AS19433-L

FormIt Lab

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Learning Objectives

- Learn basic functions of FormIt
- Discover advantages of Pro features
- Discover difference between existing products and how they fit into a FormIt workflow
- Learn how to create your own FormIt workflow

Description

This lab is designed to give users hands-on experience with FormIt software. We will go step-by-step through creating geometries in FormIt, bringing geometries in from other programs, modeling them together to form a cohesive model utilizing basic and advanced tools, creating and applying materials, adding levels, reporting different object properties, grouping objects, arraying objects, running energy and daylight analyses, starting a sharing session with others, and then transitioning the model to Revit software. You will gain firsthand experience with utilizing this new and powerful toolset that can literally travel anywhere with you.

Your AU Experts

*With a formal architectural education, **Brandon Wlosinski** serves as the Manager for Virtual Design and Construction at BNIM. His knowledge of architecture and deep understanding of technology combine in this role to support BNIM's presence as a cutting-edge national design firm. Brandon helps to lead BIM standards and project development, but more importantly, he keeps his finger on the pulse of what is new and emerging in the arena of design technology. Brandon received his B. of Architecture from Iowa State University in 2013.*

***Daniel Siroky** is an Architectural Technology Specialist at BNIM Architects in Kansas City. In this role he supports project teams with rendering, daylight analysis, and computational design workflows. In addition to project support, he is involved in guiding the integration of technology and design at the firm. He is a graduate of Iowa State University with degrees in Architecture and Environmental Studies.*

What is FormIt?

Is this a SketchUp/Rhino/Revit/etc. Killer?
Many of you have come to this class with this question in mind. Is FormIt the Autodesk answer to SketchUp? The answer is: kinda sorta. I know, not the most exciting or bold answer you might have been expecting. FormIt is its own program. While it is response to modeling tools currently on the market, it is a software in its own right, a natural progression from earlier Autodesk tools, most notably Vasari. So, then the question becomes, What is FormIt?

FormIt is a BIM tool
FormIt is derived with the intent to create BIM geometries. Immediately, upon starting to model in FormIt, you are creating smart geometries that begin to carry information about themselves to be used later. We will drill into how we create and manage this information throughout this training.

FormIt is for Pre-Design onwards
FormIt is the tool to use at any stage of design from Pre-Design all the way through Design Development for different tasks. Right off the bat, you can begin modeling off of a sketch or surrounding site conditions or design criteria. Once you get a design challenge, FormIt can be your tool to start, and it can start anywhere, be it from a desktop or mobile, in the office or with a client. You can update and refine the design as you go forward, and bring it into latter stages of design to hand off to other tools when needed.

FormIt makes everyone friends with Revit
FormIt natively saves your models in a RVT file, so the geometries and information you define in it are carried over natively. Not only that, but we can import Revit information to FormIt. We can also convert SketchUp, Rhino, and other geometries to be inserted into the files as well. Once they are brought in and become part of the file, they too can be layered with information and natively moved to Revit.

FormIt is for all systems
FormIt is a web-based tool, which means that the program is made with hardware agnosticism in mind. Whether you are on a Mac or PC or something altogether different, as long as you have a WebGL enabled browser, you will be able to run FormIt. Since FormIt is cloud based, it gets updates direct from the developers and happens without any downtime for reinstallation or massive firm-wide deployments.

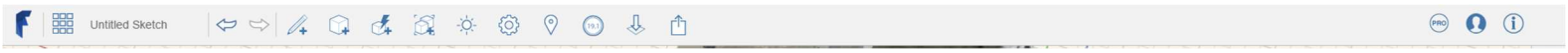
FormIt is still progressing
FormIt has been released for over two years now, and in that time has seen itself change drastically. By being a web-based cloud ptool, quick development and change will keep FormIt on the cutting edge of design tools.

Formit 360 Pro vs. Free
A brief note about formIt Pro vs. FormIt Free. Most of FormIt is free at the time of this writing. We will be training on FormIt 360 Pro, which includes several pieces not found in the Free version, including Solar Analysis, Energy Analysis, and Sharing Sessions.

Introduction to the User Interface (UI)

The UI
As with many programs, you need to know what you are looking at before proceeding action. The following pieces are an explanation of the UI/UX design of FormIt and to go through the organizational logic surrounding the toolsets.

The Top Bar
The top bar of the FormIt relates to the basic functionalities within FormIt, which we will go into throughout this lab. Starting from the left and moving right, you have:



1. The Main Menu – New, Open, Save, Save As, Open A360 Drive
2. The File Name
3. Undo/Redo
4. Sketch tools – Line, Arc, Spline, Square, Circle
5. Primitive tools – Cube, Dome, Pyramid, Cylinder, Roof
6. Advanced Modeling tools – Join, Cut-trough, Sweep, Cover, Loft
7. Group tools – Group, Ungroup, Make Unique, Edit Group
8. Daylight tools – Shadow toggle, Time Controls, Solar Analysis
9. Settings – Application and Sketch Settings
10. Location tools
11. Energy Analysis Tools
12. Import
13. Export
14. Pro Features
15. User Login
16. Information

The Main Camera Bar
This is the inner bar on the right hand side that hovers over the model space and controls the active camera.

