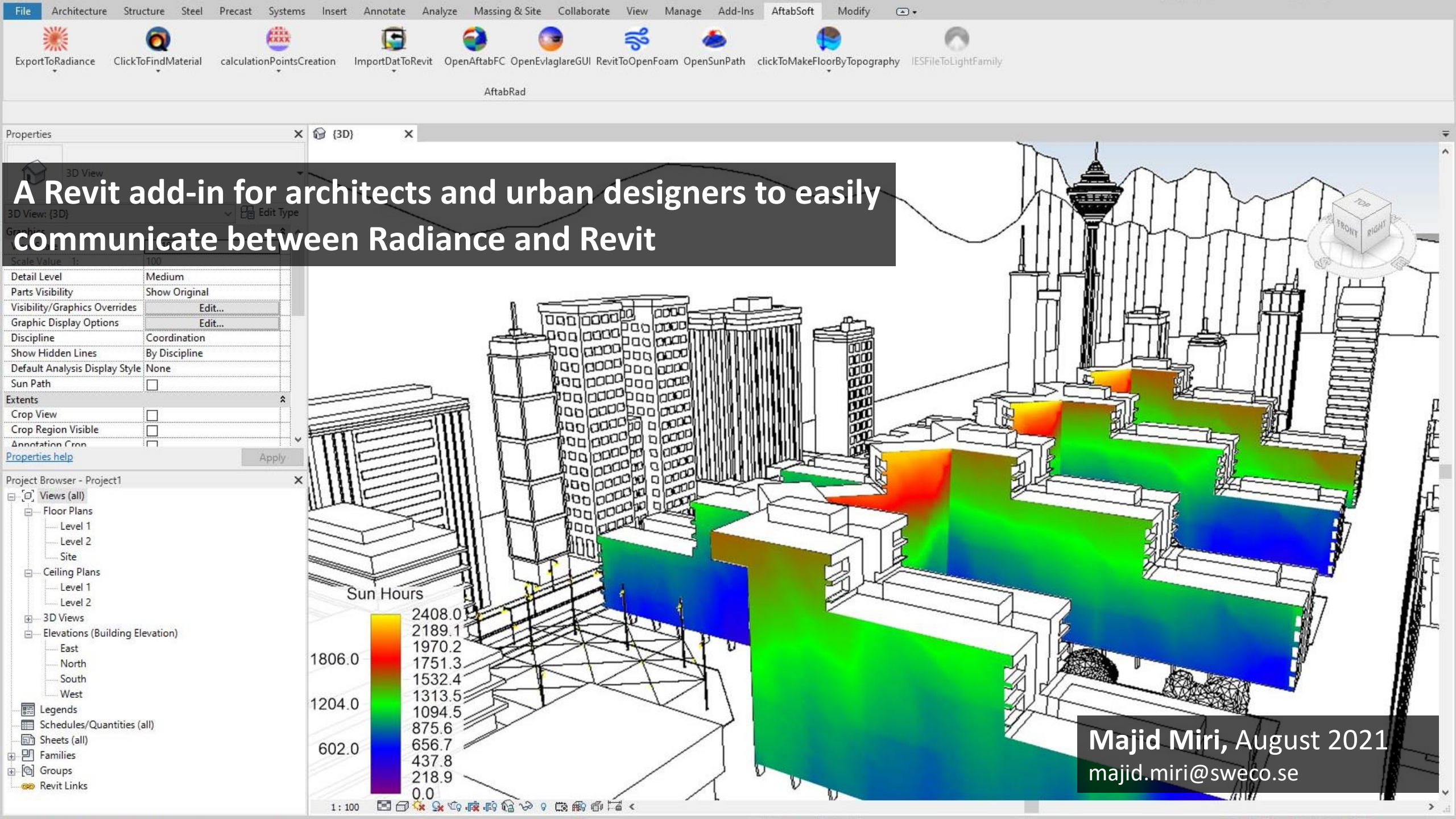
A Revit add-in for architects and urban designers to easily communicate between Radiance and Revit



Majid Miri, August 2021
majid.miri@sweco.se

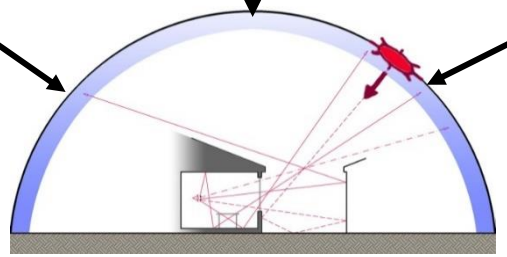
Daylight Simulation Program

scene
- scene geometry
- optical material properties
- surrounding landscape
- ground reflectance
- status of electrical lighting
- status of shading devices

area of interest
- viewpoint
- grid of sensor points

space usage
- space type (office, …)
- lighting requirements
- schedule (occupancy, lighting, …)

Sky condition
- date, time
- latitude, longitude
- sky condition (overcast, clear, …)
- weather data



Daylight simulation engine
(raytracing, radiosity, …)

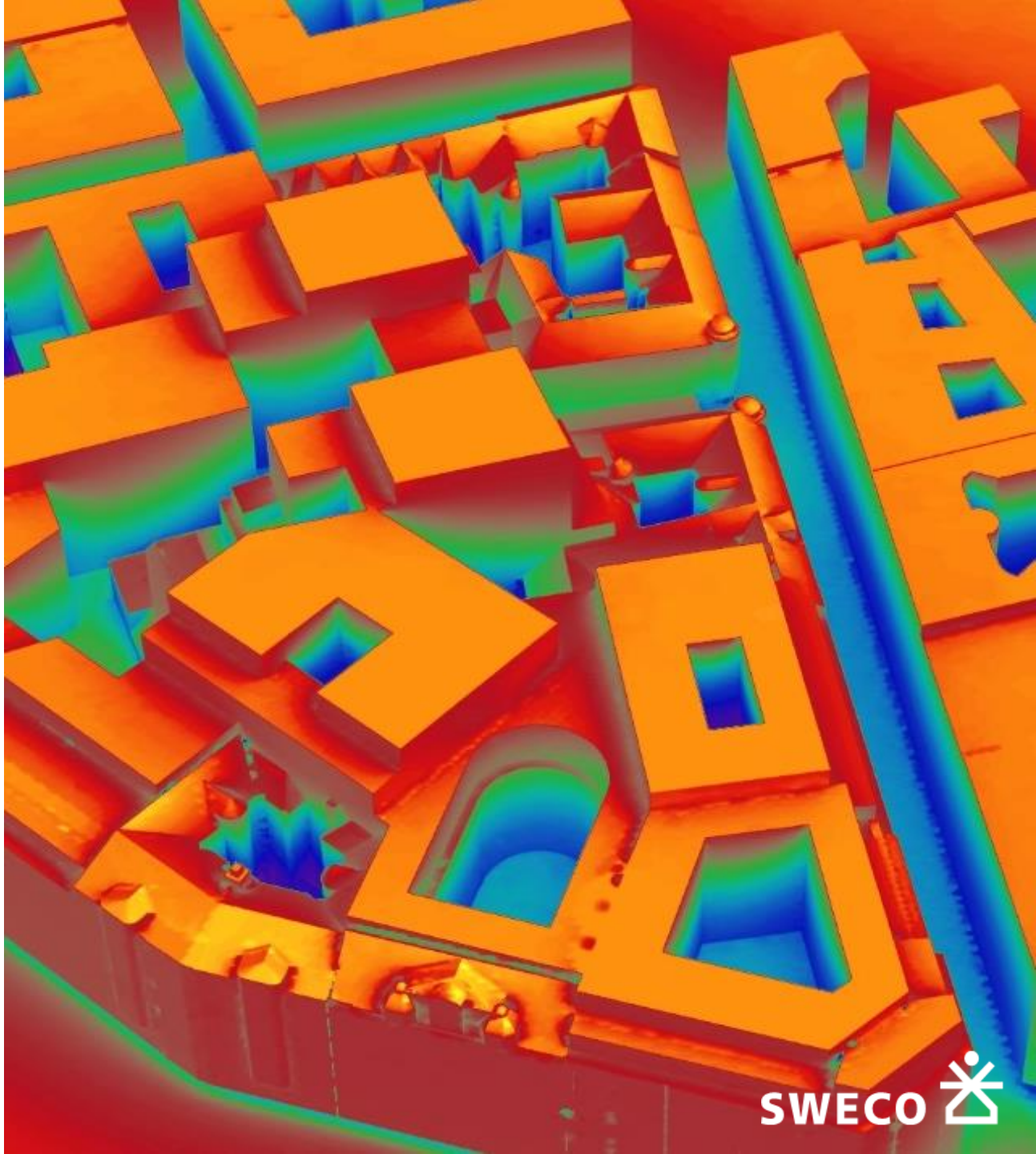
Intermediate results
illuminances
luminances, etc.

Results processor

Simulation outcome
Performance metrics
visualizations

Elements needed for a daylight simulation*

* Reinhart CF, Daylighting course lectures, MIT, 2012



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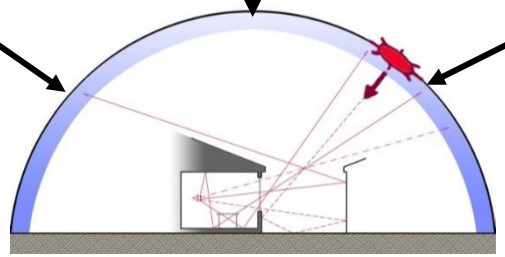

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3d Modelling software:

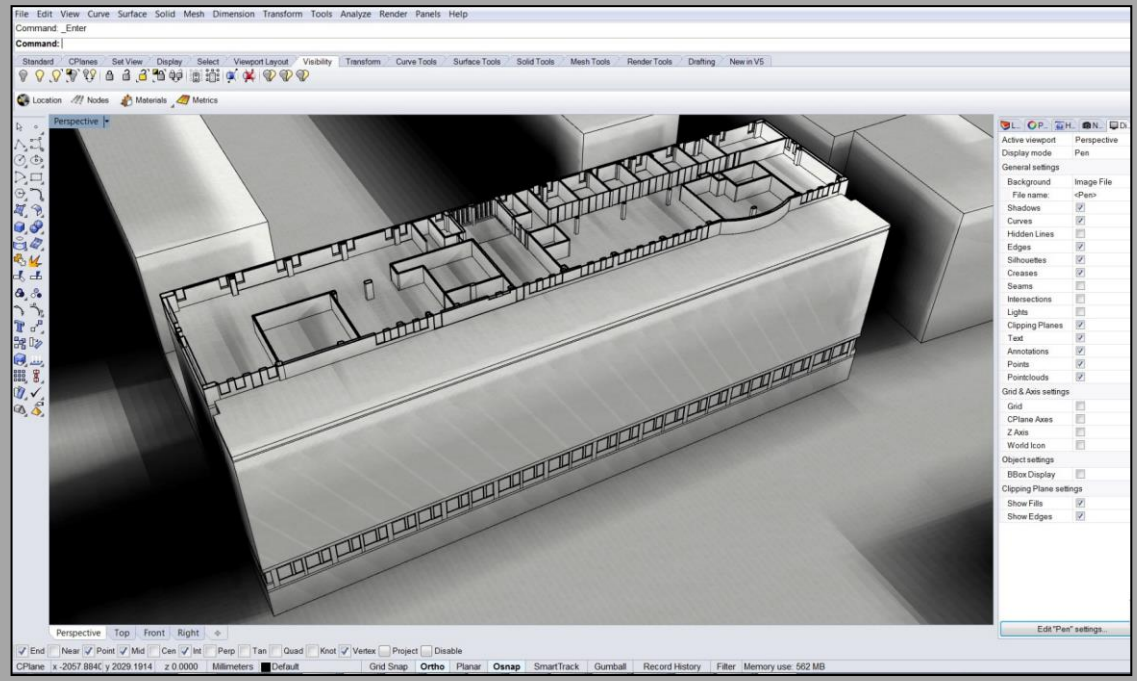
REVIT

Rhinoceros®

AUTOCAD

SketchUp

GRAPHISOFT
Archicad®



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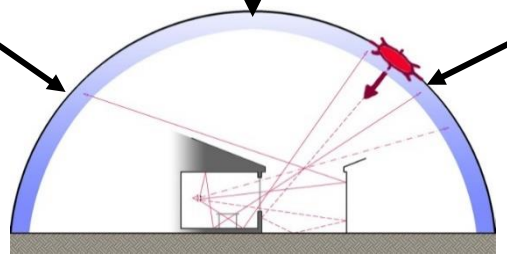

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Translator Software (with user friendly interface):

SPOT
Sensor Placement + Optimization Tool

DIVA

ALFA

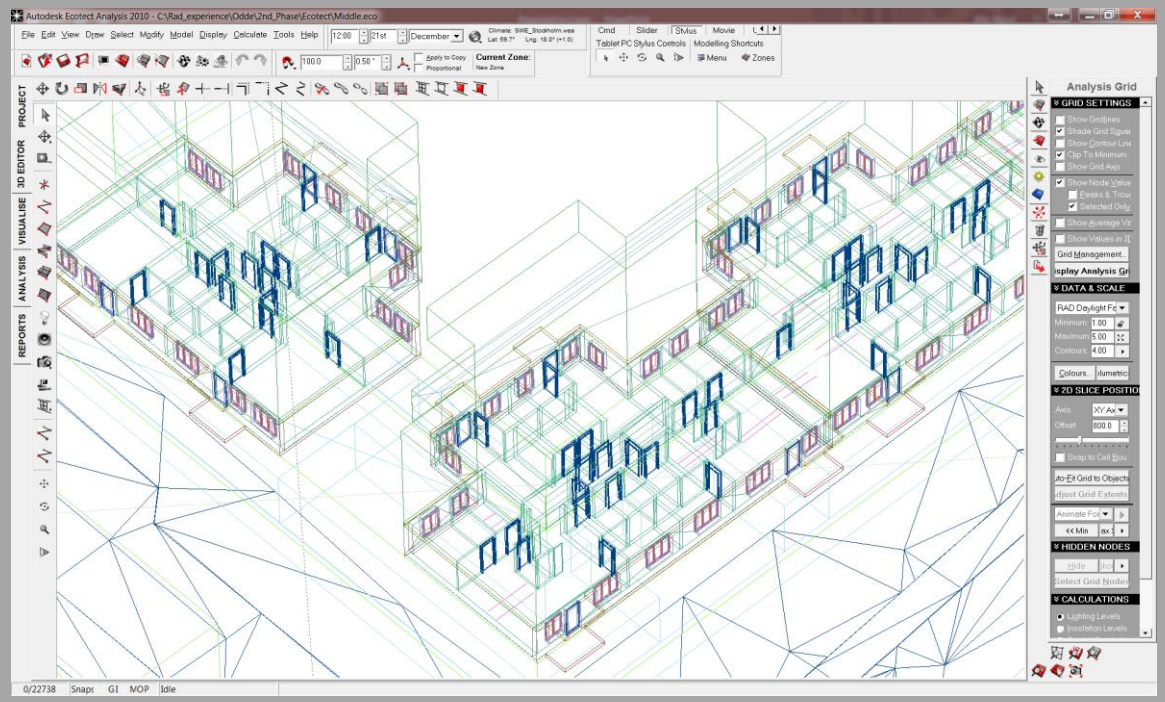
ClimateStudio

DesignBuilder

OpenStudio

umi

ies INTEGRATED ENVIRONMENTAL SOLUTIONS



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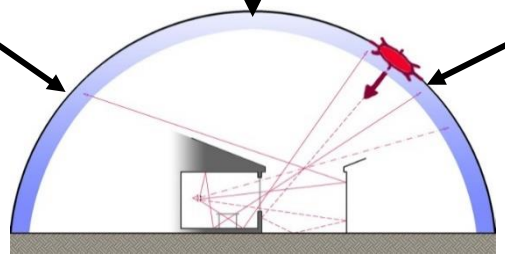

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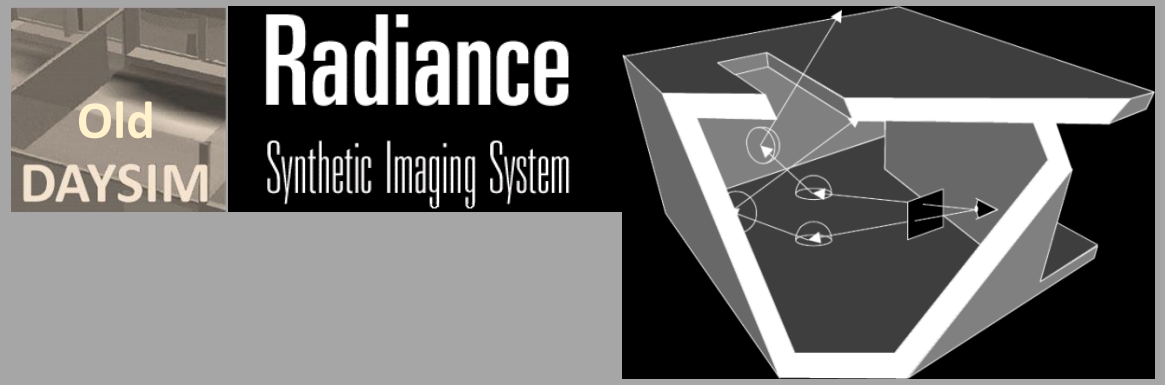
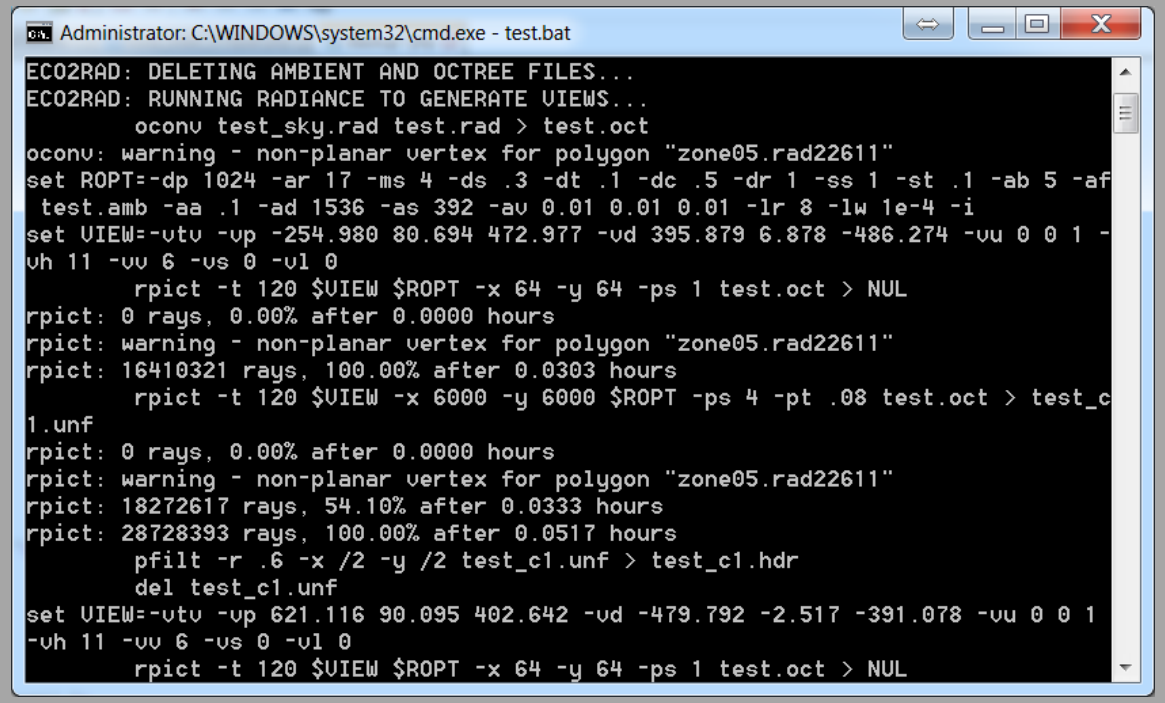
Calculator/Simulator software:





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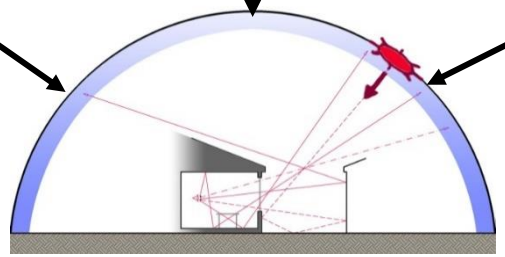

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Presenter Software:

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OpenStudio

umi

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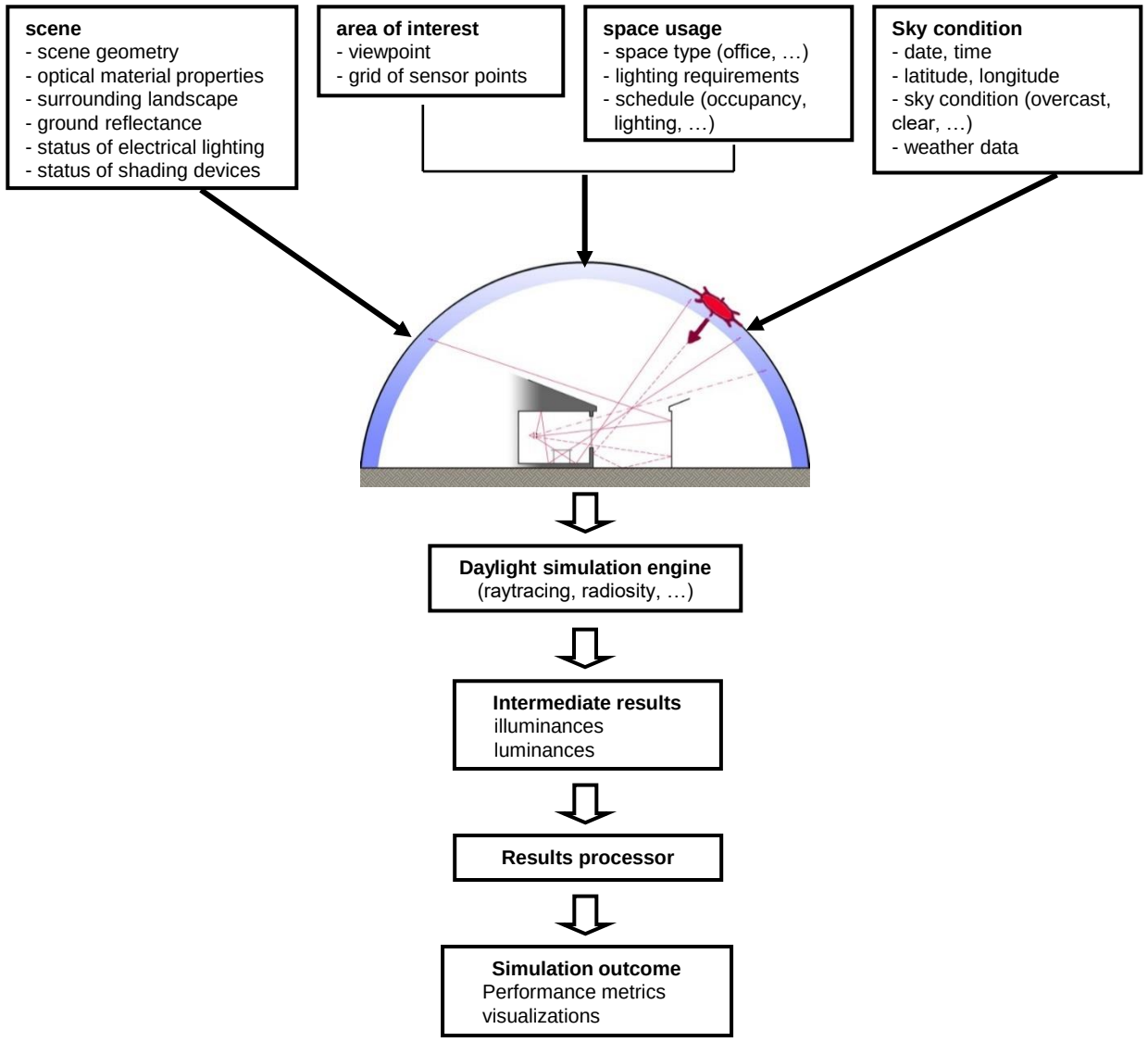
BIM Model + Daylight Simulation Program



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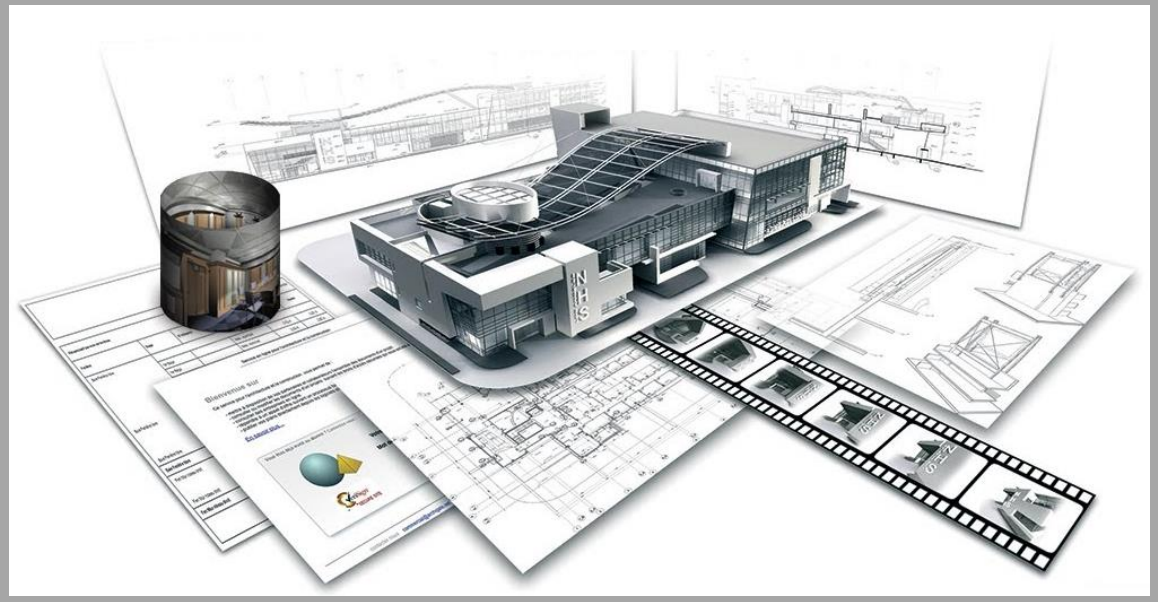
AUTODESK REVIT

