AUTODESK UNIVERSITY 2013

# Autodesk® Revit® Cloud!

Michael “Zee” Zeeveld, Assoc. AIA, ACI

**AB1357** Using Autodesk Revit software during the schematic design phase of the project enables you to quickly explore design alternatives through iterative design. Tapping into the information-rich models for quantity takeoffs helps to produce more accurate cost estimates, compressing the timeline from design to procurement to construction, virtually eliminating errors and omissions, and reducing the likelihood of RFIs and change orders. With integrated analysis for energy and carbon, you gain design insight where the most important design decisions are made. Perform wind and solar radiation analysis with user-friendly tools. Conduct cloud-based whole building energy analysis with web-based software. Optimize energy efficiency, and work toward carbon neutrality earlier in the design process. With faster, more accurate energy analysis of building design proposals, architects and designers can work with sustainability in mind earlier in the process, plan proactively, and build better.

## Learning Objectives

At the end of this class, you will be able to:

Explore quick design alternatives through iterative design

Tap into the information-rich models for quantity takeoffs

Use integrated analysis for energy and carbon neutrality

Validate design sustainability earlier in the process

## About the Speaker

Michael is a Senior Application Specialist currently based out of Atlanta. He travels the southeast spreading the word about Revit, BIM, the AEC industry and software technology. Michael has more than 18 years of experience ranging from CAD management, commercial architectural drafting/Team Leader, 3D modeling, visualization and program customization to information technology. He has experience in software applications that include AutoCAD, AutoCAD Architecture, Revit Architecture/ Structure, 3ds Max Design, Photoshop, SketchUp, and Autodesk 360. Michael is an Autodesk Certified Instructor and Revit Certified Professional for AutoCAD, AutoCAD Architecture, Revit Architecture, 3ds Max Design and is an Autodesk Consulting Specialist and Structural Specialist. He is an Associate Member of the American Institute of Architects. He has had the distinct honor of presenting and teaching at Autodesk University in 2006, 2010, 2012and 2013, as well as a presenter at RTC and multiple AUGI CAD Camps. He can be reached via email at: mbzeeveld@yahoo.com

# Contents

## Part I - Schematic Design Phase

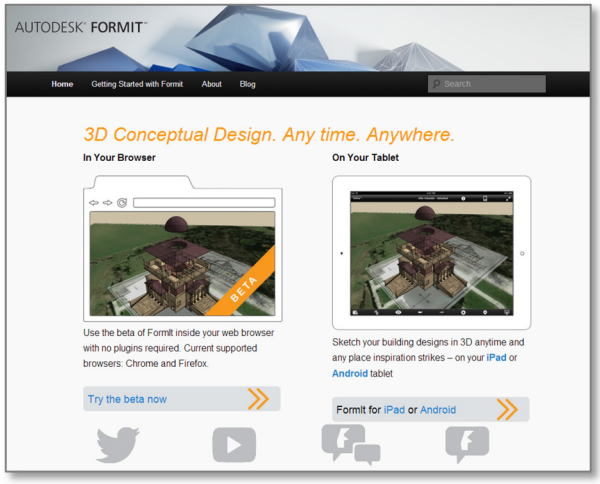
**Task:** Using Autodesk Revit software and web-based Revit related tools, during the **schematic design phase** of the project this enables you to quickly explore **design alternatives** through iterative design.

**Task time:** (three tasks 5 minutes each) 15 minutes

**Instructions:**

### FormIt

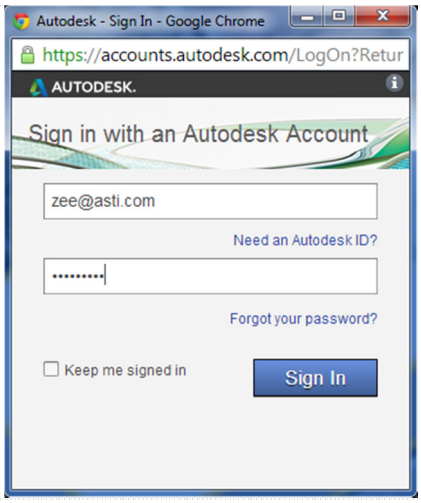
1. Using Google Chrome, open Autodesk FormIt http://autodeskformit.com/




2. "Try the beta now"

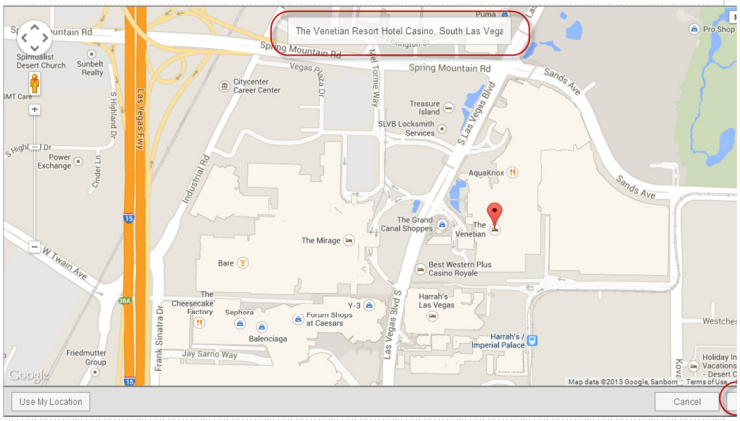
3. Sign In

   zee@asti.com
   AU2013Zee

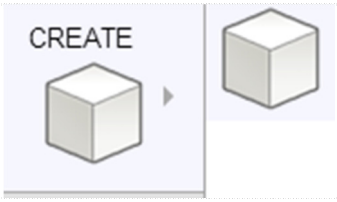


4. Set Location

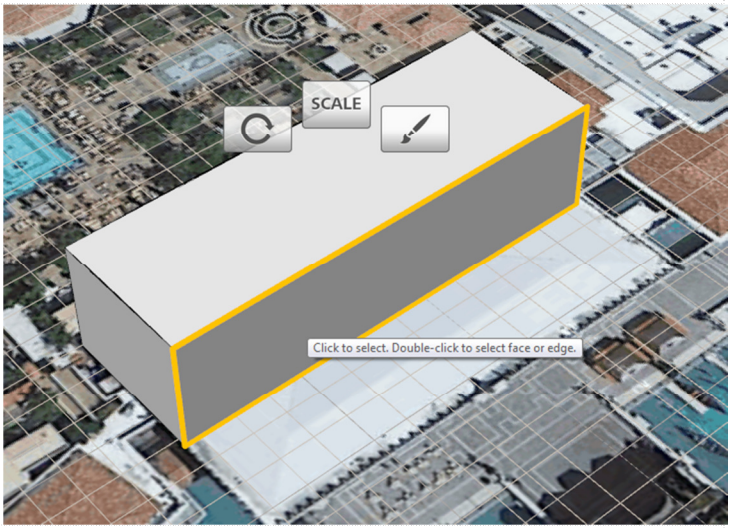

5. Venetian, Las Vegas, NV




6. Create a shape using a starter form. Place the form on the site image.



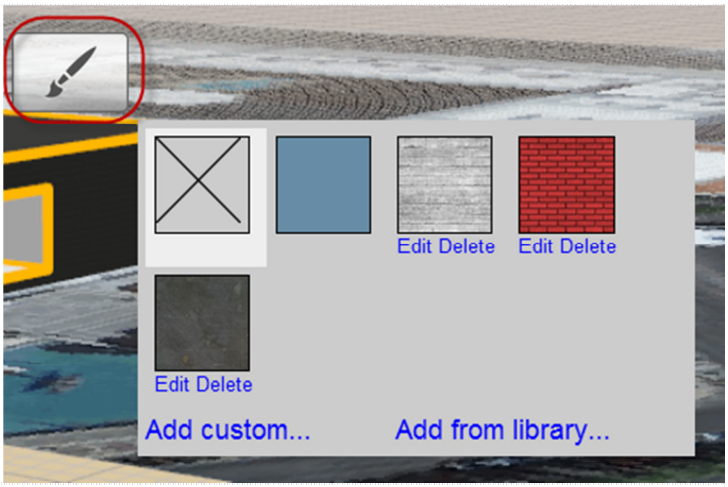

7. Double click a side of the shape to select. The side edges will light up yellow. Hold down to extrude its side



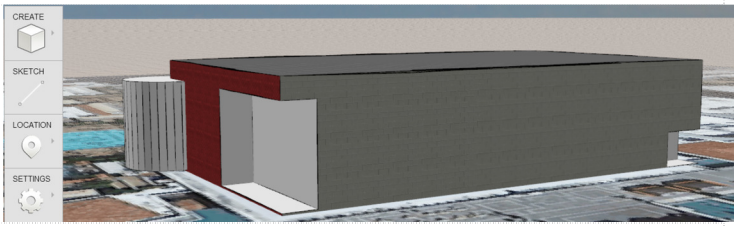
8. Add materials by selecting the model, and picking the paint brush.

9. Add from Library for a diverse selection

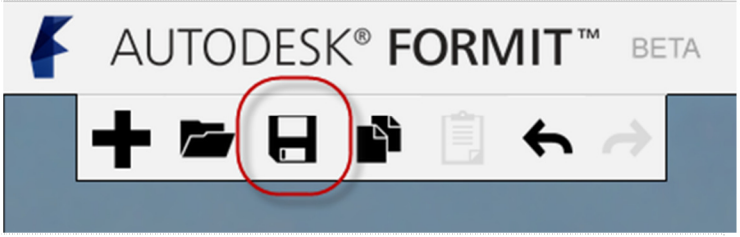
10. Materials can be edited after placement by selecting “Edit” underneath the material.