17. View Top – Camera looks straight down in an orthographic view.
18. View 3D – Camera looks at objects in perspective.
19. Fly-through Mode (aka Jetpack) – The camera is placed in a first-person view, where walking controls are put into WASD and space bar controls vertical movement
20. Select – Mouse is used to select objects. This action is by default mapped to right click

21. Orbit – Mouse spins the camera around a selected point. This action is by default mapped to right click + drag.
22. Pan – Mouse moves the camera in Xyz directions. This is by default mapped to middle mouse click + drag
23. Zoom In/Zoom Out

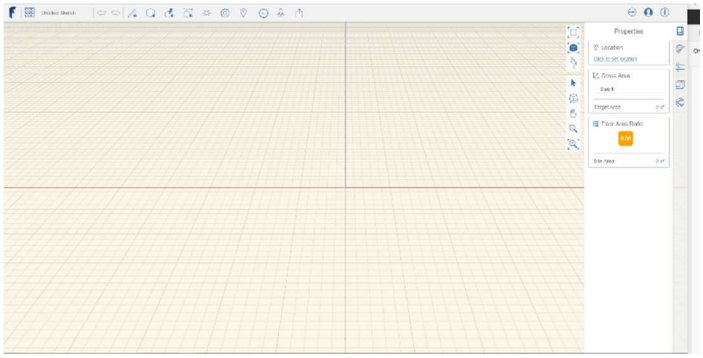
The Right Bar

The rightmost bar deals in project parameters and data, including view controls, materials, and more. Unlike the top bar, this is for things that would not generally be considered a modeling action.

24. Properties – Allows you to see the information built into selected geometries/groups, like area and volume, as well as the general model information, such as square footages.
25. Materials – Allows you to view built in materials and choose them to edit and apply them to the model.
26. Layers – Create and manage layers that geometries appear on. Layers can be turned on and off, which allows for geometries to be hidden.
27. Scenes – Allows you to place the camera in specific areas. By managing layers, this can be a way to create specific views for different design options.
28. Levels – A key information element that allows you to divide geometries into levels. This is a key part for translating FormIt to Revit.
29. Content Library – A place to store modeled items, such as furniture. Can be linked to your A360 drive or to a local location.
30. Share – Allows you to start a sharing session with multiple parties.

The Model Space/Canvas

The main workspace in the center of the screen is the canvas where you will sketch and place geometries.



The Grid acts as the base ground plane geometries will snap to.

The XYZ guides going out from the global origin orient the model. Holding shift while drawing will snap lines to these directions.

The Right-Click/Context Menu

While working in FormIt, you can right click on geometries and the canvas to bring up a circular contextual menu (not wholly unlike Rhino) that has some commands that are not found in the other menus.

31. MultiMove
32. Copy
33. Paste
34. Rotate
35. Scale

36. Array
37. Group/Ungroup/Edit Group/Make Unique
38. Lasso
39. Rotate Grid – Rotates the base grid of the model space.
40. Set Axes – Moves the base XYZ axes lines from the origin.

Basic Modeling

Starting your model

Starting a model in FormIt will in a few ways feel like a mix between how you would model in Revit and SketchUp. There is some prep work to do before

Login

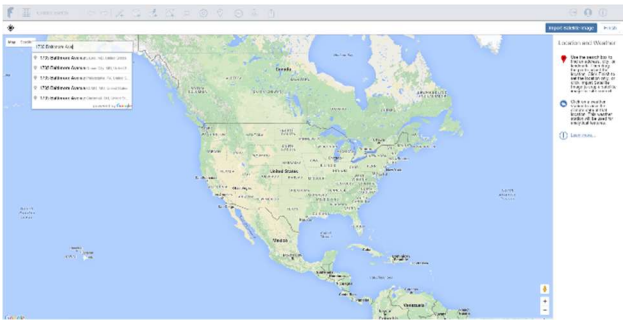
Formit will let you start modeling immediately and will only prompt you to log in when you access specific areas of the program. In order for the sketch to be saved and to access additional features, you will need to log in to your A360 account through FormIt.

1. Click the person silhouette icon in the upper right corner.
2. Input your username and password for your A360 account.

Location

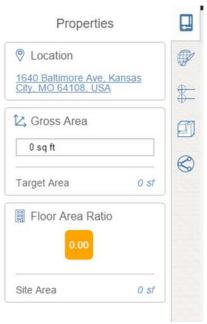
One of the first thing you should do at the start of a project is to set the location of your project. We do this by:

1. Go to the Map-Pin icon in the top bar.
2. Search for your address and/or use the map pin to place the location dynamically.
3. Choose a weather station nearby. This will being up wind and psychometric charts that you can use for reference later.
4. Click Import Satellite Image.
5. Drag the corners of the square to choose the area that you want to develop the sketch in and click Finish Importing.
6. This will take you back to the modeling area with the to-scale satellite image brought in.
    a. As of this training, there is no 3D terrain in FormIt.



Site/Building Information

Some of the first pieces to define in the model are the site area and target square footage. This will allow us to set specific goals to keep track of. If you don't know what these goals are yet, it is ok to skip this part.



1. Go to the Properties menu in the right hand bar. This is immediately pulled up after selecting location. It will list Location, Gross Area, and Floor Area Ratio.
2. Under Gross Area, click the 0SF text for Target Area. In here, we want to put in what our target gross square footage for the building will be
3. Under Floor Area Ratio (FAR), click the 0SF next to Site Area. Here we will put the total site square footage. As we select objects and groups to model, the FAR will automatically update, letting us know if we are building to an FAR that is appropriate for this location.
4. Levels – In the right hand menu bar, you can choose the levels menu and begin populating rough approximations of different level heights. When you add a level, FormIt defaults 12' between floors. This is not necessary to include right away, but you will want to define this early on, at least roughly, as it helps with area takeoffs, which we will go over later.

The Line Tools

There are two types of drawing tools in FormIt, Basic and Advanced. We will begin with the basic tools and focus initially on line creation tools. If you have ever modeled before, many of these basic tools will feel incredibly familiar to you.

The Pencil

This is your simplest tool. This lets you specify two points and create a line between them. The points of the line will automatically snap to the grid.

1. Click the Draw tool in the top menu.
2. Select the Pencil tool
3. Click one point in space and create the base point.
4. Click another point in space. The line will appear.
    a. Once the line is finished, you can click the distance and edit the number amount to lengthen or shorten the line along the vector defined by the base point to the second point.

