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Welcome to the IES <Virtual Environment> plug-in to Trimble SketchUp. This plug-in links SketchUp 6, 7 and SketchUp Pro 6, 7 to the <Virtual Environment> suite of tools: VE-Ware, VE-Toolkits, VE-Gaia and VE-Pro. This document is intended as a brief introduction to the plug-in to let you get started.

More detailed videos, how tos, help, forums and tutorials can all be found on SketchUp™ Plug-in
IESVE Toolbar

The plug-in appears as a toolbar in SketchUp. The toolbar has 11 features which will be described in more detail below:

Thin Walls and Thick Walls
The IESVE plug-in for SketchUp can be used with models that have been drawn using either a Thick Walls or Thin Walls method.

Thin Walls – Available in both SketchUp Free and SketchUp Pro, this is the most basic way of drawing models where a single surface represents a floor, wall, roof element.
Thick Walls – Available only for SketchUp Pro users, this mode allows realistic building models to be analysed using the plug-in where floors, walls and roofs have been modelled with a thickness as in the real-life building.
Set Building Properties

Set Building Properties: Set data for the entire building

Location is important for building performance analysis because location and climate dictate the performance of the building. Set the location by clicking Select Location from the dialog. This opens the <VE> Location Browser:
Set Building Properties

The <VE> Location browser allows you to choose major cities throughout the world. The browser has three levels: Continent [Africa, Antarctica, Asia etc]; Country / State / Territory [UK, Arizona, Manitoba etc]; then City [London, Phoenix, Winnipeg etc]. Select a location closest to your project. The local carbon fuel mix and weather data is derived by selecting the location. The resource fuel mix translates into the carbon emissions factor per fuel type for the project that is used to determine the carbon footprint.

Once the location is selected, the latitude and longitude will be updated automatically, if you would like a more exact latitude and longitude, you can use Google Earth (It will be explained later in the guide).

Within the Set Building Properties dialog, you will also need to set the Building’s Constructions, Building Type and Building HVAC Service.

![Building Constructions](image)

### Building Constructions

- **Constructions:** What constructions are used in your building? What glazing types do you wish to use?
- **Building Type:** What is the principle function of the building you are designing?
- **HVAC Service:** How is your building heated and cooled?
Set Building Properties

Building Type

HVAC Service

IESVE Plug-in for Trimble SketchUp
Version 3 User Guide
Push Through Doors and Windows

Push Through Doors and Windows (SketchUp Pro Thick Walls only)

When a model has been constructed in Thick Walls mode windows and doors can be added as Groups or Components. Ensure the Group/Component has the correct category definition using the IESVE Toolbar Select Groups or Select Components button to define them (see later) then place the Groups/Components on the outer surface of walls.

With the Window or Door Group/Component selected then select the Push Through button and the Group/Component will be pushed through to the inner surface of the wall and will be correctly recognised by the plug-in when rooms are identified.
Build a Storey from a Floor Plan

Build a Storey from a Floor Plan (SketchUp Pro Thick Walls only)

Use the Build a Storey tool to extrude any 2-dimensional floor plan (for example a DXF floor plan) into a full height 3-dimensional Thick Walls model.

Step 1
Start with a 2-D floor plan (this can be a dxf, dwg or simply a 2-D sketch).

Step 2
Select the floor plan then click the Build a Storey from a Floor Plan button on the IESVE Toolbar. The Build a Storey settings dialog will be displayed.

Enter the Height of each Storey, the Ceiling/Slab Thickness and Number of Storeys then click Go.
Build a Storey from a Floor Plan

Step 3
The building will be extruded as defined by the settings.

Each Storey has room layout as specified in the original floor plan and the number of storeys, storey height and slab thickness (thick walls) are as defined in the settings dialog.

Note: the user settings dialog has an option to use the current settings as default, tick this to use these values as default the next time the Build a Storey tool is used.
Select Groups

**Select Groups:**
Define the attributes of group(s):

When you have components or groups in your model, you need to go into the ‘Select Components’ or ‘Select Groups’. You need to identify if the specific group(s) or component(s) will be analyzed as room surfaces, whole rooms, shade, door, window, or excluded.