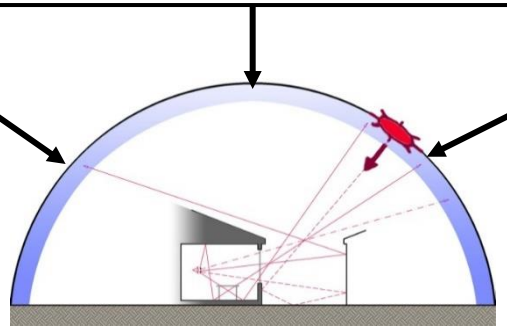
GRAPHISOFT Archicad®

MicroStation



Daylight Simulation Program

BIM Model



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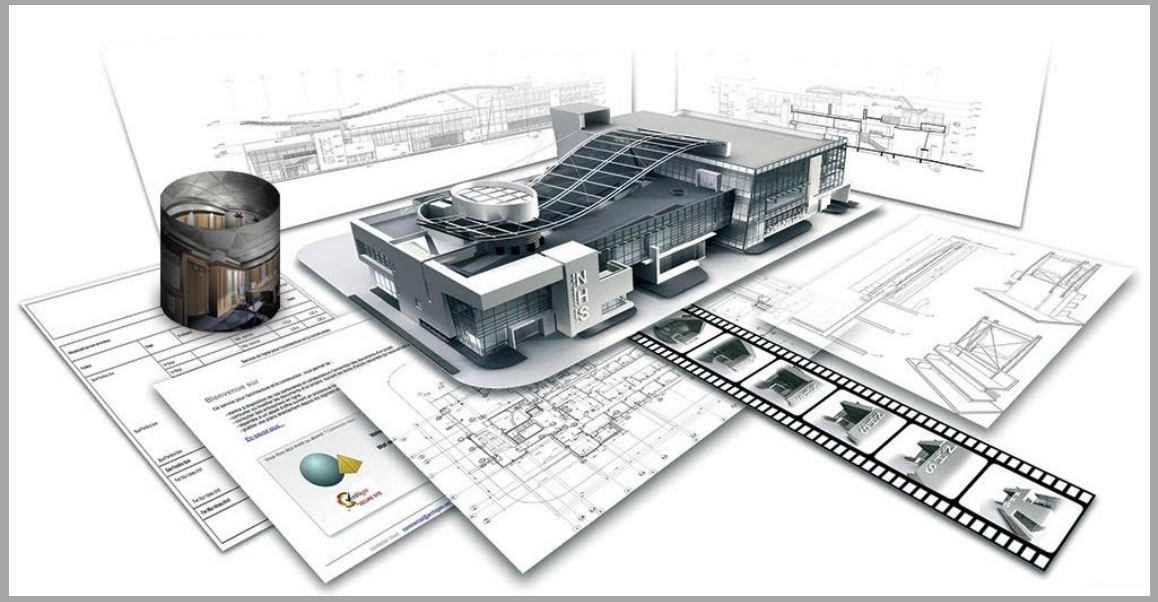

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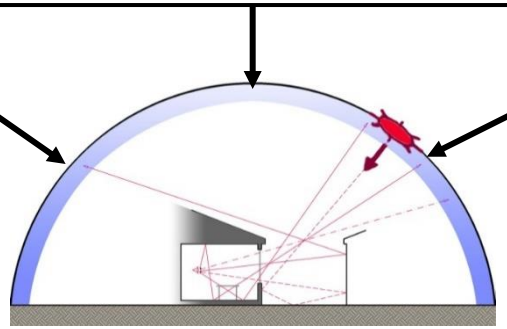

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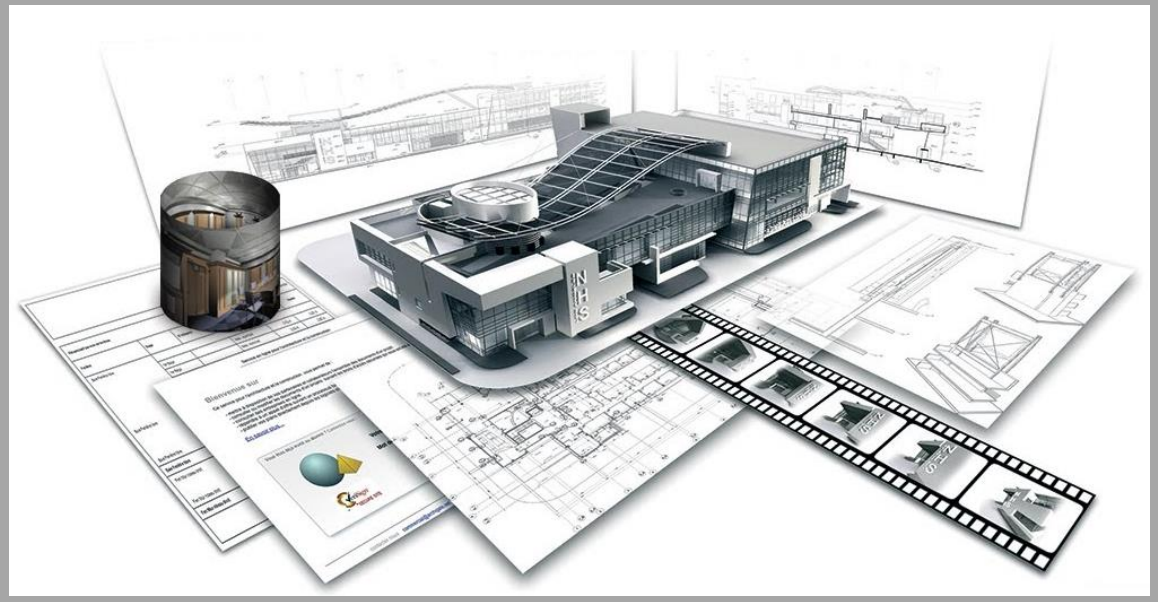

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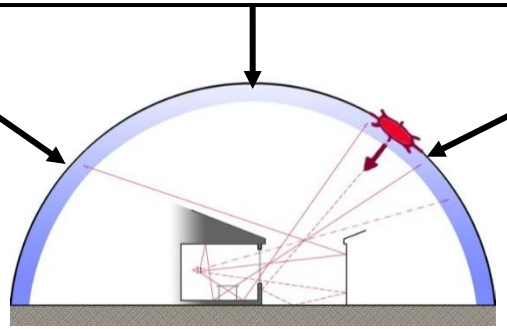

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AUTODESK REVIT

ElumTools
Real Lighting for Autodesk® Revit®

AUTODESK® 3DS MAX®

360 Insight

ReluxCAD for Revit

Sefaira

LightStanza

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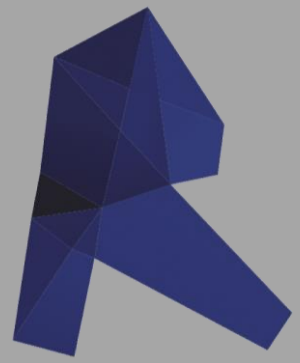
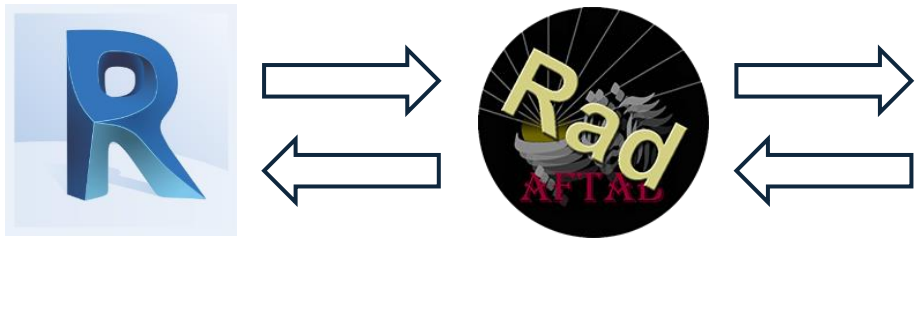


AUTODESK REVIT

AftabRad



Advantages:

- No need to have an extra software to communicate between the modelling software and Radiance
- No need to specify scene geometry / space usage / geographical specifications / building orientation
- No need to manually explode and change each solid glass object to a one surface object
- Such a tool can be helpful during each step in Architectural design process from the beginning to the end.
- Any inputs (like material specifications, rooms selection, etc.) that assign to the model whenever in the design process can be valid until the end
- It provides raw Radiance files (*.rad, *.mat, and *.pts files) to do whatever we want with Radiance and Daysim.

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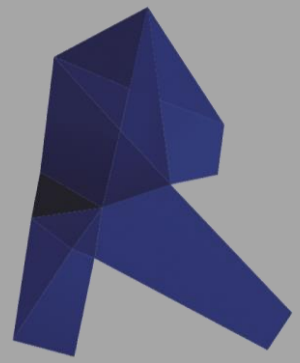

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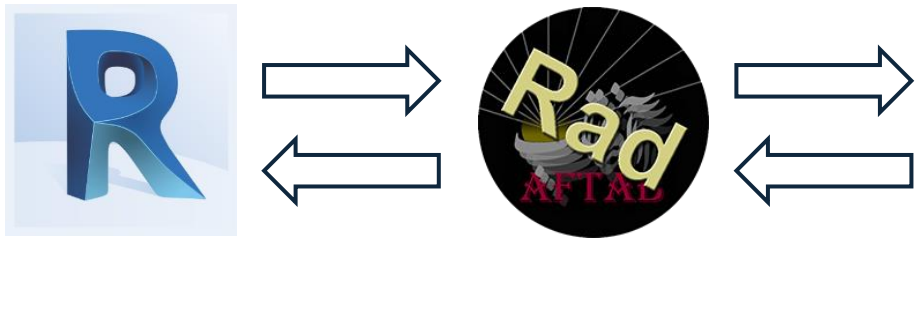
AftabRad



OpenFOAM

Advantages:

- It can handdle any complexities in the model, but we should be aware about the Radiance efficiency if the exported rad files become very heavy.

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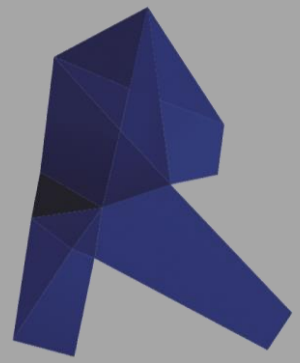


AUTODESK REVIT

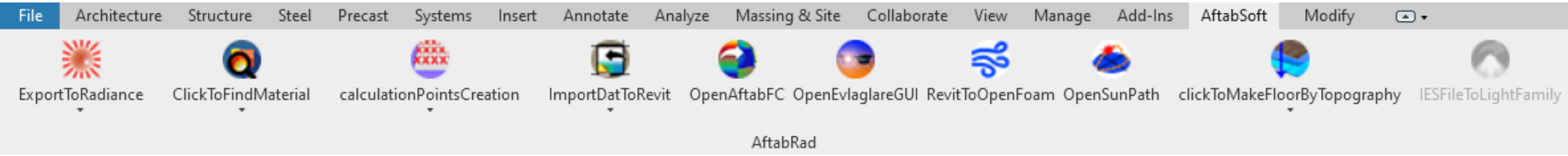
AftabRad

python

IronPython

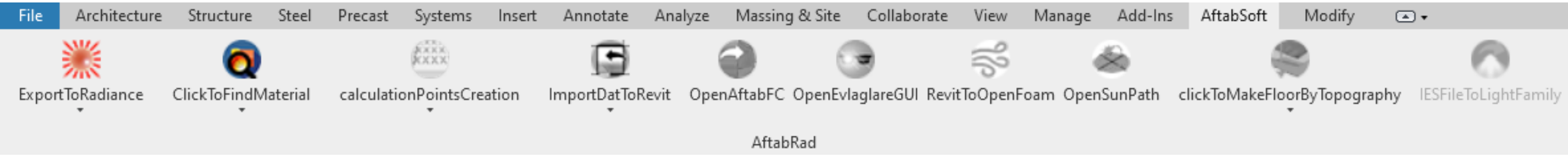
Radiance
Synthetic Imaging System

AftabRad Revit Add-in Interfaces



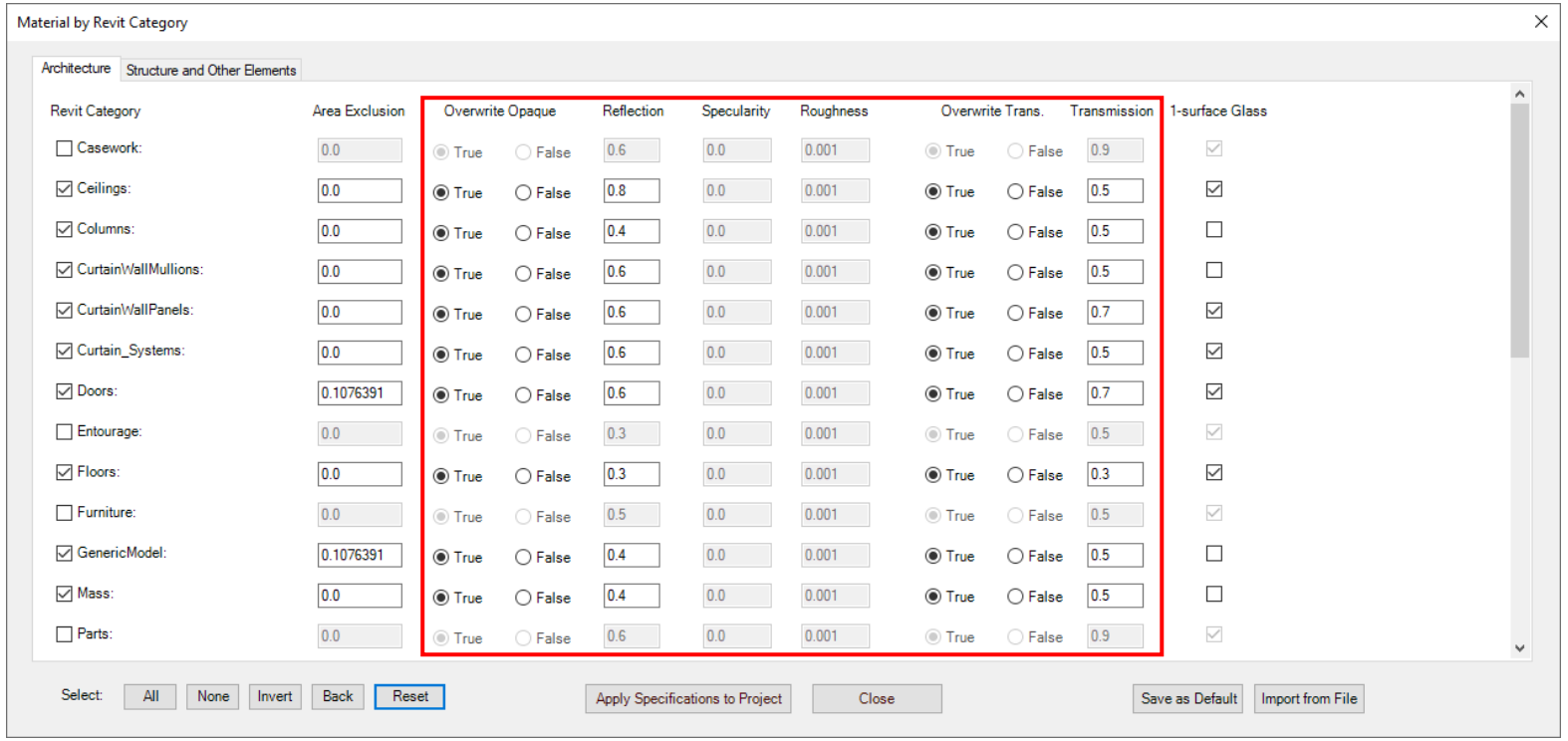
Tutorial link: http://aftabsoft.net/aftab-rad.php

AftabRad Revit Add-in Interfaces



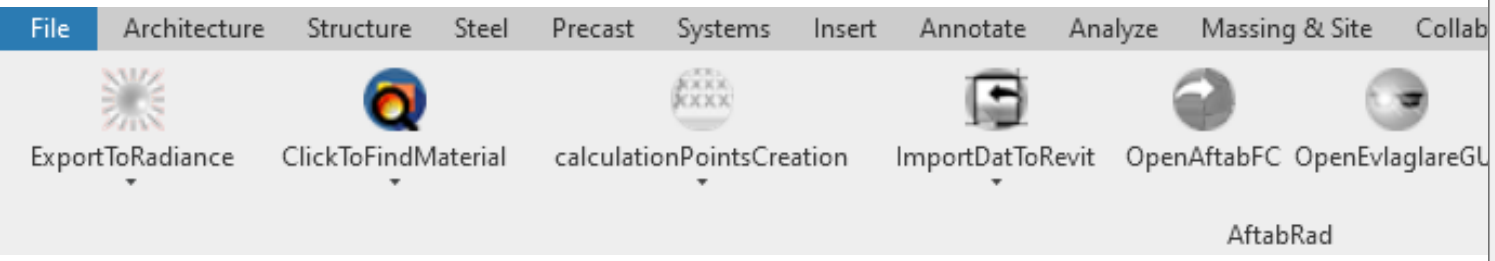
How to Define Radiance Materials?

- Creating Radiance Material based on Revit Categories



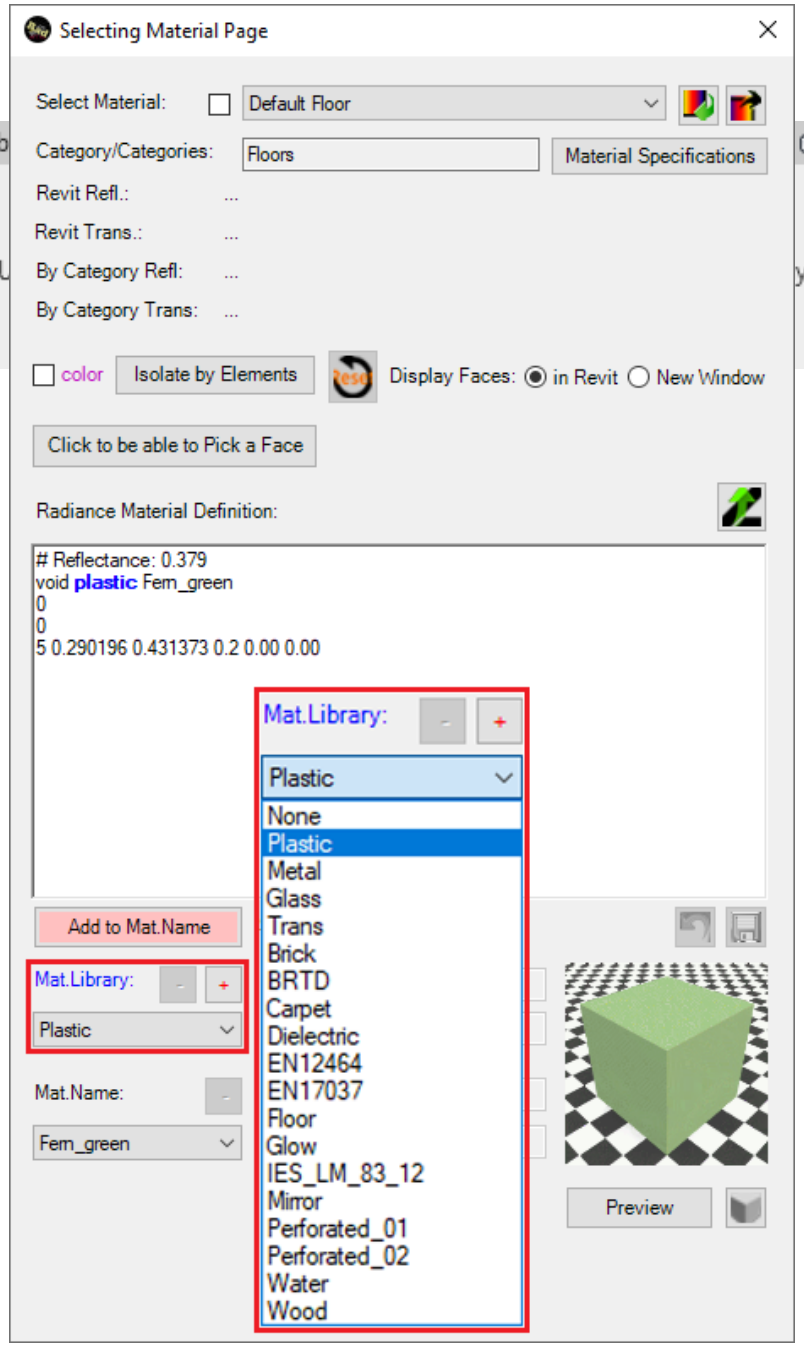
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/RadMaterialByCategories.htm

AftabRad Revit Add-in Interfaces



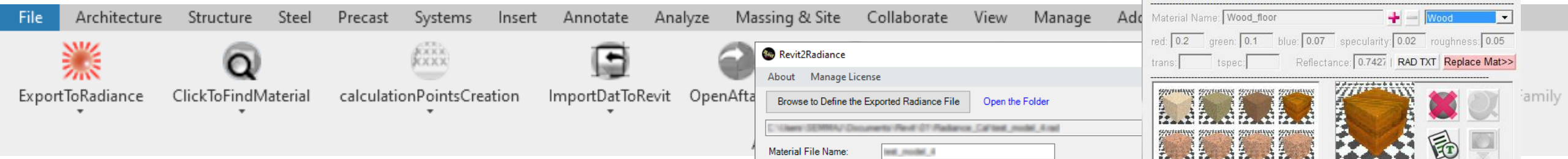
How to Define Radiance Materials?

- Creating Radiance Material based on Revit Categories
- Replacing the Revit Materials with Radiance Material



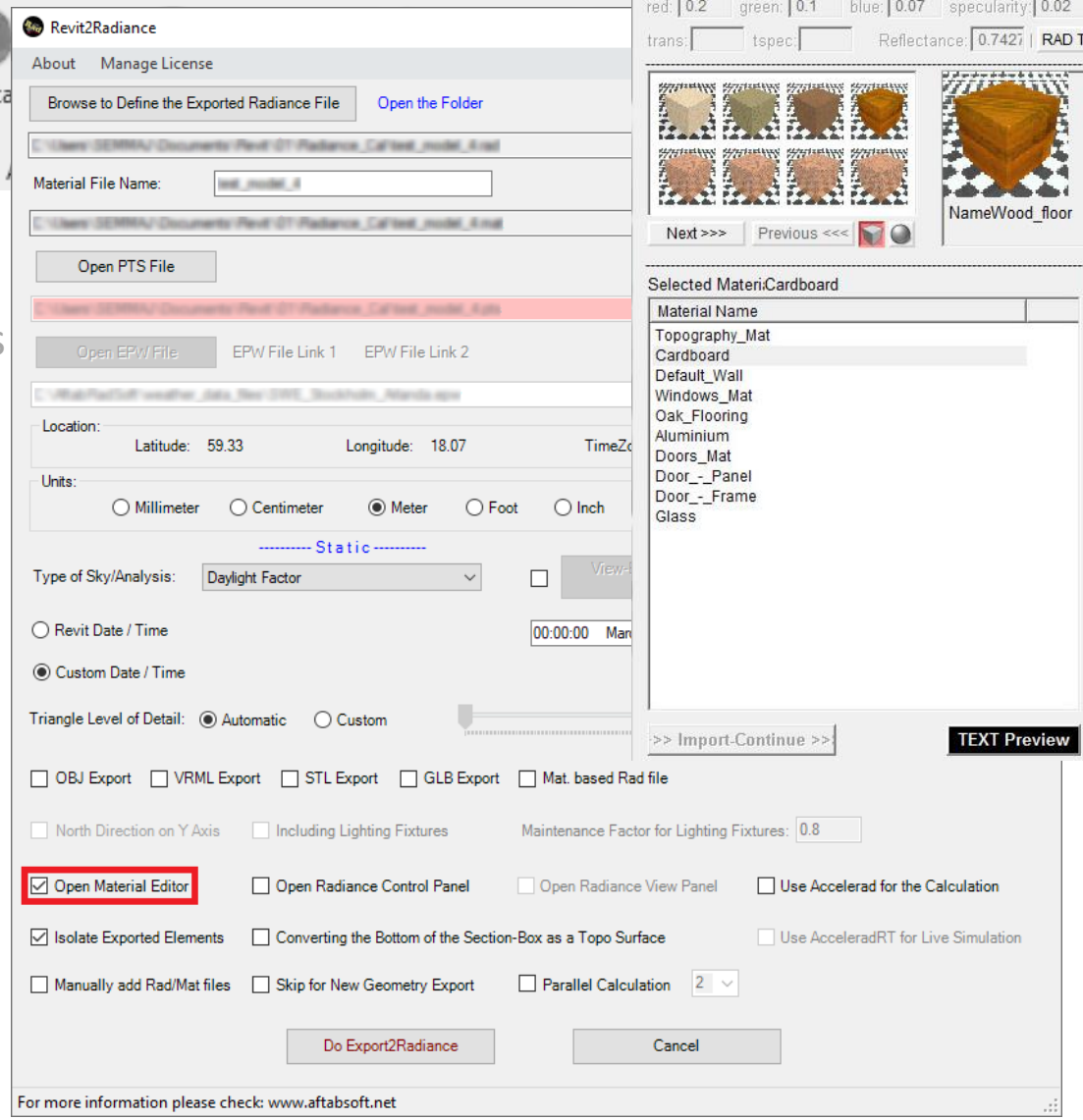
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/RadMaterialBySelectedSurfaces.htm
https://www.aftabsoft.net/AftabRadTutorial/RadMaterialByRevitMaterial.htm

AftabRad Revit Add-in Interfaces



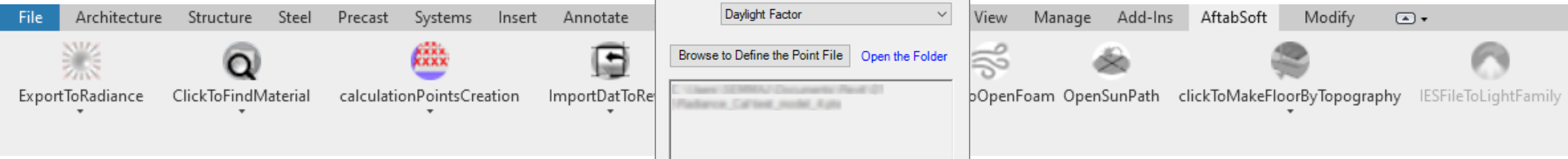
How to Define Radiance Materials?