Arc

Another simple tool that will draw a rounded arc.

1. Click the Draw tools in the top menu
2. Select the Arc tool (or press A)
3. Click on one point in space and create the base point.
4. Click another point in space.
    a. You can edit the distance between these points in the same manner as the Line tool
5. Select the height of the arc. The arc will appear.
    a. You can click the arc height and edit it numerically.

Spline

Creates a multi-curved line, also known as a spline.

1. Click the Draw tools in the top menu
2. Select the Spline Tool (or press S)
3. Click on point in space to create the base point.
4. Click another point in space and a basic line will appear.
    a. You can click the distance and edit them numerically.
5. As you go to select a third point, you will notice the position of the point will change the curve of the line. You can choose to place the point once the curve matches the desired shape.
6. You can continue to add points to the Spline. Each additional point will alter the spline's current and previous curves.

Surfaces

As you put lines together and form a complete shape, the shape will auto-fill and create a surface that can be extruded and manipulated from 2D to 3D. The next two tools will automatically create surfaces.

Rectangle

Creates a rectangular surface with 4 points and 4 lines. Once create, you can select and move the edges and corner points to manipulate the shape. You can then select the surface and extrude it up to a cube.

1. Click the Draw tools in the top menu
2. Select the Rectangle tool (or press R)
3. Click on point in space to create the base point.
4. Click another point in space and a basic line will appear.
    a. You can click the distance and edit them numerically.
5. You can then select the location of the opposite edge.
    a. You can click the length once the edge is placed and edit it numerically.
6. To extrude, select the surface and pull upwards. This will create a cube.
    a. You can click on the height and edit it numerically.

Circle

Creates a circular surface with an outer edge and center point. It is defined by its radius and diameter. Can be extruded to a cylinder.

7. Click the Draw tools in the top menu
8. Select the Circle tool (or press C)
9. Click on point in space to create the base point.
10. Click another point in space to define the size of the circle by its radius.
    a. You can click the distance and edit them numerically.
11. To extrude, select the surface and pull upwards. This will create a cylinder.
    a. You can click on the height and edit it numerically.

Solids

In the last set of instructions, we covered extruding surfaces into 3D solids. In FormIt, there are also tools to place basic air-tight 3D solids into your model,

commonly referred to as primitives. There are five primitives that can be edited in different ways. In general, when working in the mobile apps, primitives are easier to work with than line tools.

A Cube is a basic square box. Once placed, you can select the sides and extrude them further to create the shape desired. You can also select the edges and manipulate them to create sloping shapes.

A Dome is a basic hemisphere. You can select the slat piece and extrude it out to create a topped cylinder.

A Pyramid is a basic triangular form. You can pull the top point to make the pyramid steeper. You can extrude the sides and base to create interesting forms. You can also manipulate the edges.

A Cylinder is a basic extruded circle. You can scale the top and bottom circles to manipulate the cylinder geometry.

A Roof is a basic extruded triangle. You can manipulate the surfaces by extruding them and go from a standard rood to a complex one. This is not the same as a Revit roof geometry.

Grouping

Grouping is one of the basic methods of organization within FormIt and one of the basic steps to keep model elements separated from one another.

As you model without grouping, you may notice that modeling on top of different geometries causes them to immediately merge and stick together. This stickiness is a result of the methodology that FormIt uses when creating smart geometries and is actually really useful when you are trying to create airtight models for things like 3D printing. However, we don't always want things to stick together, and so we use grouping.

The grouping tools are part of the top menu bar as well as the right-click context menu. There are several steps to grouping.

Create Group

The first step of using groups is creating them.

1. Click the Grouping tools in the top menu
2. Choose Create Group
3. Select the geometries you want to group together, including lines, surfaces and solids.
4. Click the checkmark to create the group.
    a. Alternatively, to quickly create groups, you can select multiple geometries while clicking + holding Shift, then either right clicking and choosing the Create Group tool, or pressing Alt+G.

Once you create a group you will see that when you click on it, it gets highlighted in a dotted line. This will signify that everything in the dotted line is a group. Now, everything will move together and be copied/pasted together throughout the model.

Edit Group

Once a group is created, either double click it to edit, go to the group tools and choose Edit Group, right-click and choose edit group in the context menu, or highlight the group and press Alt+E

One of the things that you will notice when you copy and paste groups or array them out, when you edit them, the changes you make in one group will show up in the other groups that were copied/pasted from it. In Revit terms, you would be editing the type, and changes are being applied towards all. This helps when you are working with a large amount of the same geometries all grouped together and you want them to remain the same, for example, an apartment building or hotel with similar but separate room geometries and properties. However, you may also want to create individual instances of these groups to make one-offs or similar types.

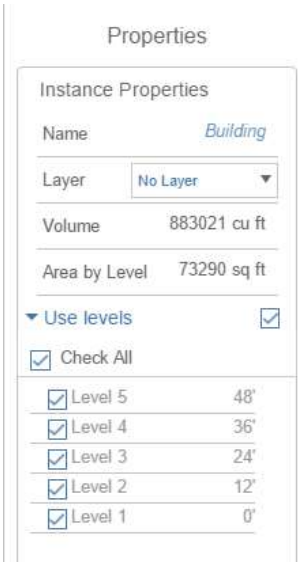
Make Group Unique

Once a group is copied and pasted, you can make this copy an unique individual instance so that its changes are its own by right-clicking the group and choosing Create Instance, by going to the Groups tools menu and choosing Create Instance, or by highlighting the group and pressing Alt+M

Beyond the functions of creating groups, there are properties that are contained within a group that are important to remember. Some of these we will only briefly touch on here and go into more detail later.

