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Insight Solar Analysis Help

This guide covers the Insight Solar Analysis with Revit 2017 workflows available with Insight plugin v3.0.0. The most recent solar analysis Insight plugin is v1.0.0.19.

Additional Revit support.

About Insight Solar Analysis

Insight Solar Analysis with Revit provides in context solar radiation analysis results to help you track solar energy throughout your design. The plugin provides automated settings for specific study types, as well as customizable options. The following analysis types are currently available:

Analysis Type	Description
Solar Energy – Annual PV	Annual simulation for determining PV energy production estimates
Custom	Customizable simulation for general solar insolation studies

Insight Solar Analysis with Revit uses the Perez Solar Model, a calculation method that occurs locally within Revit.

The diagram below represents how Insight Solar Analysis with Revit works.

Requirements

Insight Solar Analysis is supported for Revit 2016 and above. More recent versions of Revit will often feature more functionality. Refer to the Insight Lighting & Solar Analysis Forum for available versions and functionalities.

Access requirements for using Insight Solar Analysis with Revit:

- Autodesk Revit 2016 or above
- Most recent Insight plugin
- Access to a Revit, Building Design Suite, or AEC Collections subscription

Learn about model requirements here.

Workflows

Regardless of the type of analysis you wish to do, to get started with Insight Solar Analysis with Revit, you should:

1. Install the most recent version of the Insight plugin. Find out which versions are available here.
2. Prepare your model:
    - Set the project location.
    - Open a 3D view for analysis.

From there you will be prepared to complete any of the workflows outlined.

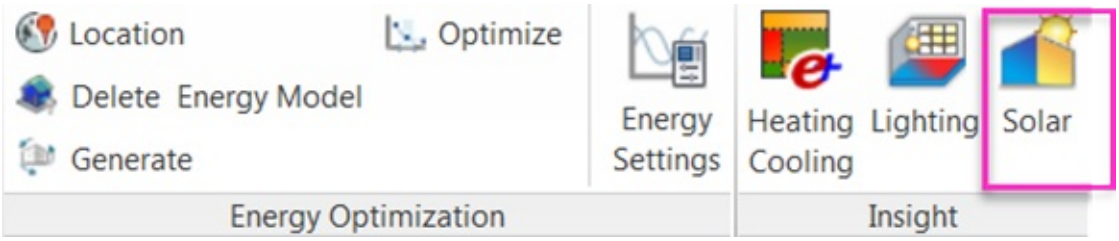
Overview

Open a Revit model. Note that for solar analysis studies you can use a conceptual mass, detailed building element model, or even a hybrid of the two.

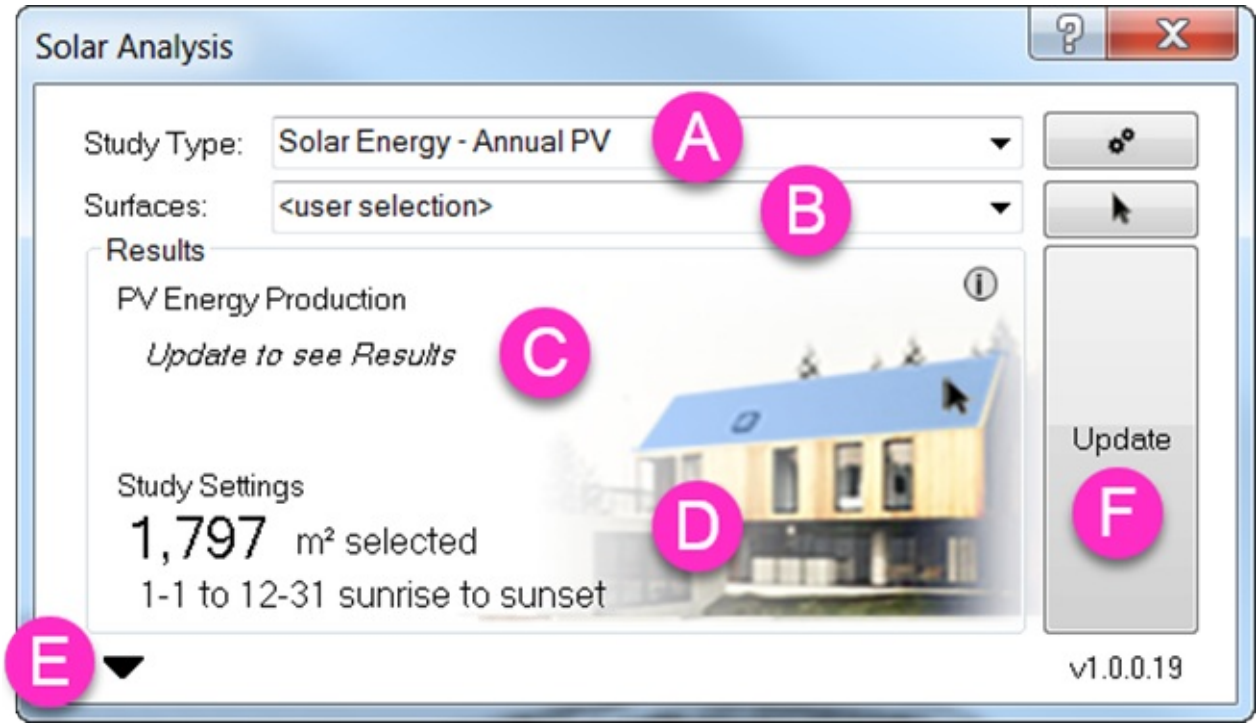
For new projects, make sure that your location is set.

Open a 3D view. A 3D view is required to run the solar analysis. You cannot view solar analysis results in a 2D view.

From the **Analyze** tab, select **Solar** from within the Insight panel. The Solar command is a separate plugin you can download from here.



The *Solar Analysis* dialog box will appear. This is where you can control your study settings.



A. *Analysis* allows you to select between different study types including:

Analysis Type	Description
Solar Energy – Annual PV	Annual simulation for determining PV energy production estimates
Custom	Customizable simulation for general solar insolation studies

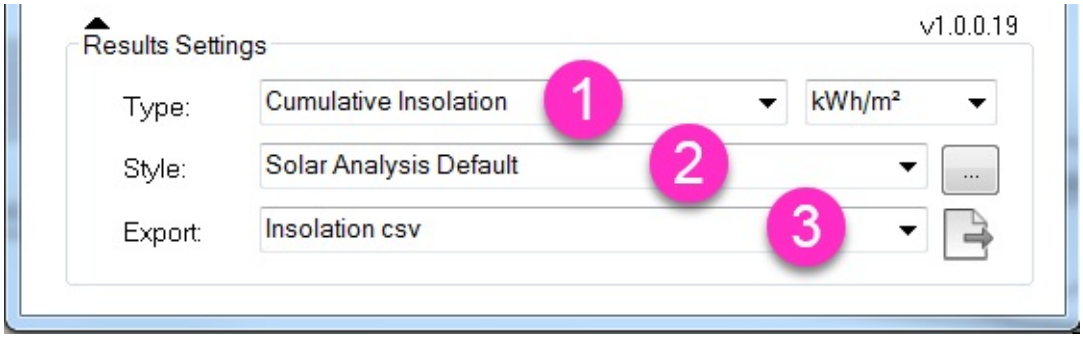
B. Select which *Surfaces* you would like to visualize results for. There are two preselection options, and one customizable option.

Surface Selection	Description
All Roof Exterior Surfaces	When selected for a model with building elements, this option automatically selects all Roof elements
All Mass Surfaces	When selected for a model with conceptual masses, this option automatically selects all mass faces
user selection	This option allows you to select your own mass and building element surfaces for analysis

C. The *Results* dialog provides a summary of *PV Energy Production* or *Insolation* results; whichever study type is selected. These results become available once the analysis is complete.

D. *Study Settings* summarize the area and time range selected for your analysis. To change the date and time range, edit the *Sun Settings* for the 3D view you have active.