- Creating Radiance Material based on Revit Categories
- Replacing the Revit Materials with Radiance Material
- Modifying the Exported Radiance Materials Before Start to Calculate



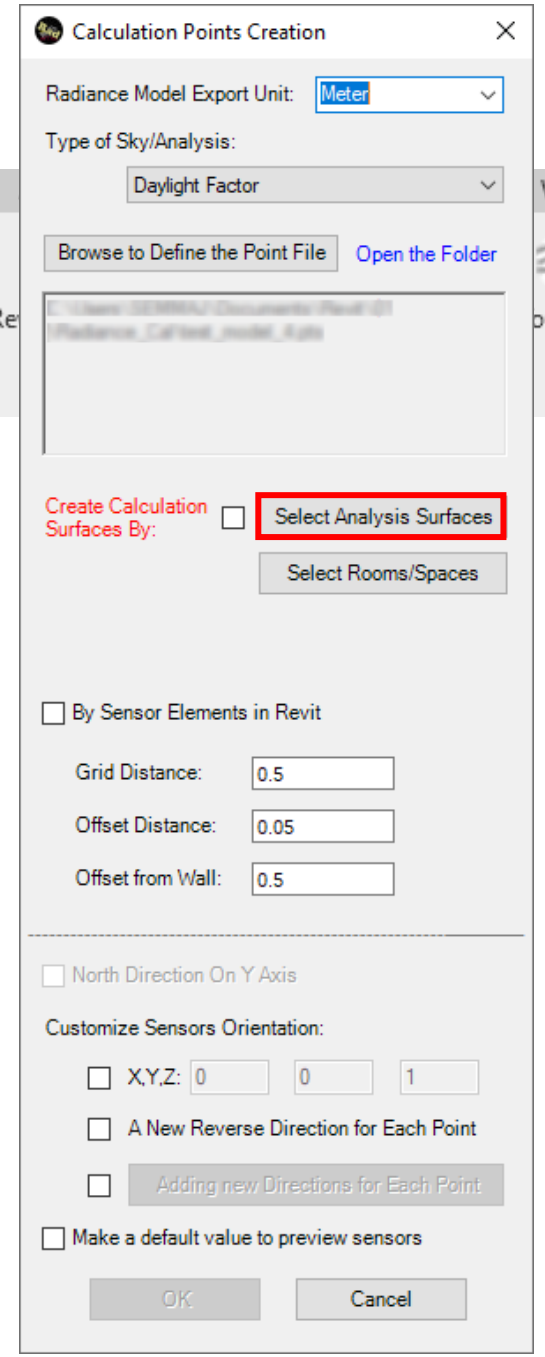
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/materialEditorPanel.htm

AftabRad Revit Add-in Interfaces



How to Create Calculation Points File?

- By selecting **Surfaces** in the model
- By selecting **Elements**



Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/BySelectingElementsSurfaces.htm

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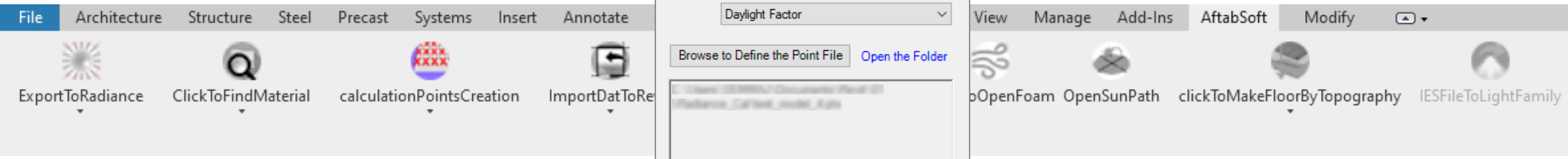
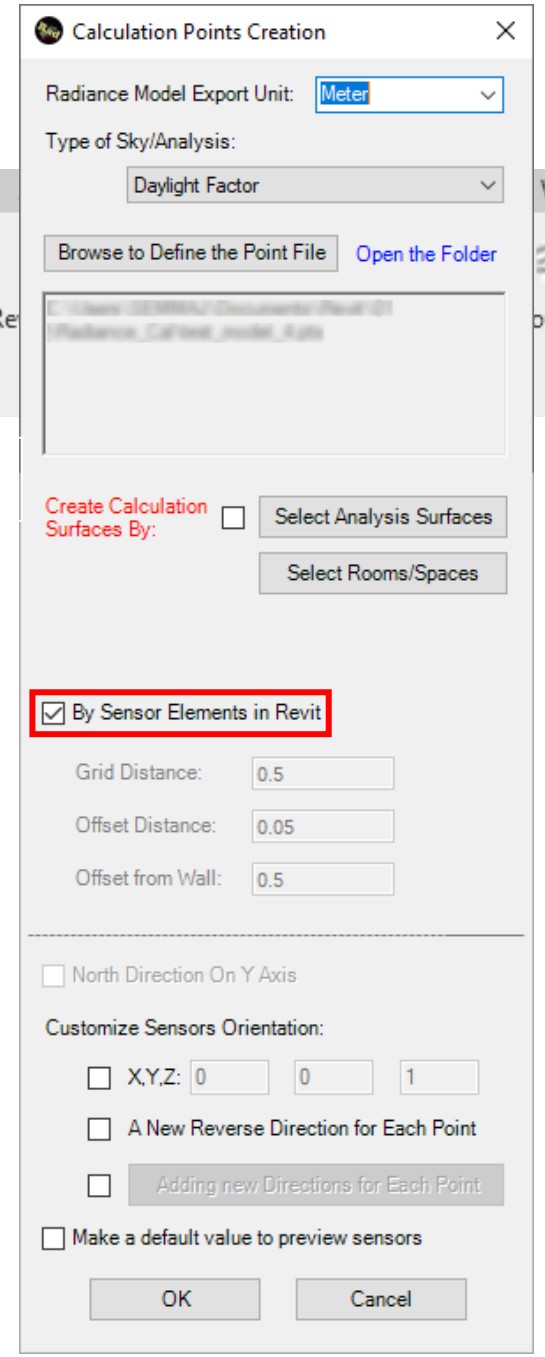
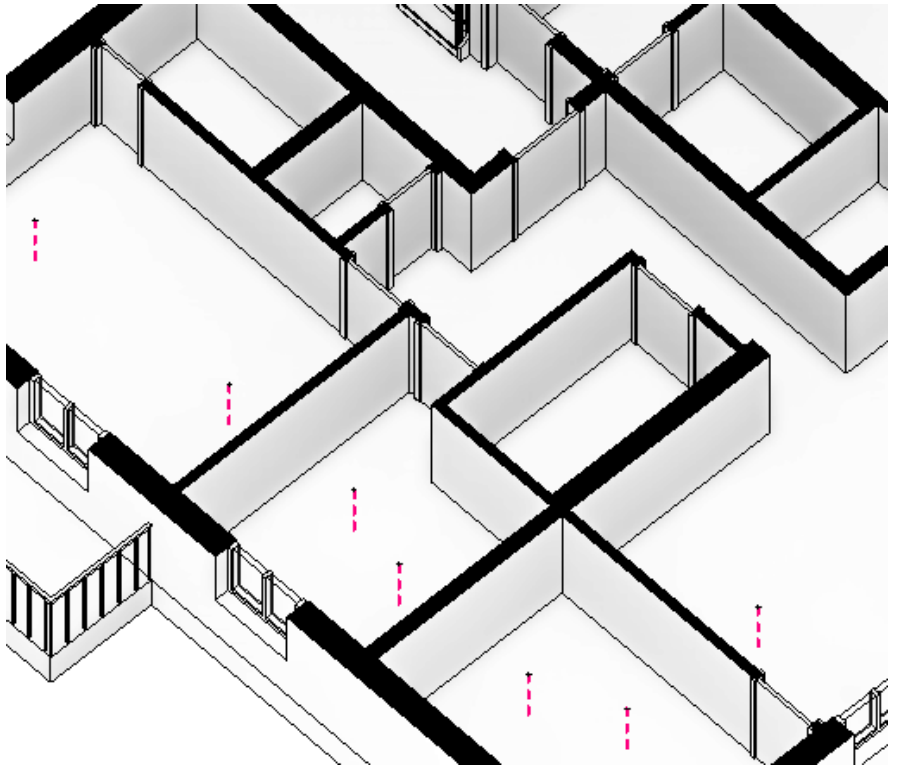


How to Create Calculation Points File?

- By selecting Surfaces in the model
- By selecting Elements
- By selecting some **Sensor Elements** as calculation points





Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/CreateCalculationPointsFile.htm

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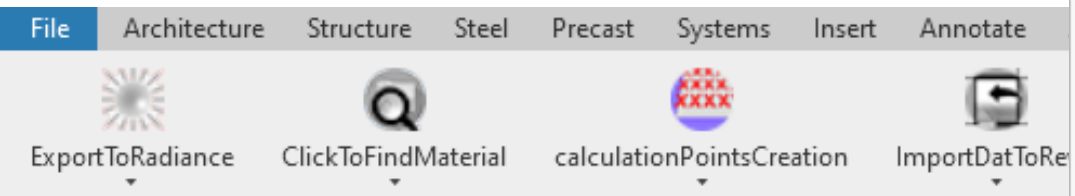
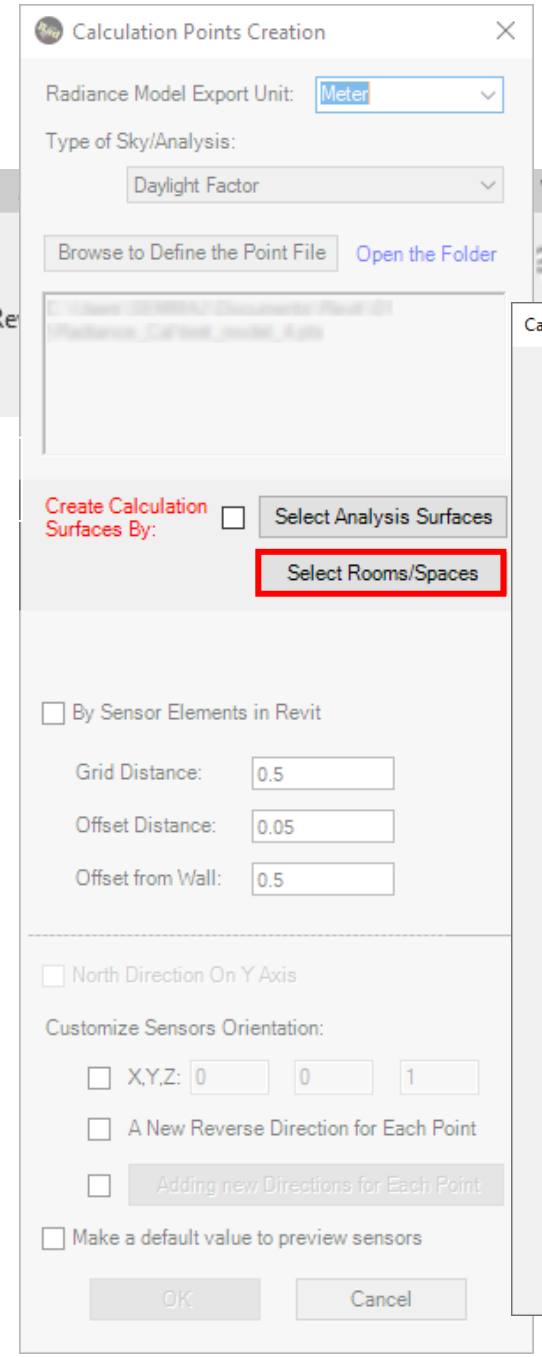
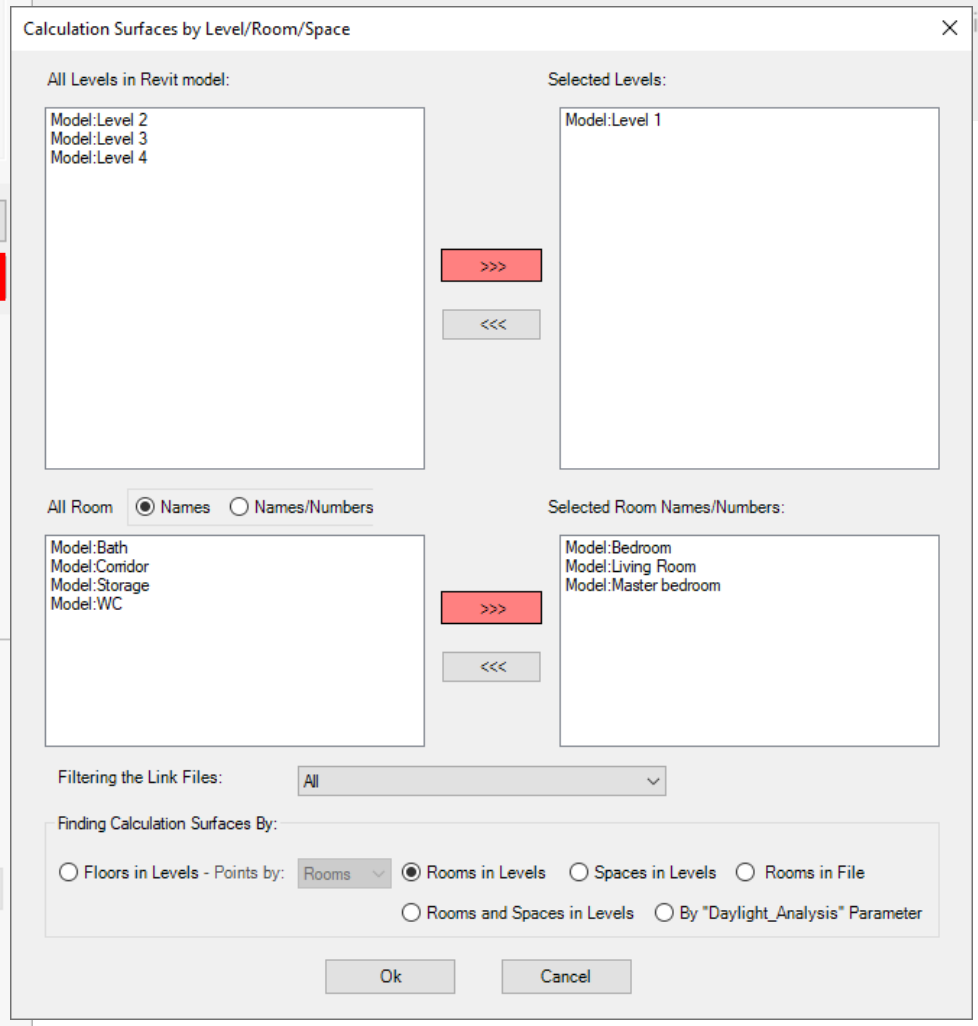


How to Create Calculation Points File?

- By selecting Surfaces in the model
- By selecting Elements
- By selecting some Sensor Elements as calculation points
- By selecting some **Rooms** or **Spaces**





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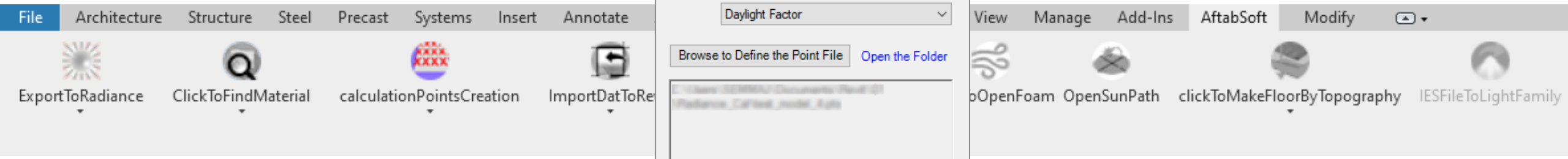
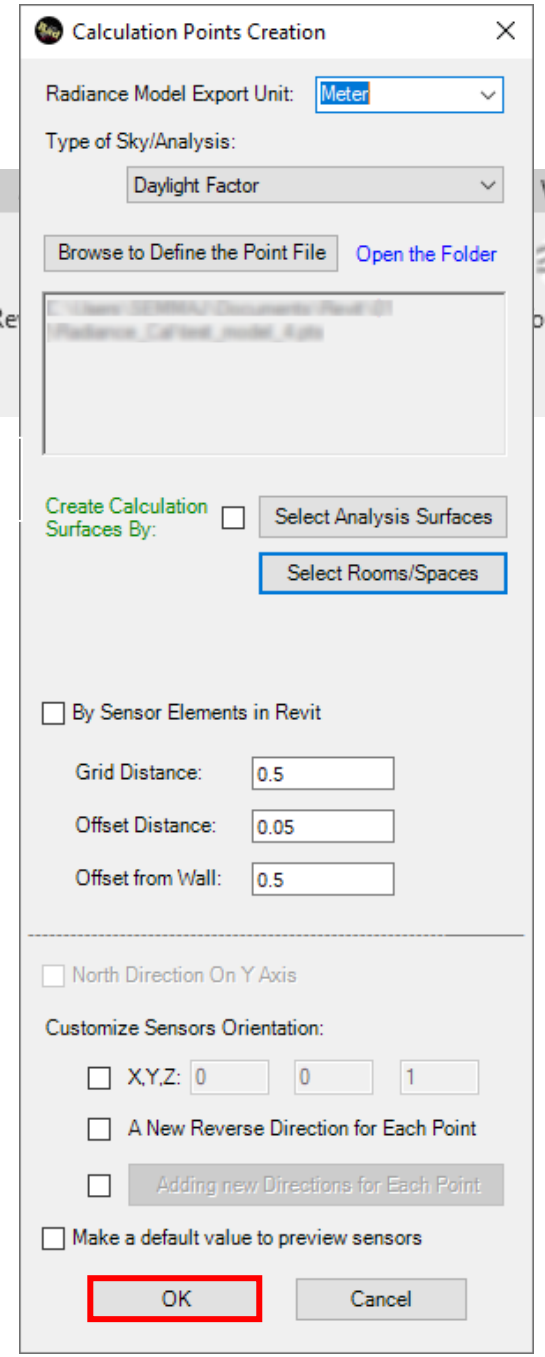
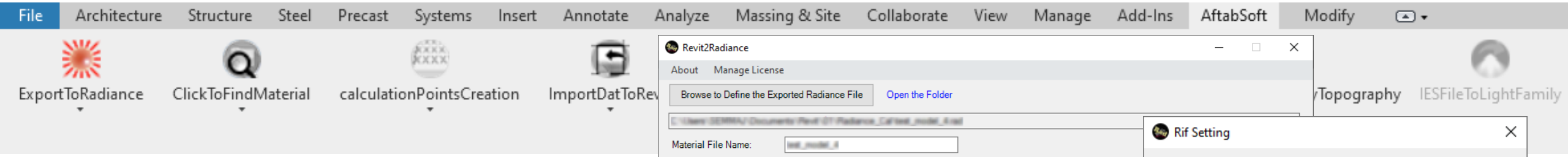


How to Create Calculation Points File?



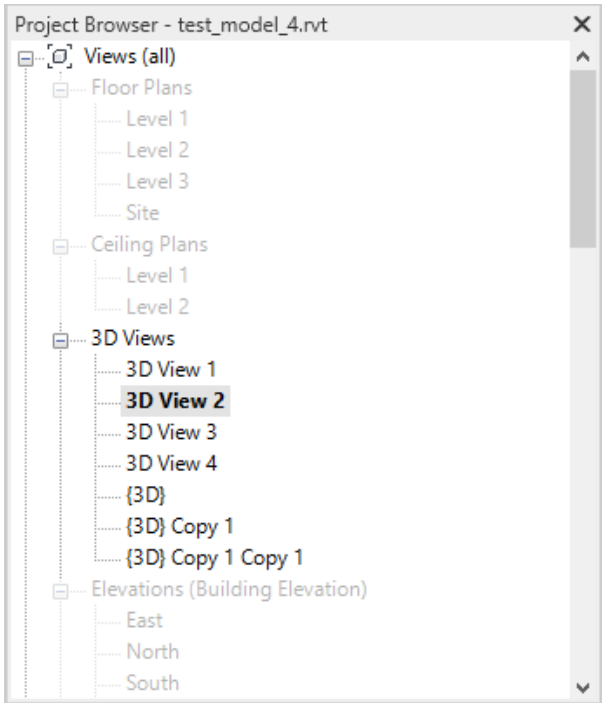
It creates: *.pts files

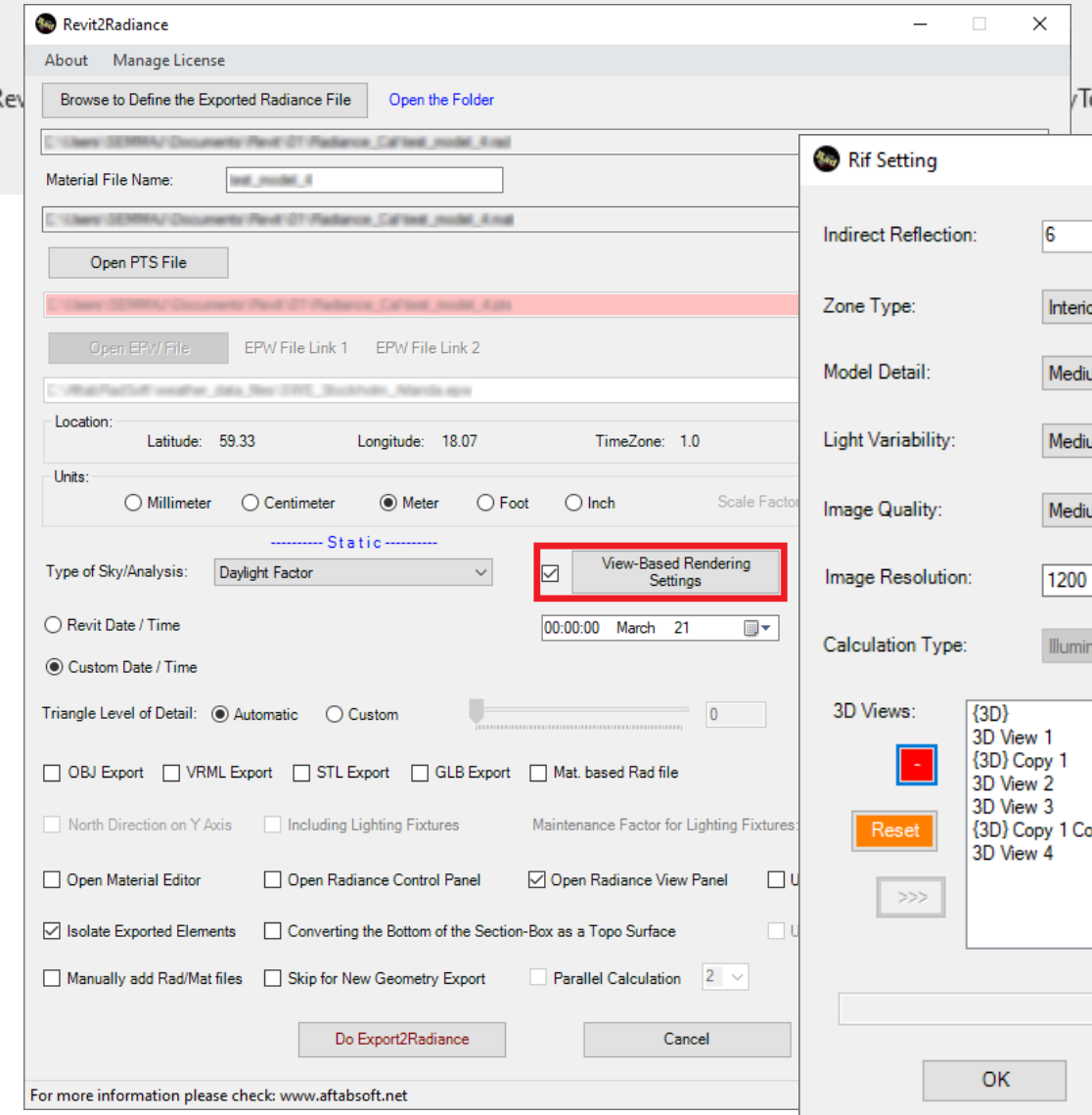
AftabRad Revit Add-in Interfaces

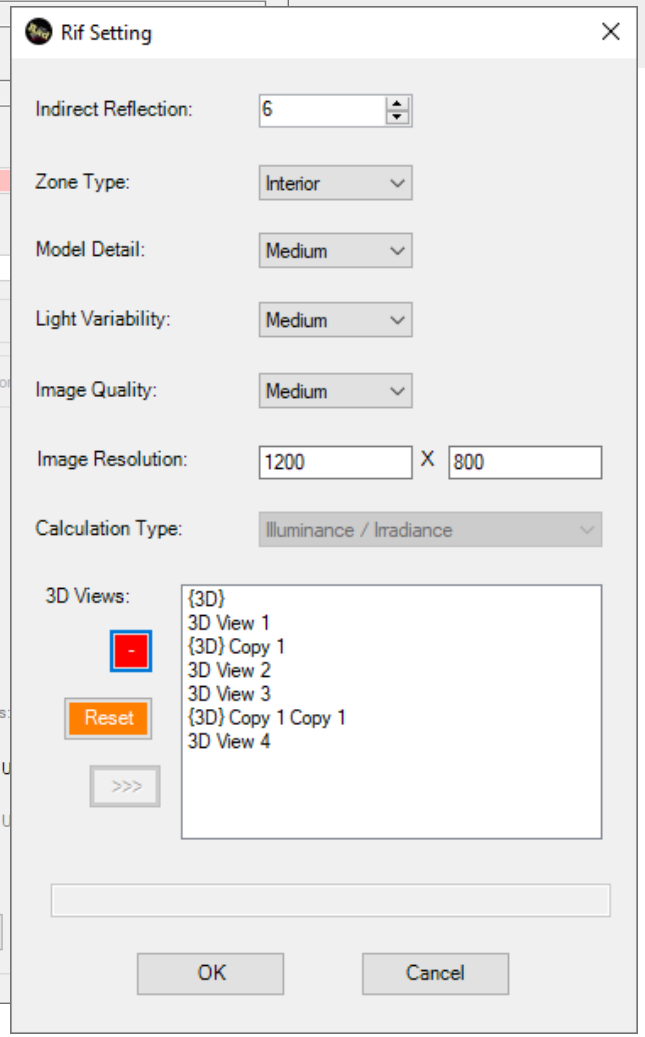


How to do a View Based Simulations?