Group Properties

Here are important pieces of group properties to pay attention to.



1. Name – Create a unique name for the group. This becomes more important for your model organization as time goes on, as it will allow you to identify what groups you are working on and identifying them once they get imported into Revit, as it becomes the name for the RFAs that get created.
2. Layer – Tells you what layer the group appears on. We will go into more detail on this in the advanced techniques section.
3. Volume – Allows you to see the volume of the grouped objects. Good for immediate takeoffs.
4. Use Levels – Check this to get area takeoffs by the levels defined in the Levels menu from the right hand menu. You can specify specific levels to be included in a group.
5. Category – You can set the category of the geometries, that apart from organizational, will translate once brought into Revit.
6. There are other things that remain specifically within the groups and stay as part of the groups properties:
    a. Undo/Redo – the delta history remains within a group. This means that as you work in the group, you can undo and redo within the group and it will only go through changes within the group but will not affect anything outside the group.
    b. Materials – Materials remain unique to groups and can be copied and pasted between groups.

Saving

At this point you should now have the guides to create and manage basic geometries to the point of massing models that will carry enough basic properties that you can do area/volume takeoffs. The last thing to know at this point is saving, which can be done from the Main menu or by pressing Ctrl+S.

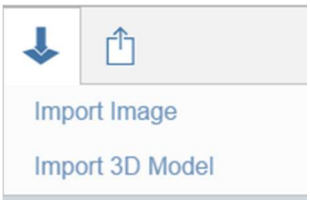
When you save the model, it will save to your A360 cloud as a FormIt sketch and as a Revit file. This Revit model is natively readable, with most geometries coming in as generic masses. We will go more into Revit translation in the following section.

Advanced Modeling

Advanced Tools and Techniques

Now that we have gone over the basics of working in FormIt, we will go over the more advanced tools and techniques that will allow you to begin adding details and getting more and more information out of your files.

Advanced Setup - Import



In addition to the basic setup we detailed before, you can utilize the import tool in the top menu bar to import 2D images and 3D geometry. With 2D images you can import any of the supported image types and begin modeling off of them. This is incredibly useful in the iPad version, where most sketch apps will create images that can be directly imported into the FormIt360 App. The 3D geometry you can import is limited to OBJ and STL files at the time of this training. Now some of you may be wondering about SketchUp geometry specifically, and so here is the lowdown on SketchUp:

SketchUp Imports

SketchUp imports are not natively supported, so you can either export them out to one of the supported types as mentioned above, or you can utilize the handy-dandy SketchUp Converter that FormIt360 provides without charge and convert the geometry to .AXM format and make it natively readable by FormIt.

1. First you will need to download and install the FormIt converter from the FormIt website at http://formit360.autodesk.com/blog/formit-converter/
2. Open the version of Revit that it installed for. It will show up under your Add-Ins tab. You do not need to open a file to use this tool.
3. Choose the SketchUp to FormIt converter.
4. Choose the file to convert and let the process run
5. You can save the files to an output folder either locally or in your A360 cloud drive.
6. You should now be able to load the file directly into FormIt360

Revit Imports

FormIt is not able to natively read RFA files at this time, and similar to SketchUp geometries, they need to be put through a converter.

7. First you will need to download and install the FormIt converter from the FormIt website at http://formit360.autodesk.com/blog/formit-converter/
8. Open the version of Revit that it installed for. It will show up under your Add-Ins tab. You do not need to open a file to use this tool.
9. Choose the SketchUp to FormIt converter.
10. Choose the file to convert and let the process run

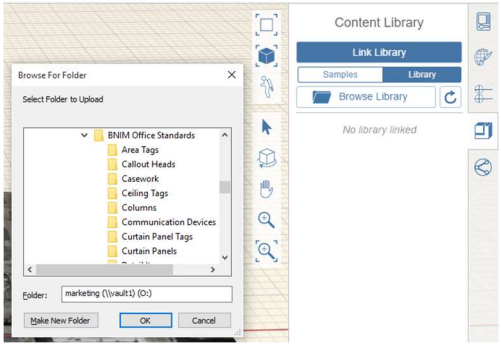
11. You can save the files to an output folder either locally or in your A360 cloud drive.
12. You should now be able to load the file directly into FormIt360

Link Library

Another advanced piece of FormIt is also derived from a similar logic found in Revit, in which you can define a library of content that has been created. This can include both native and converted geometry. You will notice that the sample library that is created is filled with a number of standard Revit families that have been converted for FormIt.

The Library palette is found in the right hand menu bar.

You can click Link Library and choose a Local or A360 location to look for Library content, which will then populate in the palette. If there are converted families that have multiple modeled types, then FormIt will organize them together, and you will be able to click a bubbled number to select which type you want to put into your Formit model.



Advanced Modeling Tools

The geometry in FormIt is all mathematically based. This is similar to the method by which Revit geometry is based, though it is not as advanced as NURBS, but it is more complex than SketchUp's methods. These advanced tools takes advantage of this modeling method and applies mathematical functions to create complex geometries.

Join

A Join is a method by which two geometries are mathematically put together so that they stick, and any overlapping geometry is removed, leaving a complete, single geometry. This is different from modeling tools like SketchUp and more similar to NURBS modeling, though not as advanced. You can do a join by selecting two geometries and going to the Advanced Modeling Tools and clicking Join.

Cut

A Cut is the opposite of a join, where a geometry is mathematically subtracted from another, leaving a complex void. To do a Cut, go to the Advanced Modeling Tools and select Cut. Then choose the host geometry and press the Check to continue. Next, choose the cutting geometry and press the check to confirm the selection.