E. You can expand *Results Settings* to define additional settings for analysis.



1. The *Type* allows you to select between different analysis types:

- Cumulative Insolation
- Average Insolation
- Peak Insolation

You can also specify which units you would like to use for results:

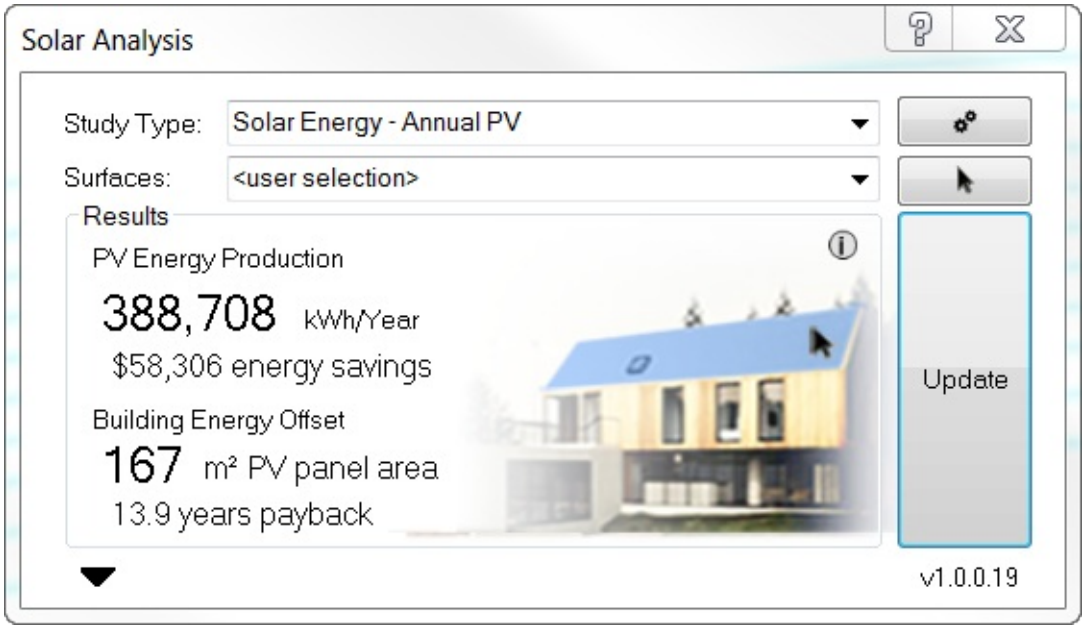
- Wh/m2
- kWh/m2
- BTU/ft2

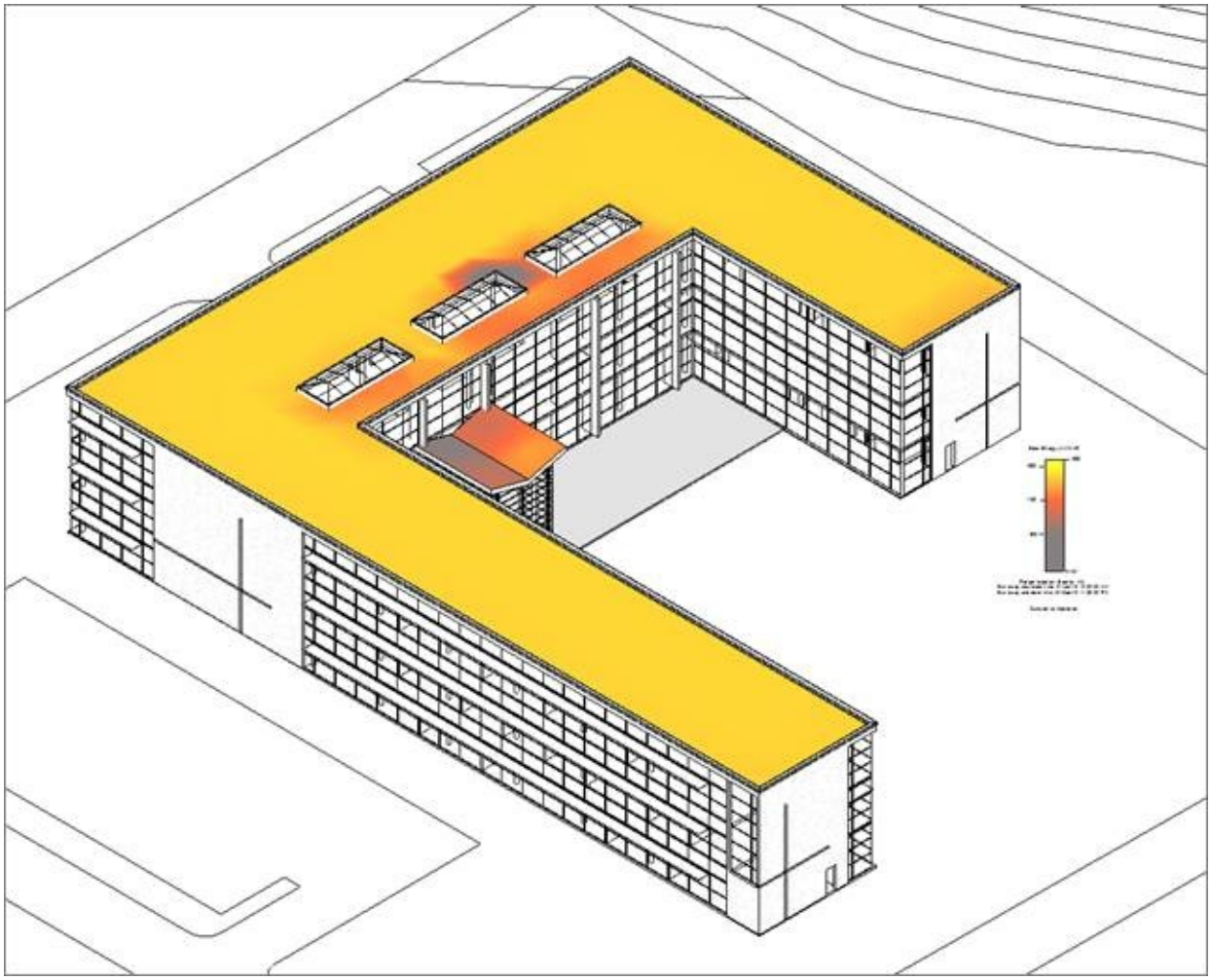
2. The *Style* controls the color scale and legend settings. Use the drop down menu to select a different style, or select the […] to create your own style.

3. *Export* allows you to export results as a CSV. This option will be enabled once the analysis is complete.

F. Once all settings are defined, you can select **Update** and the analysis will begin. The analysis happens locally (within Revit), and you will see a status bar indicating analysis progress.

Once the analysis is complete, the *Solar Analysis* dialog will update with a results summary and results will appear in your active 3D view.





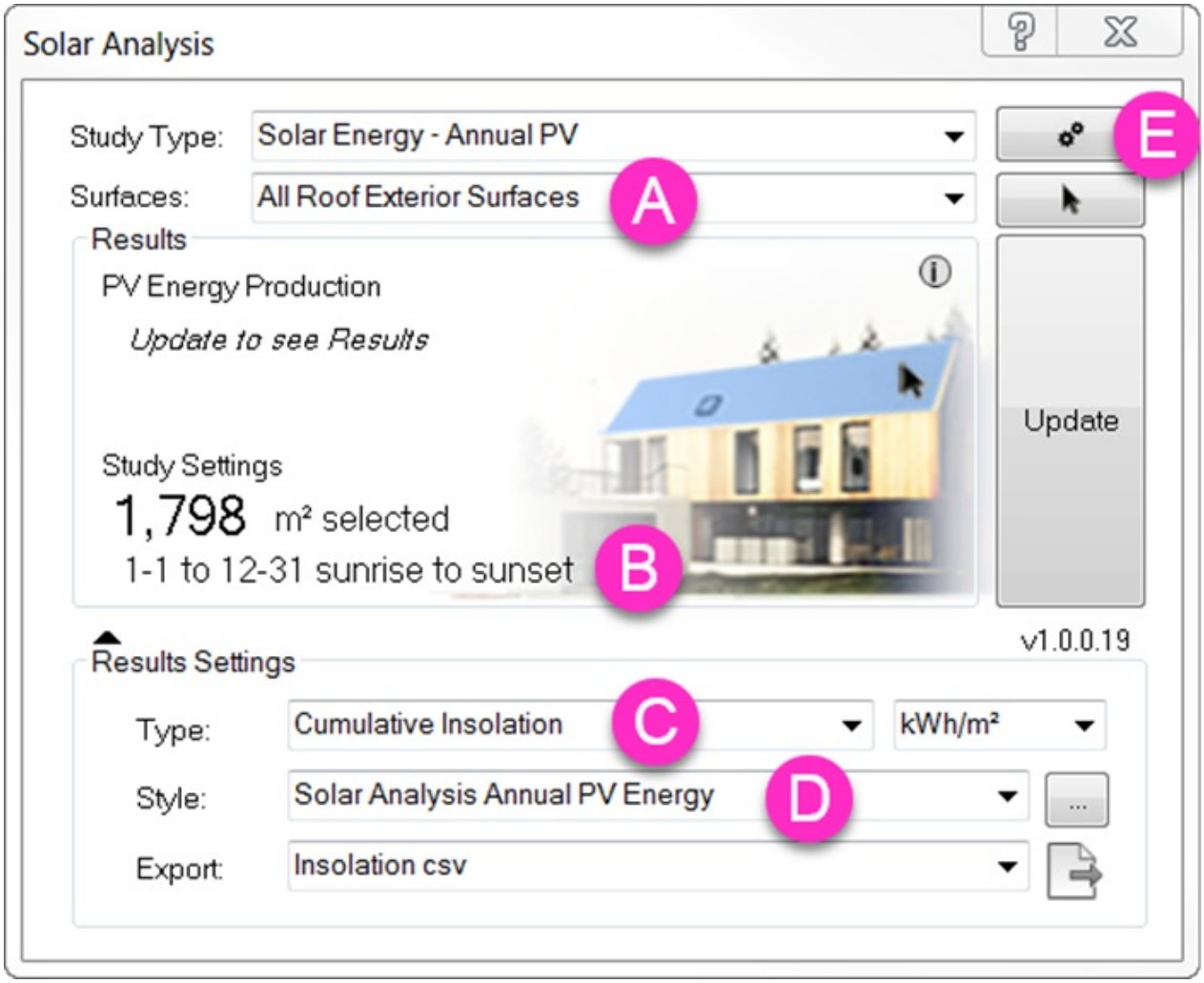
To make any changes to the analysis settings, or select new surfaces for analysis, simply edit the settings or selections, and press **Update** again. New results will override previous results. Note that solar analysis results cannot be saved with the Revit model.