11. Continue to add more shapes




12. Save the file




13. Rename the file AU2013”Your initials”
*Example: AU2013MBZ*

14. *Close FormIt and browser*

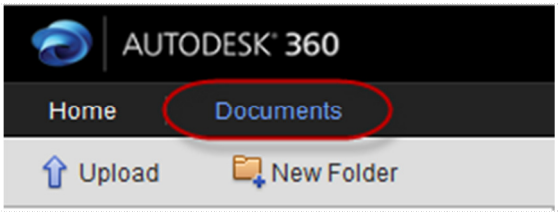
## Autodesk 360 Documents

1. Login to Autodesk 360 Documents

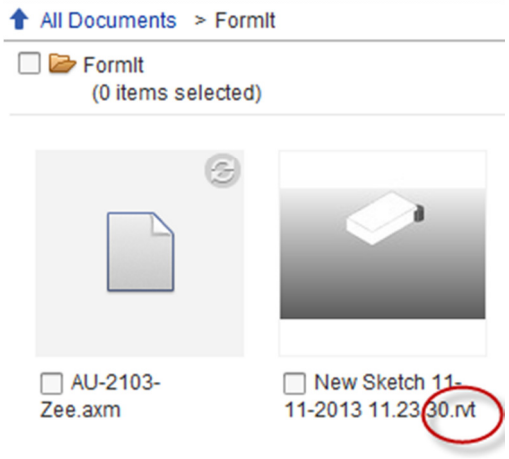
   https://360.autodesk.com/landing

   - *zee@asti.com*
   - *AU2013Zee*

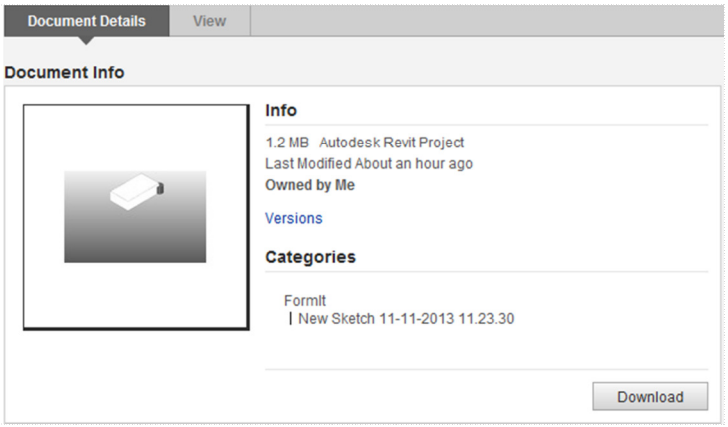

1. Click on the Documents tab to see your files



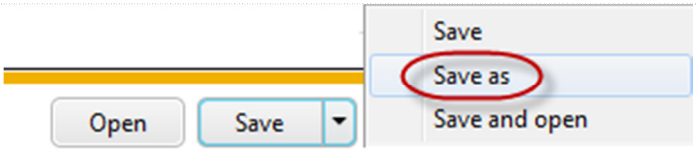

2. Autodesk 360 Documents **automatically** save FormIt files to a Revit RVT




3. Click on the icon of the file, then select the “Download” button



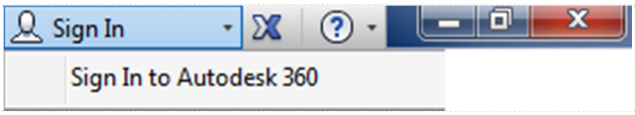

4. “Save As” to your computer



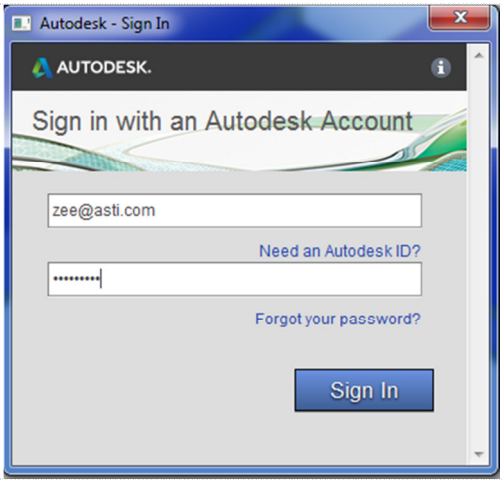
## Revit

1. Open Revit

2. Sign in to “Autodesk 360”



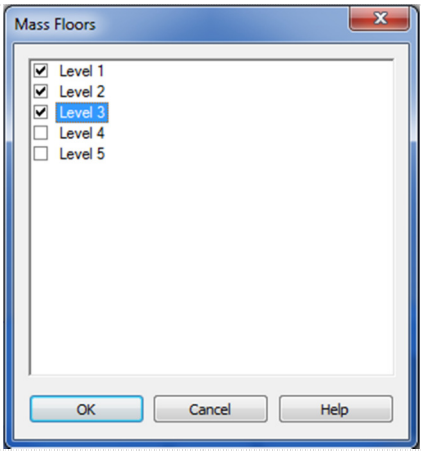

3. Sign In:
   zee@asti.com
   AU2013Zee



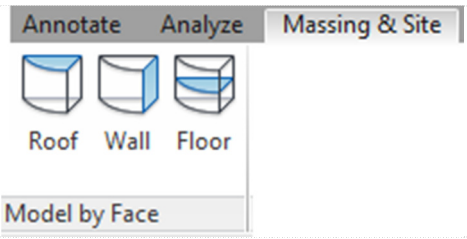

4. Open the recently downloaded Revit cloud file

5. Or open existing class file: demo_EnergyAnalysis.rvt

6. Create Mass Floors

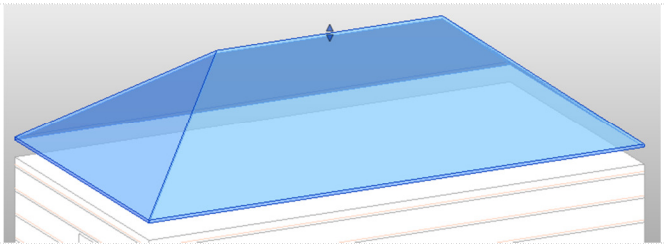



7. Assign Floors, Walls and Roof




8. Create Hip roof with the Roof tool.

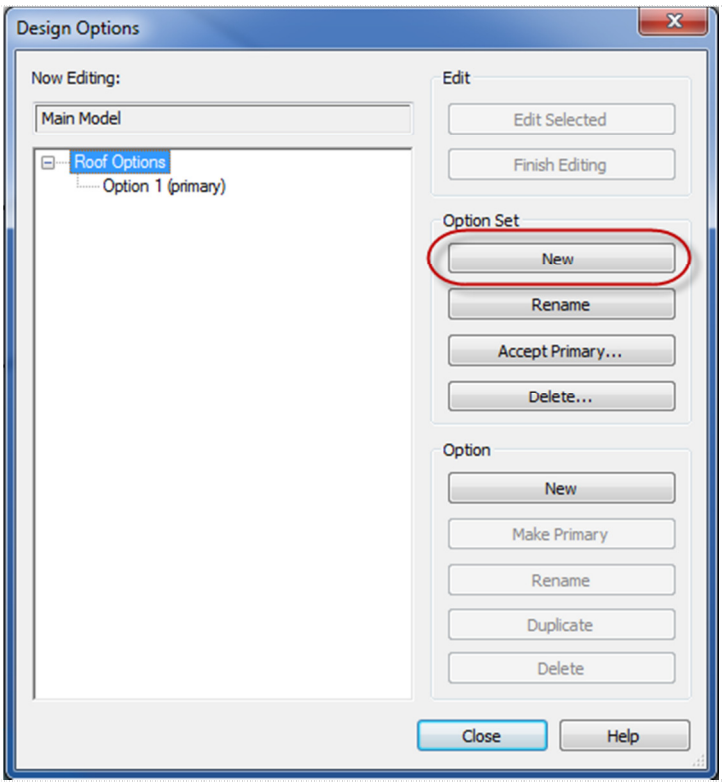
9. You should have 2 roofs, the flat roof from the model and the hip roof you just created.



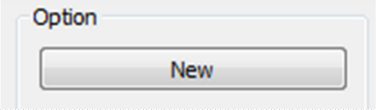
10. Enable Design Options

11. Select “New”

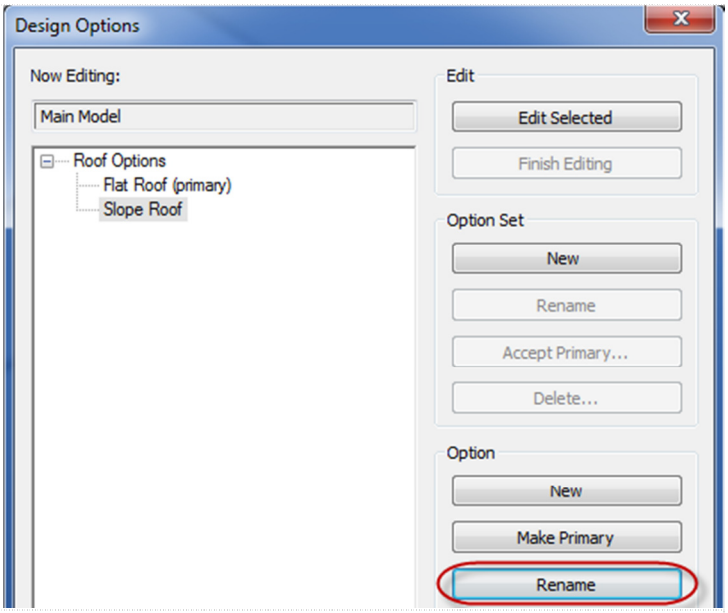
12. Rename “Option Set 1” to “Roof Options”




13. Add and additional Option by picking “New” under Options section

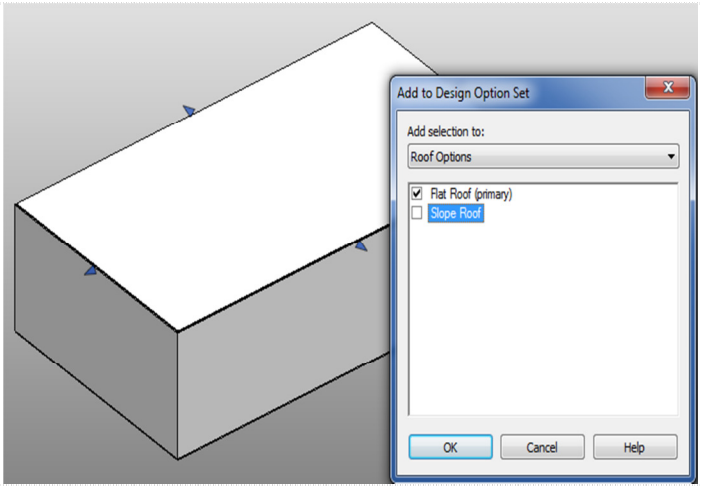


14. Rename the two Options to “Flat Roof” and “Slope Roof”

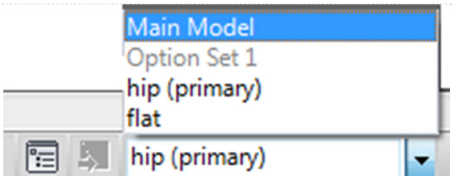



15. Assign flat roof to the “Flat Roof” Option

16. Assign the Hip roof to the “Slope Roof” Option




Toggle the Design Options to see the results of displaying the Flat vs. Slope roof




17. Save and close the file

This project could be further developed into a detailed model for construction with Families, properties, valuable information and data for scheduling, but for the limitation of time, we will stop there and move on to the next section.