- By selecting some Revit views

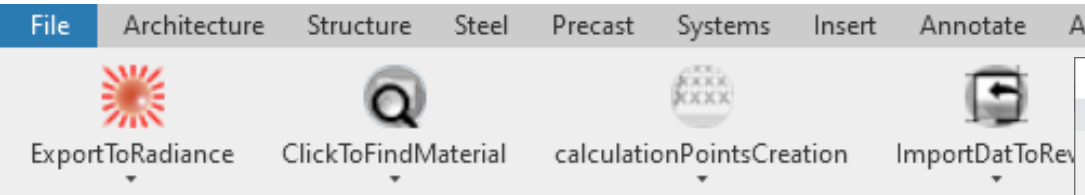






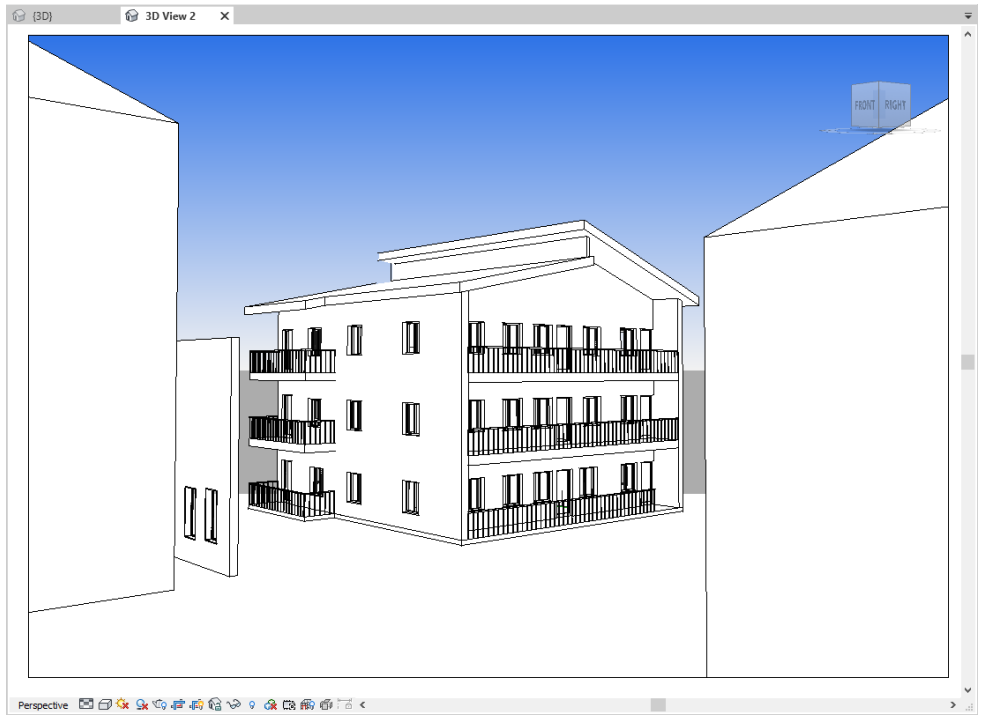
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/DefiningSpecificViews.htm

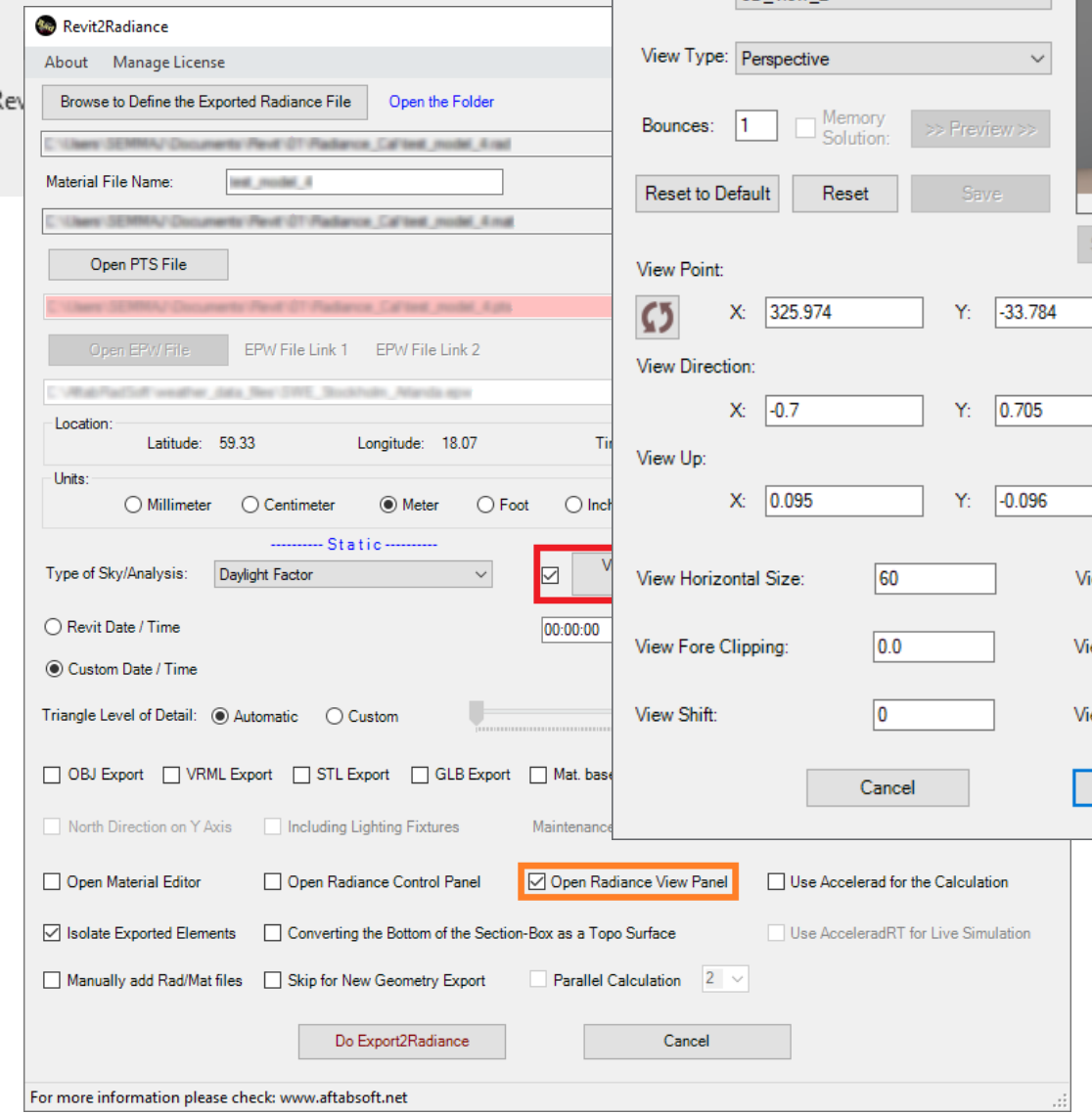
AftabRad Revit Add-in Interfaces



How to do a View Based Simulations?

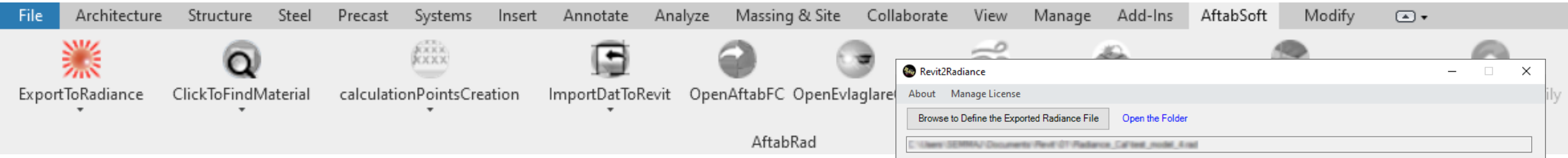
- By selecting some Revit views





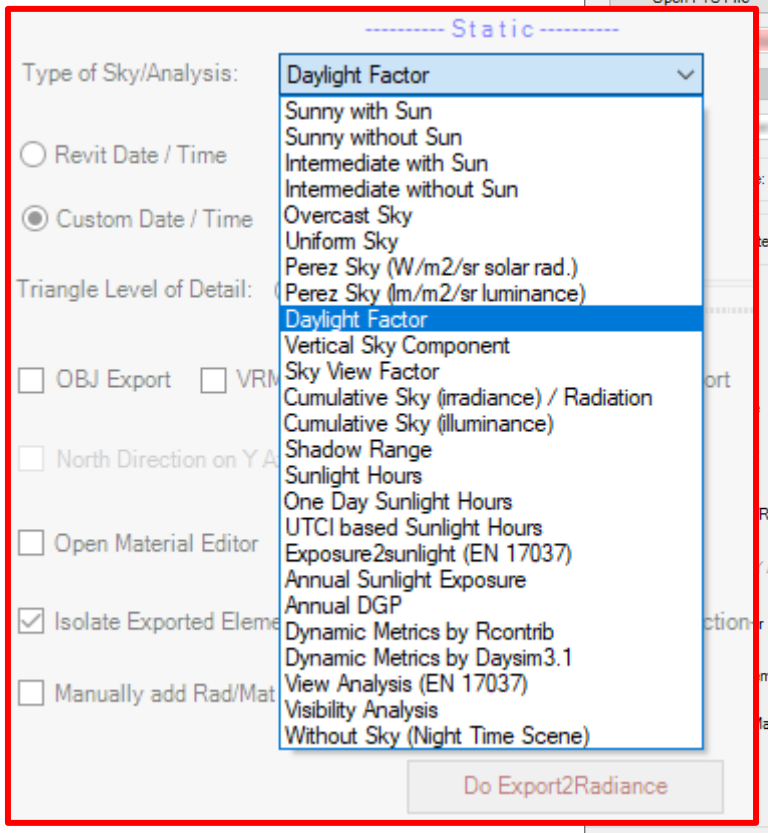
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/DefiningSpecificViews.htm

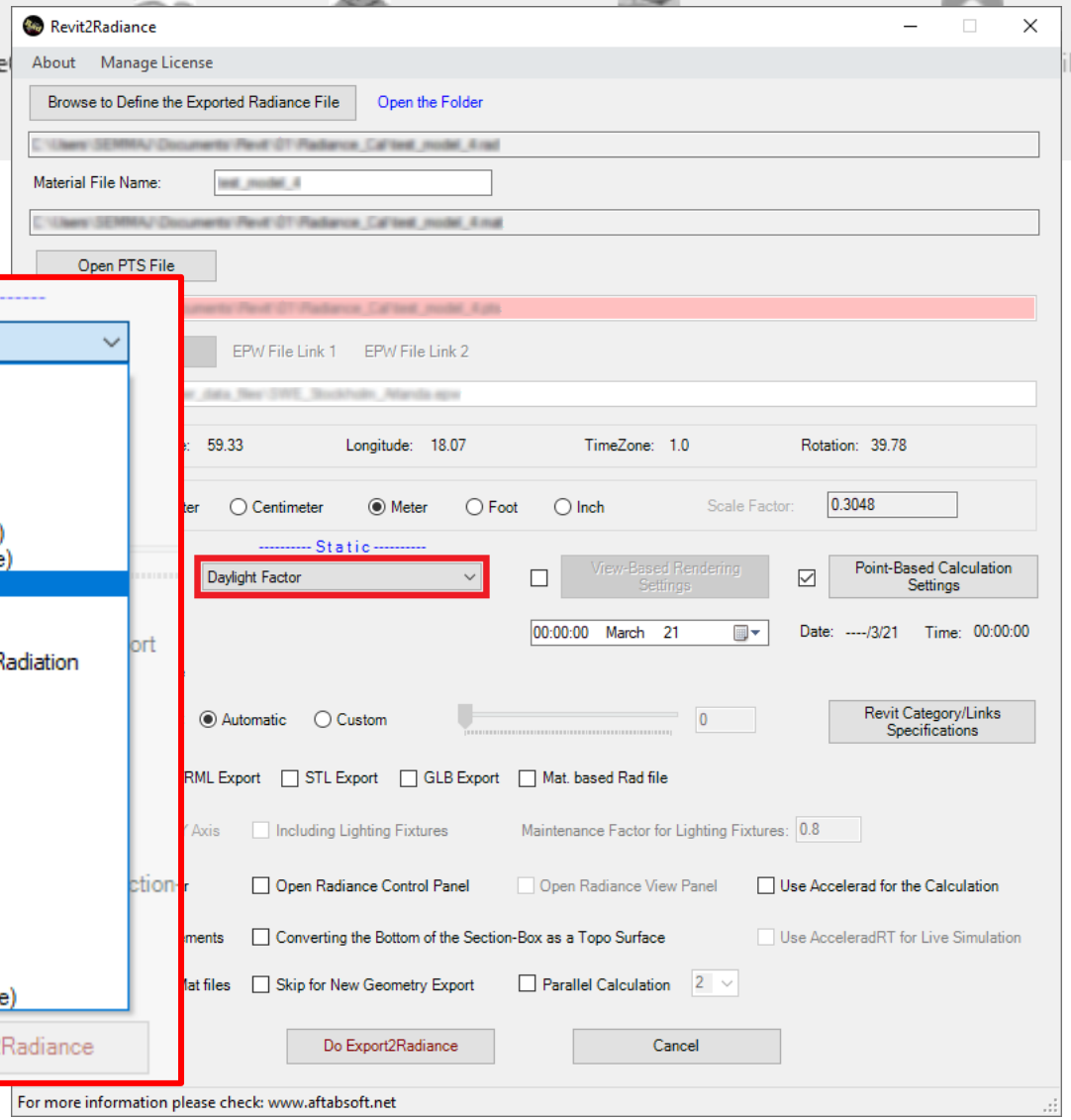
AftabRad Revit Add-in Interfaces



Which Types of Analyses can be done by this Add-in?

Shadow Range
Sunlight Hours
One Day Sunlight Hours
UTCI based Sunlight Hours
Exposure2sunlight (EN 17037)
Annual Sunlight Exposure
View Analysis (EN 17037)
Visibility Analysis



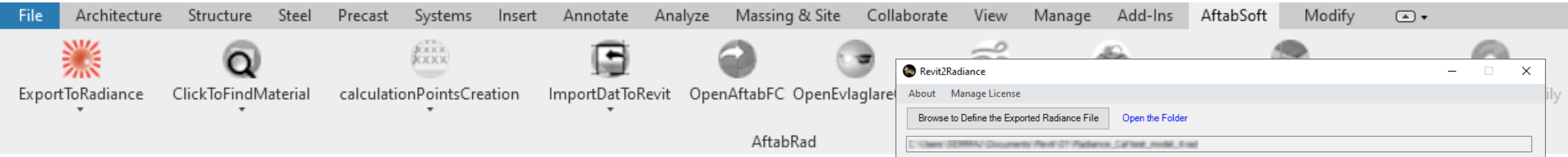


python

Radiance
Synthetic Imaging System

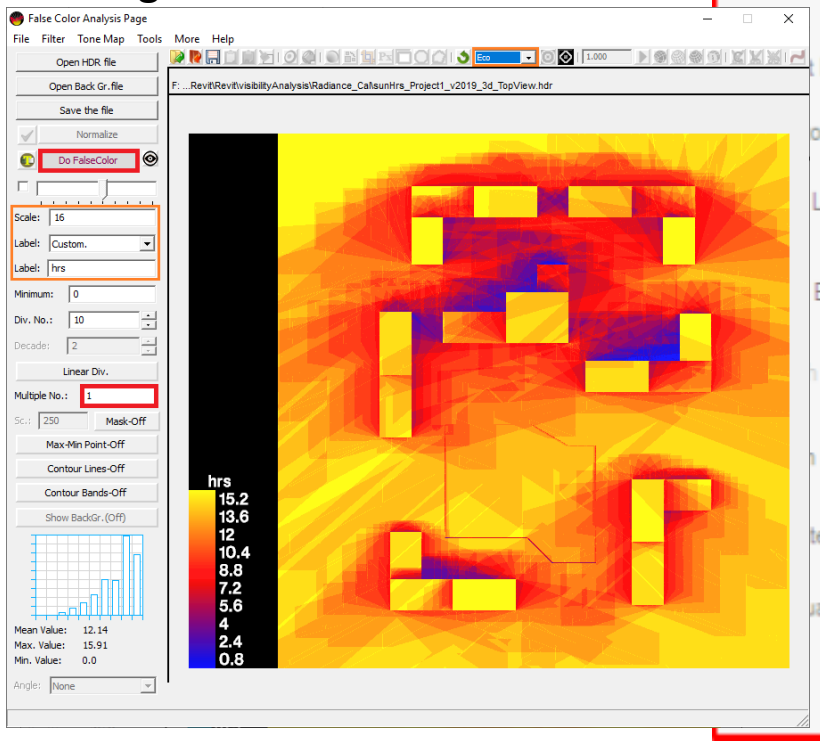
Tutorial link: https://aftabsoft.net/aftab-rad.php#CalculationTypes

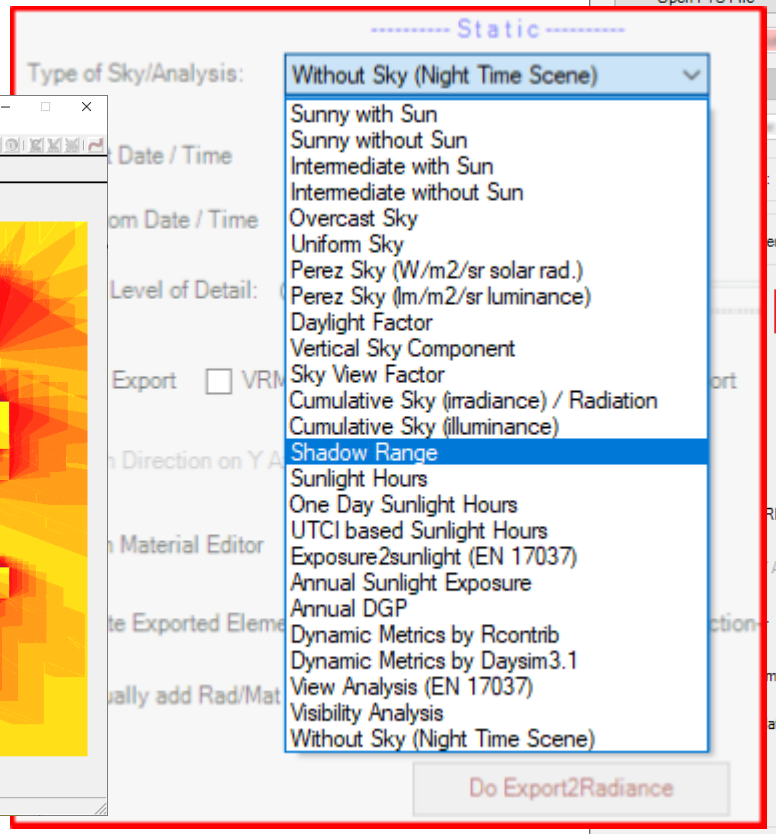
AftabRad Revit Add-in Interfaces

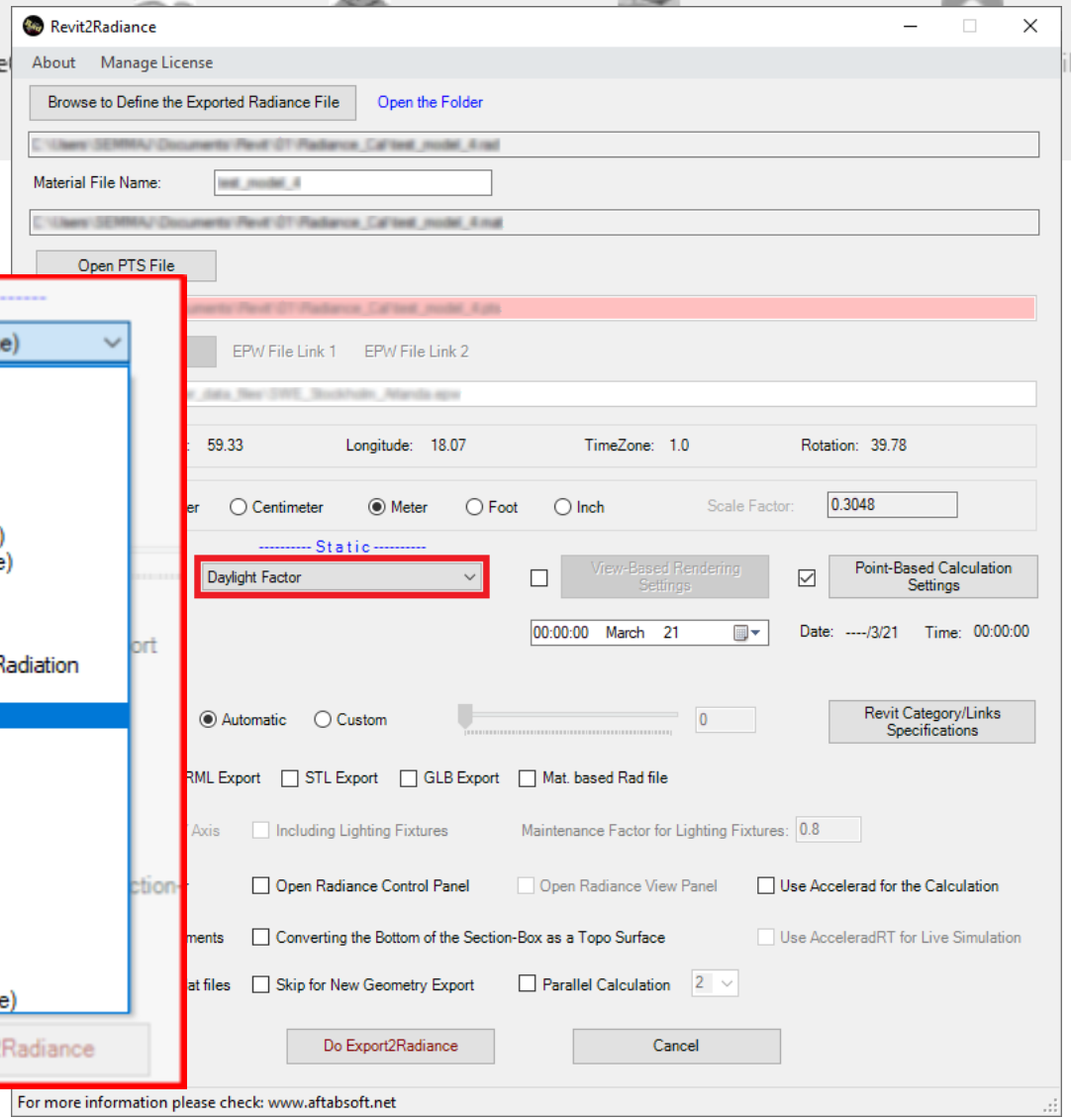


Which Types of Analyses can be done by this Add-in?

Shadow Range

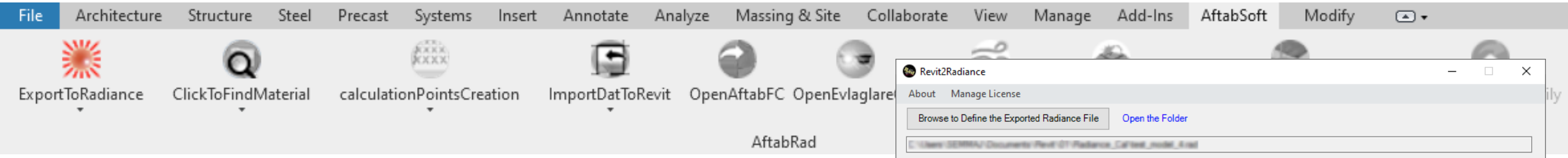






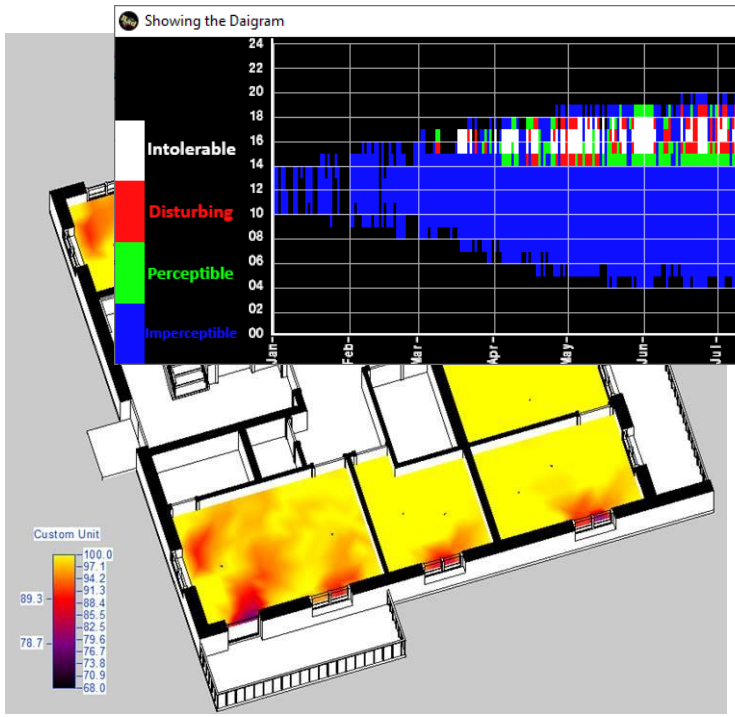
Tutorial link: https://aftabsoft.net/aftab-rad.php#CalculationTypes

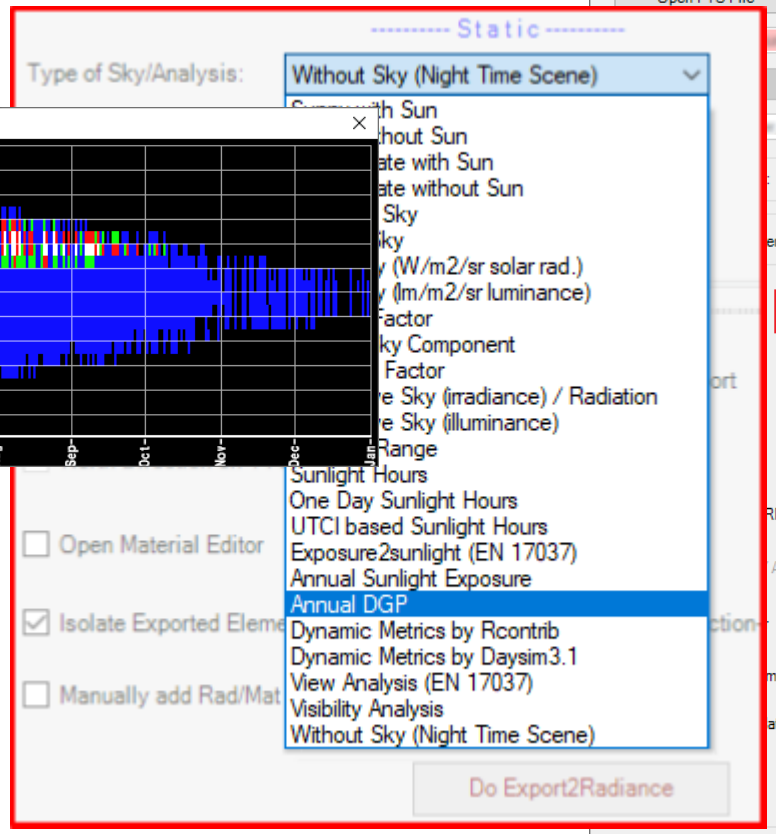
AftabRad Revit Add-in Interfaces

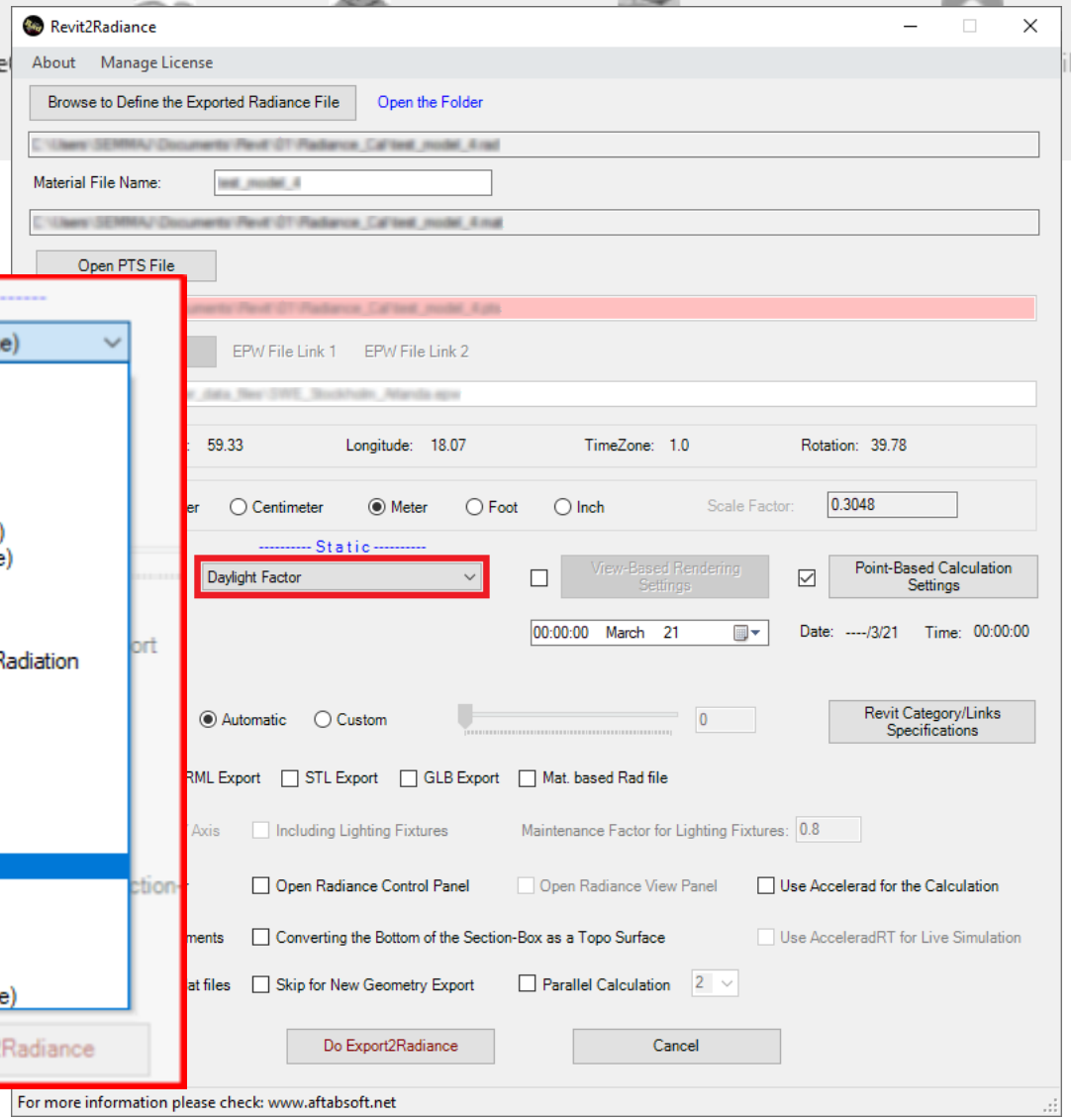


Which Types of Analyses can be done by this Add-in?