**Room:** Surfaces defined as room will form part of room boundaries. Rooms define the analysis model that is exported to <VE>.
- **Room surfaces** is used when the Group contains surfaces that form only part of a room shell.
- **Whole room(s)** is used when the Group contains all the surfaces that bound the room (or set of rooms).

It is advised to use whole room(s) wherever possible when modelling to achieve the best results when using the IESVE plug-in for SketchUp. This will allow rooms to be quickly found by the plug-in and gives the best quality geometry export to <VE>.

**Shade:** Objects defined as Shade are treated as shading surfaces within the model and therefore taken into account for shading analysis, not for thermal analysis.

**Door:** Group or component will be translated as a door in the <VE> analysis model.

**Window:** Group or component will be translated as a window in the <VE> analysis model. Note that the group or component will need to have a material opacity between 1-99 in order to translate as window in VE-Pro.

**Excluded:** All Groups and Components are per default excluded from export and will not appear within the analysis model.

*Note:* Groups/Components defined as Door or Window can be placed on Thick Walls buildings using the Push Through tool (as described in previous section).
Identify Rooms & Set Room Properties

Identify rooms & Set Room Properties:
Find all rooms in the model & set data for individual rooms

Identify Rooms
Identify rooms is used to find all the bounded rooms in the model. Bounded rooms are geometrical surfaces that fully enclose a space or volume. The simplest form of this would be that a cube needs six sides to fully enclose the room. A non-bounded box (or selected surfaces) will be treated as Shading Surfaces.

Note: Shading devices will be used by the VE to shade the building. Examples of shading devices are overhangs or brise soleil. Surrounding buildings will also shade your building.

When rooms have been identified the IES<VE> Analytical model is displayed (in X-ray mode by default) and the <VE> Room Properties list is displayed showing details of all rooms that have been identified.

Set Room Properties
Set room properties; this dialog helps you set the constructions, type of use and HVAC system for the room(s) that you have selected. (Rooms can be selected from the list or by using the Select a Room button)

Use the SAVE Icon to save Room Names. Sort rooms and floors by clicking on the “Level” and “Room” column headings.

If construction set or HVAC service are not defined, it will inherit the constructions and HVAC system from the building properties that was previously defined.
Identify Rooms & Set Room Properties

Select a Room:
Left click when the <VE> Room properties dialog is open to select rooms you want to edit.

Right click to get further options:

Display Properties Room: <Room Name>
Selection of this menu item opens the room properties menu for the selected room:
Identify Rooms & Set Room Properties

Insert Floors
Insert floors is useful to split a single massing volume into single or multiple floors. One floor is drawn as a default to start, click on ‘Identify Rooms’, after the room has been found, right-click on the room, select ‘Insert Floors’. Select ‘Check to insert as many Storeys as will fit’, floors will be inserted based on the overall height of the volume automatically.

Toggle all Room names visibility
Selection of this menu item toggles the display of the room names on and off:
Identify Rooms & Set Room Properties

*Toggle View of Shading Surfaces Only*
Select this option to display or hide all shading surfaces on the analytical model.
Identify Rooms & Set Room Properties

**Toggle VE Model shading**

The <Virtual Environment> has a convention to describe zones that will be modelled as thermal zones, and surfaces that will be modelled as shading surfaces. Thermal zones are enclosed volumes, traditionally coloured blue in the <Virtual Environment>. Shaded surfaces are non-enclosed volumes, or single surfaces, traditionally coloured yellow in the <Virtual Environment>. To be able to identify these entities in SketchUp the Toggle VE Model shading menu shows the SketchUp Model in the traditional colours of a VE Model:

The blue zones are thermal zones; these will be included in the energy calculations; the yellow zones are shading elements (obstructions). The two types shown on this drawing are the parapet walls and the adjacent building. The parapet is created as a single surface, the adjacent building has no floor (shown below):
Identify Rooms & Set Room Properties

Toggle X Ray
Select this option to display the IES<VE> analytical model with all surfaces in X-ray mode or not.