Annual Photovoltaic Analysis

You can use Insight Solar Analysis to determine photovoltaic feasibility and predicted energy production and savings for your project.

To conduct this study, follow the steps outlined in the **Overview** and take note of the following.

When selecting the *Solar Energy – Annual PV* study type, note that the several of the analysis settings are preset.



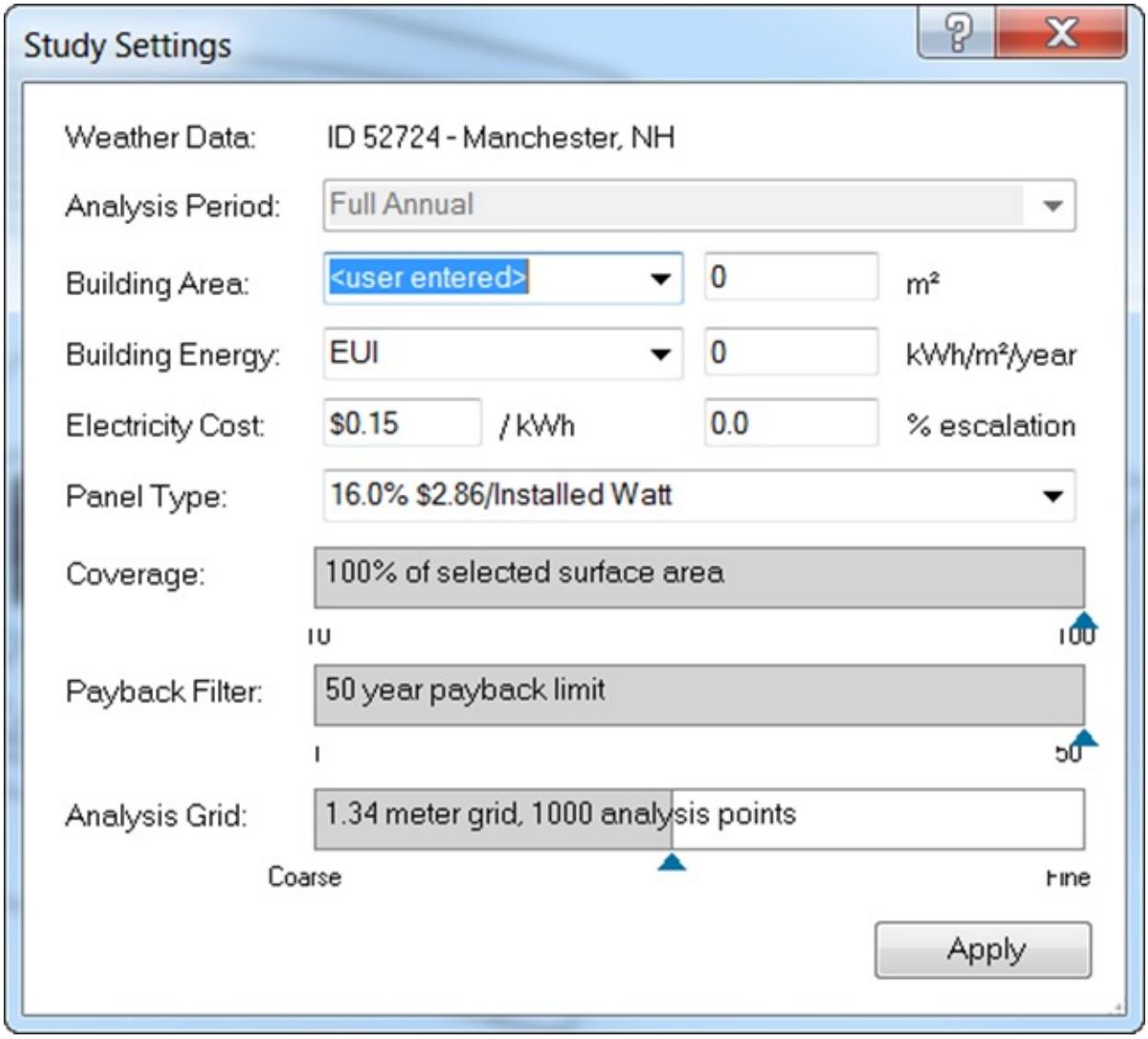
A. The *Surface* selection will automatically select **All Roof Exterior Surfaces**, as PV panels are most often placed on roofs. This can be overridden by selecting the drop down.

B. For PV study types, the full year, from sunrise to sunset will be used as the date and time range. This can be overridden by changing the date and time selecting in *Sun Settings*.

C. The result *Type* will be set to **Cumulative Insolation**.

D. *Style* will be preconfigured to a legend that displays color scale results that detail PV opportunities.

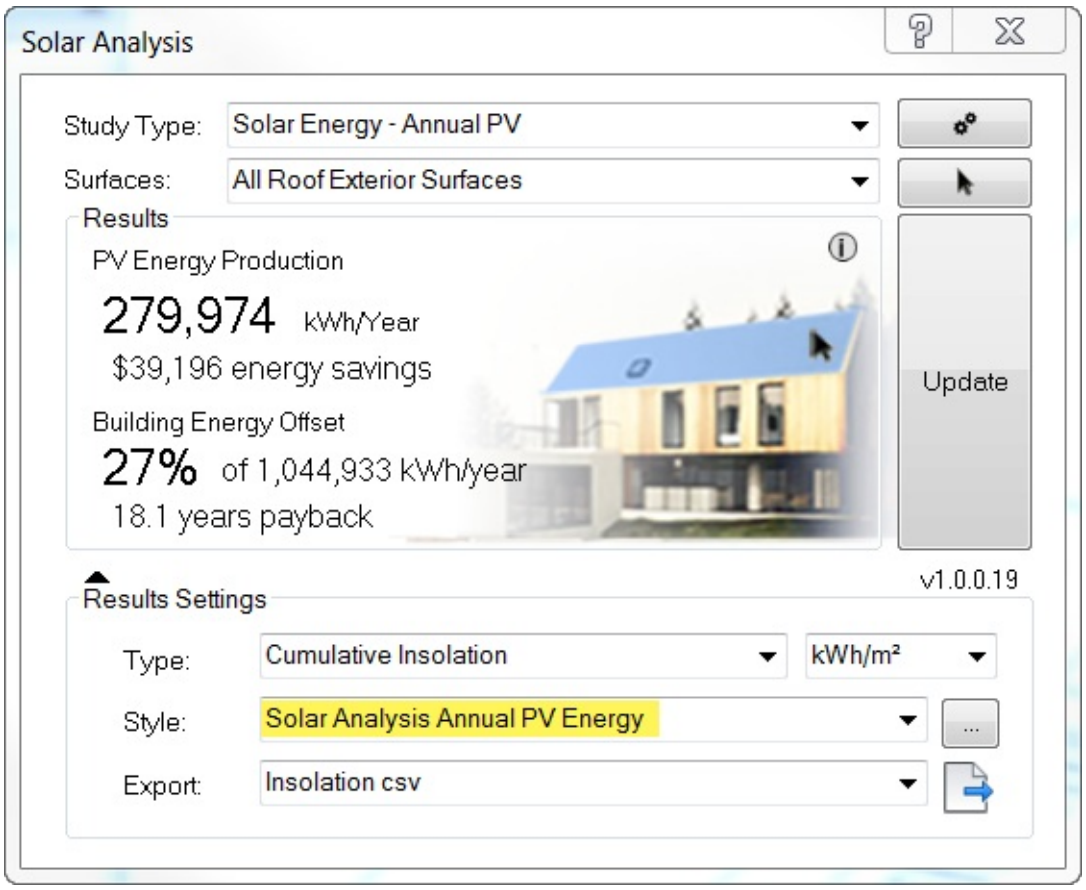
E. Additional settings are available by select the *Settings* option in the top right. These settings will only be enabled when you select the PV analysis type.