## Part 2 – Information-Rich

**Task:** Tapping into the information-rich models for **quantity takeoffs** helps to produce more accurate cost estimates, compressing the timeline from design to procurement to construction, virtually eliminating errors and omissions, and reducing the likelihood of RFIs and change orders.

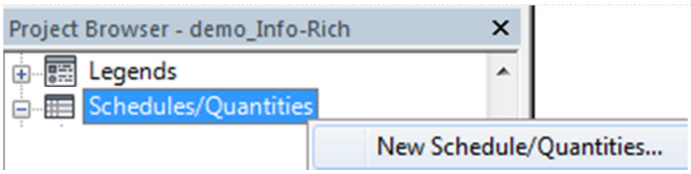
**Task time:** 5 minutes

**Instructions:**

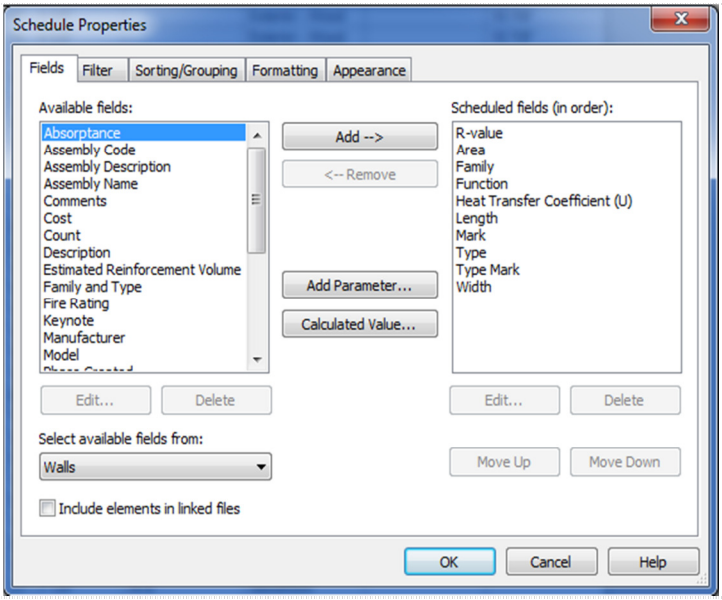
### Quantity Takeoffs

1. In Revit, open class file: demo_Info-Rich.rvt

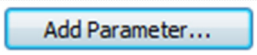
2. Start a new Schedule for "Walls"
3. Or Open the existing "Z - Wall Schedule Quantities"



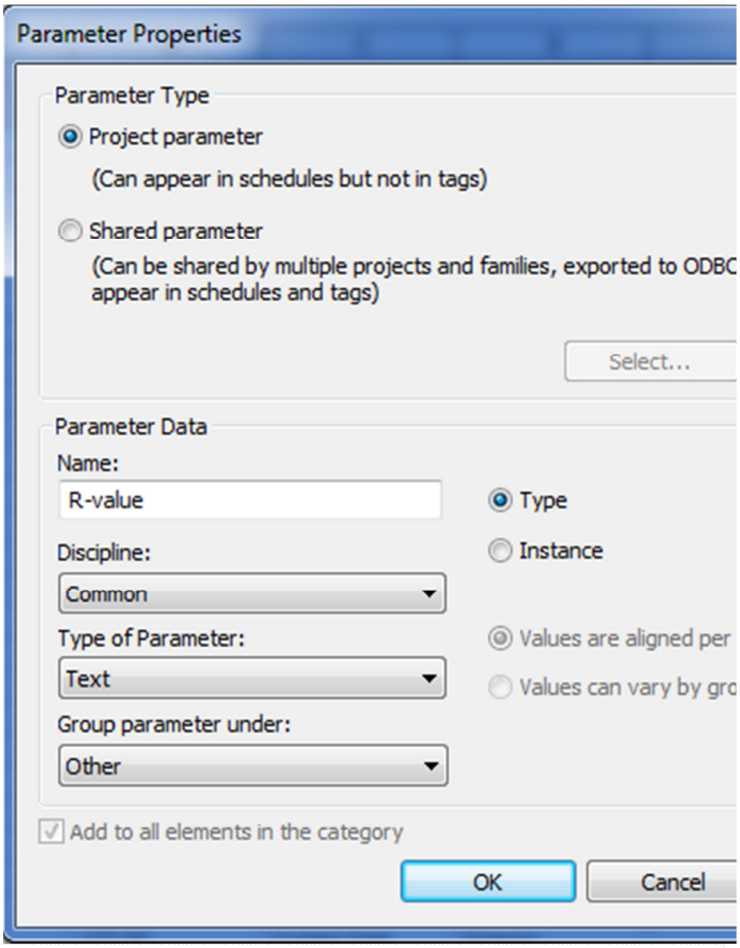

4. Assign component level - wall, doors, R-values by creating a parameter.



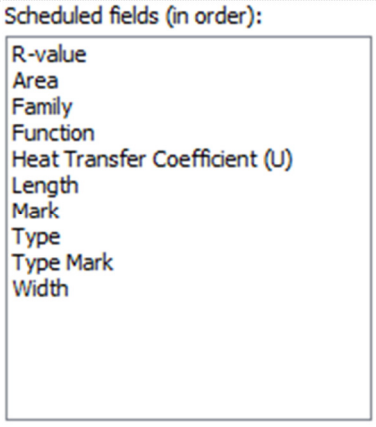

1. Add Parameter



2. Name the new Parameter “R-value”
3. Change the Radial button to Type. This can be a “Type” parameter, so it will update to all of the same wall types.
4. Change the Type Parameter to “Text”
5. Group it under Other
6. Select “Ok”
7. Assign R-values - areas floor area




8. Add additional “Available Fields” as indicated on the example to the right
9. Select “Ok” when finished.



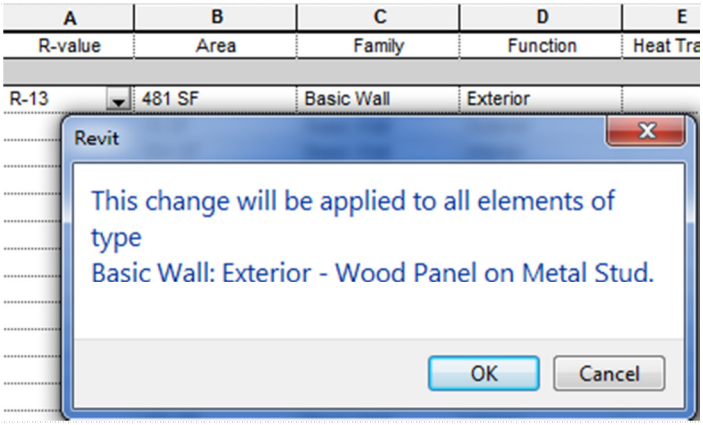
10. In the schedule, R-value is displayed as an empty field. We can assign a number to that field, and it will populate all of the rows of the same type of wall, because of the “Type Parameter” option we chose above.

<Wall Schedule>

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| R-value | Area | Family | Function | Heat Transf | Length |
| | 481 SF | Basic Wall | Exterior | | 46' - 5 5/8" |
| | 78 SF | Basic Wall | Exterior | | 39' - 9 5/8" |
| | 264 SF | Basic Wall | Interior | | 22' - 10 7/8" |
| | 82 SF | Basic Wall | Exterior | | 5' - 10 7/8" |
| | 364 SF | Basic Wall | Exterior | | 27' - 1 1/2" |
| | 361 SF | Basic Wall | Exterior | | 26' - 11 3/4" |
| | 260 SF | Curtain Wall | Exterior | | 23' - 5 1/2" |
| | 231 SF | Basic Wall | Interior | | 24' - 6 7/8" |
| | 41 SF | Basic Wall | Exterior | | 12' - 8 1/4" |
| | 34 SF | Basic Wall | Exterior | | 12' - 5 1/2" |
| | 409 SF | Basic Wall | Interior | | 25' - 4 3/8" |
| | 395 SF | Curtain Wall | Exterior | | 23' - 8 3/4" |
| | 171 SF | Basic Wall | Interior | | 11' - 2 7/8" |
| | 770 SF | Basic Wall | Interior | | 73' - 1" |
| | 178 SF | Basic Wall | Interior | | 11' - 5 1/8" |
| | 178 SF | Basic Wall | Interior | | 11' - 5 1/8" |
| | 178 SF | Basic Wall | Interior | | 11' - 5 1/8" |
| | 178 SF | Basic Wall | Interior | | 11' - 5 1/8" |
| | 1263 SF | Curtain Wall | Exterior | | 87' - 7 1/2" |
| | 115 SF | Basic Wall | Exterior | | 7' - 3 3/8" |
| | 421 SF | Basic Wall | Exterior | | 34' - 8 1/2" |
| | 70 SF | Basic Wall | Interior | | 5' - 9 3/4" |
| | 148 SF | Basic Wall | Interior | | 12' - 11 1/4" |
| | 75 SF | Basic Wall | Interior | | 5' - 11 1/2" |
| | 178 SF | Basic Wall | Interior | | 11' - 5 1/8" |

11. Click into the first R-value field, and type in “R-13”

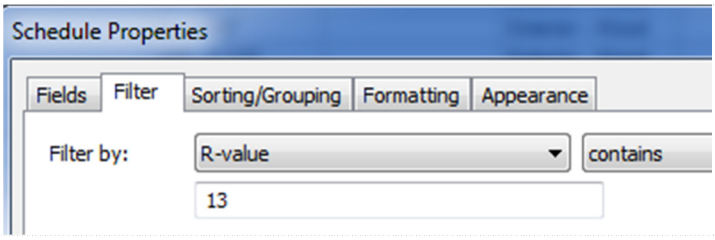
12. Select “Ok” to the message.