Highlight Disconnected Edges
Use this tool to help troubleshoot rooms that were not found by the plug-in. Any edges that are not connected are highlighted blue.

Highlighted Disconnected Surfaces
Use this tool to help troubleshoot rooms that were not found by the plug-in. Any surfaces that are not connected are highlighted red.

Clear Highlights
Select this option to remove the highlighting on any disconnected surfaces or edges.

Show or Hide Unselected Faces
This option allows the model to be hidden with only faces selected by the user left to assist with any further modelling the user wishes to do.
IESVE Menu

To access the IESVE Menu commands select Tools >> IES.

Set Building Properties, Select Groups etc
These menu options perform the same functions as the toolbar buttons documented in earlier sections of this user guide.

Identify Rooms in Selected Faces Only
Use this tool to run the room finding algorithm on a reduce set of faces. Select the faces that bound the rooms you want to analyse then select his option.

Note: this tool can be most useful when troubleshooting sections of the geometry that do not find rooms as expected.
IESVE Menu

Set VE Rooms Analysis Options
This opens the <VE> Analysis Settings dialog.

Analysis Type – Select Thin Walls or Thick Walls depending on how the model has been drawn.

Analyse Visible Layers only – when ticked the Room Finding algorithm will only consider rooms on layers that are set to visible in the SketchUp Layer Settings.

Maximum Wall Thickness – when in Thick Walls mode this value will treat any space with thickness lower than this value as a wall volume.

Vertical-Horizontal Transition Angle – the angle that defines whether a sloped surface is a Wall (vertical) or a (roof).

Minimum Room Height – when identifying rooms any space lower than this height is ignored.

Minimum Floor Area – when identifying rooms any space with a floor area lower than this value is ignored.

Tidy up Model
The Tidy Model options allow the user to remove superfluous lines that may slow down or inhibit the room identification process, ensuring a faster and higher quality model transfer to <VE>.

Delete Detached Lines – Delete any lines in the model that do not form part of a surface boundary.
Delete Polygons with a Single Face – Removes any closed loops within a surface.
Delete all Text (exc. Room Names) – Deletes all extra text from the SketchUp model (leaves room names as identified by the IESVE plug-in)
Access Virtual Environment Suite Tools

Access Virtual Environment suite tools

Click these buttons to link to VE-Ware, VE-Toolkits, VE-Gaia or VE-Pro.

**VE-Ware**
Click this button to launch VE-Ware [more info: VE-Ware]
VE-Ware is free building energy and carbon assessment software, also contains Free VE-SBEM for UK regulation compliance.

**VE-Toolkits**
Click this button to launch VE-Toolkits [more info: VE-Toolkits]
VE-Toolkits offer early stage analysis for quick iterative assessments covered by a range of Toolkits including Sustainability, LEED, Green Star and more.

**VE-Gaia/VE-Pro**
Click this button to launch VE with access to VE-Gaia and VE-Pro [more info: VE-Pro, VE-Gaia]

VE-Gaia offers a step-by-step workflow analysis, iteration and reporting interface which weaves a clear route through the VE engine. VE-Pro is our most powerful, flexible and most in-depth suite of building performance analysis tools.

**Help / IES VE Website:**
Click to access the Help files, or to access the IES website [www.iesve.com]

**Definitions Floors, roofs, walls:**

- **Ground Floor Slab:** horizontal surface that is not in contact with a room below
- **Roof:** horizontal surface that is not in contact with any room above
- **Upper floors:** horizontal surface that is in contact with a room above
- **Exterior Wall:** vertical surface that is not in contact with any adjacent room
- **Interior Wall:** vertical surface that is in contact with an adjacent room
- **Exterior Window:** a window on an exterior wall
- **Interior Window:** a window on an interior wall or floor
- **Skylights:** a window on a roof