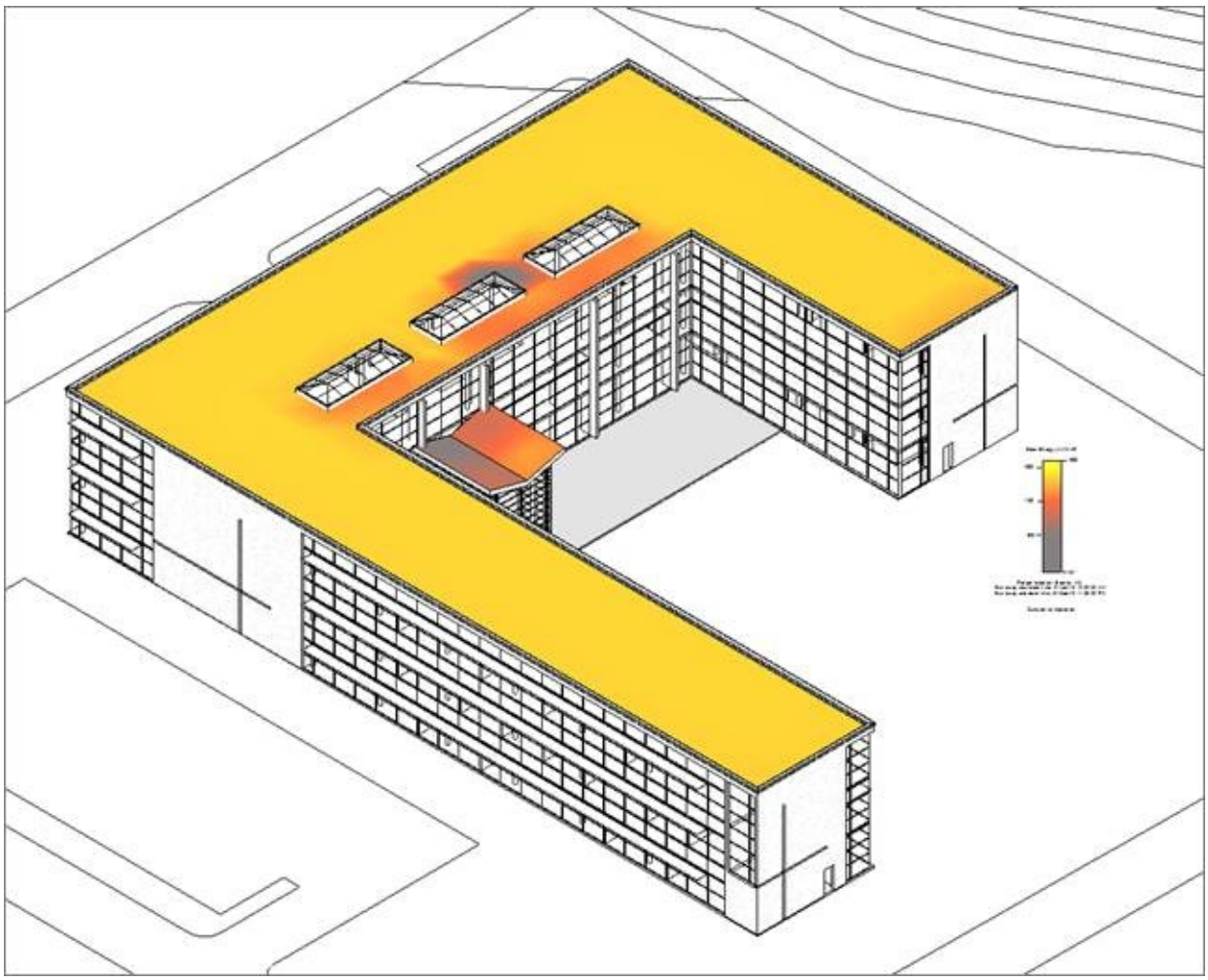


Building area, *building energy*, *electricity cost*, and *escalation rate* can be entered based on energy analysis results from Insight. These values will be used to calculate energy offset predictions and energy costs savings.

Relating to the PV panels, *panel efficiency*, *coverage*, and *payback limit* can be entered. Again, these values will be used to calculate energy production and payback periods.

Once your settings are defined and you've selected to **Update** the calculation results, you'll see the visual results in your 3D view. If you've defined the additional settings (*building area, energy, electricity cost*, etc), you'll get additional data in the *Results* panel. You'll also be able to toggle between different results visualizations to better understand PV performance.


Solar Analysis
Study Type:
Solar Energy - Annual PV
Surfaces:
All Roof Exterior Surfaces
Results
PV Energy Production
279,974 kWh/Year
$39,196 energy savings
Building Energy Offset
27% of 1,044,933 kWh/year
18.1 years payback
Update
v1.0.0.19
Results Settings
Type:
Cumulative Insolation
kWh/m²
Style:
Solar Analysis Annual PV Energy
Export:
Insolation csv

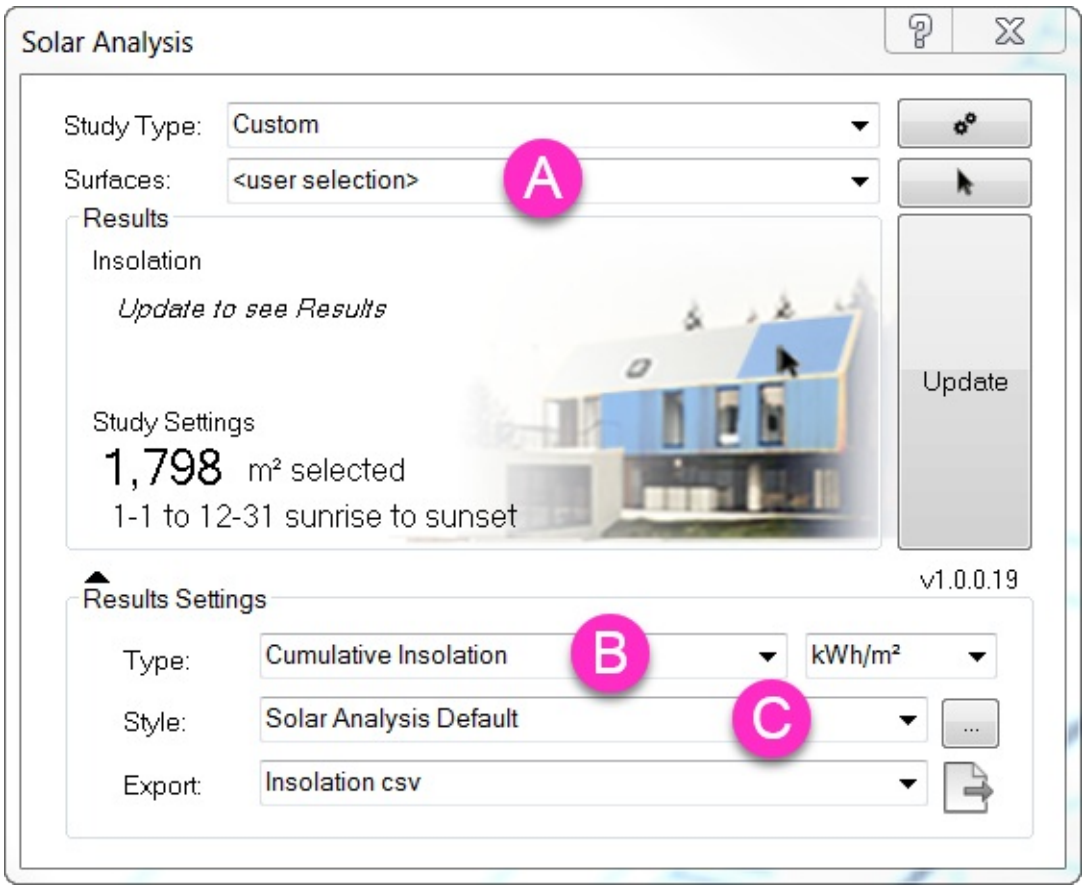


Custom

You can use Insight Solar Analysis to create your own custom analysis types, specifying your own date and time range, surface selection, and result types, and visualization style.

To create these study, follow the steps outlined in the **Overview** and take note of the following.

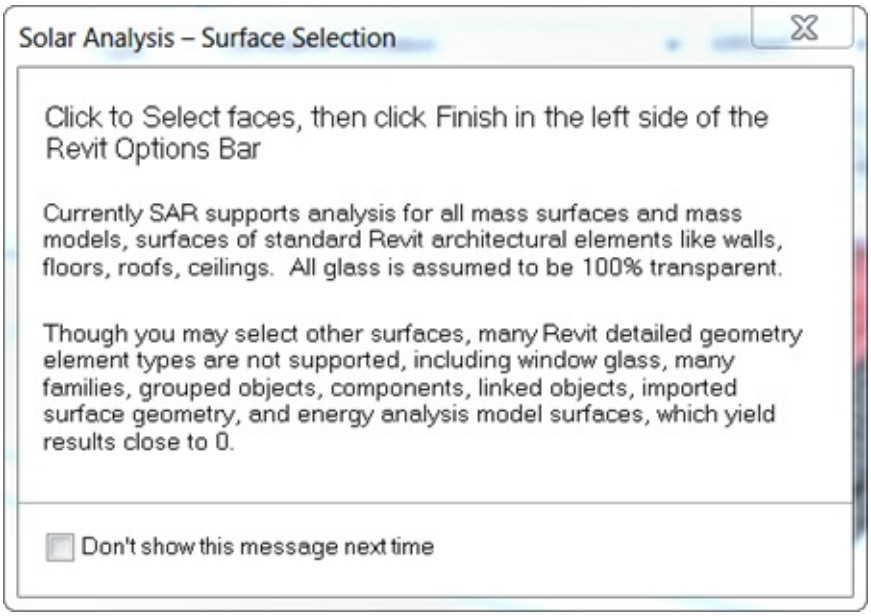
When selecting the *Custom* study type, you'll want to define additional settings.