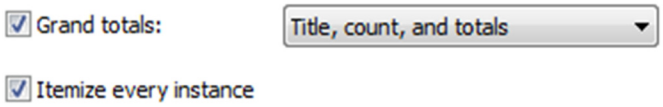

13. All of the same wall types now have the “R-13” value.

| A | B | C | D |
|---|---|---|---|
| R-value | Area | Family | Function |
| R-13 | 481 SF | Basic Wall | Exterior |
| | 78 SF | Basic Wall | Exterior |
| | 264 SF | Basic Wall | Interior |
| R-13 | 82 SF | Basic Wall | Exterior |
| R-13 | 364 SF | Basic Wall | Exterior |
| R-13 | 361 SF | Basic Wall | Exterior |
| | 260 SF | Curtain Wall | Exterior |
| | 231 SF | Basic Wall | Interior |
| R-13 | 41 SF | Basic Wall | Exterior |
| R-13 | 34 SF | Basic Wall | Exterior |

14. In the “Filter” tab, filter by “R-Value”, and “Contains” 13. See example to the right




15. Under “Sorting/Grouping” tab, make sure “Grand Totals” is checked.




16. Resulting schedule should display a Quantity Grand total of 44 walls with R-13

| | |
|---|---|
| R-13 | 123 SF |
| R-13 | 70 SF |
| R-13 | 95 SF |
| R-13 | 416 SF |
| R-13 | 43 SF |
| Grand total: 44 | |

**Task 2:** Tapping into the information-rich models for quantity takeoffs helps to produce more accurate **cost estimates**, compressing the timeline from design to procurement to construction, virtually eliminating errors and omissions, and reducing the likelihood of RFIs and change orders.

**Task time:** 5 minutes

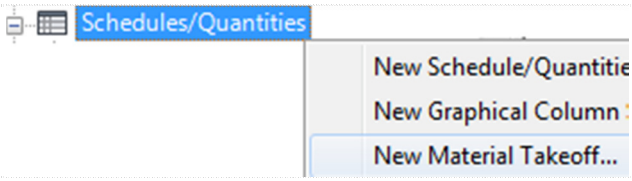
**Instructions:**

## Cost Estimates

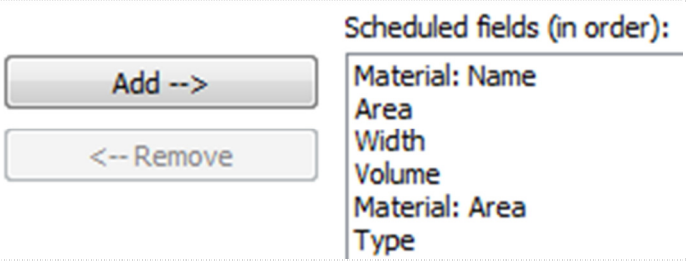
1. Once data is compiled and collected, it can be further drilled down into for cost related pricing tools.

Note: To save time and not create a schedule from scratch, use the same file fro mabove “demo_Info-Rich.rvt and open the schedule “Z - Wall Material Takeoff”, then jump to Step number 7 in this exercise.

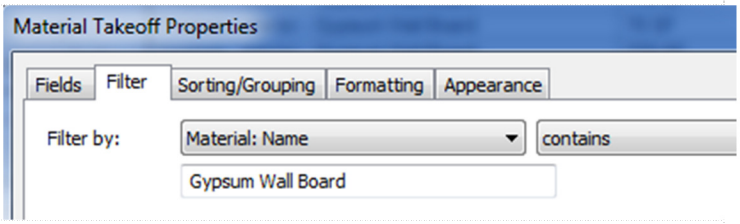
2. Open the Create a new schedule for “Material Takeoff”



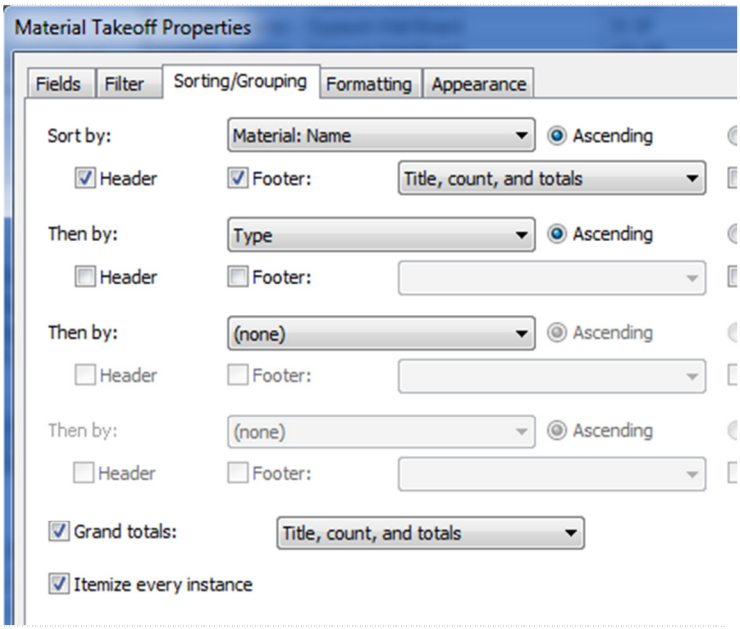

3. Add the following to the schedule based on the example to the right.




4. Filter the schedule by “Name” that “contains” “Gypsum Wall Board”



5. Sort and group like the example on the right.




6. Resulting data is displayed.

<Wall Material Takeoff>

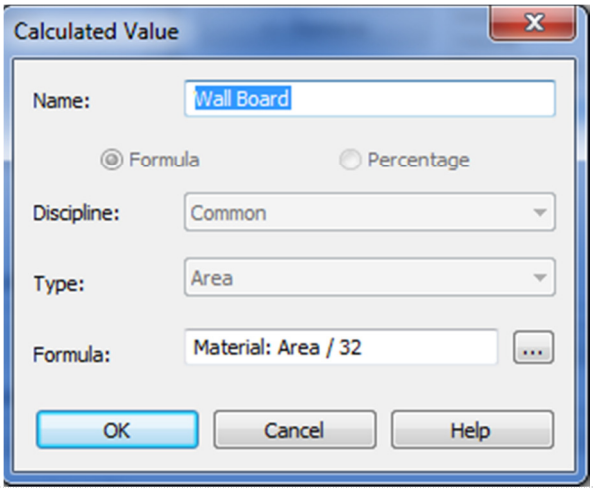
| A | B | C | D | E | F |
|---|---|---|---|---|---|
| Material: Name | Area | Width | Volume | Material: Area | Type |
| Finishes - Interior - Gypsum Wall Board | | | | | |
| Finishes - Interior - Gypsum Wall Board | 16 SF | 5 1/2" | 7 CF | 15 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 16 SF | 5 1/2" | 7 CF | 15 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 16 SF | 5 1/2" | 7 CF | 15 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 8 SF | 5 1/2" | 4 CF | 8 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 8 SF | 5 1/2" | 4 CF | 8 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 8 SF | 5 1/2" | 4 CF | 8 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 6 SF | 5 1/2" | 3 CF | 6 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 6 SF | 5 1/2" | 3 CF | 6 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 93 SF | 5 1/2" | 41 CF | 87 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 6 SF | 5 1/2" | 3 CF | 6 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 4 SF | 5 1/2" | 2 CF | 4 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 68 SF | 5 1/2" | 30 CF | 68 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 6 SF | 5 1/2" | 3 CF | 6 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 14 SF | 5 1/2" | 6 CF | 14 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 34 SF | 5 1/2" | 15 CF | 33 SF | Exterior - BrakeMetal above SF |
| Finishes - Interior - Gypsum Wall Board | 7 SF | 11 1/8" | 6 CF | 7 SF | Exterior - Cor-Ten on Metal Stu |
| Finishes - Interior - Gypsum Wall Board | 22 SF | 11 1/8" | 20 CF | 22 SF | Exterior - Cor-Ten on Metal Stu |

7. In the “Fields” tab of the Material Takeoff Properties dialog box, select “Calculated Value…” button


8. Name it “Wall Board”

9. Change the Type to “Area”

10. In the Formula box select the “…” button and choose “Material: Area” this will be added to the formula. Add a space then a forward slash “/” and another space. The formula should look like the example to the right.



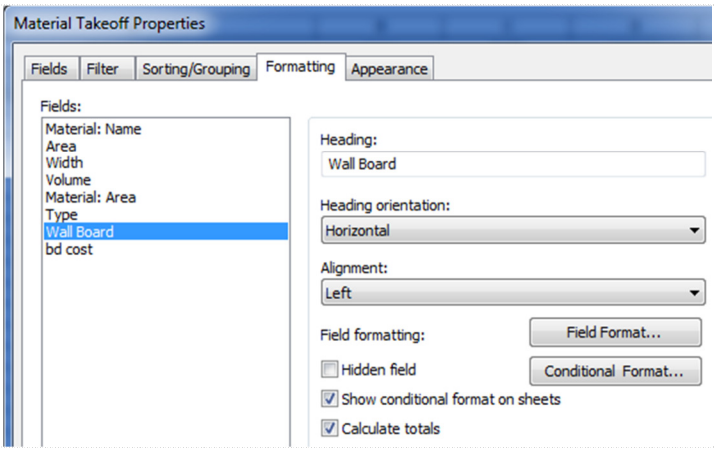
11. Results should show up in the "Wall Board" column.