Annual DGP

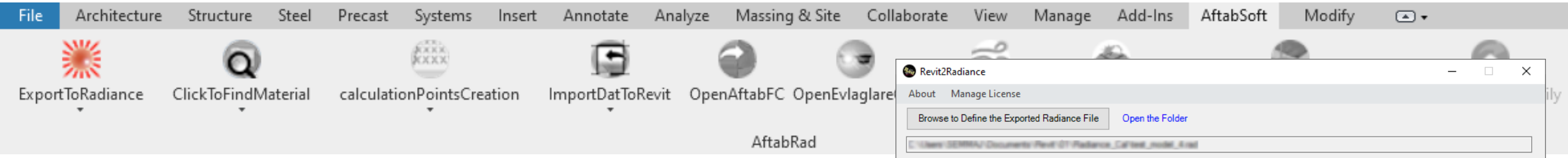






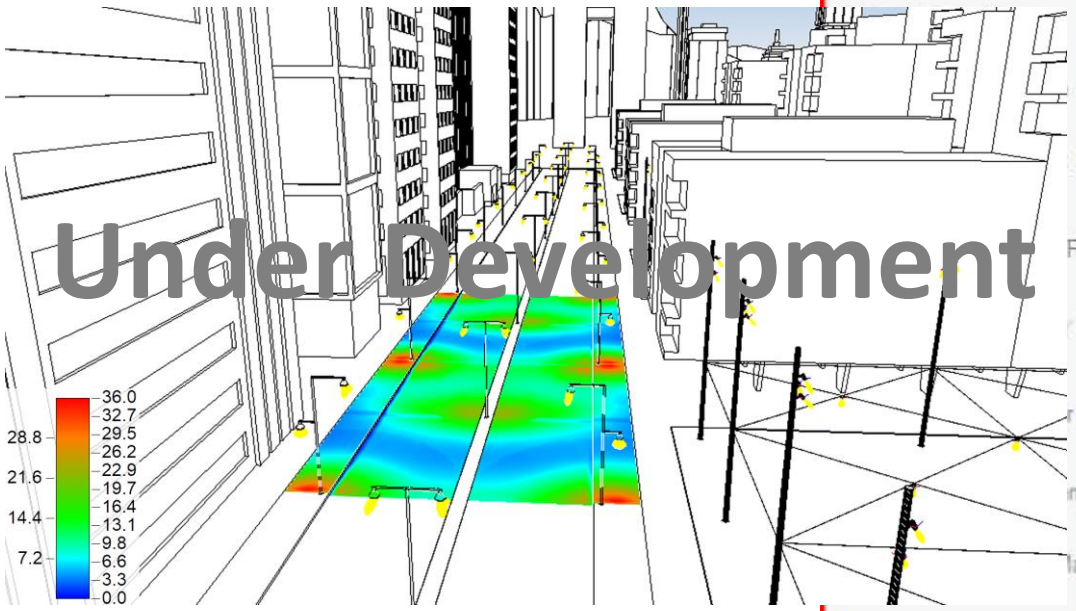
Tutorial link: https://aftabsoft.net/aftab-rad.php#CalculationTypes

AftabRad Revit Add-in Interfaces

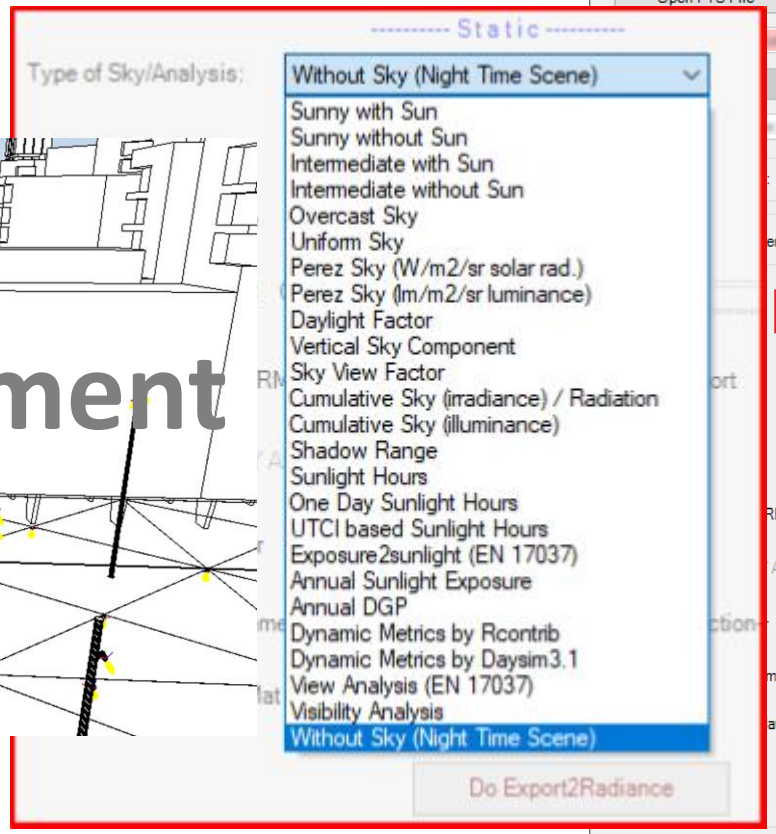


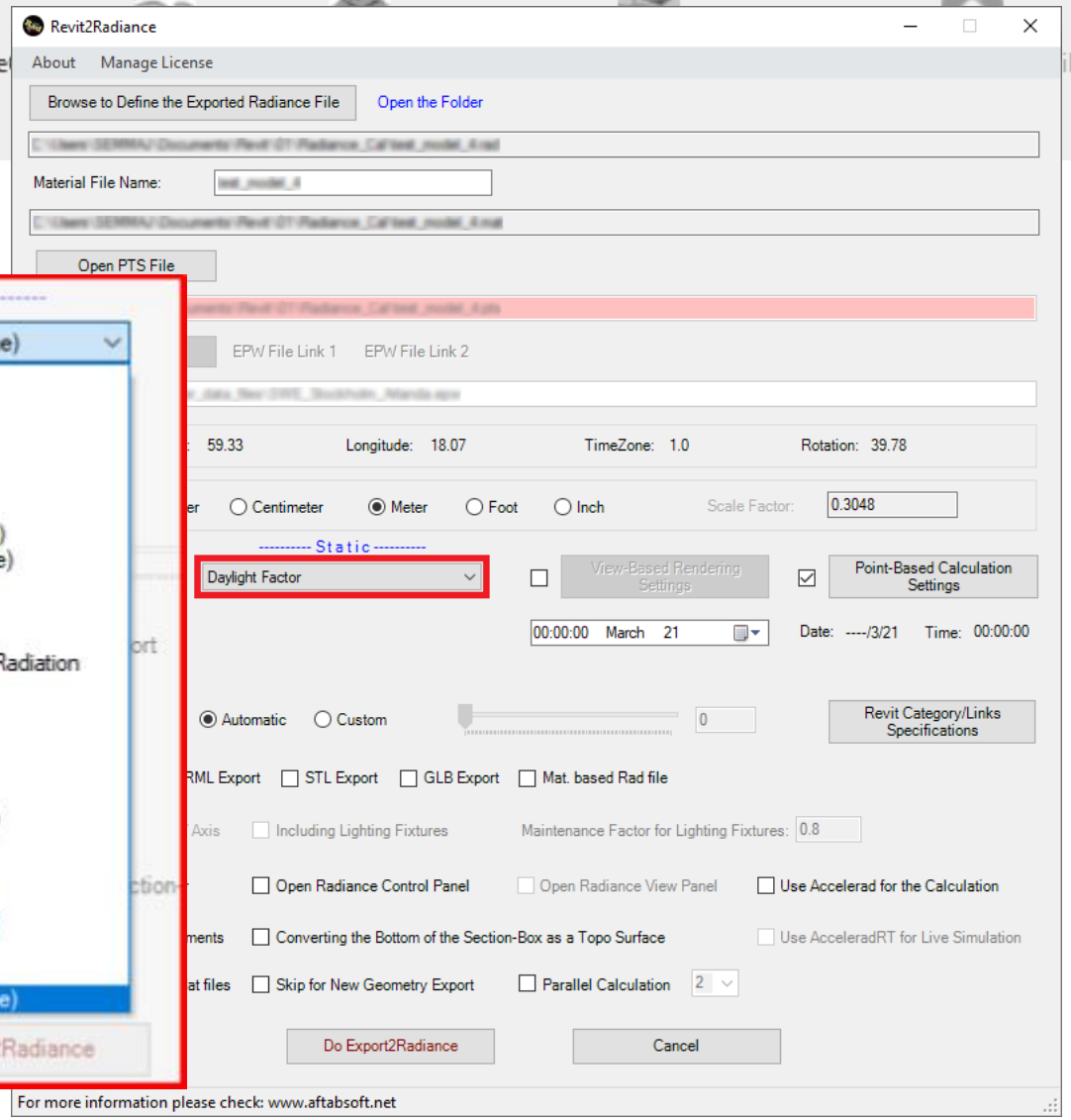
Which Types of Analyses can be done by this Add-in?

Without Sky (Night Time Scene)



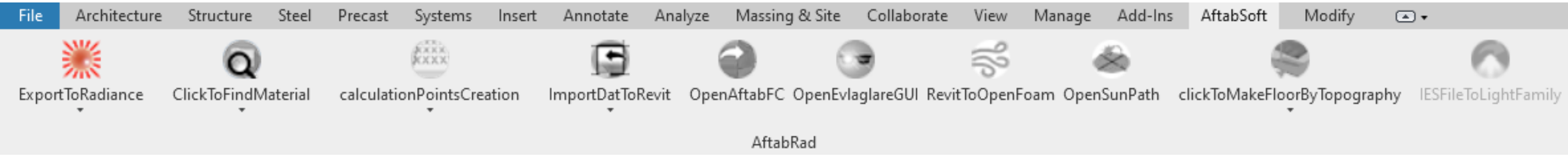
Under Development





Tutorial link: https://aftabsoft.net/aftab-rad.php#CalculationTypes

AftabRad Revit Add-in Interfaces

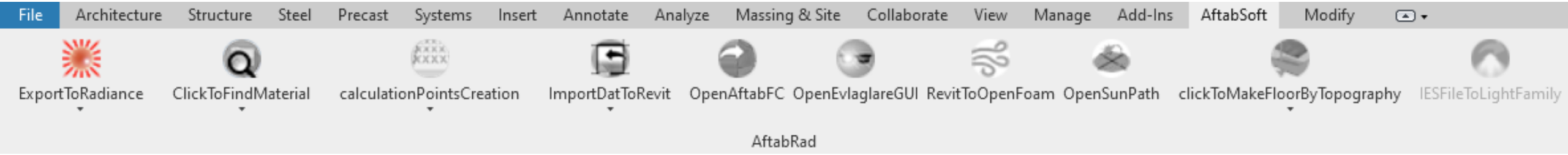


How to handle big size 3Ds model when exporting to Radiance?

- Excluding to export any elements that is hidden in the current view inside Revit

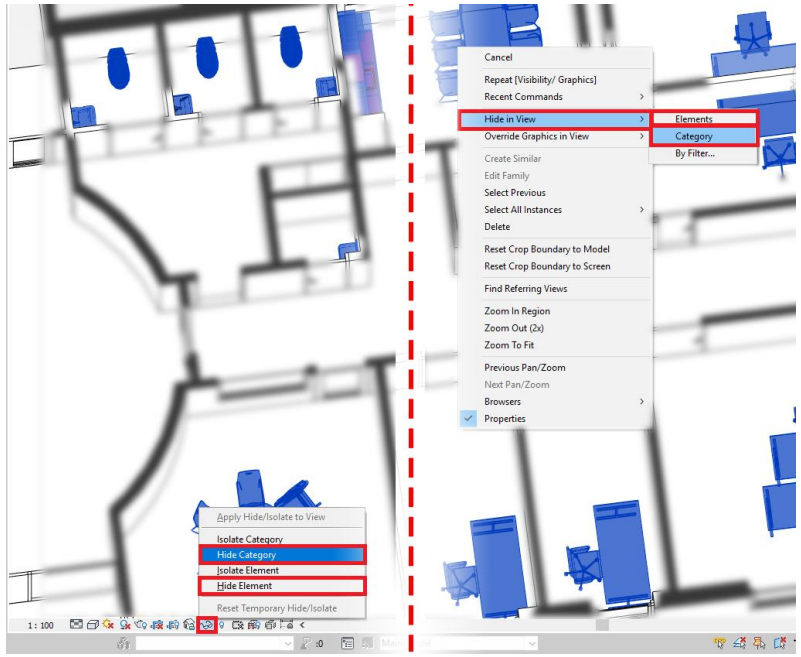
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_byHidingElements.htm

AftabRad Revit Add-in Interfaces



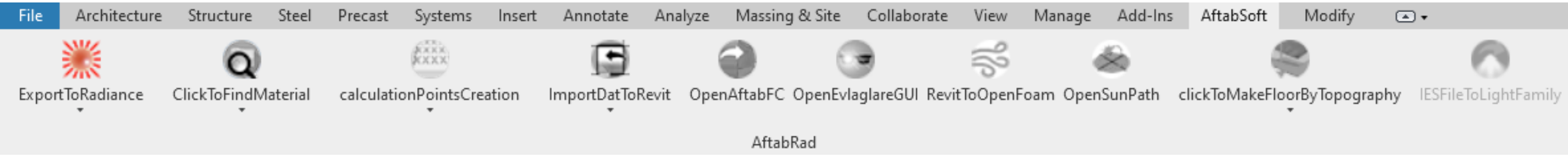
How to handle big size 3Ds model when exporting to Radiance?

- Excluding to export any elements that is hidden in the current view inside Revit
  - Hide the Selected Elements or Categories



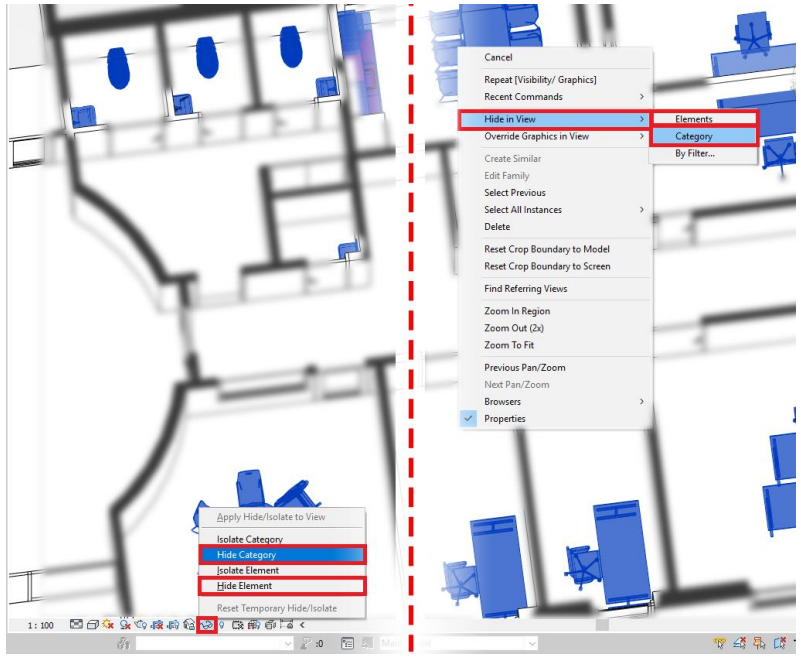
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_byHidingElements.htm

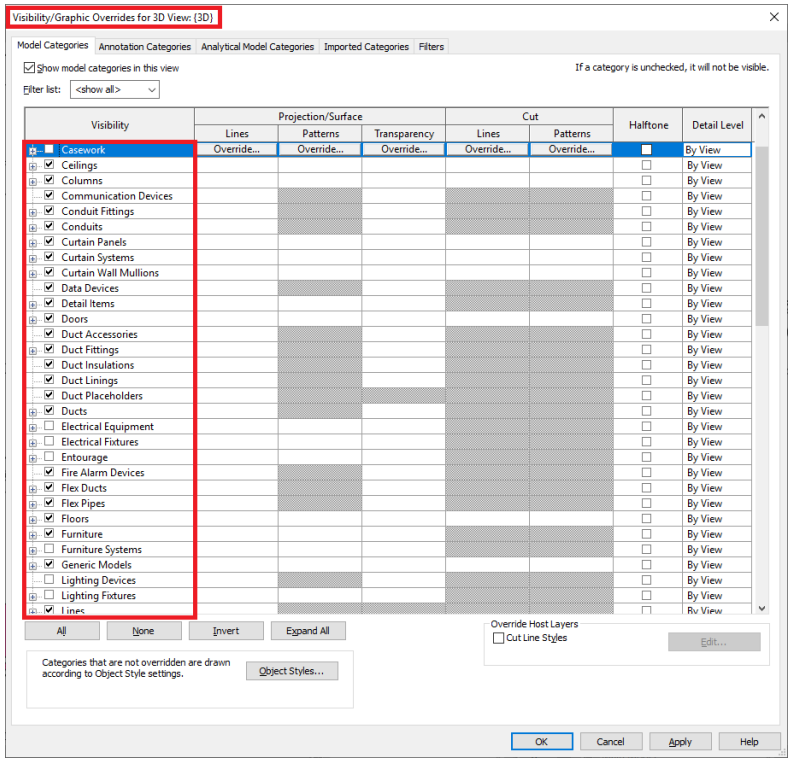
AftabRad Revit Add-in Interfaces



How to handle big size 3Ds model when exporting to Radiance?

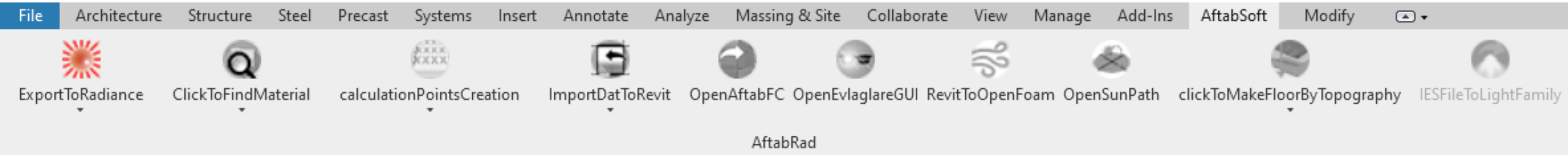
- Excluding to export any elements that is hidden in the current view inside Revit
  - Hide the Selected Elements or Categories





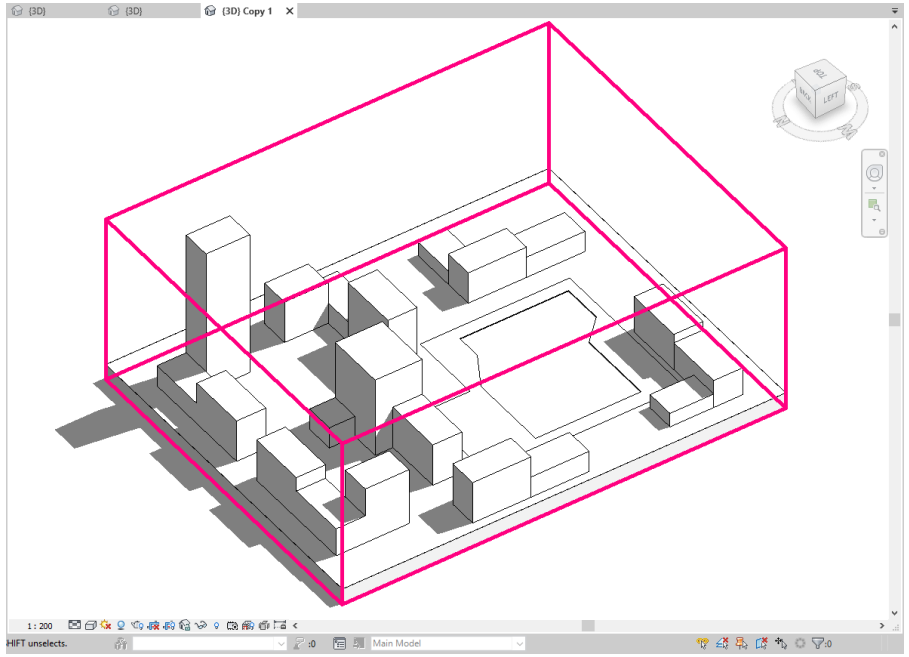
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_byHidingElements.htm

AftabRad Revit Add-in Interfaces



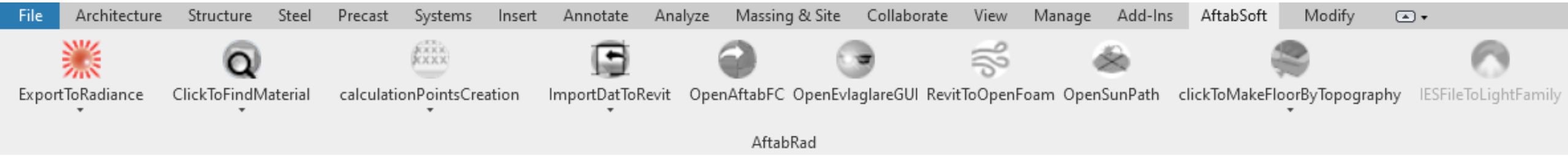
How to handle big size 3Ds model when exporting to Radiance?