A. For the *Surface*, you can select any of the existing settings from the drop down.

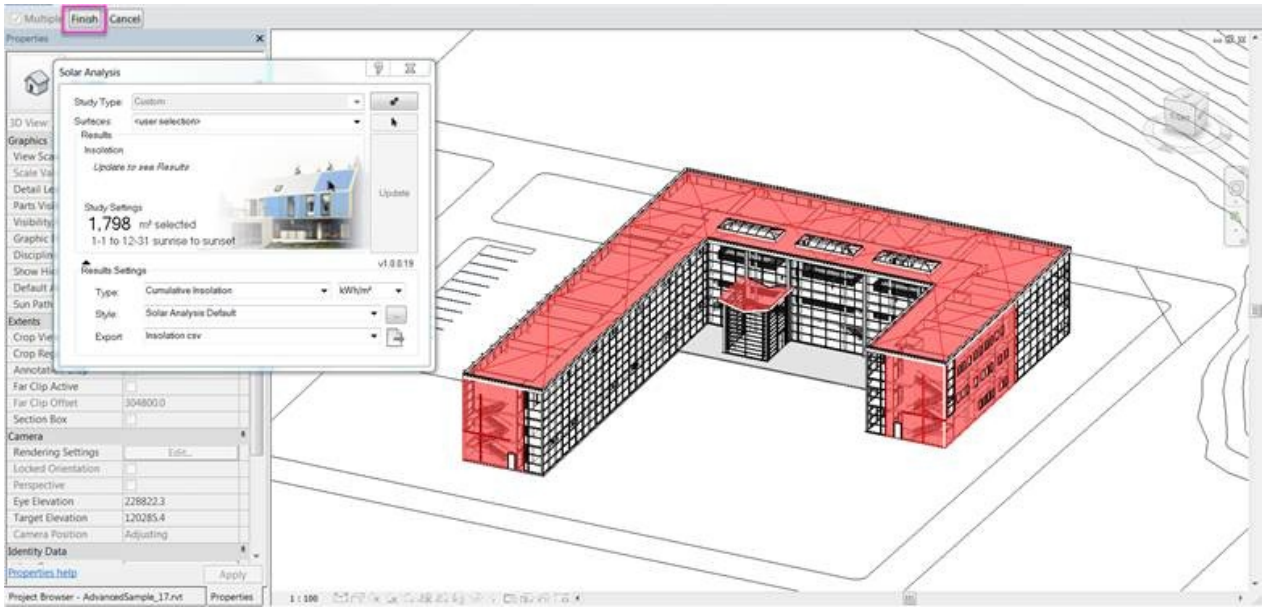
Surface Selection	**Description**
All Roof Exterior Surfaces	When selected for a model with building elements, this option automatically selects all Roof elements
All Mass Surfaces	When selected for a model with conceptual masses, this option automatically selects all mass faces
user selection	This option allows you to select your own mass and building element surfaces for analysis

If selecting your own surfaces (**user selection**), set the drop down, then the arrow icon to the right.



This will prompt a dialog that explains how Insight Solar Analysis with Revit interprets material settings for analysis. Read more about this in the Material Settings section.

Close the dialog to continue. Select the surfaces in your Revit model that you would like to produce analysis results for, then select **Finish** in the top left of the Revit ribbon. This will close the surface selection process.



B. Set the results *Type* and *Units*.

C. By default, the *Solar Analysis Default* visualization *Style* will be selected. You can change this by dropping down the menu and selecting a different analysis style, or creating your own.

Select **Update** once all the settings are defined, and results will appear in your 3D view and the *Results* summary panel.

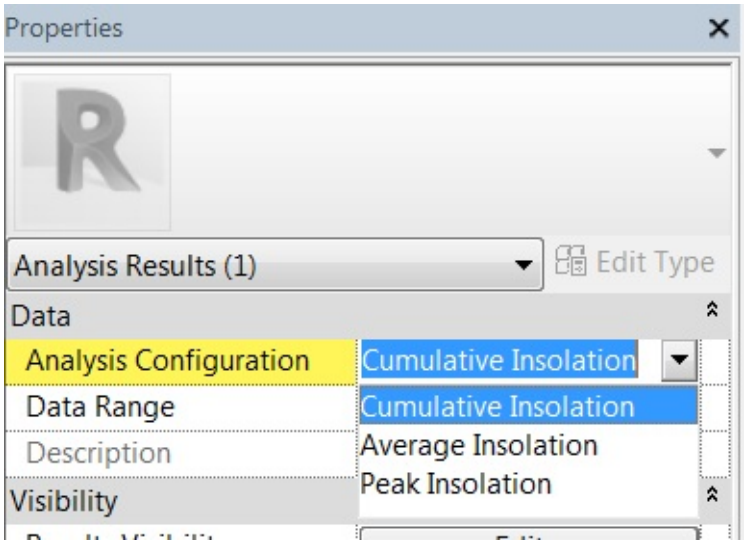
Managing Results

Insight Solar Analysis results are visible in 3D views only, and are not saved with the Revit file. To access results after closing a model, it is suggested to set up 3D views with the preferred dates and times preset, so you can quickly generate results for studies.

Analysis Display Settings

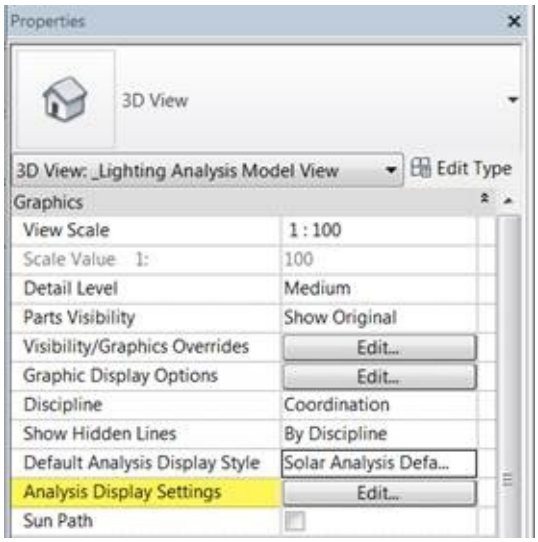
Insight Solar Analysis with Revit generates analysis results on selected Revit surfaces.

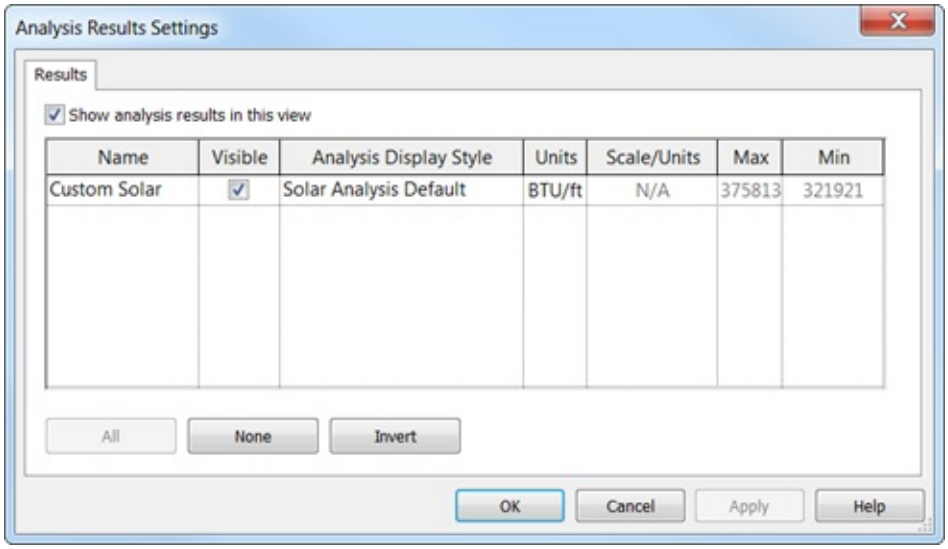
For both study types, you can toggle through different visualization styles. To change between results, select the analysis plane and change the **Analysis Configuration** in the **Properties** panel.



If other available anaylsis results appear to be 0 or have no value, try changing the *Units* to see smaller range results.

You can also turn result visibility on and off in 3D views. Open a 3D view and select **Analysis Display Settings** from the *Properties* panel.