12. They can be sorted to ascending if desired.

| G |
| --- |
| Wall Board |
| |
| 0.48 |
| 0.48 |
| 0.48 |
| 0.24 |
| 0.24 |
| 0.25 |
| 0.20 |
| 0.20 |
| 2.72 |
| 0.20 |

13. Got to the Formating button in Properties and select "Wall Board", then choose Calculate Totals check box.

14. Select the "Field Format" button

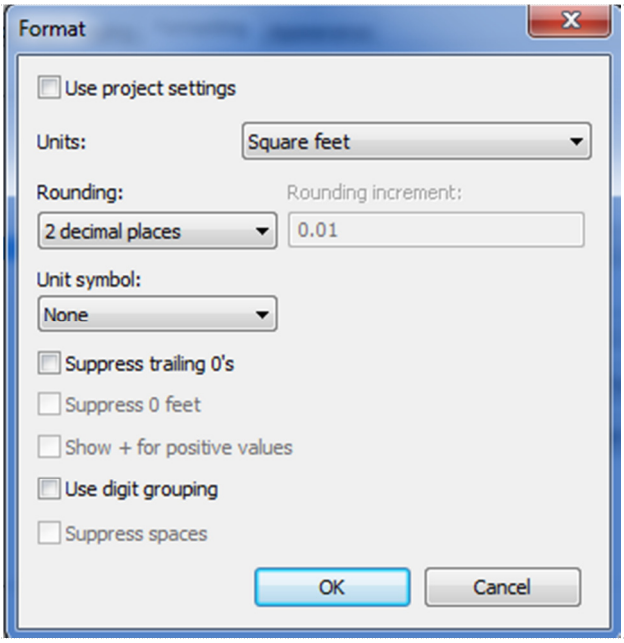



15. Uncheck the "Use project settings:

16. Change the setting for Rounding to "2 decimal places"

    Note: This can also be set to "0 decimal places" to round up and display a whole number, which equals 1 sheet.

17. Select "OK", and see your results. The totals should be at the bottom of the schedule.



18. Now lets get some pricing and total things up

19. At the time of this class, *Lowe's* had Gypsum Wall Board 4x8 by the sheet for $10.25. This is the cost per unit we will use.

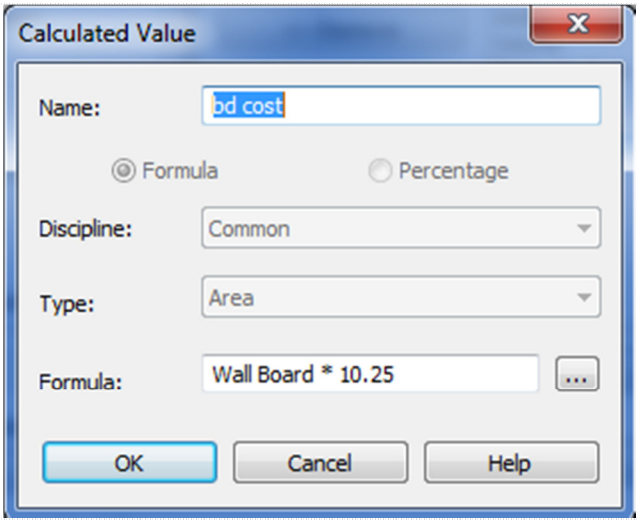

20. Back to the "Fields" tab and "Calculated Value…"


21. Lets name this "Bd cost"

22. Set the Type tp "Area"

23. And for the Formula choose "…" and pick the "Wall Board", then a space and asterisk "*", space and 10.25 for the price.

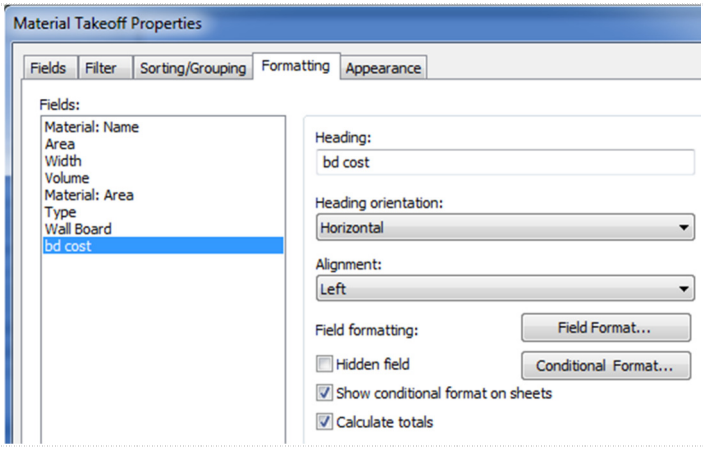
24. The formula should look like the example on the right. Select "OK"




25. Go to the Formatting tab and select the "Bd Cost"

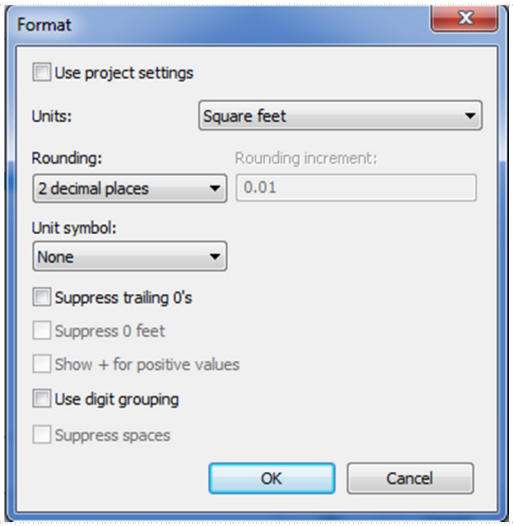
26. Check "Calculate totals" box.

27. Choose "Field Format…"



28. Change the setting to “2 Decimal places” and select “OK”

29. The schedule should display the results and total at the bottom.




## Part 3 –Analysis

**Task:** With integrated **analysis for energy and carbon,** you gain design insight where the most important design decisions are made.

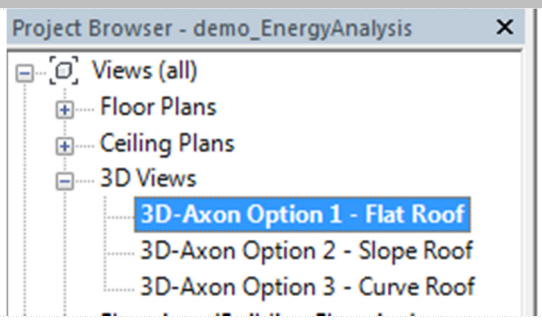
**Task time:** 5 minutes

**Instructions:**

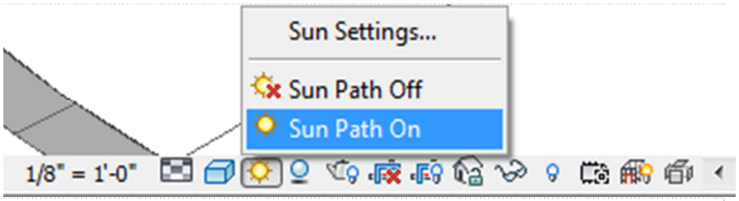
### Energy Analysis

1. Open class file: demo_EnergyAnalysis.rvt

2. In Project Browser, under the 3D View, open “3D-Axon Option1 – Flat Roof” view

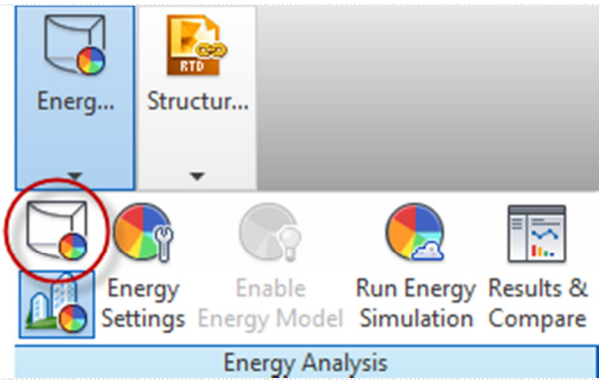


3. In the view display, turn on the "Sun Path On"




4. Go to "Analyze" tab Energy Analysis Panel

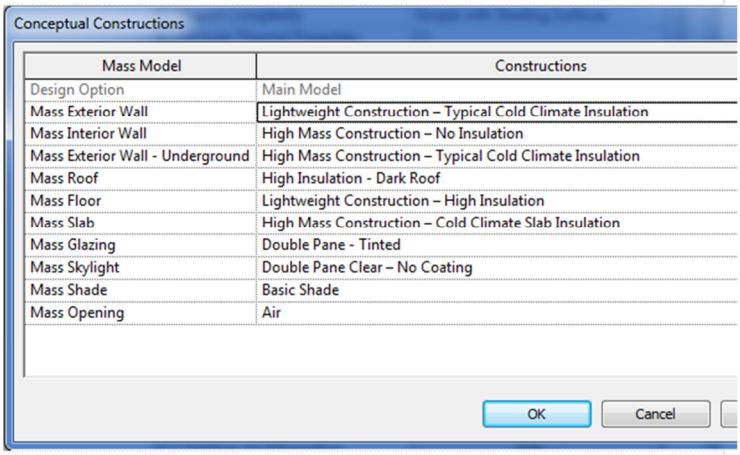
5. Select "Use Conceptual Mass Model"



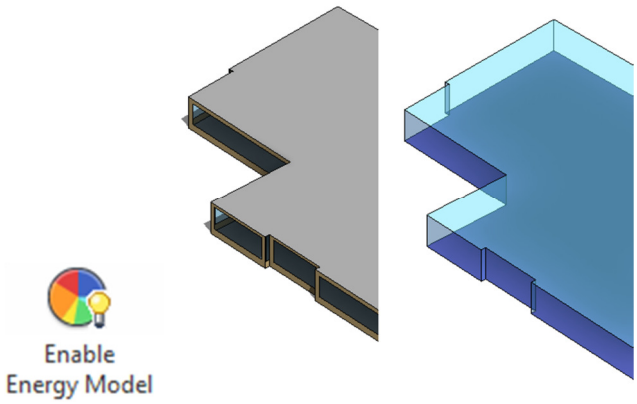

6. Select "Energy Settings"
7. Change Building type to "Office"
8. Export Category to "Rooms"


9. Under "Conceptual Constructions" select "Edit"

10. Match the setting on the right example:



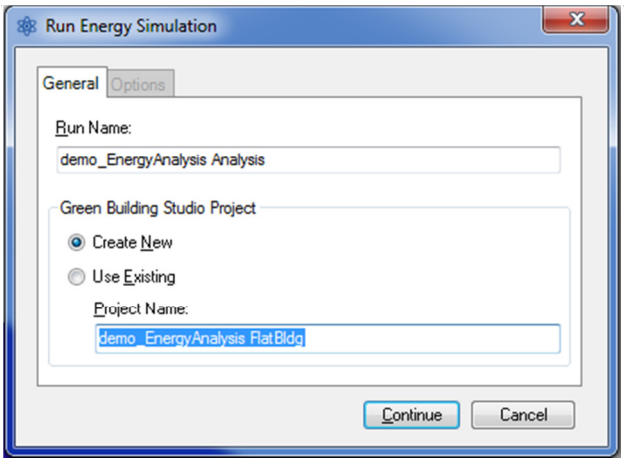
11. Enable the “Energy Model”