Sweep

A Sweep, also known in some programs as a Follow or FollowMe, is a method by which one surface geometry is extruded along a path. To do a Sweep, draw a surface, such as a circle. Then, draw a line, arc, or spline from the center of the angle. Go to the Advanced Tools and choose Sweep. Select the surface you wish to sweep and press the check. Next, choose the line, here

known as your path, and press the check. The surface geometry should now extrude along the path.

To note, if geometry looks to be missing or disappeared, then you may need to create a path that doesn't turn as sharply.

Cover

A cover is a method of taking an opening that may seem inherently uneven and mathematically applying a geometry that covers the opening. This is particularly useful when creating dynamic roof shapes, closing uneven openings, and creating airtight models for 3D printing.

To perform a cover, go to the Advanced Tools and select the Cover tool. Select the edges surrounding the edges and press the check to confirm the selection. The cover geometry should now appear. This can work with straight and curved edges.

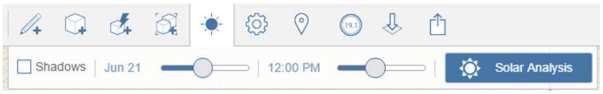
Loft

A Loft is similar to Cover. It is used for creating complex geometries based on different profiles. For example, if you have a number of different floorplate geometries and you want to create the skin between them. Loft will allow you to select the different profiles and create the connective geometry.

To perform a Loft, got to the Advanced Tools and select Loft, or press LO. First, choose the base profile and press check to confirm the selection. Continue through and select and confirm each subsequent profile. Once you have selected them, press the check to finish the selection. After a moment the new geometry should appear.

Daylighting Tools

As you work through your model, you will want to get a sense for how the building looks and performs with daylight. FormIt has these tools natively built into the program. These tools require that you have set a location. If you have not, it will default to Boulder, CO.



Shadows

If you go under the Sun and Shadows tools in the top menu, you can turn Shadows on by clicking the checkbox next to Shadows. You can then adjust the daylighting in the model by moving the sliders to pick a day of the year and the time of day. This will change the way the shadows appear.

Pro Feature – Daylight Analysis

One of the most useful of the Pro features is the Daylight Analysis tool.

1. Select the grouped geometries you want to run the analysis on.
2. In the Sun and Shadows tool in the Top menu, click Solar Analysis.
3. Wait for the model to download the weather data for the location you have set.

4. Select the mode you want to do the analysis. Monthly Peak will give you the top amounts within a given month, good for determining sun shading feasibility. Year Cumulative will give you the totals given in a year, best used for determining solar panel feasibility.
    a. If you choose the Monthly Peak, you will need to choose the month you want to analyze.
5. Select the faces you want to analyze.
6. Click Analyze and wait for the analysis to complete.
7. When finished you will see the surfaces you selected colored by a heat map. You can run your cursor over any part of the area to do a spot check to see the solar gain in that spot in K-BTUs/sqft

Pro Feature – Energy Analysis

If you have used Revit's energy analysis tools alongside Green Building Studio or similar programs like Sefaira, this will seem familiar to you. This analysis will run several iterations of your model against different energy circumstances several times over, and then generate a dashboard of information for you to review. Recently, this tool has been consolidated into Insight 360, which uses the same engines such as Solon and Energy Plus.

1. To start, select the group of geometries you want to analyze and ensure that Levels are applied to it.
2. Next make sure that you have chosen what kind of building this is in the general properties palette.
3. In the top menu bar, select Energy Analysis and then choose Generate Insight360.
4. Wait for the project to be created and for the initial iterations to run.
5. Once finished, you should be taken to the Insight 360 Project Dashboard

The Dashboard is laid out so that you will be able to see a basic view of your building with several parts and pieces

- In the Building Form window, you can see your model and interact with it. The overall USD/sqft/yr is displayed in the upper left corner and the location is displayed in the lower left corner.
- The Benchmark Comparison window compares your USD/sqft/yr against general results from EnergyPlus Cloud data. This is a quick way to see if you are on par with standard buildings of similar typology.
- Model History will list out which factors of your building are most impactful. From here, you can select the different factors and view them graphically.
- Lighitng Efficiency will show the impact of including more energy efficient lighting will have on your building's overall performance
- PV surface coverage – Shows what kind of percentages of PV will impact your building
- PV Panel % Efficiency – Shows different efficiencies of PV Panels and how impactful they will be to your building's performance
- PV Payback Limit – Shows how many years it will take for a standard PV array to pay for itself, given the coverage and efficiency of the array.
- Scenario Performance – Shows the differences in cost/sqft/yr given different iterations of you model with different types of equipment, such as windows, to show how different efficiencies will cost more or less depending on energy leak.

- Model Comparison – You can upload different iterations of your model with different orientations and layouts and get a quick view to the overall comparison between them to see which is more energy efficient.
- Cooling Loads – You can run a cooling load study on the model. The Building Form will show a heat map of where the heavier loads will be in your building.
- Solar Radiation – You can run a solar radiation and energy production study from Insight360 which will give you some different information than the analysis run from within FormIt itself, though the engines are the same. When you run this, you can select where you would place your solar cells and what kind of report to run. This will generate a calculation as to how much energy you can produce in a given time period. You can change the study settings to be get the number more specific.

Materials

Materials are inherently a part of a model these days. Before recent advancements in FormIt, I would have normally put this section under Basic Modeling. However, many of you will find that when working in a basic FormIt model, where you only have masses or other basic components, a white model works pretty well. As you get more and more put into the model and prep it for more than just showing basic massings, then you can begin to add materiality to the mode to bring it more to life.

Materials in FormIt are not so different than model materials in other programs. To access the materials currently in the model, you click on the Materials button in the right hand menu and the palette will open. Here you will see a list of pre-made materials.

Applying Materials

To apply a material, simply click on any of the available materials and a small bar will appear on it. Choose the paintbrush icon to select the material and then click the surface you wish to apply the material to.