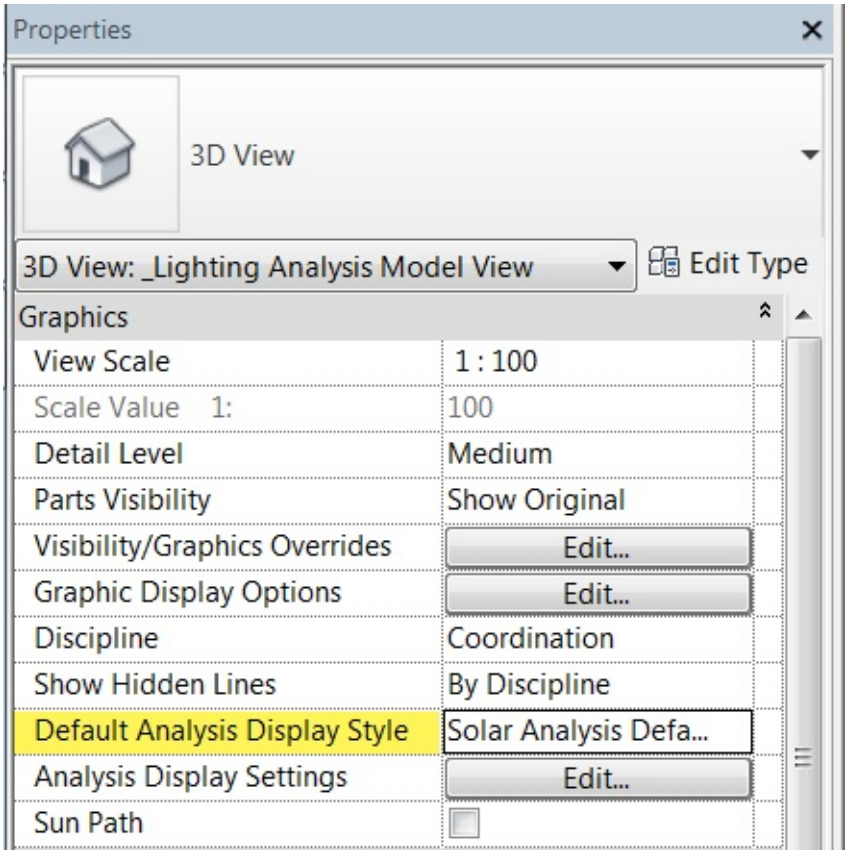


You can also change result *Units* through this dialog.

Customizing Analysis Visual Styles

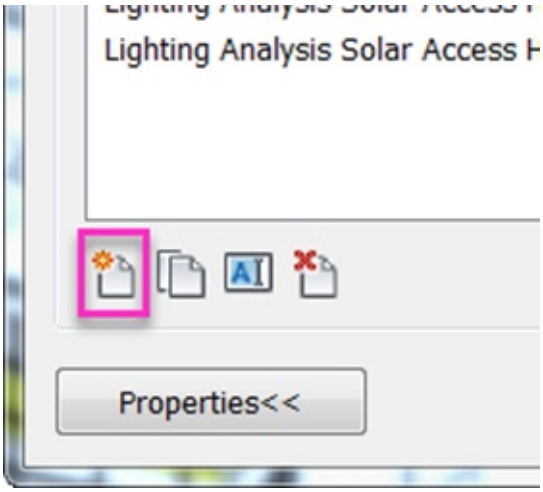
For all analysis types, default analysis display styles are used to visualize results. The steps below will allow you to modify these or create your own.

Open any view that has visible analysis results. In the *Properties* panel, select the [**…**] for **Default Analysis Display Style**.

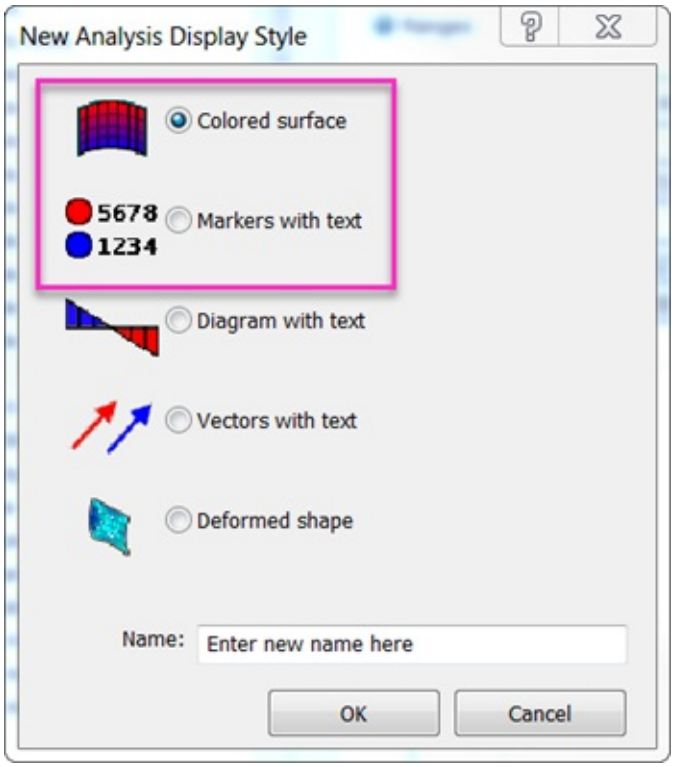


The **Analysis Display Styles** dialog will appear. The styles on the left are all default styles. Select any one of these to see change the visualization style in the current view.

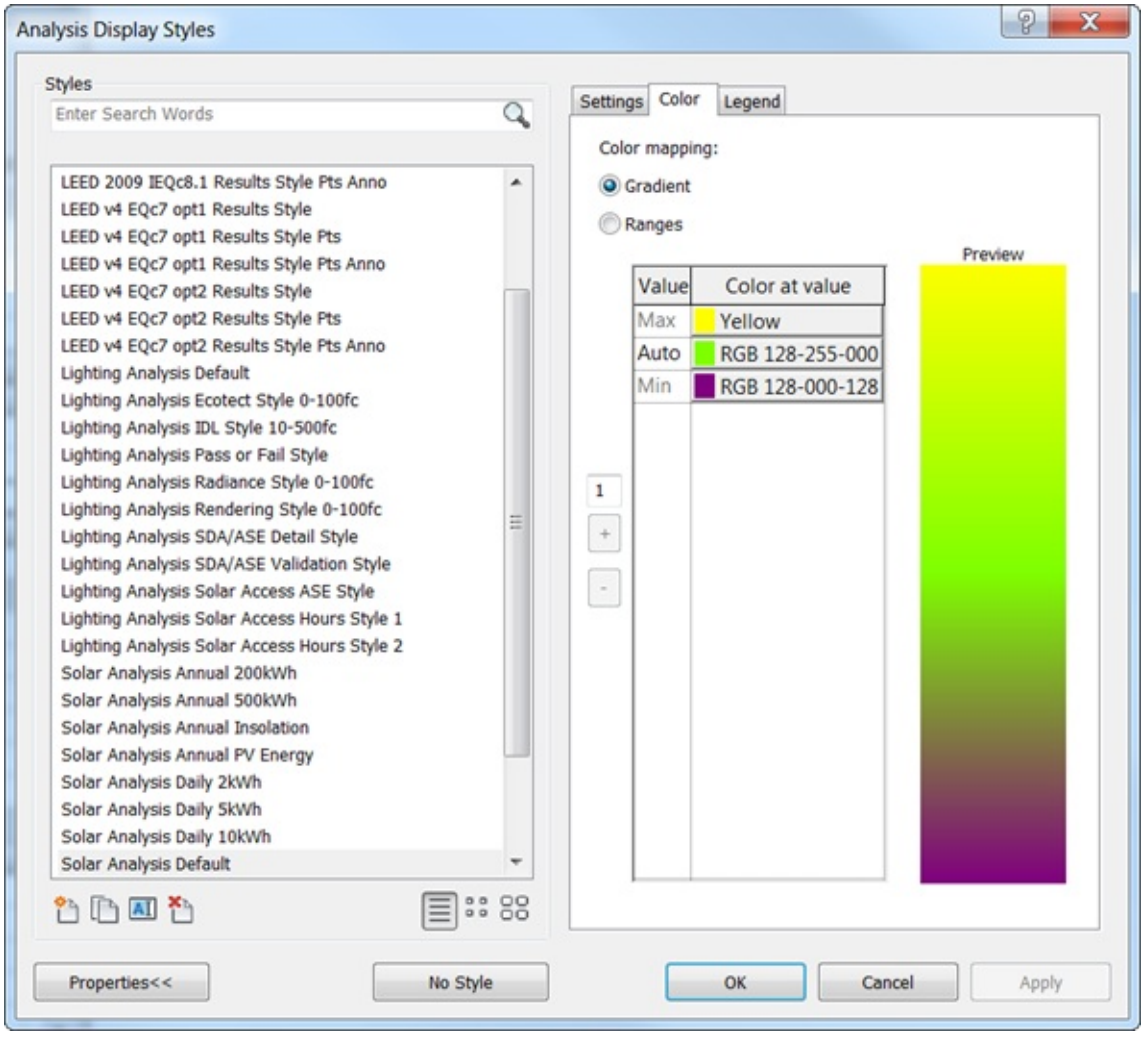
To create your own style, select **New**.