12. “Run the Energy Simulation”

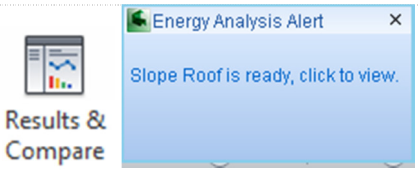

13. Name the Project: demo_EnergyAnalysis FlatBldg

14. The energy model is being pushed to the Cloud and processed. This may take a few minutes.

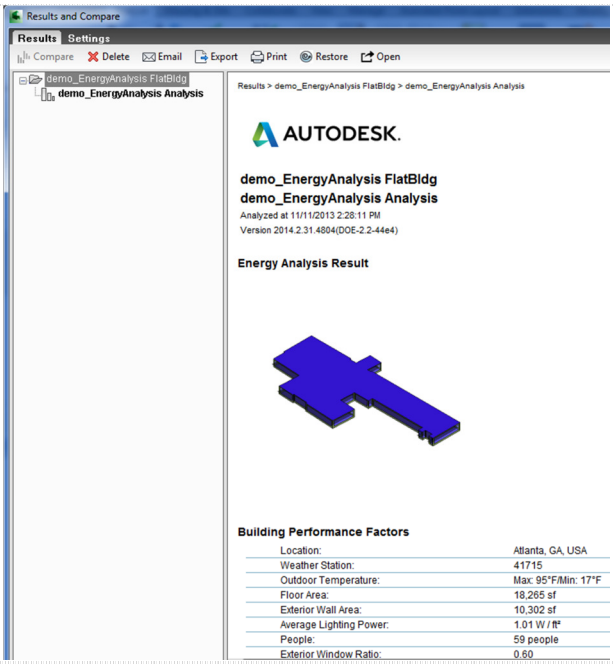




15. “Results & Compare”



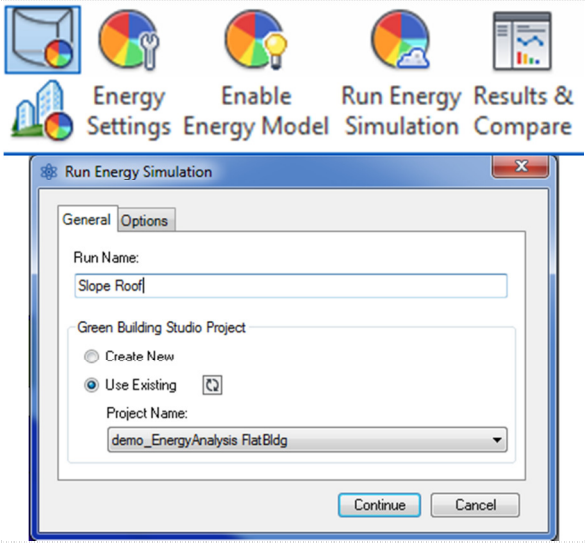
16. View the report in the “Results & Compare” viewer.



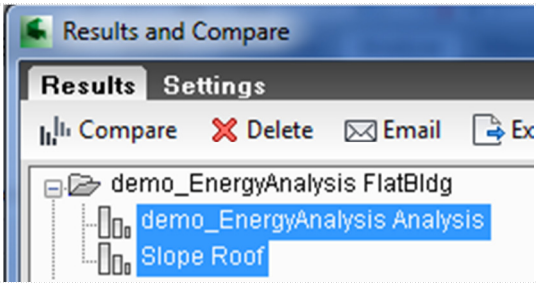

17. Run additional Energy Analysis on the Slope Roof and Curve Roof Options, by repeating similar steps above.

18. Give the “Run Name” a unique name like Slope Roof, Flat Roof, Curve Roof.

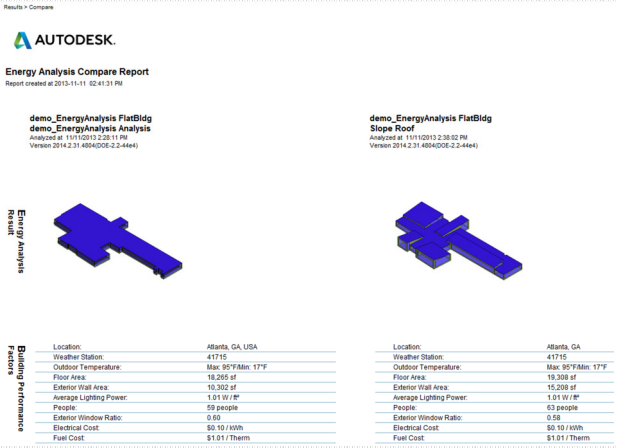
19. “Use Existing” and select project name from the first run.




20. Compare different Energy Analysis. Select two separate runs in the same project, and choose “Compare”



21. This will show a side-by-side comparison of different conditions of the building designs and how the results vary
22. Optional “Email”, “Export” or “Print” for additional discussion with clients and consultants.



Results > Compare

AUTODESK.

**Energy Analysis Compare Report**

Report created at 2013-11-11 02:41:31 PM

**demo_EnergyAnalysis FlatBldg**
**demo_EnergyAnalysis Analysis**
Analyzed at 11/11/2013 2:28:11 PM
Version 2014.2.31.4804(DOE-2.2-44e4)

**demo_EnergyAnalysis FlatBldg**
**Slope Roof**
Analyzed at 11/11/2013 2:38:02 PM
Version 2014.2.31.4804(DOE-2.2-44e4)

Energy Analysis Result

Building Performance Factors

| | | |
|---|---|---|
| Location: | Atlanta, GA, USA | Atlanta, GA |
| Weather Station: | 41715 | 41715 |
| Outdoor Temperature: | Max: 95°F/Min: 17°F | Max: 95°F/Min: 17°F |
| Floor Area: | 18,265 sf | 19,308 sf |
| Exterior Wall Area: | 10,302 sf | 15,208 sf |
| Average Lighting Power: | 1.01 W / ft² | 1.01 W / ft² |
| People: | 59 people | 63 people |
| Exterior Window Ratio: | 0.60 | 0.58 |
| Electrical Cost: | $0.10 / kWh | $0.10 / kWh |
| Fuel Cost: | $1.01 / Therm | $1.01 / Therm |

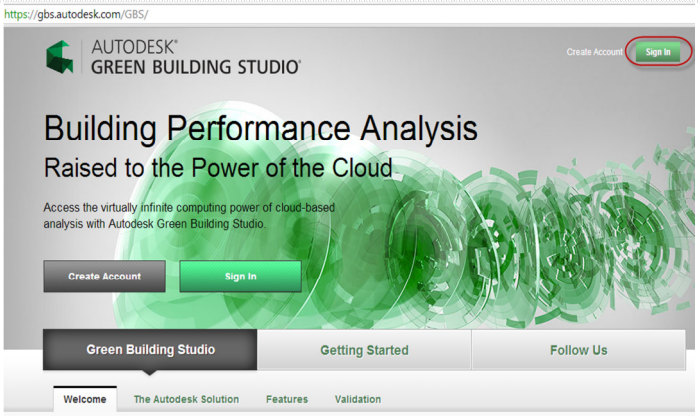
**Task:** Conduct **cloud-based** whole building **energy analysis** with web-based software. Optimize energy efficiency, and work toward **carbon** neutrality earlier in the design process.

**Task time:** 5 minutes

**Instructions:**

## Carbon

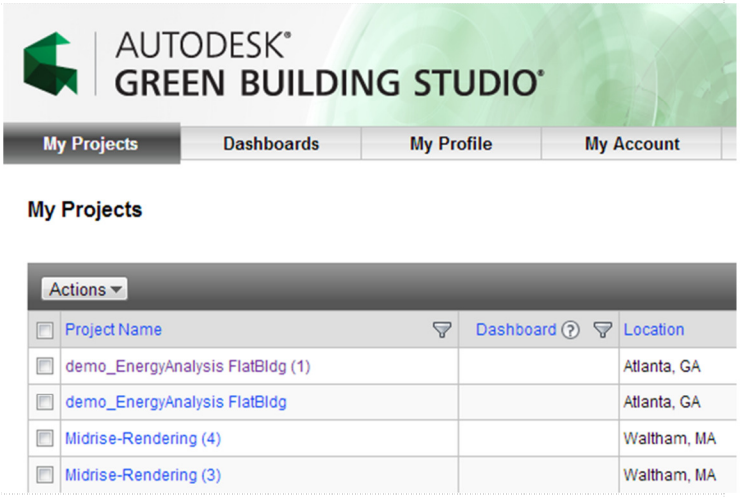
1. Green Building Studio Analysis
2. In a web browser go to: https://gbs.autodesk.com/GBS/




3. Sign In:
   zee@asti.com
   AU2013Zee

4. Project will automatically be listed that were ran for Energy Analysis in Revit.

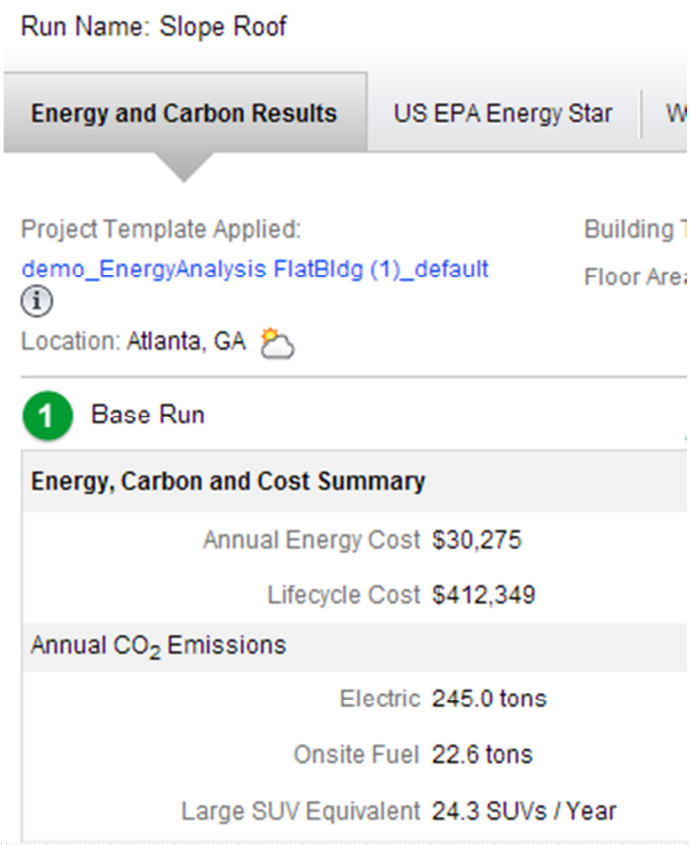
5. Select the top/most recent listed project, or the project you recently ran.




