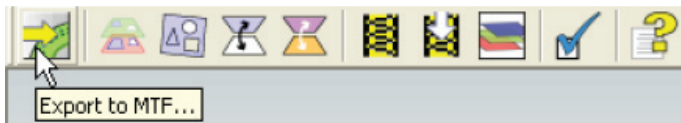


Figure 9: Button access to export to .MTF

You will now be guided through a set of steps in order to properly export the model. Depending on the state of your model and the modeling guidelines you have followed, a couple of messages may appear. Please refer to the *Plugin User Guide* for detailed information about the export process.

Section 2 - Importing an .MTF file into Modeler software

Once you have exported the .MTF file, you can import it into Modeler software, either as a single model or into an already opened project:

1. Within Modeler software, access the **Import Model – Modeler MTF File (.mtf)** option from the **File** menu.
2. Browse the file system to locate the .MTF file of interest, select it, then click **OPEN**.
3. The .MTF file will be opened.

You are now ready to work with your 3D room model within Modeler software.

Before you continue with the sound system design or room-acoustical predictions, we recommend checking the model for all items described in greater detail on page 7.

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Model Verification

RT source location

SketchUp® and the *Plugin* do not support the definition of the location of a source for reverberation time predictions as required by Modeler software. Upon import of an .MTF file, Modeler software determines the position of the RT source based on the dimensions of the imported model. Please double-check this pre-determined location and re-locate the RT source if necessary.

Set Acoustical Parameters

The .MTF file does not contain any information about the acoustical environment of the room model. Use the Acoustics Tab in the Detail View to set the relevant acoustical parameters like temperature, humidity, occupancy and background noise.

Location of coordinate system origin

After import into Modeler software, you may decide to change the location of the origin of the coordinate system, e.g., in order to match Modeler software's Room View Grid to characteristic dimensions of the model. Use the **Center ...** function to accommodate for this origin shift. For example, in order to locate the origin at the position of any vertex in the model, select the corresponding surface, select the **Properties** tab in the Detail View and select the desired vertex in the table. Now, right-click and chose **Center Vertex**.

Surface descriptions

After import into Modeler software, you may want to consider assigning surface specific descriptions since these are not available in SketchUp and the Bose Modeler Software Plugin for Google SketchUp.

Conclusion

We certainly hope the concepts and recommendations discussed in this application note are helpful to you. We anticipate it will make sense for the way you work with Bose® Modeler® Sound System Software.