Creating/Editing Materials

If you want to create your own materials, there are a number of options and pieces for this now built into FormIt, as of a recent update.

1. In the materials palette, click Add Material
2. Give the material a name.
3. Click on the blank Texture square to add a texture to the material. This will open up an image editor
    a. In the lower left corner, click “Load image from file.”
    b. Select the image file you want to use as a texture in the model. These can be PNG, JPG, GIF, or BMP
    c. Once the file is loaded you will see a preview of the texture as it will look tiled along the model.
    d. You can crop the image down using the four croplines in the center. This will let you specify a specific area of the image without moving it through another image editor beforehand
        i. Use the Zoom bar on the right to enlarge the image for more accurate cropping.

   e. Initially, the tiling will appear in simple rows. However, there are three options that you can use to alter the patter.
      i. 1:1 Ratio – Keeps the image in a square ratio
      ii. Mirror X – Every other column is reflected over the x axis
      iii. Mirror Y – Every other row is reflected over the y axis.
4. Click the Color box to apply a web RGB color to the material. If you added a texture, this will affect the color of that texture.
5. Click the Bump box to add a bump map. A bump map is generally a black-grey-white image that, when applied, uses the values of the black-grey-white to denote depth. This allows materials to have a rough, or bumpy, texture to them. This is useful when working with something like wood or grass textures.
6. Click the Cutout box to add a cutout map. In similar function to a bump map, a cutout map will allow you to use a black and white image to denote a pattern on a material to lessen the opacity in certain areas, or cut out. This allows for porous materials, like concrete, to come out looking better.
7. Use the opacity slide bar to change the transparency of the material. This is the basic tool used for creating glass materials.
8. Use the Reflection Direct and Opaque slide bars to affect how light hits and reflects off the material. This allows to create glossier or more matte based materials.
9. Click OK to create the material.

Once created, you can go back and edit the materials by selecting the material and clicking the Edit Icon. You can also copy materials by clicking the copy button, and then you can edit it down to make it slightly different to add variation. You can delete materials by clicking the trash icon.

Pro Feature – Importing Materials

If you want to have more robust materials, you can use the Import Materials option to bring in complex materials from the Autodesk Materials library. These will be similar to more complex materials you might have in other programs like 3DS Max and Revit.

Rendering

As of right now, there is no advanced rendering tools available in FormIt. However, by using materials and view settings, you should be able to create presentable images that are expected within Pre-Design and Schematic Design phases.

How Materials Are Organized

Materials are at first organized completely based in the overall model. However, as you click through, add materials, and apply them, you will see that when you select a material in a group, you will see that another are in the palette activates next to Samples called In Sketch. The In Sketch palette will show you where different materials have been applied, either to the Main Sketch or to individual groups. Similar to how the Undo/Redo is managed, the materials and their edited history is kept within the group itself. This also means that if you edit a material in one group, the same material will not update in another. But fear not. If you to apply a material to another group, you can click the small arrow that appears when you hover over the group organization in the material palette. This will allow you to select the geometry within that group, so you can quickly apply a new material from another group to it.

View Controls/Presentation Tools

Part of working in other modeling programs, be it Revit, SketchUp or others, is to create some kind of presentable material within the model. Here we will go over some of the visibility and view controls that incorporate what we learned about grouping in the basics.

Layers

Layers are a relatively new addition to FormIt, but those who do advanced modeling or have worked in tools like AutoCAD or Photoshop will know that they are nigh indispensable. The benefits to the model begin at organization. As you add more and more to a model, you will begin by creating groups to organize your modeled content. However, as you get more complex, layers will allow you to organize groups together so that they can be managed. When assigned to a layer, a group can be toggled on or off. This allows us to hide geometries quickly and effectively. This is ideal when creating different design options.

To add a layer to a model, simply click the Layers button on the right hand menu and click Add Layer.

Once the layer is selected, you can double-click on the name to change it from generic Layer 1 to something more descriptive so we know what is in the layer. You can add multiple layers, name them, and even drag and drop them to create a hierarchy of layers.

To add a group to a layer, click on the group and go to the Properties palette. Here you will see the Layer dropdown under Name. Assign from No Layer to a layer you have created.

Once added to a layer, you can go back to the Layers palette. Now, when you select geometries assigned to a layer, it will tell you which layer those groups are assigned to. You can then Click the arrow icon that appears to the right of the layer names to select geometries on other layers directly from this interface.

Finally, you can click the checkbox to hide the geometries on that layer, giving you quick and effective visibility controls.

View Settings/Visual Styles

Within the settings menu in the top menu bar, there are a number of options for editing how the model looks in the model space. This can be particularly useful in order to customize your modeling experience and creating presentable material.

- Edge Contrast – Change how thick the lines show in the model space. As you work towards something more presentable, you may want these lines to become thinner or even disappear.
- Silhouette Contrast – Change how dark the silhouettes of the model appear. Lower this to give the model more of a sheen to it.
- Visual Styles – These styles will allow you to customize the look of the model, but many will come at the cost of model performance.
    - High Definition – This will utilize some of the Large Model Viewer functionalities and render out materials to a more refined level. This will considerably slow down your model, but will give you good looking images and create more accurate dynamic

lighting for shadows and reflectivity. It will also smooth the model out more to give it a finished look.

- Display Ambient Shadows – Turns non-direct shadows on and off. Turn off to improve performance.
- Display Edges – Put the Edge Contrast to 0
- Display Silhouette Outlines – put the Silhouette Contrast to 0
- Display Wide lines – change lines to bold, wide lines
- Display sketchy lines – Changes lines to a rougher look.
- Display hidden lines – Shows lines hidden behind surfaces to create a wireframe view.
- Display Extended lines – Extends the lines in a model visually past their endpoint for that architectural drawing look.
- Display Grid – Turns the grid on and off.
- Display Axes – Turns the main XYZ axes display on and off
- Display North Arrow – shows a North arrow in the model space
- Display Levels – Turns Level lines on and off while maintaining the level properites.