6. Select the first listed item / or roof component

7. Select the “energy and Carbon Results” tab. Review the Cost Summary, CO2 Emissions and data collected.

8. Review the additional tabs across the top.



## Part 4 – Sustainability

**Task:** Perform **wind and solar radiation analysis** with user-friendly tools. Allowing you to validate design sustainability earlier in the process.

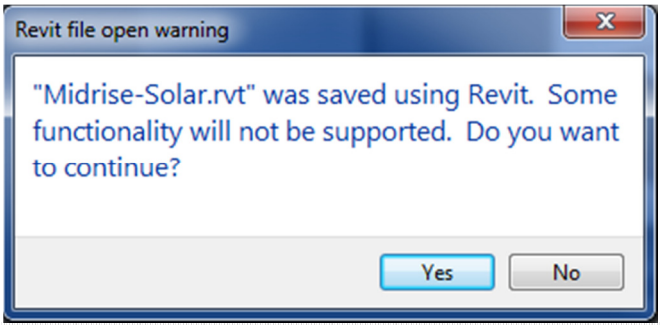
**Task time:** (two tasks 5 minutes each) 10 minutes

**Instructions:** Vasari is currently a beta software that is built off of the Revit engine. It has the potential to continue to be a separate product, or be incorporated into Revit as a whole.

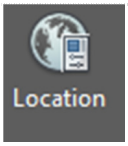
### Wind

1. Open Vasari from your desktop


2. Select the file “xxx.rvt” from your class files.
3. Select “yes” if promoted when opening the file.

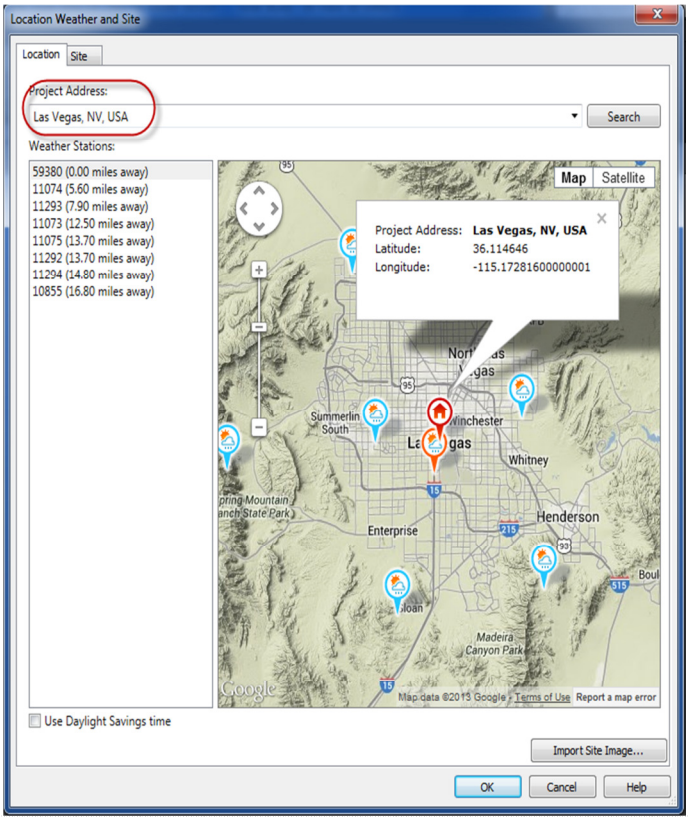



4. Under the “analyze” tab, select the “Location” button

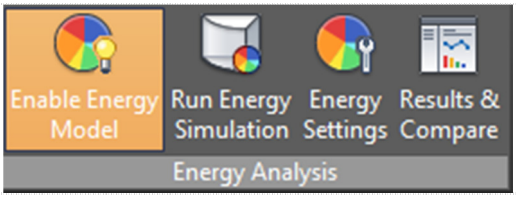


5. Set the project location to “Las Vegas, NV”

6. Select “Ok”




7. On the Analyze tab, select the “Enable Energy Model”

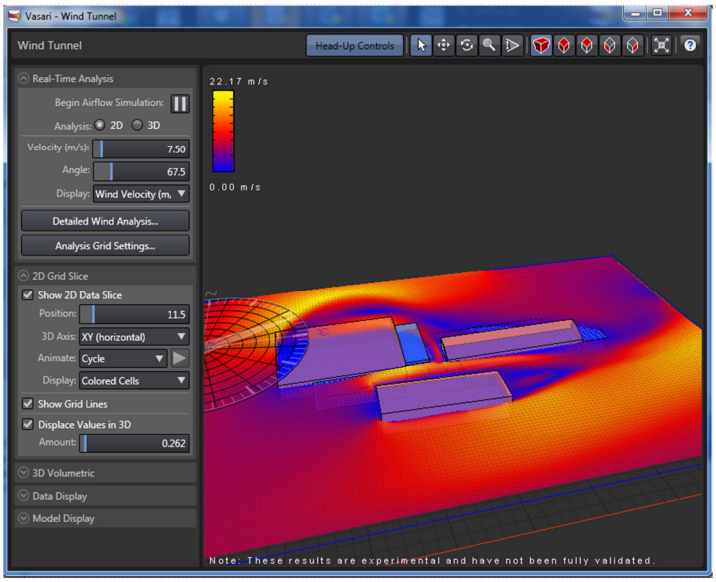



8. Choose “Show Mass Form”


9.

10. Under the “Climate Analysis panel, choose “Wind Tunnel”

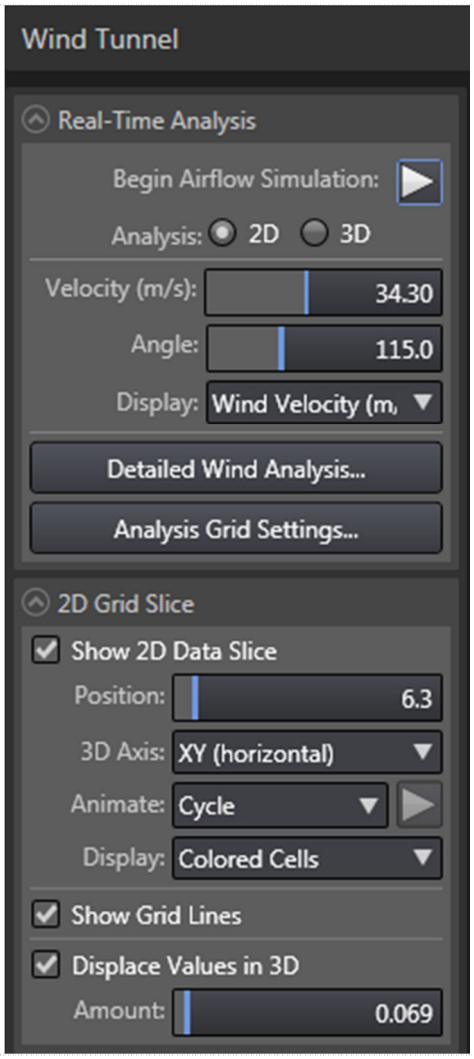
11. This will open the “Vasari – Wind Tunnel” app panel.



12. The simulation should start automatically. But can be started and stopped with the “arrow” or “pause” button

13. Adjust the Velocity (m/s) to 20, then adjust it to 50, and watch the results vary.

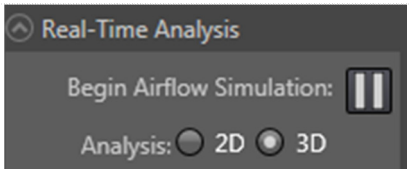
14. Change the Angle, which will affect the direction the wind is coming from.

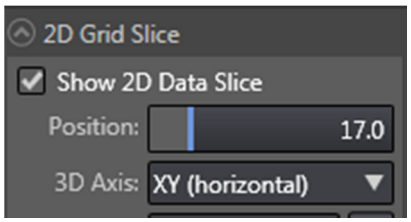


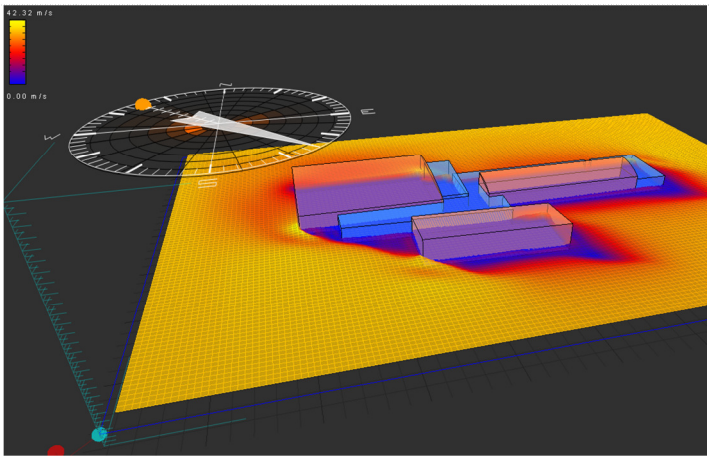

15. Change from 2d to 3d Analysis

16. Adjust the 2d Grid Data Slice Position to see the results of how the wind is affecting the building at different heights.

17.