For solar analysis results, **Colored surface** and **Markers with text** are the styles that should be used.



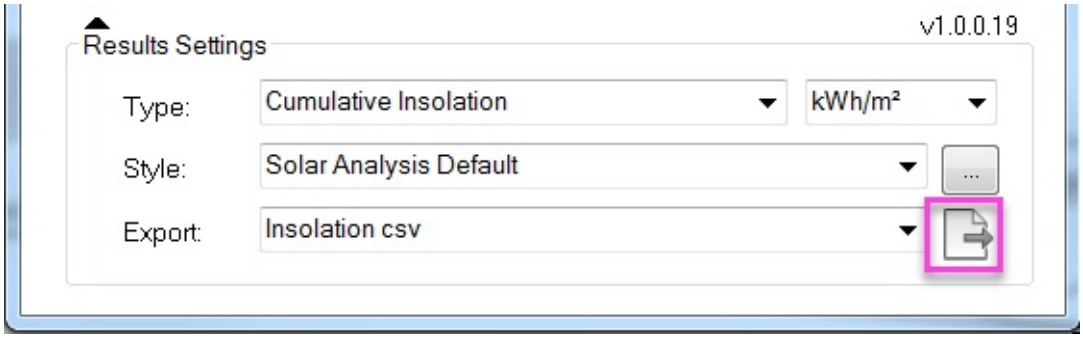
Control the **Settings**, **Color**, and **Legend** in the respective tabs.



Adding values associated with specific colors will allow you to highlight specific thresholds.

Exporting Results

One results have been generated in your 3D view, you can export analysis point location and associated data as a CSV.



Selecting **Export** will prompt you to name the CSV and specify a file destination.

The resulting CSV will produce a summary of the simulation and list values of individual analysis points and their location in the model.

Source	Date	Time	Model	Type	Study Average Insolation Valu	Total Study Surface Area	Total Study Insolation Value	Study Date Range	Study Time Range	Longitude	Latitude	Unit
Revit 2016	02-Mar-17	11:52 AM	AdvancedSample_17.rvt	Cumulative	366856.5634	16687.34435	6121861800	01-Jan-10,31-Dec-10	Sunrise,Sunset	-71.461	42.991	BTU/ftÂ²

Analysis Surface	Parent object type	Category	Parent object ID	Average Surface Insolation Valu	Surface Area	Total Surface Insolation Value
1002467264	Floor	Floors	139829	366856.5634	16687.34435	6121861800

Analysis point inde	Insolation value	Parent surface	point x	point y	point z	normal x	normal y	normal z
1	345007.9406	1002467264	-26.65445717	94.8507395	24.9343832	0	0	1
2	373230.9261	1002467264	-16.33279776	94.8507395	24.9343832	0	0	1
3	375792.3258	1002467264	-6.011138349	94.8507395	24.9343832	0	0	1
4	375247.0065	1002467264	4.310521062	94.8507395	24.9343832	0	0	1
5	375792.3258	1002467264	14.63218047	94.8507395	24.9343832	0	0	1
6	375792.3258	1002467264	24.95383988	94.8507395	24.9343832	0	0	1
7	375792.3258	1002467264	35.27549929	94.8507395	24.9343832	0	0	1
8	375771.5623	1002467264	45.5971587	94.8507395	24.9343832	0	0	1
9	375771.5623	1002467264	55.91881811	94.8507395	24.9343832	0	0	1
10	375771.166	1002467264	66.24047752	94.8507395	24.9343832	0	0	1
11	375792.3258	1002467264	76.56213693	94.8507395	24.9343832	0	0	1
12	350907.6673	1002467264	-26.65445717	84.49289595	24.9343832	0	0	1
13	373968.9814	1002467264	-16.33279776	84.49289595	24.9343832	0	0	1
14	375813.1685	1002467264	-6.011138349	84.49289595	24.9343832	0	0	1
15	375097.3033	1002467264	4.310521062	84.49289595	24.9343832	0	0	1

Additional Settings & Considerations

Understanding how Insight Solar Analysis with Revit interprets architectural elements and additional control settings will allow you to expand analysis capabilities.

Model Requirements

Insight Solar Analysis with Revit requires you select surfaces for analysis. The surfaces can be from conceptual masses or building elements. There are however some limitations on surfaces that will produce accurate results.

Transparent surfaces

Insight Solar Analysis with Revit will assume elements and surfaces are either completely opaque, or completely transparent. For this reason, it is not advised to conduct solar analysis on transparent surfaces, like glazing or curtain walls for example. Read more in the Material Assumptions section.

Detailed geometry types

Currently Insight Solar Analysis with Revit supports mass surfaces and surfaces of standard architectural elements, such as walls, floors, roofs, and ceilings. While you may be able to select other surfaces, many Revit detailed geometry element types are not supported, including many family types (including Generic models), grouped objects, components, linked objects, imported surface geometry, and energy analysis model surfaces. Results for these geometry types will often lead to inaccurate results that are close to zero.

3D Views

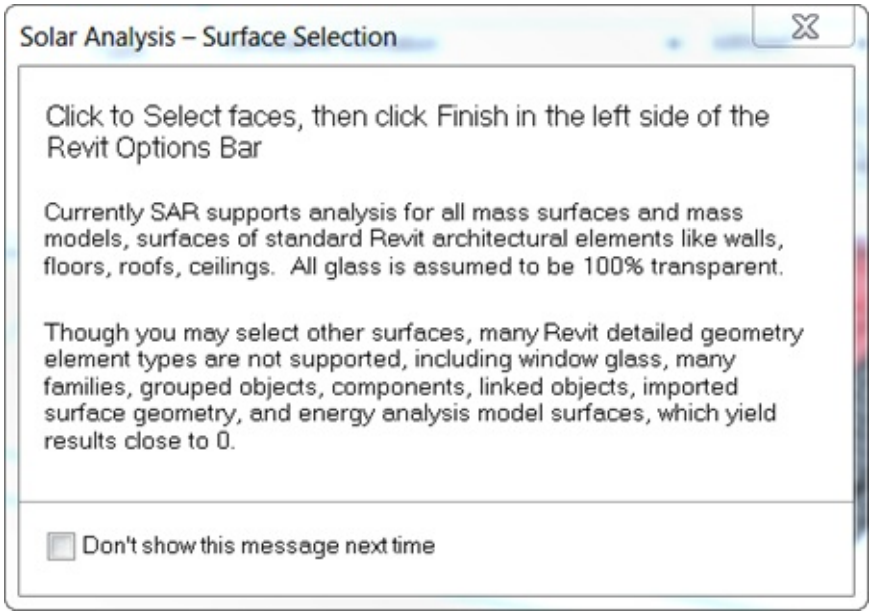
Insight Solar Analysis requires a 3D view for analysis. Whatever elements are visible and enabled in the view active when conducting the analysis will be included in the calculation and results. For example, if there is a site element you do not want to be included in the analysis, you can hide it in the 3D view to easily exclude it.

When analyzing and comparing **Design Options** make sure whatever option you want to analyze is active in the current 3D view. Whatever geometry is enabled in this view will be used for the solar analysis.

If you have specific **Sun Settings** defined for a 3D view, these settings can be used to dictate the analysis date and time range.

Material Assumptions

When you select your own surfaces for analysis, you will be prompted with an explanation of how Insight Solar Analysis interprets different surfaces.

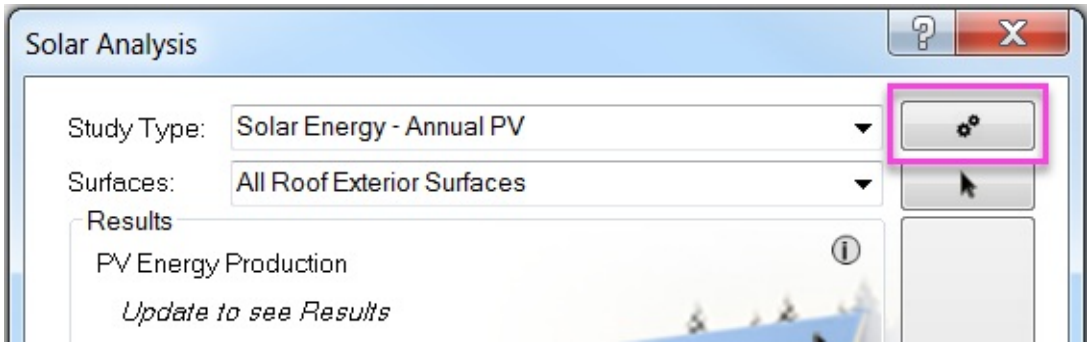


Insight Solar Analysis with Revit does not assume any material properties. Surfaces are assumed to be either completely opaque, or completely transparent. For this reason, it is not advised to conduct solar analysis on transparent surfaces, like glazing or curtain walls for example. This is an important consideration also if you want to look at solar insolation values inside your building (essentially, solar heat gain coefficient (SHGC) impacts will not be represented in results).