- Excluding to export any elements that is hidden in the current view inside Revit
  - Hide the Selected Elements or Categories
  - Hide by Section Box



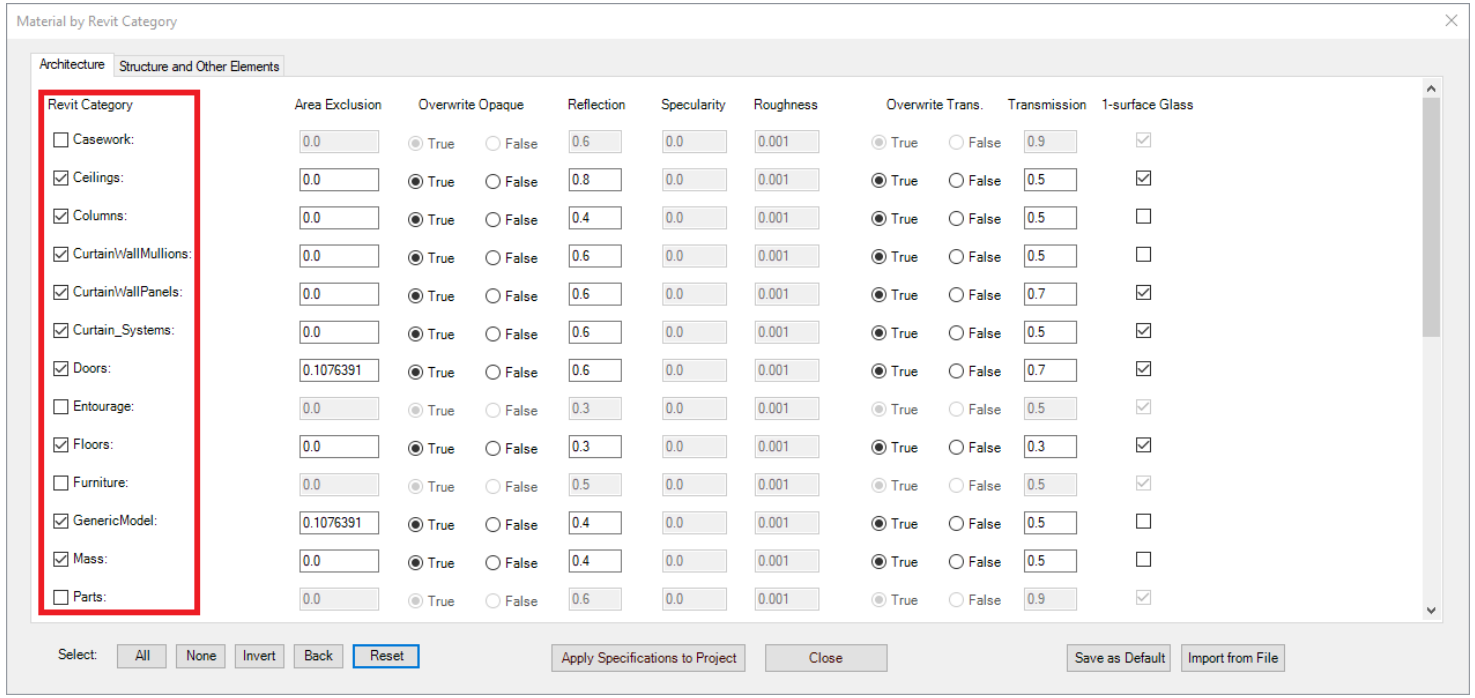
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_bySectionBox.htm

AftabRad Revit Add-in Interfaces



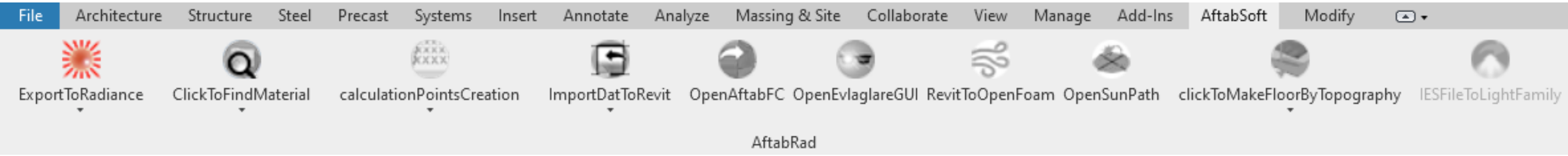
How to handle big size 3Ds model when exporting to Radiance?

- Excluding to export any elements that is hidden in the current view inside Revit
- Excluding to export any elements in AftabRad Add-in
  - Hide the Selected Categories



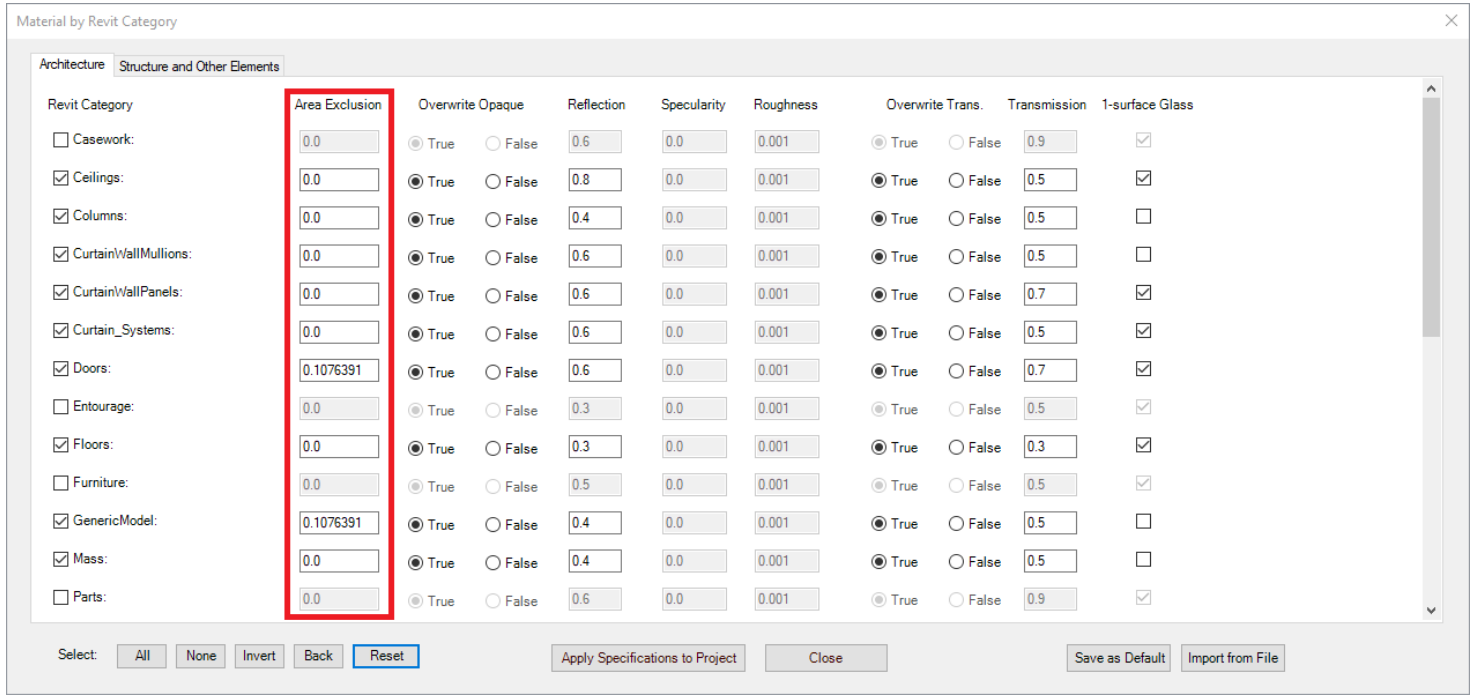
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_byCategories.htm

AftabRad Revit Add-in Interfaces



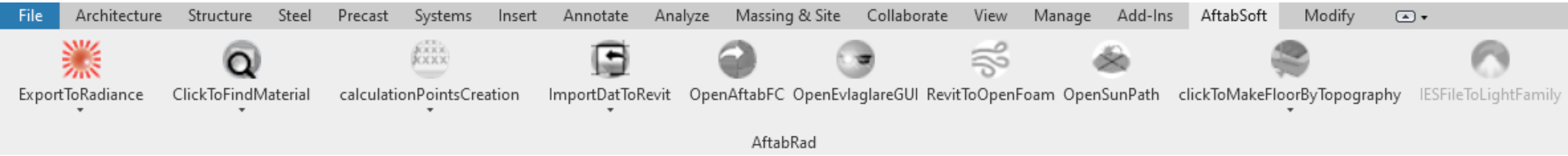
How to handle big size 3D models when exporting to Radiance?

- Excluding to export any elements that is hidden in the current view inside Revit
- Excluding to export any elements in AftabRad Add-in
  - Hide the Selected Categories
  - Hide Extra Details of Selected Families

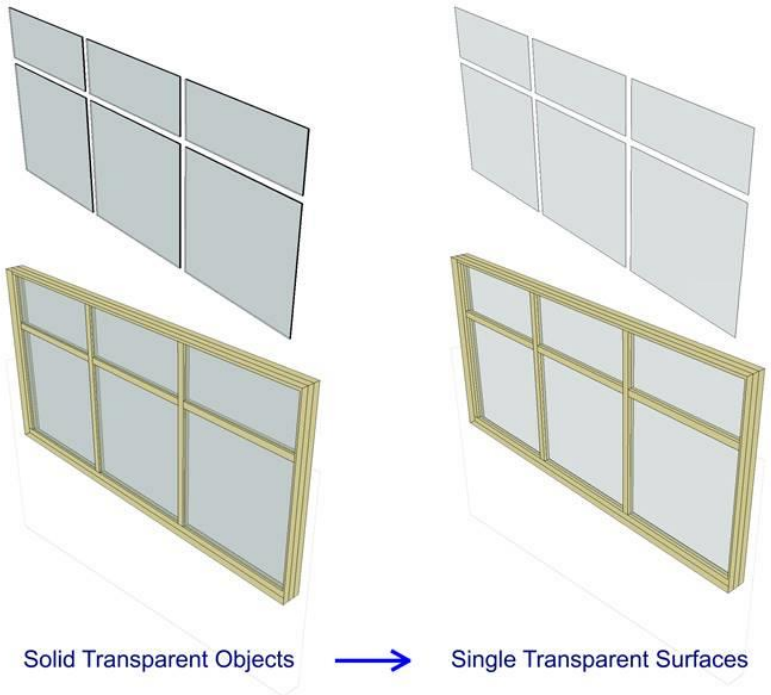


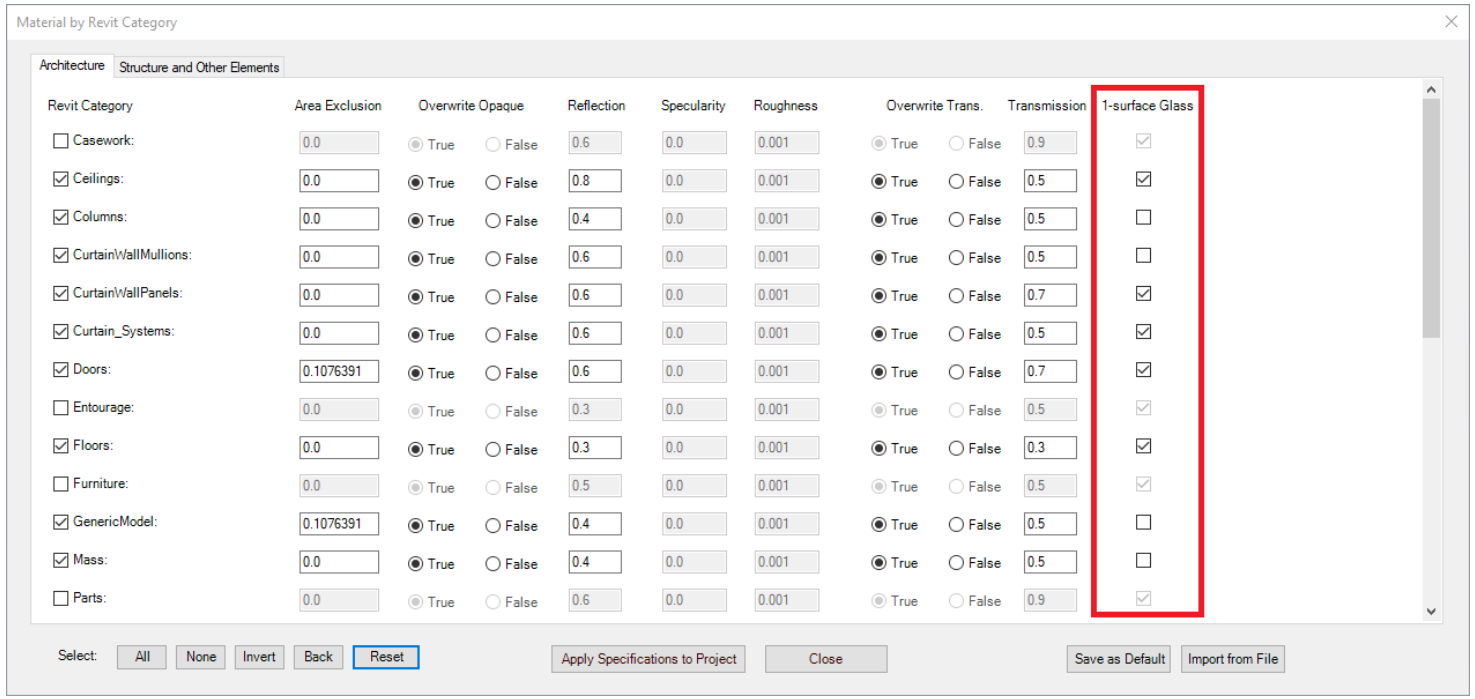
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_byAreaLimitation.htm

AftabRad Revit Add-in Interfaces



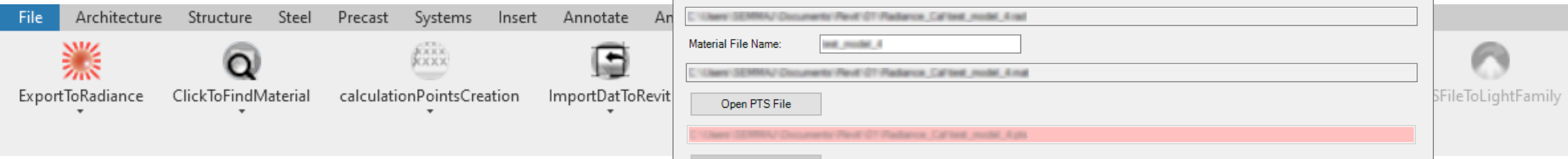
Creating Only One Surface for Each Transparent Solid Object



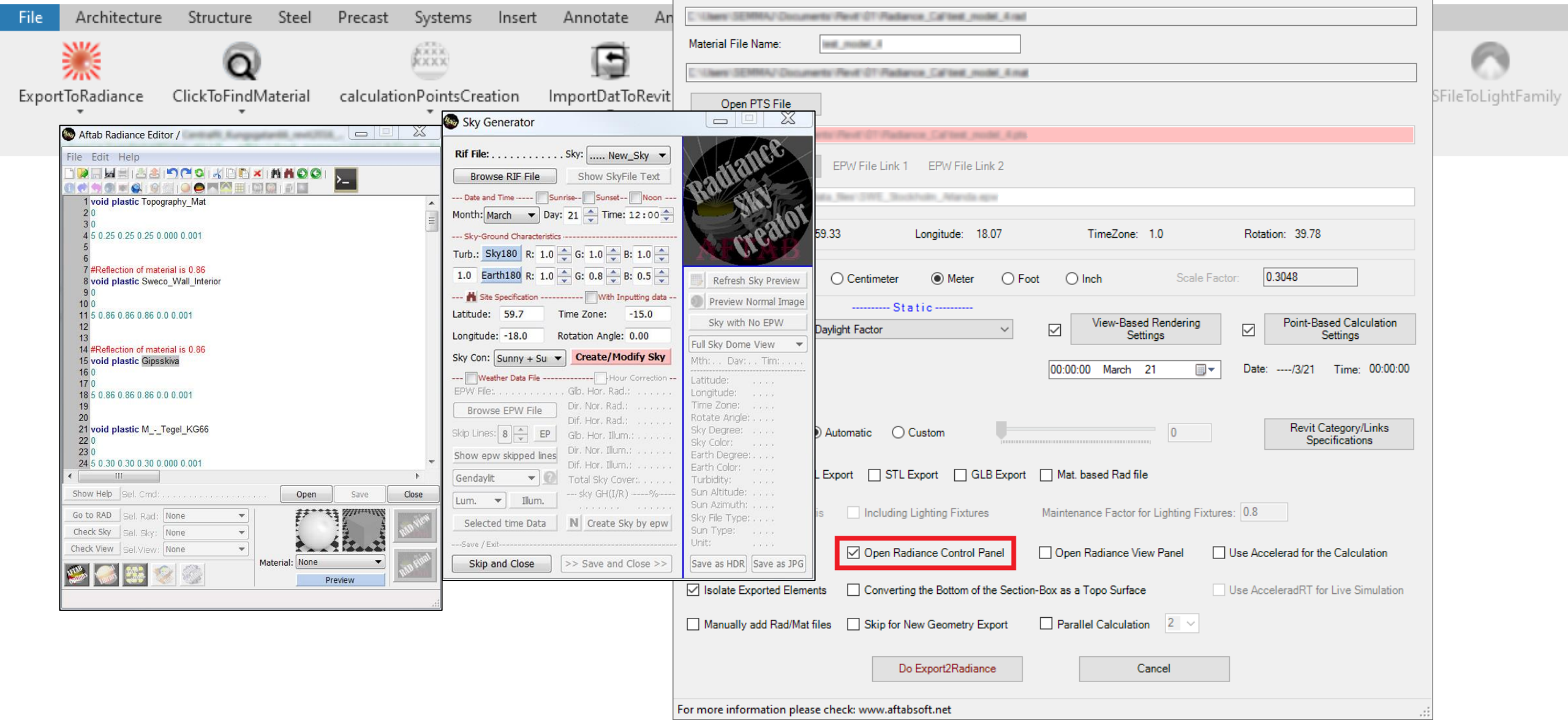


Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/simplification_ToSingleSurface.htm

AftabRad Revit Add-in Interfaces

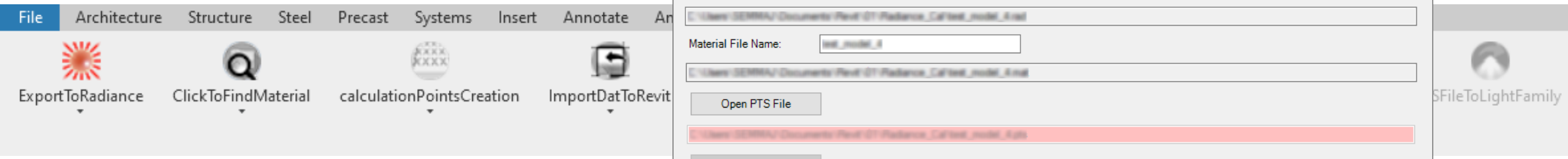


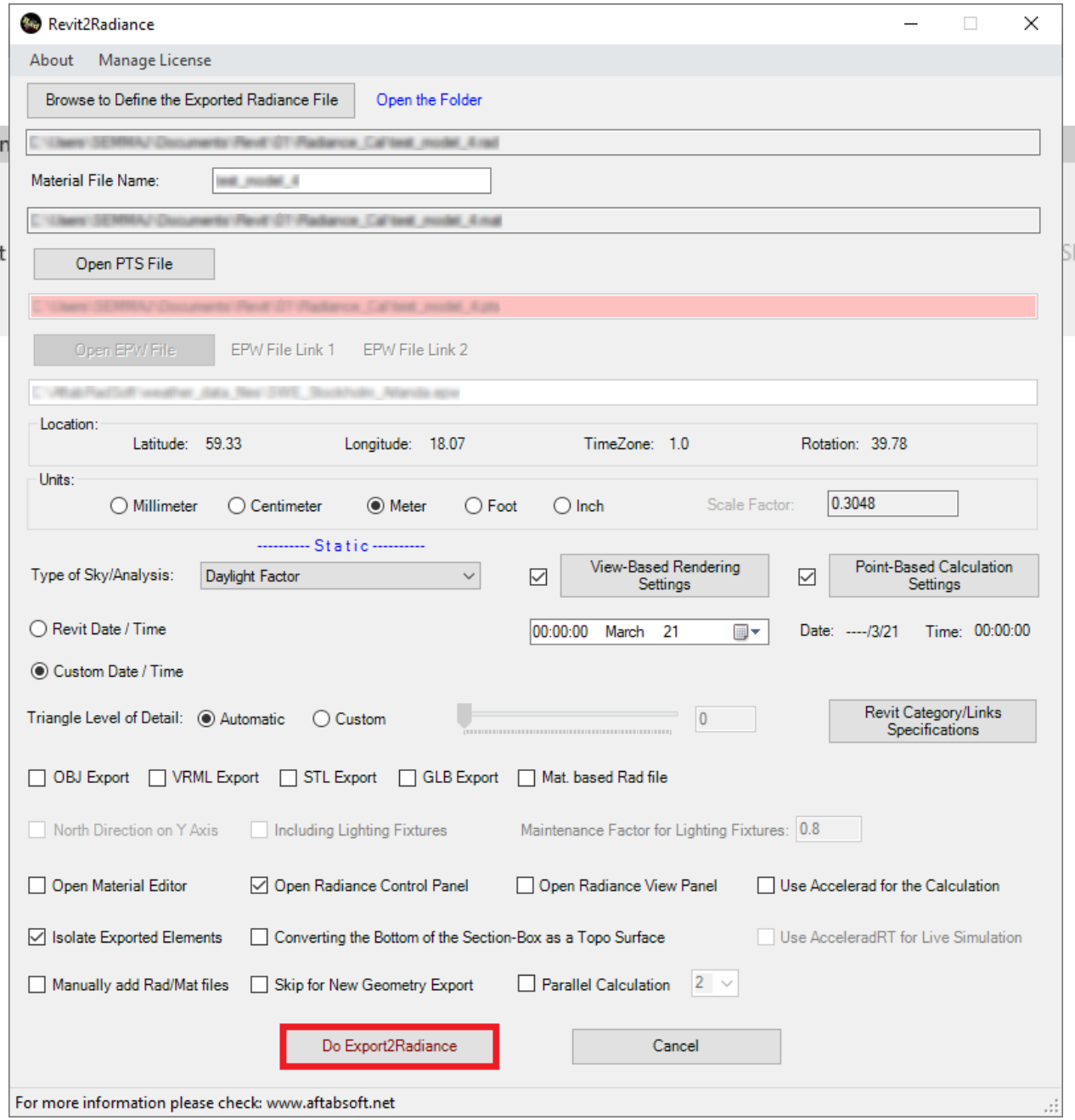
AftabRad Revit Add-in Interfaces



Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/radControlPanel.htm

AftabRad Revit Add-in Interfaces



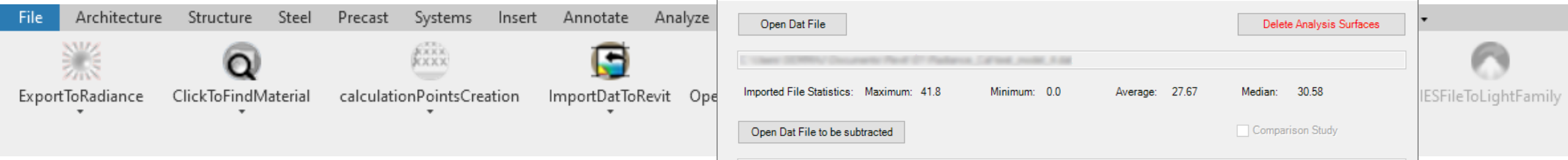


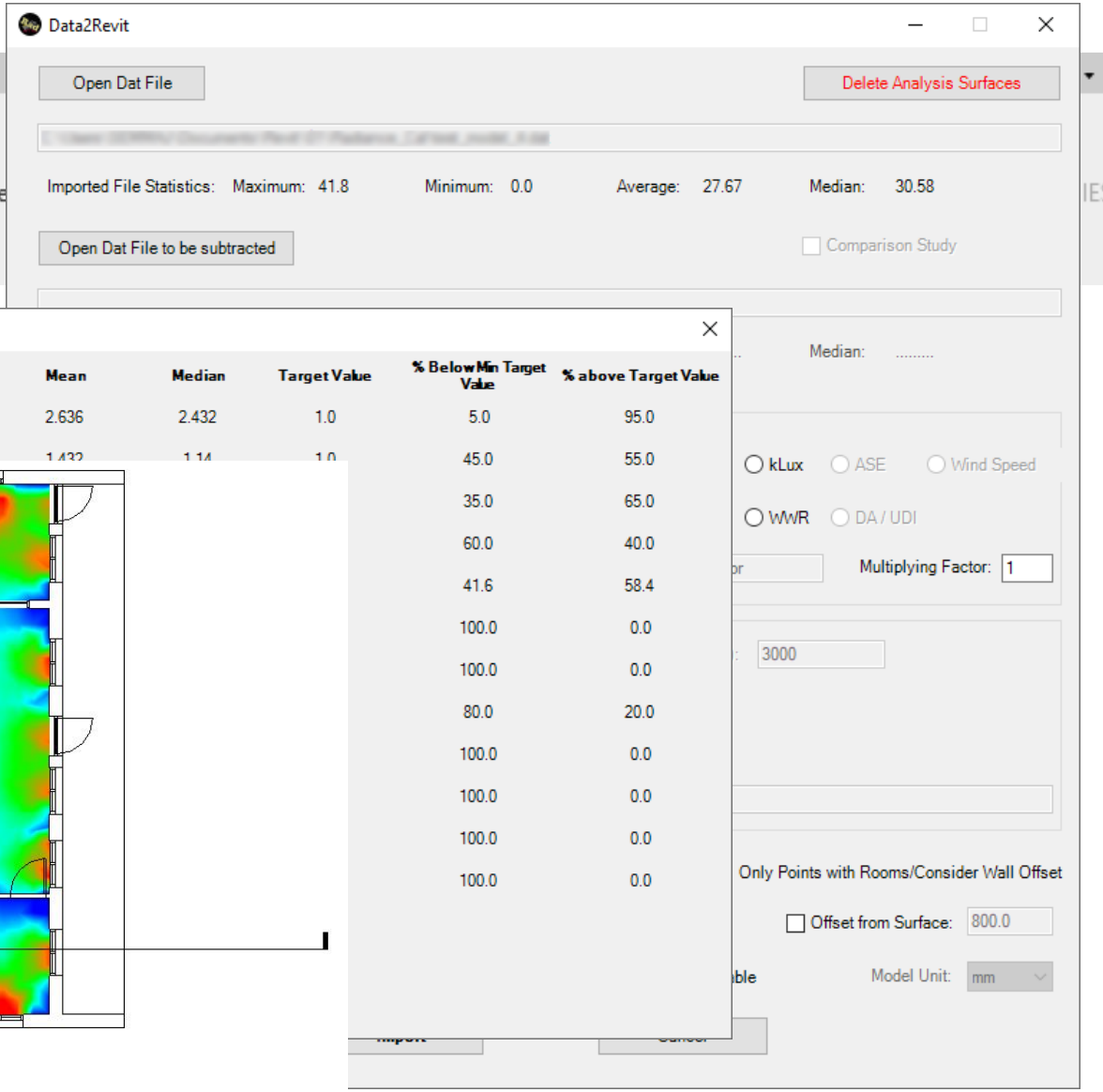
It creates:

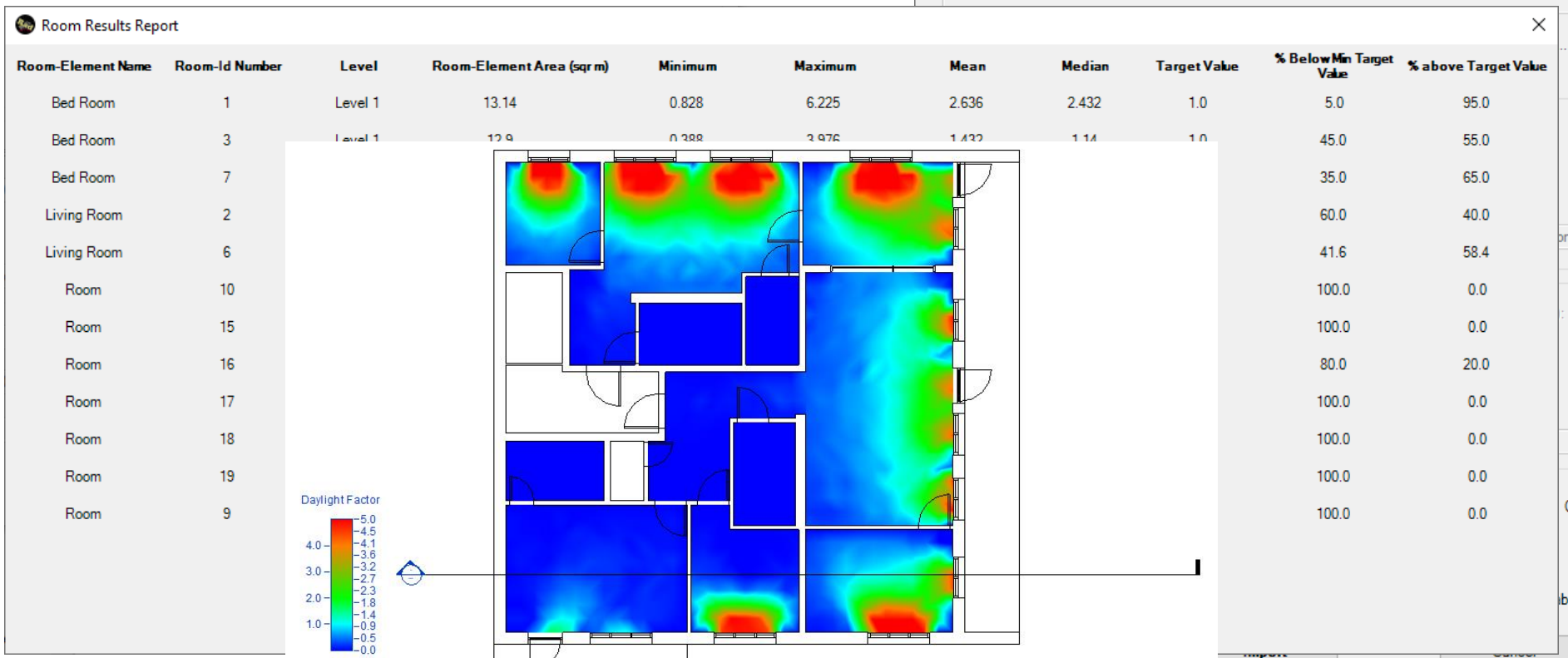
- *.rad
- *.mat
- *.sky
- *.bat

Tutorial link: https://aftabsoft.net/aftab-rad.php#CalculationTypes

AftabRad Revit Add-in Interfaces



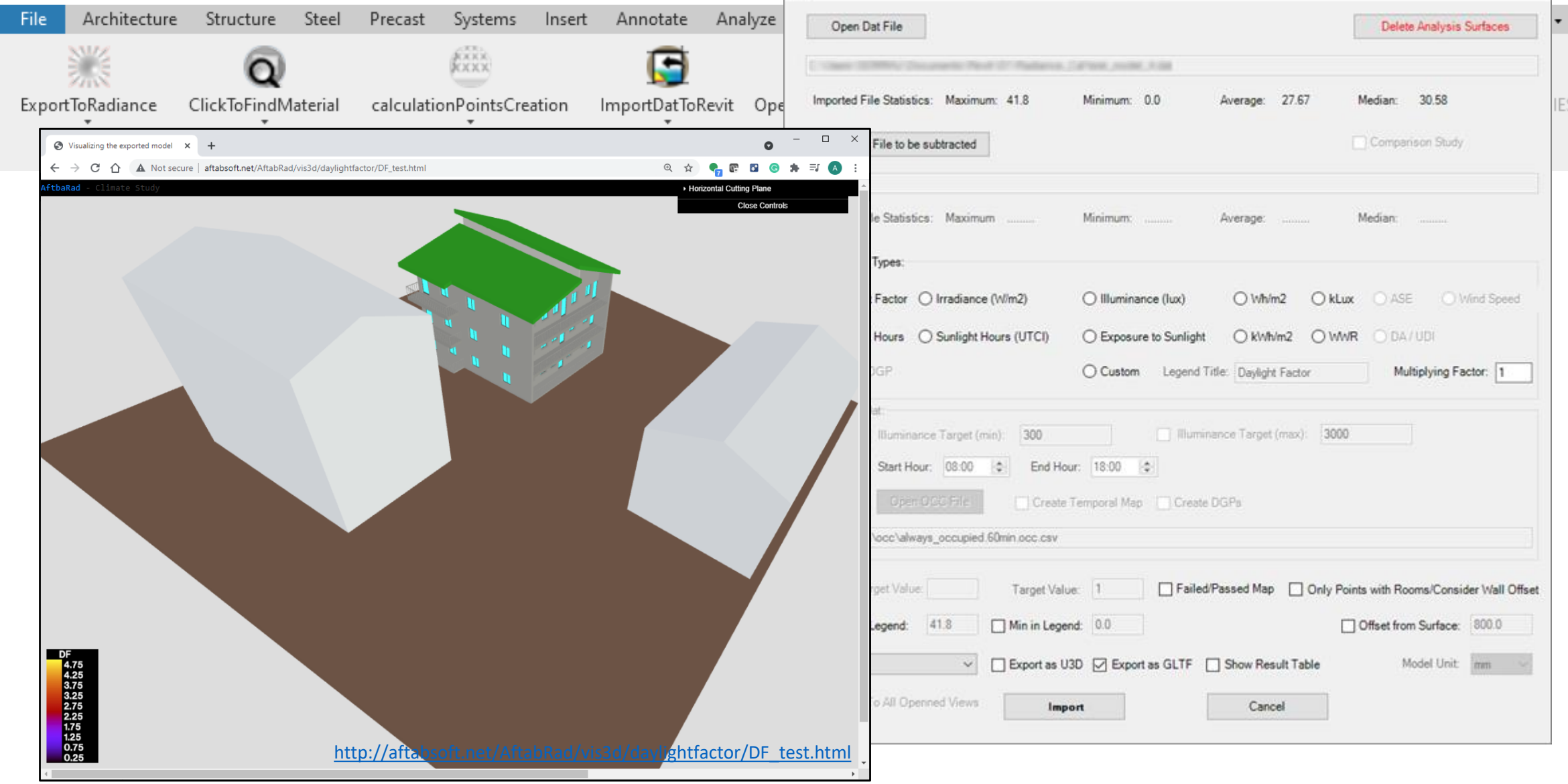




Room-Element Name	Room-Id Number	Level	Room-Element Area (sqrm)	Minimum	Maximum	Mean	Median	Target Value	% Below Min Target Value	% above Target Value
Bed Room	1	Level 1	13.14	0.828	6.225	2.636	2.432	1.0	5.0	95.0
Bed Room	3	Level 1	12.9	0.388	3.976	1.432	1.14	1.0	45.0	55.0
Bed Room	7								35.0	65.0
Living Room	2								60.0	40.0
Living Room	6								41.6	58.4
Room	10								100.0	0.0
Room	15								100.0	0.0
Room	16								80.0	20.0
Room	17								100.0	0.0
Room	18								100.0	0.0
Room	19								100.0	0.0
Room	9								100.0	0.0

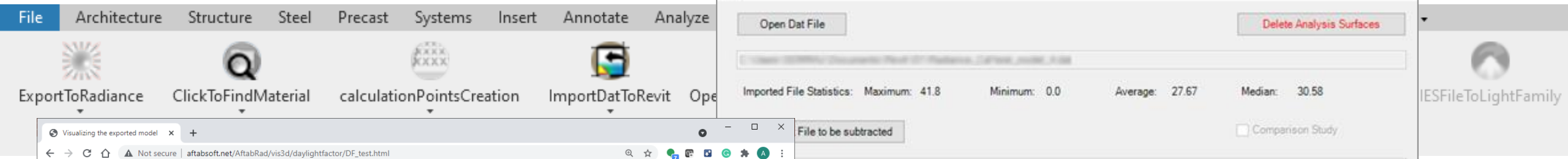
Tutorial link: https://aftabsoft.net/aftab-rad.php#Dat2Revit

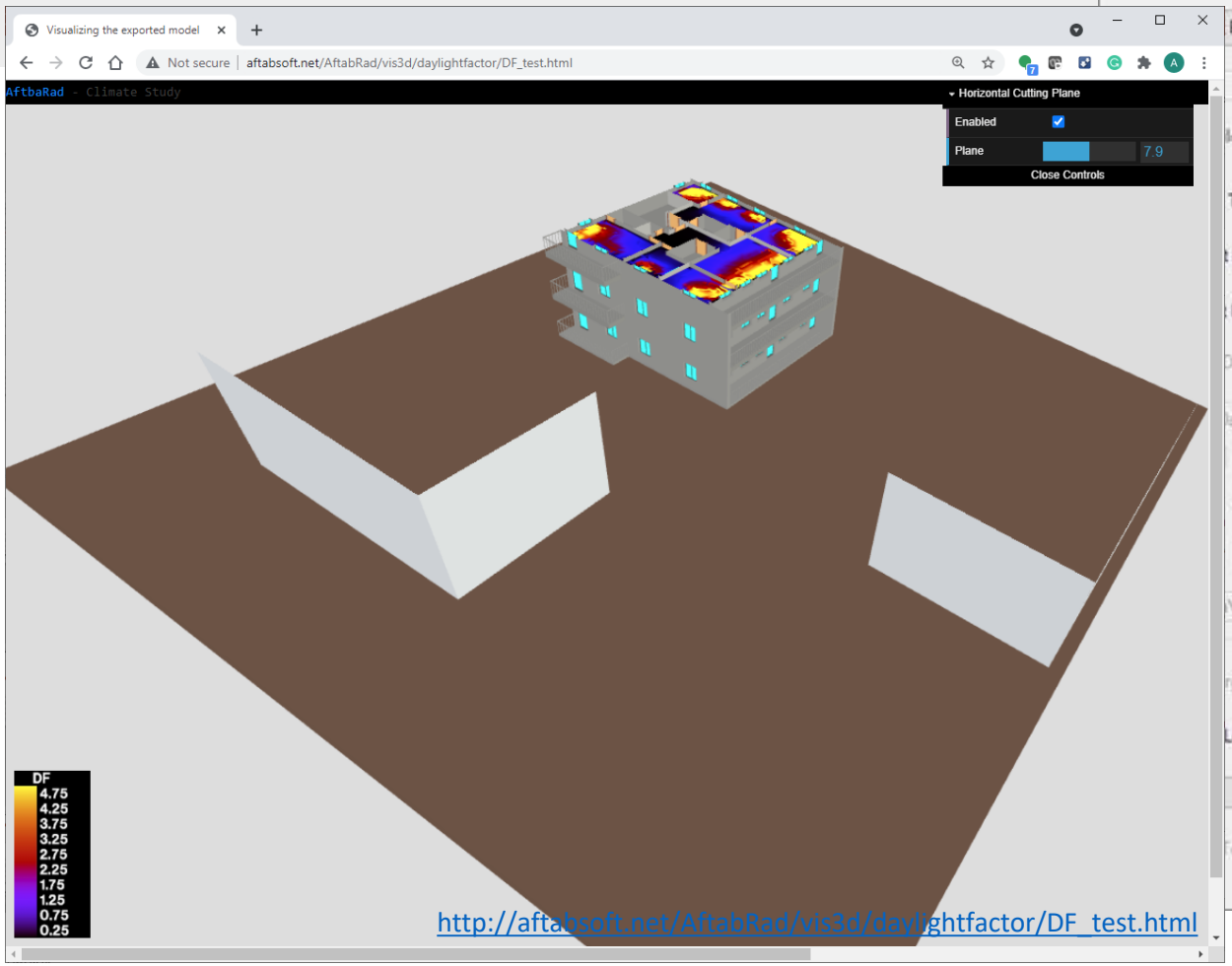
AftabRad Revit Add-in Interfaces

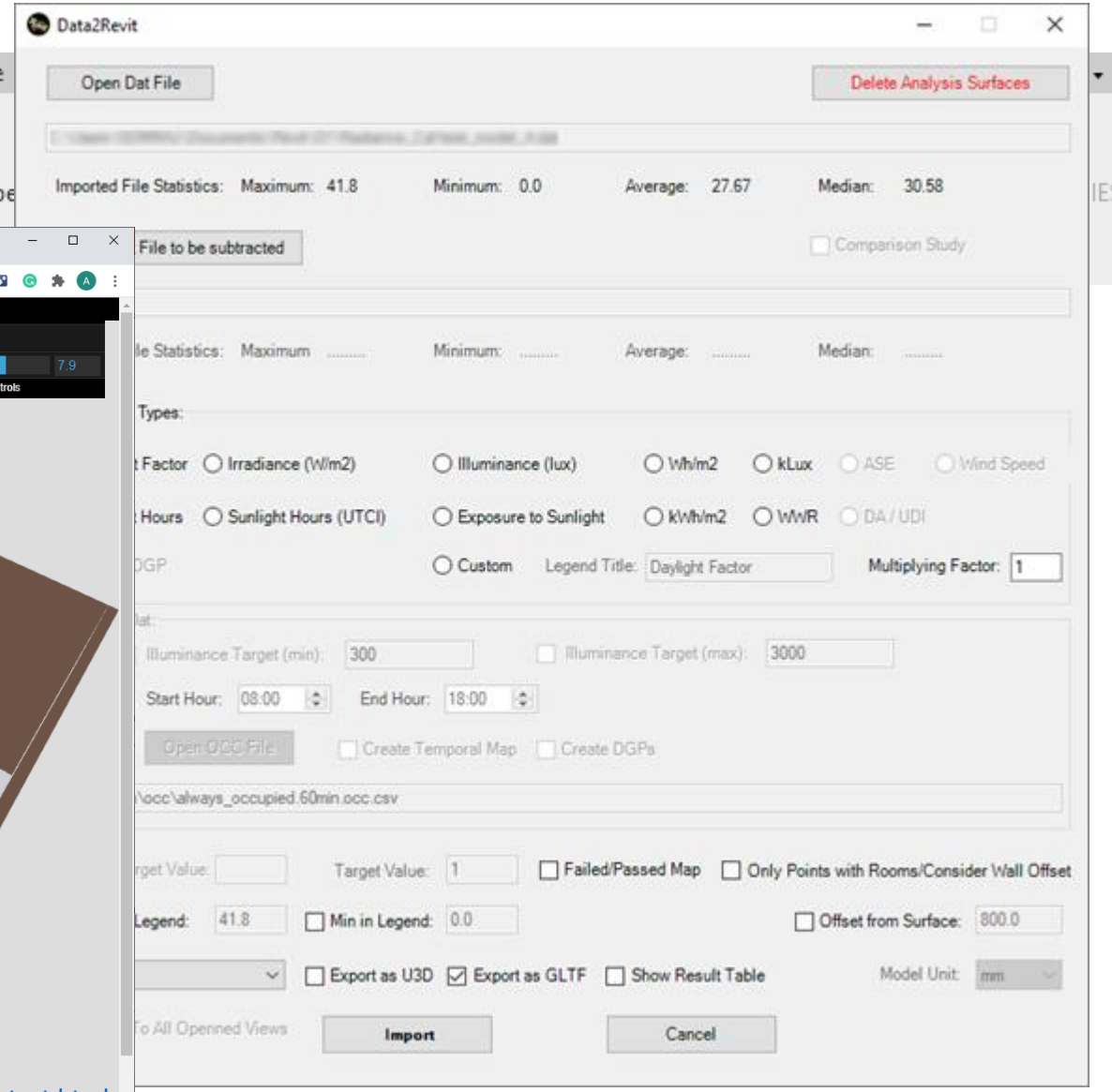


Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/RadianceDat2Html.htm

AftabRad Revit Add-in Interfaces

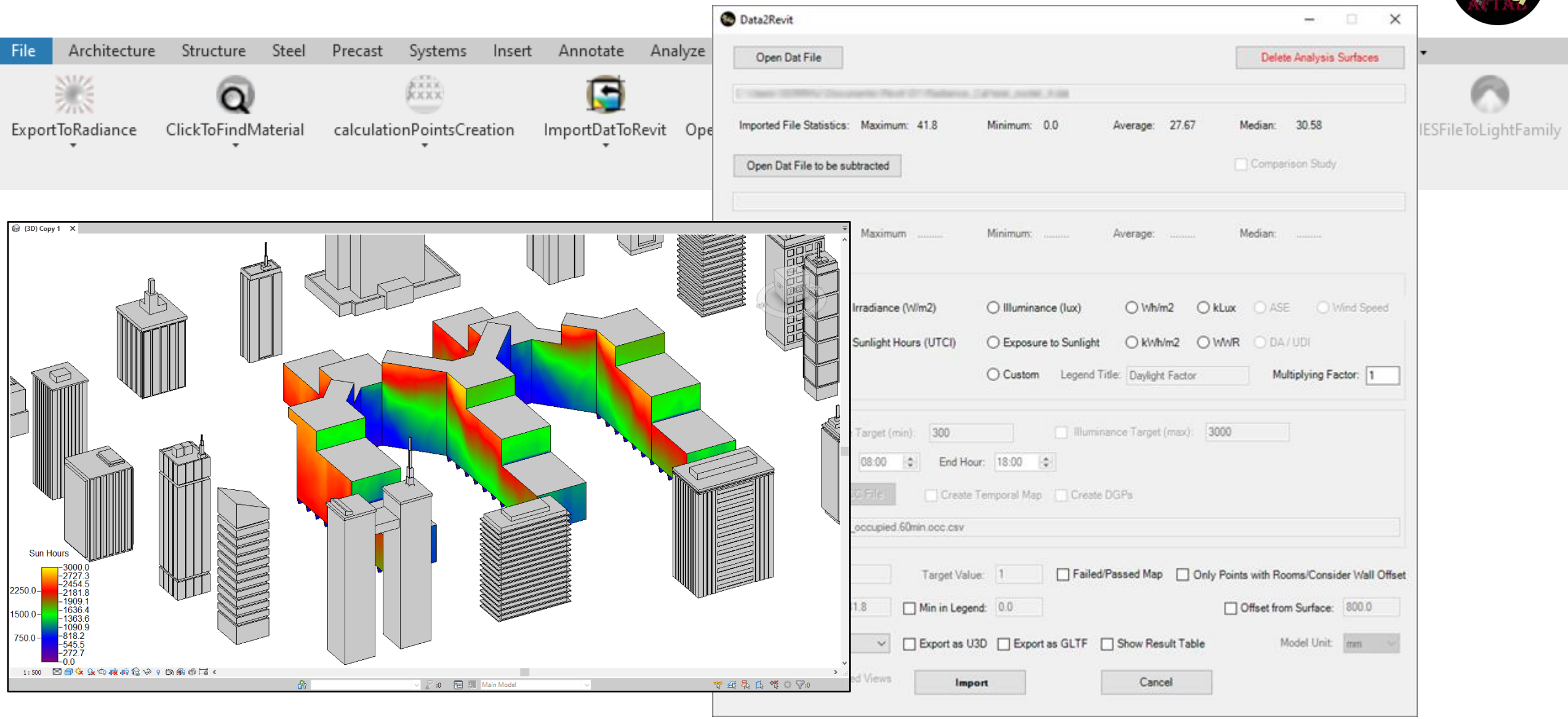






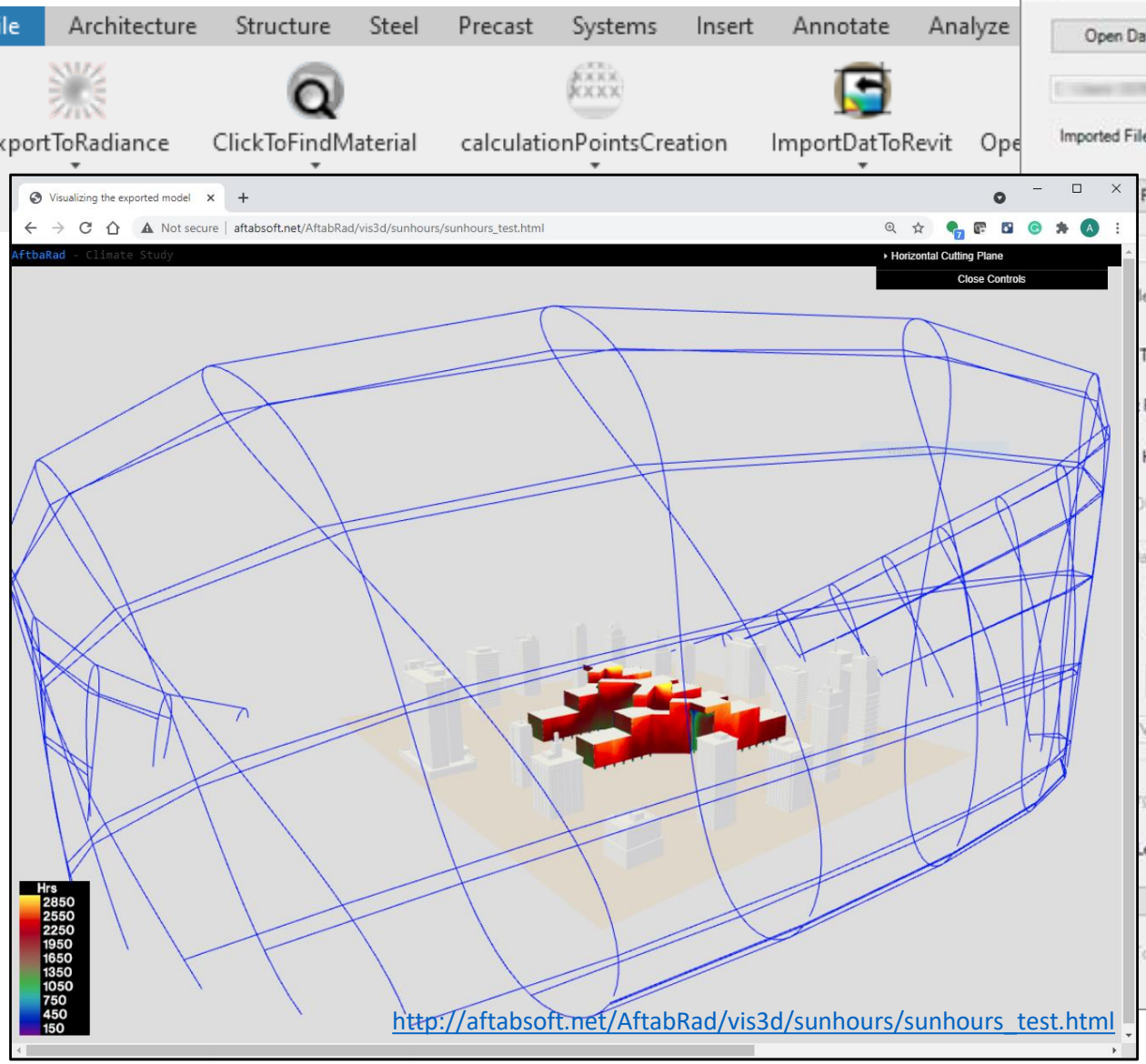
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/RadianceDat2Html.htm