18. Use the buttons on the top upper right to adjust the viewing of the model

19. Choose the Spin arrows to 3d rotate around the project.

20. Select the red 3d boxes for different perspective of the model

21. Select the “Detailed Wind Analysis” button


22.

23. This can also be accessed in the main portion of Vasari under the “Climate Analysis” panel, “Wind Rose” button.


24. This opens the “Wind Rose” tool. Here you can select:

25.  Load Weather Data

26.  Save

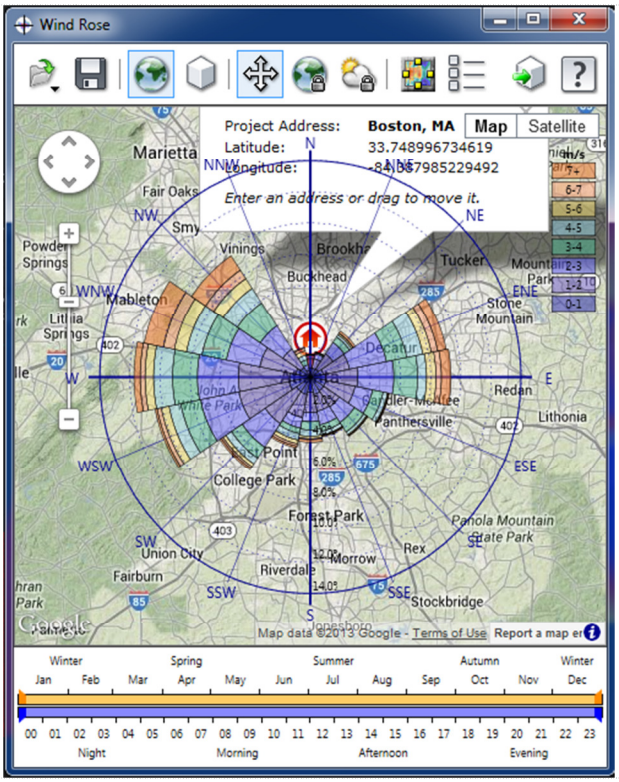
27.  Overlay Site

28.  Overlay model plan

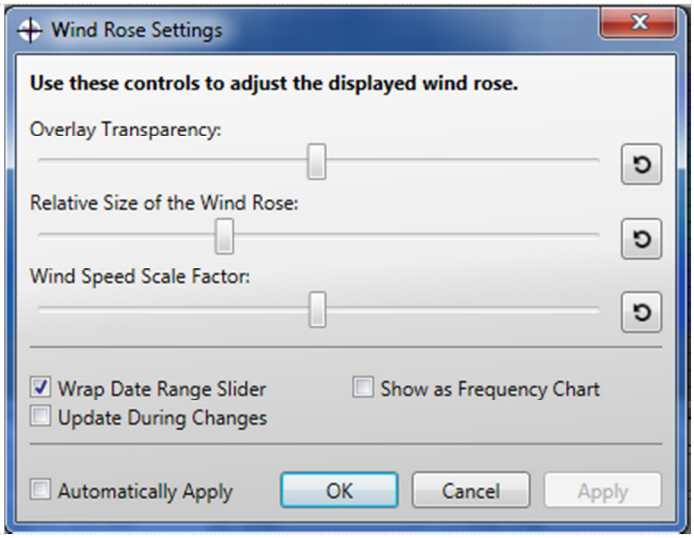
29.  Free map movement

30.  Lock location and weather

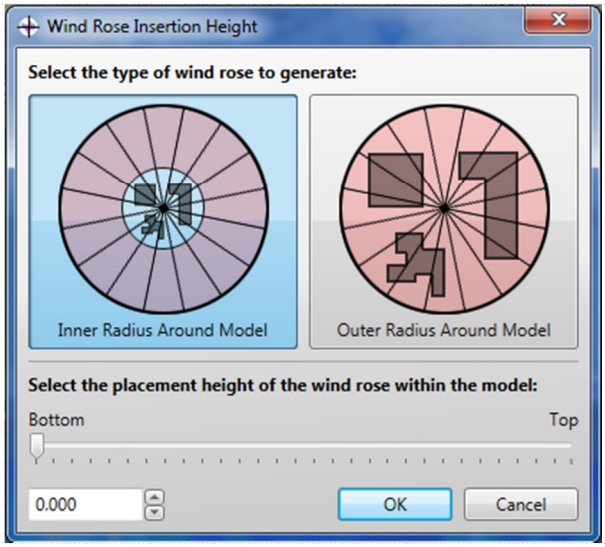
31.  Time/date range




32.  Wind Rose Settings



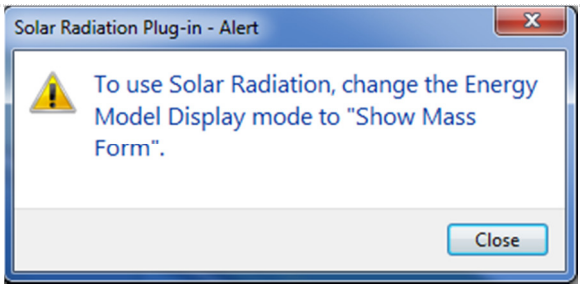
33.  Send to BIM Project



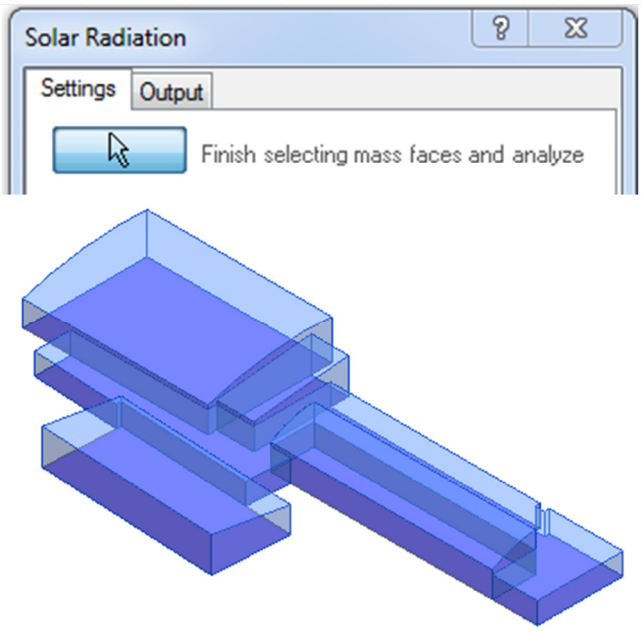
## Solar

1. Run the “Solar Radiation” tool

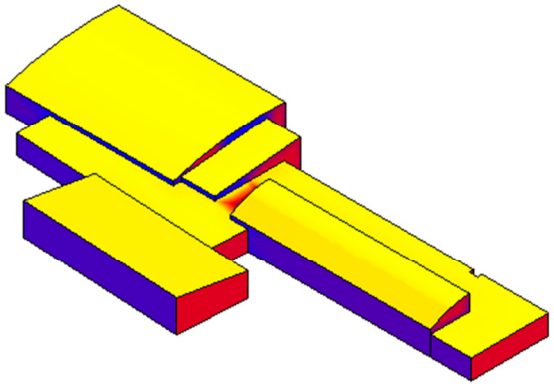

2. Change the model to display “Show Mass Form”



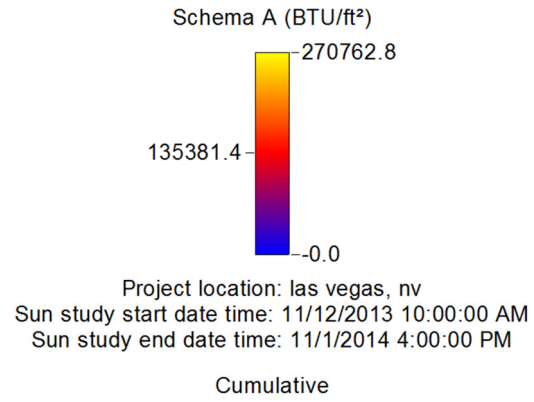

3. Select the arrow button to window across the mass faces to analyze
4. After windowing/selecting the masses in your model, reselect the arrow button to finish the selection



5.

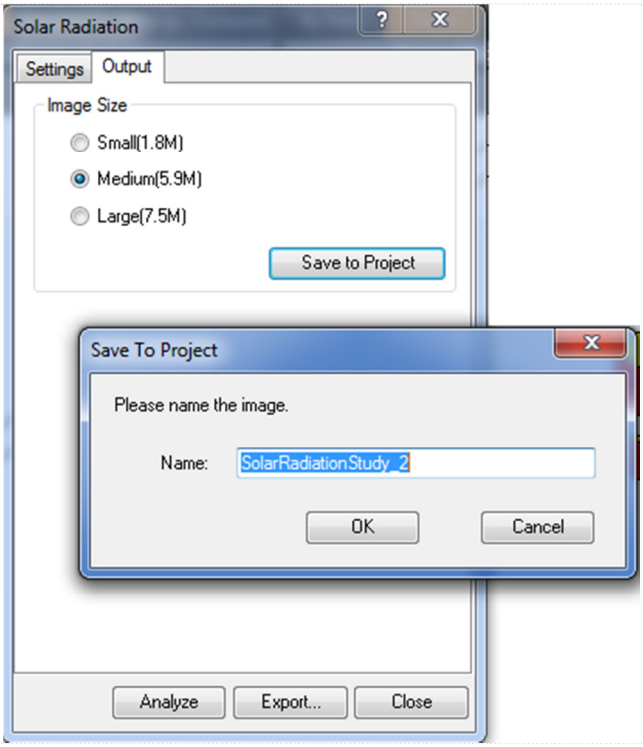


6. A report will display in the lower left corner of the screen, identifying the colors and solar heat range.




7. Project can be exported to a CSV file using the Export button

8. Save the analysis to the project under the Output tab. Leave as the default name.



## Summary

With faster, more accurate energy analysis of building design proposals, architects and designers can work with **sustainability in mind** earlier in the process, ***plan proactively***, and ***build better***.

## Summary Learning Objectives

- Explored quick design alternatives through iterative design
- Tapped into the information-rich models for quantity takeoffs
- Used integrated analysis for energy and carbon neutrality
- Validated design sustainability earlier in the process