Scenes

Scenes are a relatively new feature in FormIt. Scenes allow you to save a specific camera position and visual styles. This is useful when creating an image that captures everything just right.

1. To create a scene, first place the camera in a position you want to save.
2. Next, go to the Scenes palette in the right hand menu bar and click Create Scene.
3. Once a scene is created, you can name it and then click the arrow next to the name. Here you can select the features you want to save in the scene, Camera Position, Layers that are visible, Sun and Shadow Settings, and the Visual Styles applied to the scene. If the item is not saved, it will default to what is in the active model space.

You can use scenes to organize different options and visual styles. If you create scenes and organize them in a specific order, you can play through them in a presentation style using the Play Scenes button.

Pro Feature - Sharing Sessions

Sharing sessions are one of the first Pro features that came out and make Pro worth it by itself. Coming from inspiration from A360 Collaboration for Revit and Bluebeam Revu Sessions, FormIt can create a shared session that you can invite other users to.

1. You can start a sharing session by going to the right hand menu and clicking the Sharing Sessions icon and click Start Sharing Session
    a. This will allow you to invite users with a code or a link that you can email out to them
2. Once a user joins, you will be able to see them in the user location. You will also have access to a chat bar to send messages back and forth and get notification when someone enters or exits the session.
3. You will notice that each use has a color highlighted around them. As they enter the model, they will have the ability to work independently of the host, with all the same features the

host has. They can create and edit away. You will be able to see what they are working on, as what they select will be highlighted in the same color as their user icon is.

4. You can force their cameras to follow yours, or you can follow theirs. This adds a whole different dimension to presenting a model, and combined with Fly-through mode, will allow you to give guided walk throughs of your building.

These tools, combined with the camera controls explained in the basics of FormIt, will allow to create presentable materials and methods without needing to export to other tools, such as Powerpoint. However, should you need to, you can export FormIt in 2D to a PNG and in 3D to an OBJ or STL. These exports can go to either your local drive or to your A360 cloud drive.

Settings

Beyond view settings, you will see that there are a number of other settings listed out. These settings can be used to help customize your modeling experience.

- Snap to Grid – Turns grid snapping on and off.
- Display Dimensions – Turns the dimensions that you see when you select lines and geometries on and off.
- Units – Changes model units between imperial and metric
- Model Diagnostics – Useful tools when creating models that will be imported into other programs for visualization, further analysis, or 3D printing.
    - Display Backsurfaces – allows to see if there are any surfaces that are facing the wrong direction or if part of the inside of your model is exposed at all.
    - Display Watertight Issues – allows you to see any holes or gaps in your model that would otherwise cause issues for 3D printing or analysis.

Bringing It To Revit

One of the final pieces that brings all of FromIt 360 together and that makes it all worth it is bringing your modeled geometry into Revit to turn into fully-fledged BIM.

Bringing the model out of FormIt

FormIt will automatically save a Revit file out once you save your FormIt file. This can natively be opened in Revit. However, if for some reason you are unable to get to that file, you can download the .AXM file from FormIt and use the FormIt converter to convert geometry from the AXM to a RVT filetype.

Modeling in Revit with FormIt geometry

Once you open the Revit file, you will see that the geometries you created have been brought in as import instances of model masses, created in families that are set to the groups you created in the FormIt model. As of this training, there is not a direct translation for materials between FormIt and Revit.

Once brought in, you can use these model masses to begin defining floors by mass, walls by face, and locations for doors and windows.

With the FormIt Add-In we are also able to reload the families that we had converted into FormIt geometries. Because Revit is able to recognize FormIt groups as their own entities, this add-in can detect which ones correspond to RFA content that you used. This way, while FormIt changes geometries, we can bring in our full BIM families.

Going back and forth

After working with a model in Revit for a while, you may want to start working back and forth in programs. As of right now, most of the direction is one way, going from FormIt to Revit. However, by utilizing the reload families tools, we can go back to our FormIt models and update them, then bring the geometry in a new model, reloading the families within. We can also use some third party apps to export Revit models as OBJ or STL formats, which can be imported into FormIt.

Of course, the ideal solution would be to have synchronizations back and forth, as with programs like dRofus. There is some work going into this, and there may be ways via Dynamo or other third party tools to simulate this. However, FormIt develops rapidly, and it may be that this workflow is already under development.

Sample Project 1 : The Johnson Wax Building

In this project we will guide you through the creation of a basic model using some base drawings as guidance and then adding some advanced model detail. We will focus here mainly on model creation.

1. First, we will set our location to 1525 Howe St, Racine, WI
2. We'll skip the Import Satellite Image portion since we're building off plans
3. Import the 3 plan images
4. Scale them using a reference dimension (in this case 20' for the grid)
    a. Draw a line on the grid at the desired length (20')
    b. Align one portion of the image to an end of the line we just created
    c. Double-click on the image, then right-click and select Scale
    d. Drag the scale tool (the end without the arrows) to the aligned end of the line/grid
    e. Drag the other end of the scale tool to the end of the grid on the image
    f. Click the far arrow and drag until it snaps with the end of the line
    g. Make note of the percentage being shown so we can simply scale by that amount of the other 2 images
5. Create 3 layers for each of the images to make it easy to switch between them
6. Turn off all layers except the Ground Level and go into View Top (ZT). Start by creating rectangular surface areas for the basic building areas. Extrude up 14', triple click on the masses and assign materials.
7. Group each massing to prevent interaction and add to unique layers
8. Hide the open office layer, then go back into View Top to draw the rounded portion of the building, extrude up and add the brick material.
9. Copy the rounded massing and paste a new instance on top of the existing one. Make this new group unique.
10. Create a new material that will be glass by dropping the opacity and apply it to the new group, then reduce the height to about 4'.