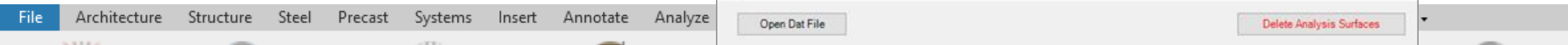
AftabRad Revit Add-in Interfaces

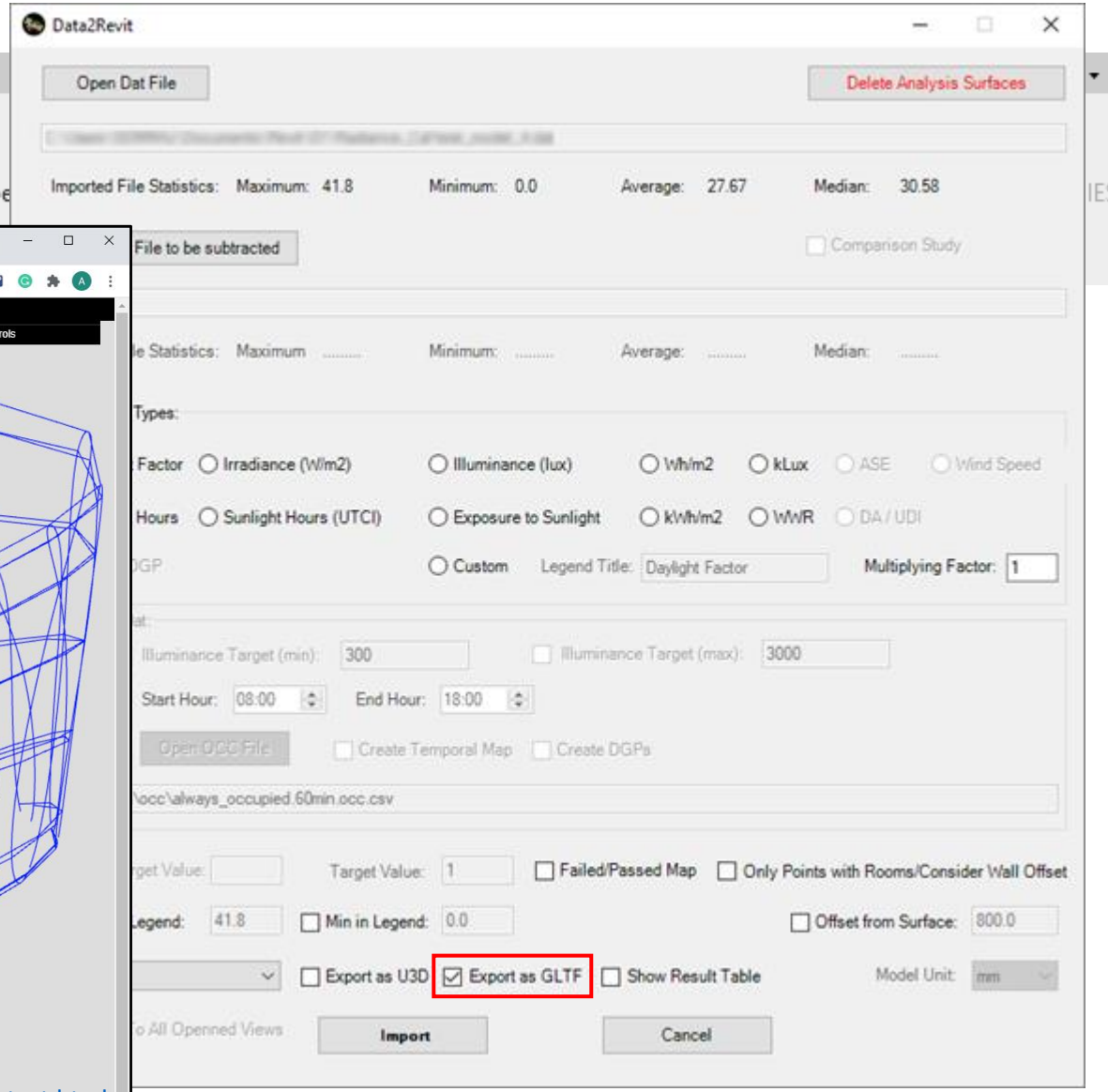


Tutorial link: https://aftabsoft.net/aftab-rad.php#Dat2Revit

AftabRad Revit Add-in Interfaces

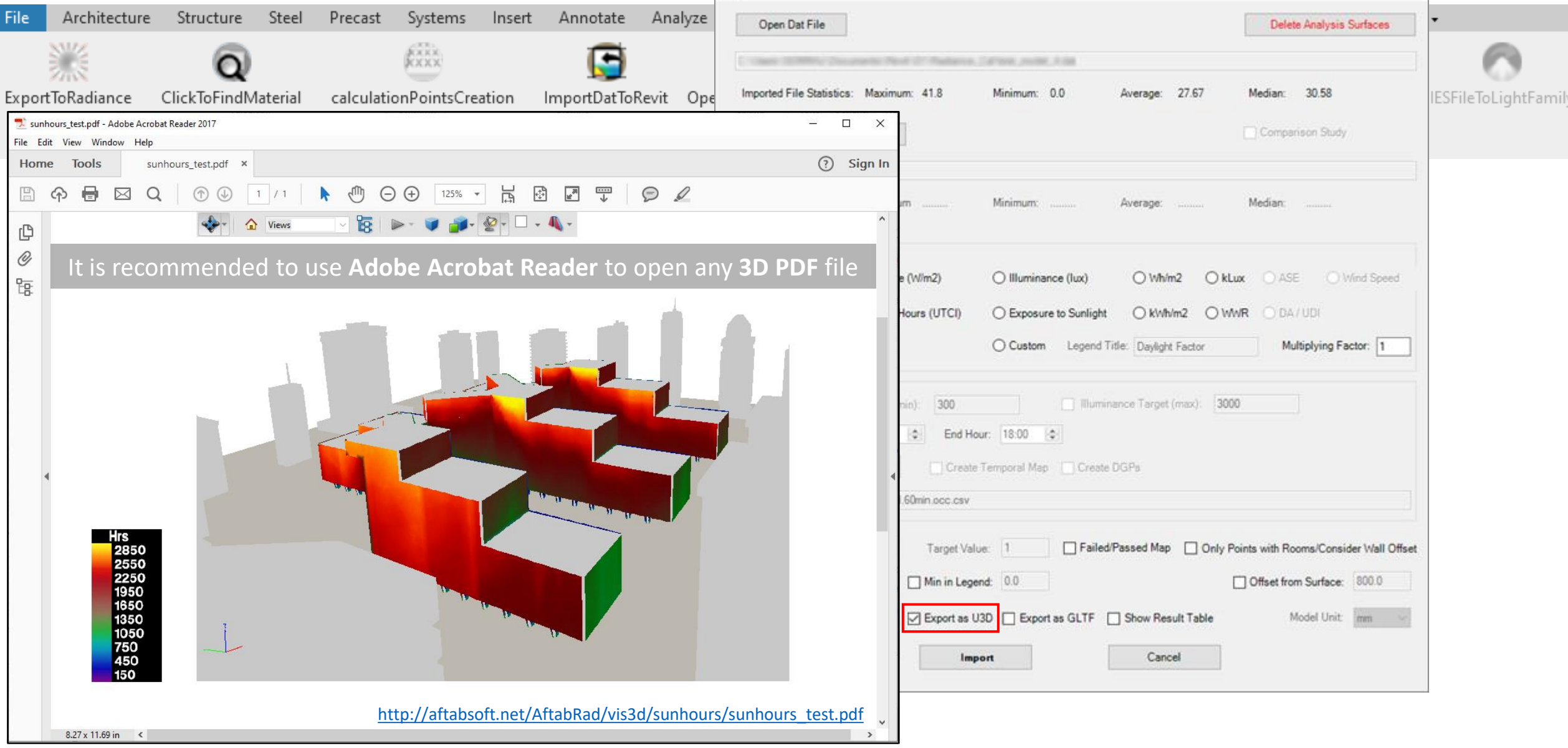






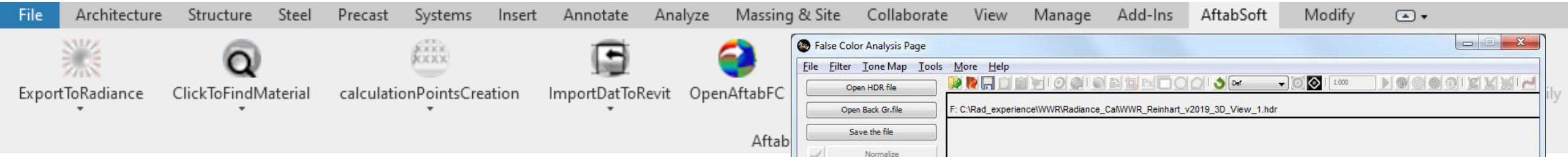
Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/RadianceDat2Html.htm

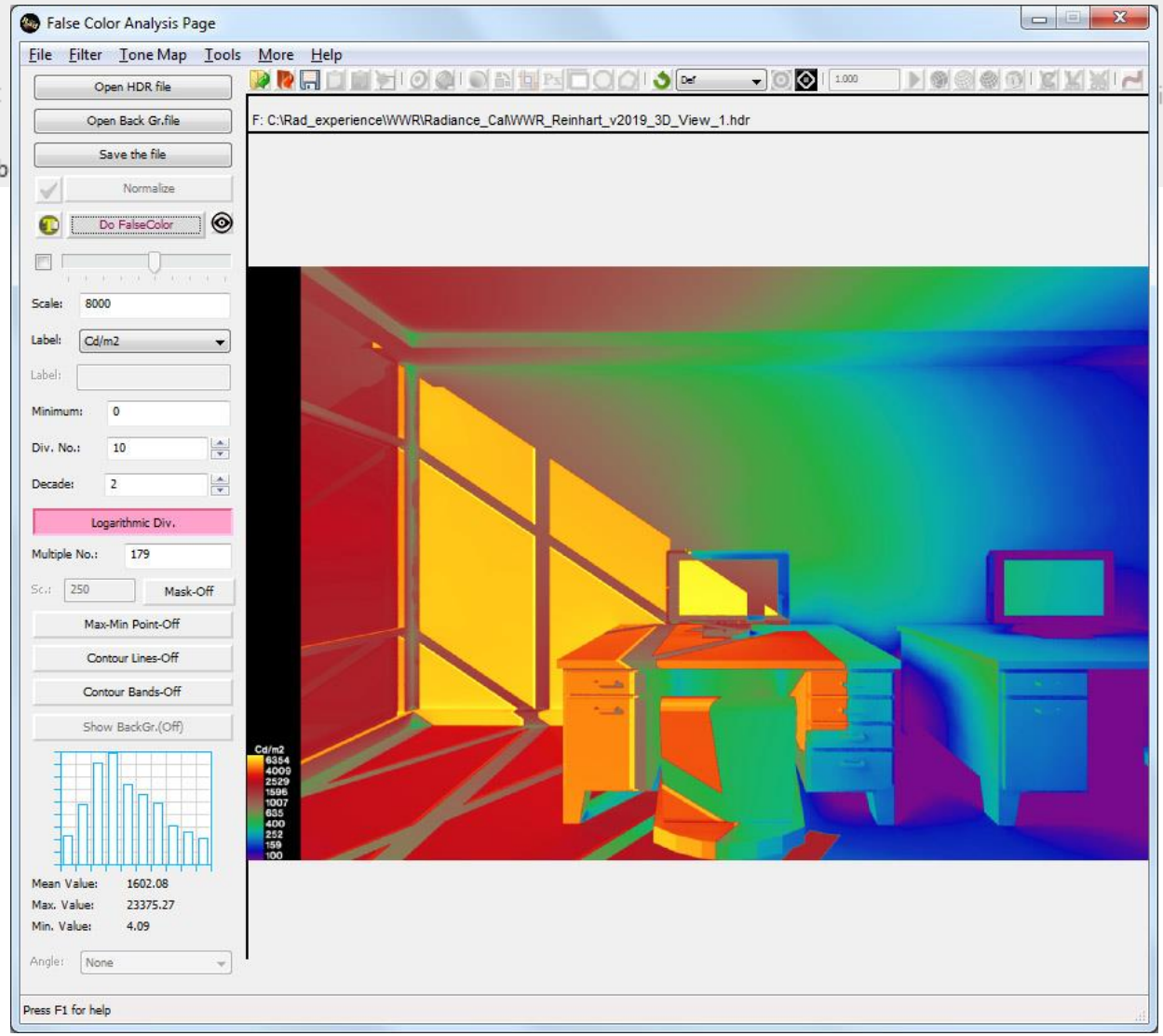
AftabRad Revit Add-in Interfaces



Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/exportAsU3D.htm

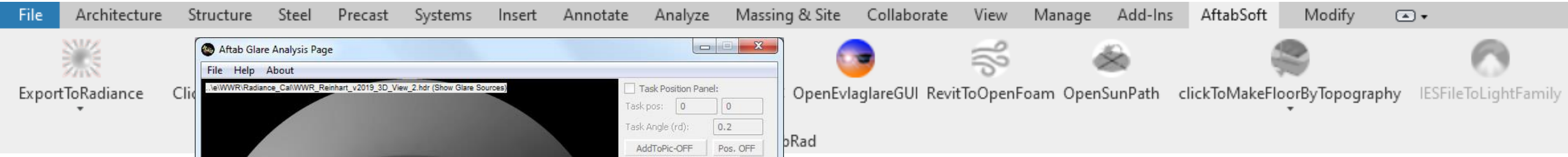
AftabRad Revit Add-in Interfaces

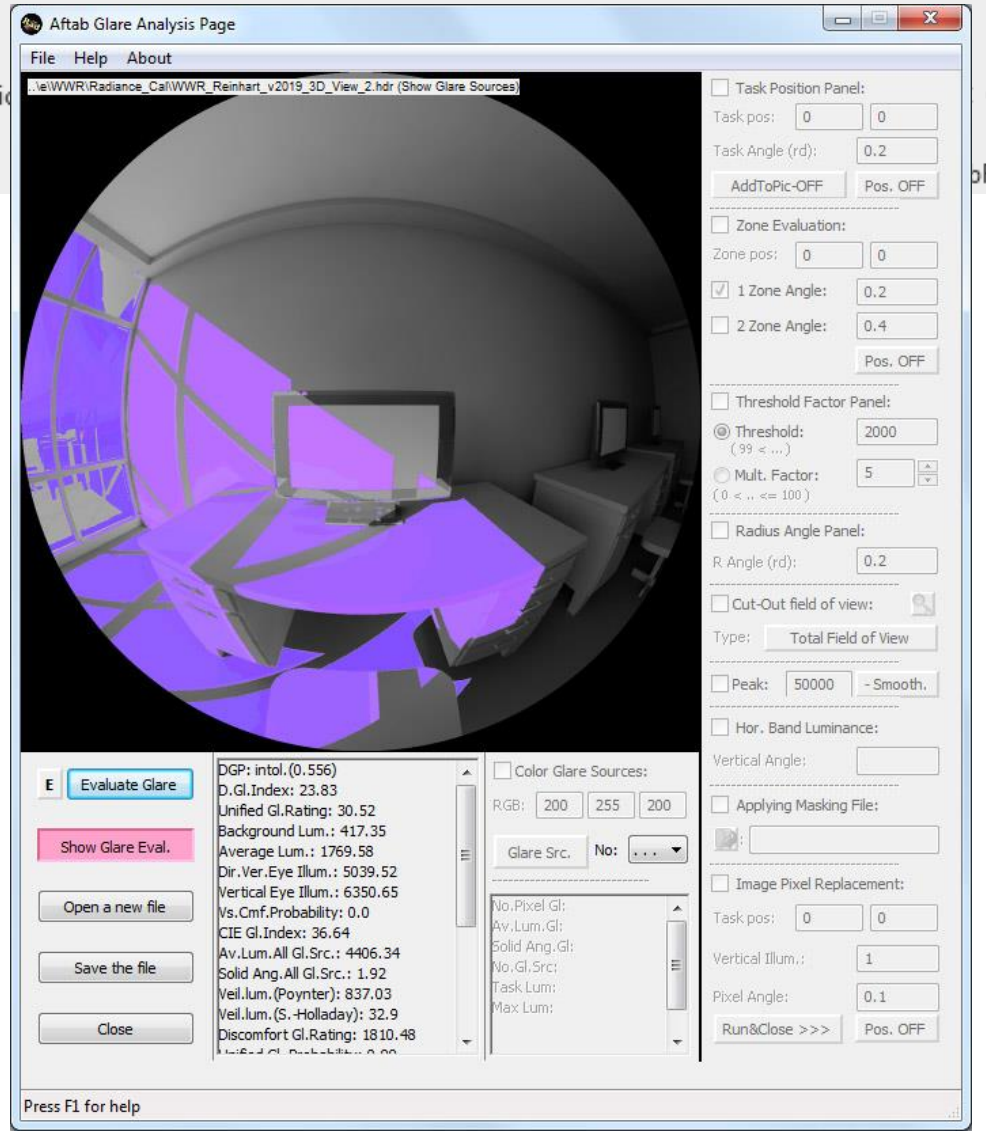




Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/hdrFalseColorPage.htm

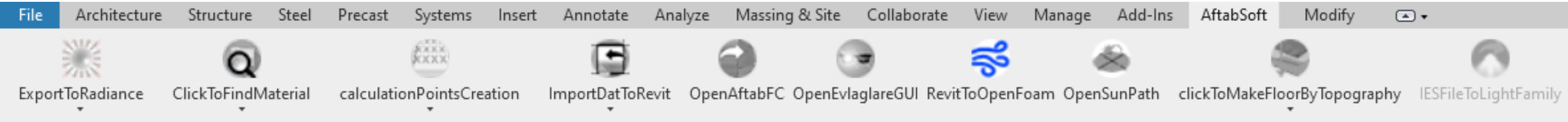
AftabRad Revit Add-in Interfaces

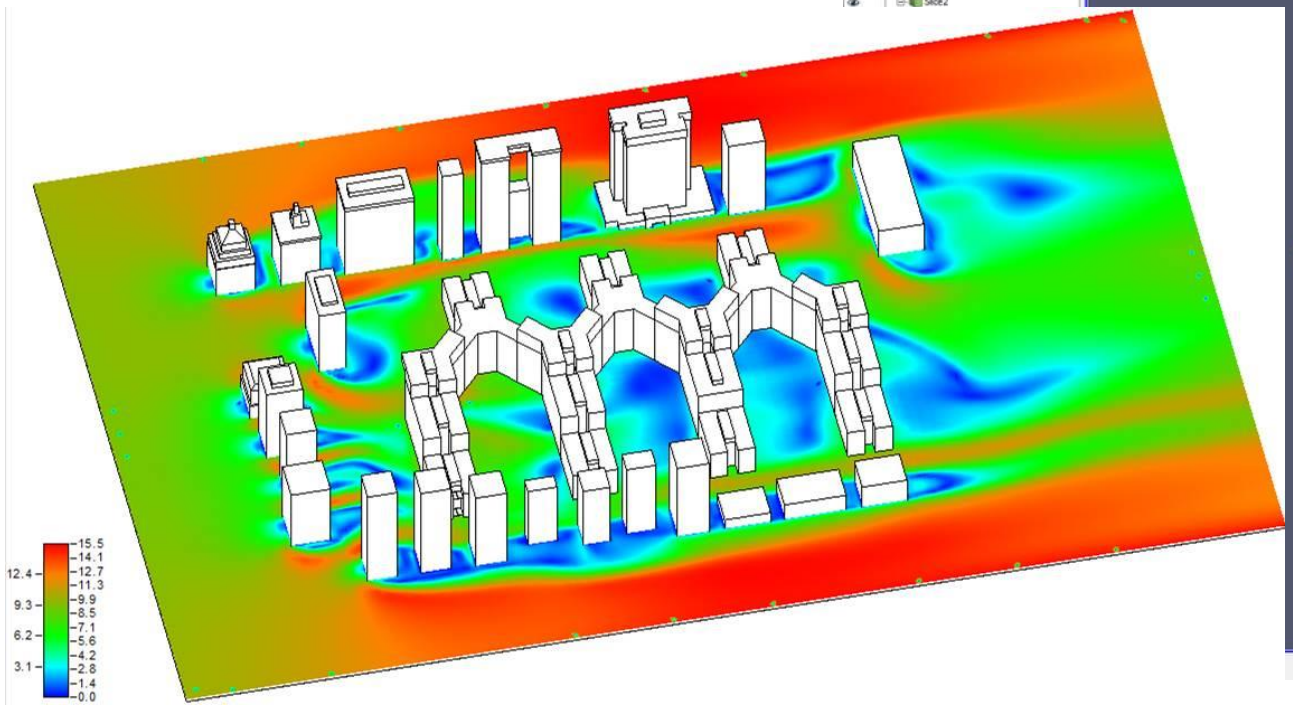


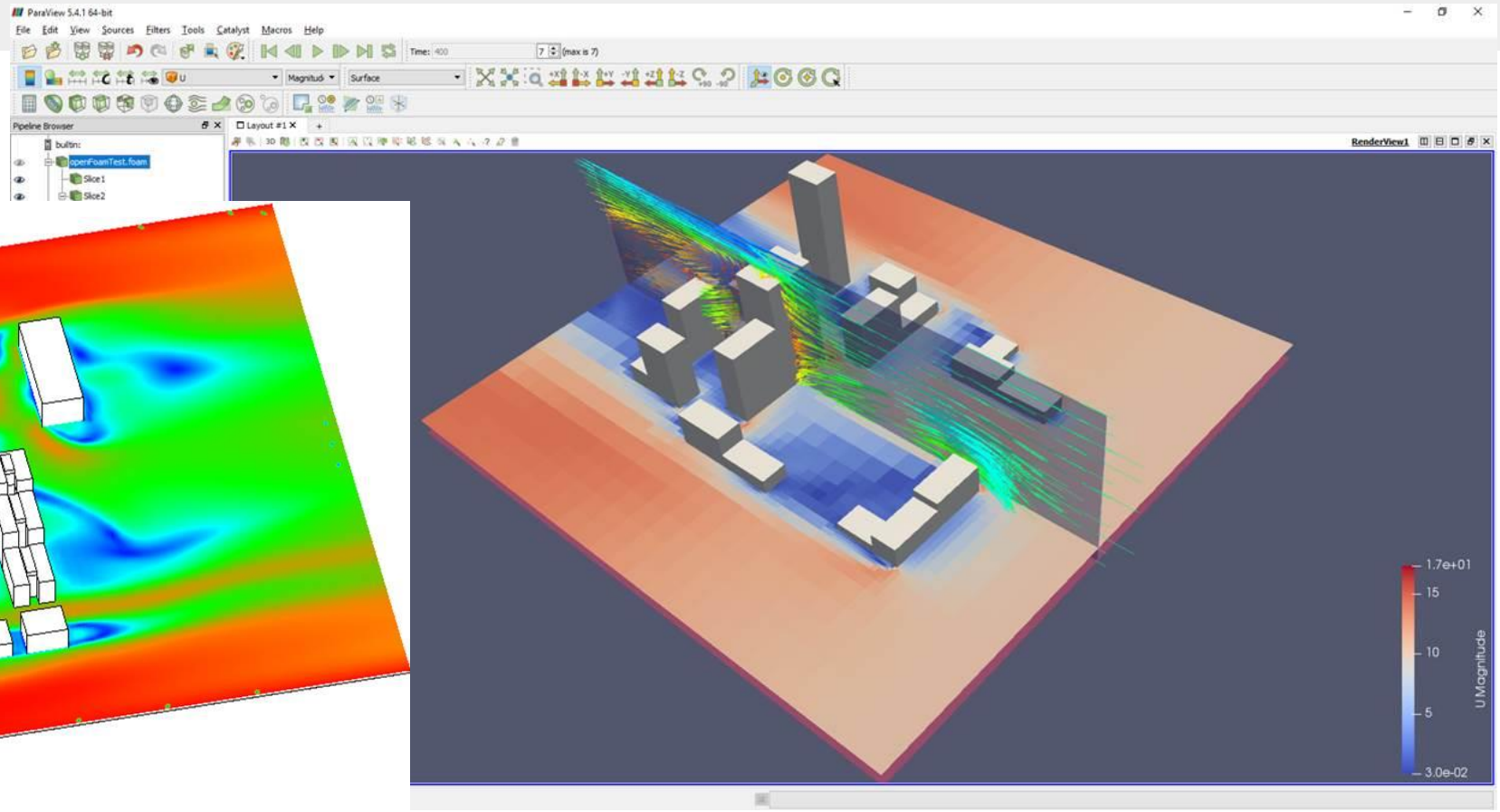


Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/hdrEvalglarePage.htm

AftabRad Revit Add-in Interfaces

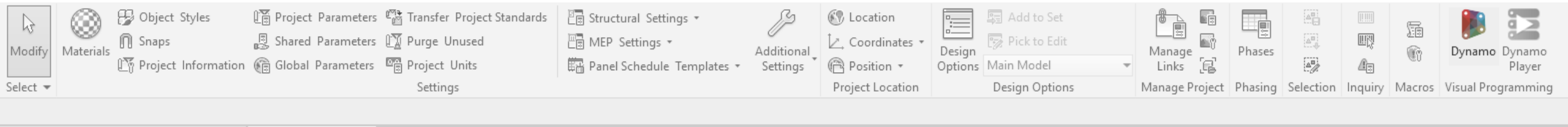


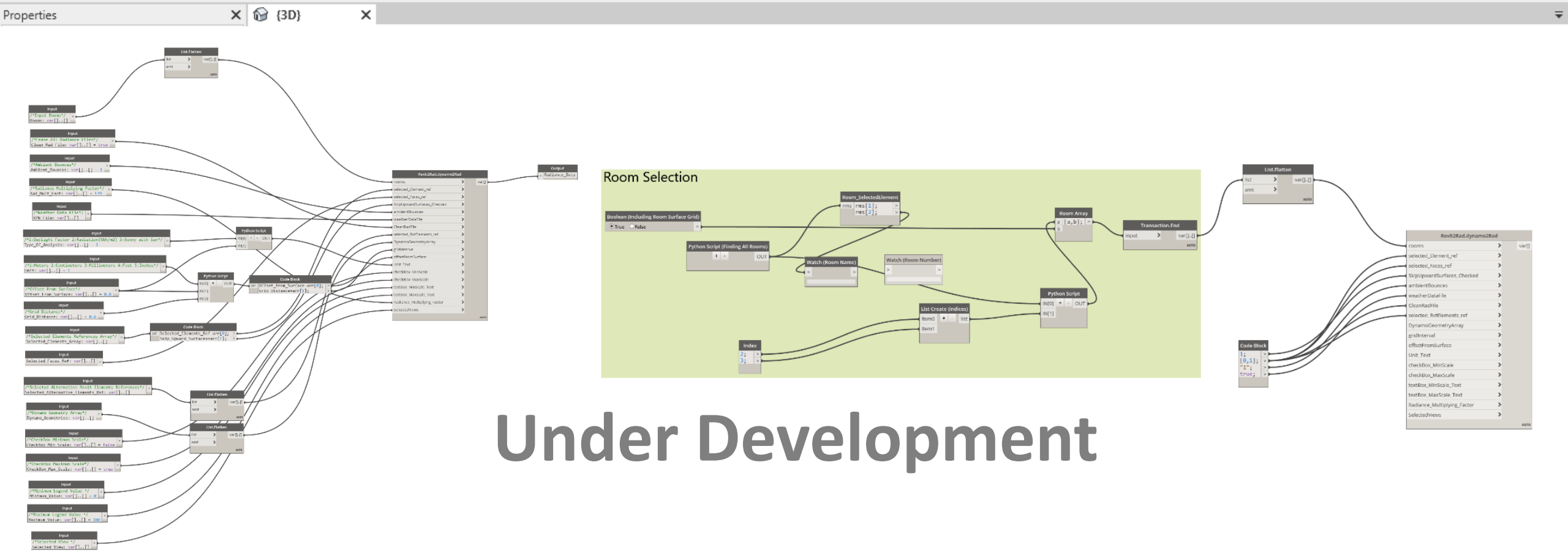




Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/windAnalysis_byOpenFoam.htm

AftabRad Revit Add-in Interfaces

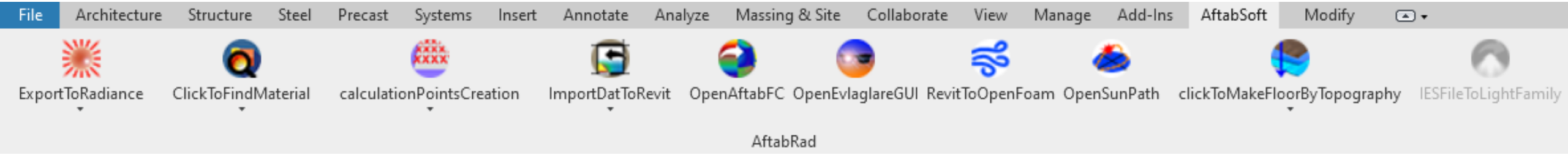




Under Development

Tutorial link: https://www.aftabsoft.net/AftabRadTutorial/DF_PtsCalculation_Dynamo.htm

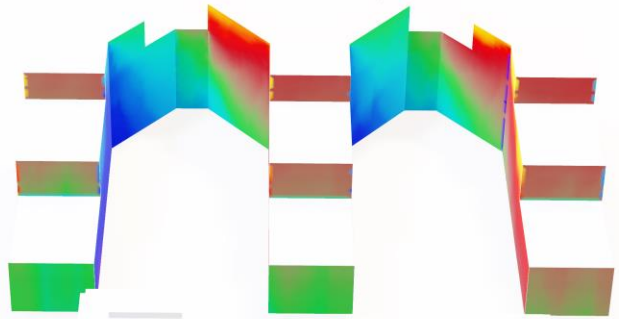
AftabRad Revit Add-in Interfaces



For more information about AftabRad Add-in and also see some of the tutorials that have been made until know, you can check this link:

http://www.aftabsoft.net/aftab-rad.php

Thank you so much



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