**Definitions Windows / holes / doors:**

- **Door:** a face drawn on another surface; opacity 100.
- **Window:** a face drawn on another surface with an opacity setting less than 1-99.
- **Hole:** a face “cut-out” or deleted from another surface; or an opacity of 0

NOTE: Exterior holes are treated as windows by the <Virtual Environment> suite of tools.
Using Google Earth to Set Location & Terrain

Using Google Earth to set location and Terrain:

Google Earth can be used to set the Latitude and Longitude of the SketchUp model, as well as using the terrain as part of your topographical surface for analysis. Firstly you need to install the Google Earth plug-in into SketchUp. (http://www.SketchUp.com/index.php?id=408)

Once installed follow the steps below!

**Step 1: Open Google Earth**

**Step 2: Navigate to the building location**

**Step 3: Get the current view from SketchUp.**

**Step 4: Open Set Building properties [Latitude and Longitude will have updated]**

Note: you will need to add the City name.
Using Google Earth to Set Location & Terrain

Step 5: If you would like to translate your terrain as part of the topographical surface. In the Layers dialog, turn on the Layer ‘Google Earth Terrain’ and turn off ‘Google Earth Snapshot’, you will should see the actual terrain.

Step 6: Go to the ‘Select Groups’ dialog, and select ‘Shade’ with the Google Earth Terrain.

Step 7: Click on ‘Identify Rooms’, and your terrain will translate as shading surfaces for your model.
Common Drawing Issues

Common drawing issues:

*Not all of my zones/buildings have been identified [Part 1 – Simple Cube]:*

More often than not the cause of this is the surfaces that make up your building or room have not bounded the space. Let's explain this using the simplest of room shapes – the cube. Let's approach the drawing in two ways and "forget" to completely enclose the cube:

**Step 1:** Draw a rectangle

**Step 2:** Use Push/Pull to create a cube

**Step 3:** Identify Rooms: **SUCCESS!!**

**Diagnosis:** Blue surfaces indicate zones [In the <Virtual Environment> or via Toggle VE Shading]

**Step 1:** Draw a rectangle

**Step 2:** Use Push/Pull to create walls (**but delete roof**)

**Step 3:** Identify Rooms: **FAILURE!!**

**Diagnosis:** Yellow surfaces indicate shading surfaces [In the <Virtual Environment> or via Toggle VE Shading]
Common Drawing Issues

Not all of my zones/buildings have been identified [Part 2 – Google Warehouse models]:

Again more often than not the cause of this is the surfaces that make up your building or room have not bounded the space. Let's explain this time by using some Google Warehouse models and then using the <Virtual Environment> to diagnose the problem.

Step 1: Open Google Warehouse model

Step 2: Identify Rooms: Partial Success!!

Step 3: Open VE or select or via Toogle VE Shading, blue is a zone yellow a shading device

Diagnosis: Spin the model and look at the base – there is no face here bounding the building

NOTE: if all you need to model is the lower building and the tall building is only required for shading than this approach is correct!!

No rooms in model: If a user only creates non-bounded rooms it is possible that no rooms will be created, the user will see the message and advice below:

![No rooms found message]

The plugin could not find any rooms in this model.

Here are the most likely reasons why rooms could not be identified:

- The model or part of it is a Sketchup Component. Components must be exploded and intersected to make them visible to the room identification process.
- Thick Walls selected in VE Rooms Analysis Options
- If thick walls have been selected but not drawn then rooms will be marked 'Outer Shell Space'.
- Make sure that thin walls are selected for thin walled buildings.
- Floor, wall or ceiling faces are missing. Check that the faces, not just the edges, of floors, walls and ceilings are actually present in the model.
- Edges of floor, wall or ceiling faces do not meet each other. Rooms can be identified only if they are completely enclosed spaces. That is to say, every edge bounding a face (wall, floor or ceiling) of a room must meet the edge of another face of the room. Check that the edges of the faces of the rooms meet each other.
- Use the Sketchup magnification tool if necessary.
- Any tiny gap will cause a leak in the space and a room will not be identified.

See the help on drawing thin walled rooms for an example.