11. Do this again, but keep the brick and make it 1'. Group these all together.
12. Moving to the courtyard area of the building, trace the outline of the building and parking area using arcs and lines. Once complete, extrude it up 14', group it, put it on a unique layer, and hide it.
13. Turn on the Second Floor layer and trace the interior line of the courtyard in a similar manner as the outer border. Extrude this plane up as well.
14. Using the cut tool, select the outer portion of the courtyard first, then subtract the inner portion from it.
15. Begin to draw the new elements shown on the Second Floor, extrude them, group them and move them up on be on top of the first level
16. Draw the rounded square of the tower (in the center of the courtyard) and extrude 130'. Select the solid by double-clicking and check "Use Levels."
17. Create 11 levels total, each 12' tall going all the way up the tower. Group the solid.
18. At the top of the tower, draw a rectangular surface that extends out from the face of the tower by 6", as well as 3' above the level line and 3' below the level line.
19. Using the Sweep tool, select the newly created rectangular surface as the sweep profile, then the top of the tower as the path. This will wrap our tower with a surface. Add our standard brick material.
20. Triple click on this new surface and right-click. Select array and pick "Length between 2 points" and set the number of items to 5. Move the group down 24' and the array with do the same for the rest of the items.
21. Begin to add more detail to other areas of the model, looking at balconies, staircases, and roof elements shown in images and the plans.
22. On the interior of the open office, we're going to recreate Frank Lloyd Wright's iconic columns using the loft tool and arraying them in multiple dimensions to save time.

Sample Project 2 : Kansas City Crossroads Development

In this project we will create a basic site plan and develop a model from massing to complexity, running analysis and conversion on different elements, ultimately bringing the model into Revit to simulate the pass of Pre-Design/Schematic Design to Design Development. This will focus on the BIM side of FomrIt.

1. First , we will set our location to 1640 Baltimore Avenue, Kansas City, MO
2. Take a site snapshot of a block surrounding the site to get context.
3. Once placed, place cubes for the basic buildings surrounding the site. Extrude the cubes out to roughly shape the surrounding context. Each contextual building should be grouped on its own.
4. There is a more complex building in the NW corner. Use linework, including arcs and splines, to create the footprint and extrude it out.

5. Place the site and contextual buildings on their own layer.
6. Create a basic massing block that represents the existing building, leaving room to the north for a small urban park. Make this its own group and set it on a layer. Be sure to name this group and every subsequent group for organizational purposes.
7. In the levels menu, create 4 levels, starting at 0' and increasing by 14' per level, ending at 56'.
8. In the corner on the top of the building, create an extruded 6"x6" column. Array it out to form a structural grid.
9. Next, create a series of girders to connect the columns laterally. Use an extruded cube or rectangle and array them out.
10. Create structural joists connecting the girders in a similar manner that you created the girders. Again, use arrays.
11. Create a basic solar panel on top of the joists. Angle it towards the southern exposure and array it out in a grid. Get as much coverage of the roof as possible.
12. Group the structural pieces and solar panels together and place them on their own layer.
13. On the southern face of the building, put a rectangle. On this rectangle, create the outline of a basic louver out of line work , including arcs.
14. Extrude the louvers out across the southern elevation of the building and array them down. Group them together and place them on their own layer.
15. Group the louvers, the solar panels, and the building mass together.
16. Go to the daylighting tools and turn shadows on. Position the camera so that you can see the effect of the shadows of the surrounding context on the building and of the building on the northern park. Save this camera position as a new scene.
17. Run a basic solar analysis. Look at the monthly peaks and annual cumulative. Take note of the solar potentials of the building with and without louvers and solar panels.
18. Next, run a basic energy analysis. See what factors are currently playing a major role for your building.
19. Copy out the building mass group to a separate part of the modeling area.
20. On top of the copied mass, add a railing or parapet by using the Sweep command
21. Edit the copied building mass so that it has rectangles on all faces for windows/curtain walls and entrances to the building. Set these groups to their own layers.
22. In the urban park to the north, use some small squares or circles to create basic trees using the Loft command.
23. Create a glass material using color, texture, and opacity.
24. Apply the glass material to the windows/curtain walls you created.
25. Next, import the pre-made terracotta texture and apply it to the remaining exterior of the building.
26. Select the building mass group and apply levels to the mass.
27. Hollow out the mass by offsetting the top and extruding out. Use the cover command to re-cover the top of the building
28. Add a floor mass to each level location. Take an area take-off of each floor and record them.
29. Divide the exterior into different groups with a floor and walls.
30. Copy each of the floors out and place them along in a horizontal or vertical layout.
31. Add interior walls to divide the floors into basic areas, placing the walls in their own groups and layers. Use materials to color the floors to represent different major program areas. Keep track of the areas of each space.

32. Add furniture to the floors using imported models in our A360 drive.
33. Save the model and re-run your energy and solar analysis on the more detailed model. Choose a single space in the model that shares a southfacing wall and run the solar analysis. See the comparison of these numbers.
34. Next, open your model in Revit and begin to add Revit elements such as floors by using floor by mass, walls by using model by face, and place windows and curtain walls where you had them modeled.
35. Use the update model tool, part of the FormIt converter, to update the furniture you placed in the model with actual RFAs.
36. Place doors into the model where openings make sense on each floor.
37. Now that you have a basic BIM model, run energy analysis using the Revit tools and compare the numbers to what FormIt is generating.
38. Go back into FormIt and create new scenes with different visibilities and camera positions. Edit their visual styles to give the models a finished look. Save the model.
39. Invite someone else in the room to sharing session to show what you did and see how your numbers compare.