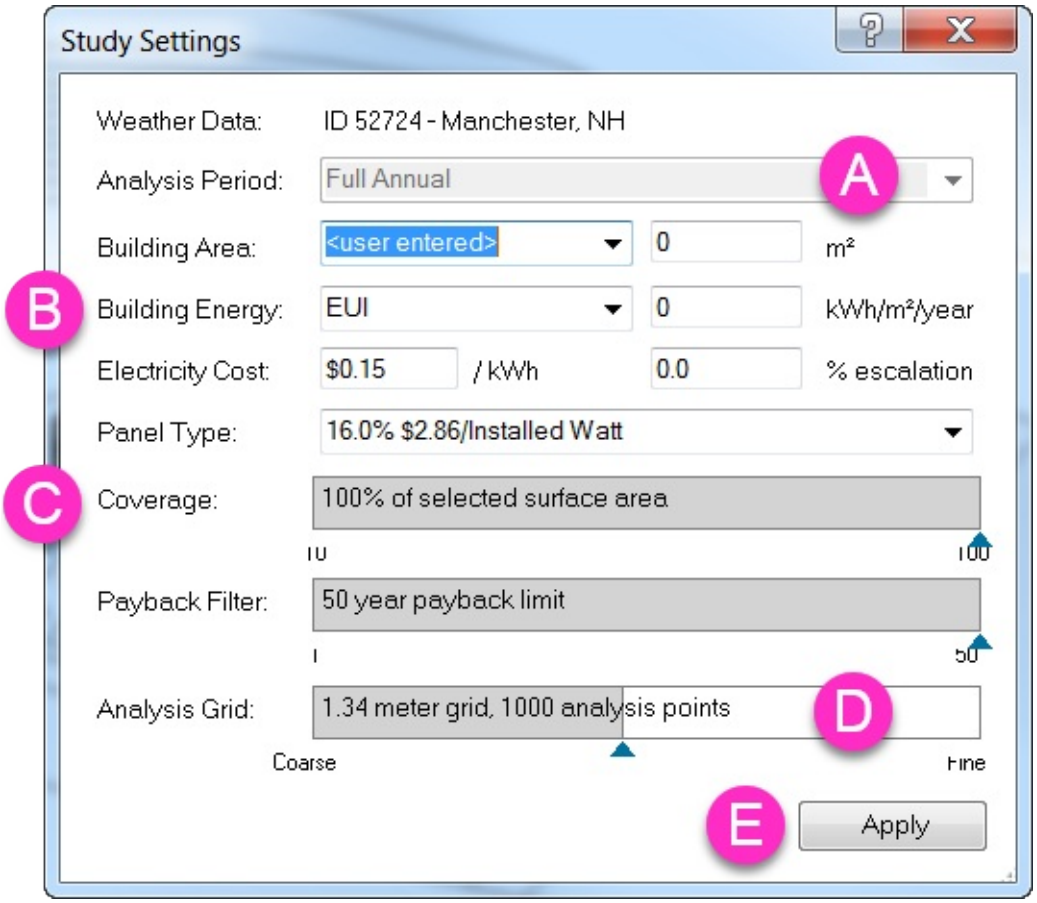
While you may be able to select these types of surfaces, results for transparent materials will often lead to inaccurate results that are close to zero.

Study Settings

Additional settings are available by select the *Settings* option in the top right of the *Solar Analysis* dialog.



Most of these settings apply to *PV Analysis* study types.



A. For *PV Analysis* studies, the *Analysis Period* will be automatically set to **Full Annual**. For *Custom* analysis studies, you can choose to use **Sun Settings**, or a **Full Annual** analysis.

B. Data having to do with building performance and utility will be used to calculate energy offset predictions and energy cost savings for *PV Analysis* study types.

Setting	**Description**
Building Area	Your building area in m2
Building Energy	Energy Use Intensity (EUI) for your project in kWh/m2/year
Electricity Cost	Electricity costs in $/kWh
% escalation	Escalation rate as %

C. Settings related to PV panels can be defined as well and will be used to calculate energy production and payback periods.

Setting	**Description**
Panel Type	Select from 3 types of panels: 16.0% $2.86/Installed Watt, 18.6% $3.06/Installed Watt, 20.4% $3.47/Installed Watt
Coverage	Percent of selected surface area covered with PV panels: 10-100%
Payback Filter	Payback limit: 1-50 years

D. The *Analysis Grid* can be defined for all analysis types. It specifies the density of the analysis grid. Note that the smaller the analysis grid (“*Fine*”), the longer the analysis will take to complete.

E. After you’ve defined the appropriate settings, select **Apply**, and the setting will be included next time you select **Update**.

Validation

Insight Solar Analysis with Revit uses the Perez solar model to calculate results. This model is used by the National Renewable Energy Lab (NREL) and their PVWatts® tool. Results from Insight Solar Analysis have been validated directly by NREL and findings conclude that differences between the results were less than 1% for surfaces oriented horizontal, east facing vertical, and south facing with latitude tilt angle.

You can test solar analysis results yourself by analyzing a surface with specified tilt and orientation in PVWatts® for a TMY station and comparing results with Insight Solar Analysis with Revit for a location with the same TMY station.

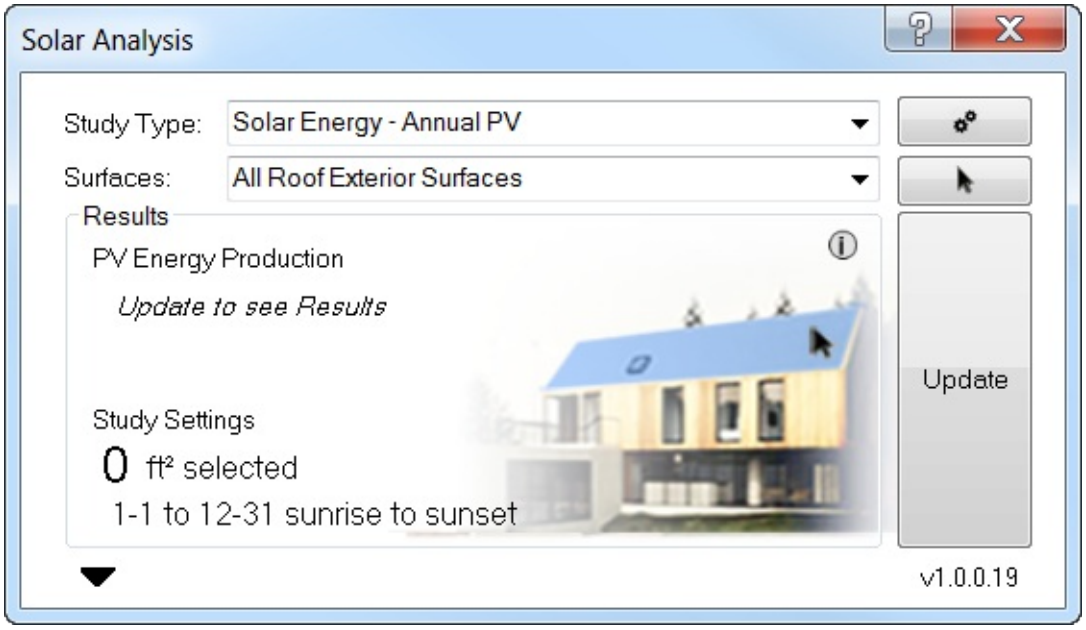
It's important to note that Revit uses a variety of weather data for analysis, not just TMY data. Read more about the Revit Internet Mapping Service. When comparing Insight Solar Analysis results to those from other tools, consider weather data sources and varying calculation methods when comparing results.

Support & FAQ

Get support for Insight Solar Analysis with Revit on the Insight Lighting & Solar Analysis Forums.

Troubleshooting

I don’t see colored results in my 3D view. Make sure you have surfaces selected in your 3D view. If the Results summary panel indicates 0 are has been selected for analysis, you’ll have to select **All Roof Exterior Surfaces**, or select your own surfaces.



If selecting your own surfaces, make sure to select **Finish**, then select **Update** to run the analysis on your selected surface.

If results still don’t appear after selecting **Update**, try running the simulation at a coarser analysis grid (accessible in the *Study settings*), especially if you have a large amount of surface area selected for the analysis. Alternatively, try selecting a smaller sized analysis surface to test that the analysis is working correctly.

Finally, make sure analysis results are visible in your 3D view by selecting **Analysis Display Settings** from the *Properties* panel. Make sure the solar analysis results are checked.

My results don’t make sense. Make sure you are following the Model Requirement guidelines and suggestions for surface and analysis result visualization. Additionally, you can try selecting a different weather station, still in the vicinity of your project location, to test nearby weather data.

Can I include SHGC impacts? No, SHGC and other material properties that would impact solar radiation results are not currently included in Insight Solar Analysis with Revit. See the Material Assumptions section for more information, but generally for solar analysis materials are considered as either 100% opaque, or 100% transparent, with no additional material or thermal properties.