

WILLIAM

So we're getting pretty close to 8:30. And I will start then. But I guess before we do that, I'm just kind of curious what kind of crowd we have. Could I get a show of hands of how many landscape architects there are here? And how many of you have used or are using Revit? What about of the landscape architects? So cool.

CARNEY:

So I did put this together. And it's Revit and Dynamo for Landscape Architecture. So I do want to focus on both softwares. And unfortunately, we're looking at an entire discipline of works. So we'll go pretty quick. I'm going to hit a lot of different topics.

But I guess, how many people want me to focus harder on the Dynamo stuff versus the Revit stuff? So let's see-- show of hands for Dynamo. And a show of hands for Revit.

So we are 50-50.

[LAUGHTER]

Perfect. No. And that's good. I've got a good spread of examples for both. So we are going to look at both. I think that Dynamo makes the workflow with Revit work. So I do think that they go hand-in-hand.

Otherwise, I think it's marginally better with Revit than it is with your typical CAD workflow. So I think you really do have to look at the two together.

That said, it's 8:30. So I'm going to go ahead and get started. Well, a couple people are coming in. Welcome. Thank you, everybody, for coming to the first class after the AU after party. We all look great.

So that's fun. My name is William Carney. I'm the BIM director of BSA LifeStructures. And we're here to talk about Revit and Dynamo for landscape architecture.

I'm really excited about this. This is my first day AU speaking. It should be a lot of fun. Feel free-- stop me with questions if you have them. I did mention we're hitting a lot because we're doing two software platforms and an entire discipline of work.

So I'm going to try to roll through. I will go fairly quick. And what I want everybody to get out of it is really how you can utilize Revit, how you can utilize Dynamo-- not how to pick and click

and do the actual work inside of there, but what features you can use and take back from this class.

The handout goes deeper into the actual pics and clicks on how to. So it is posted. Please download it. I've also posted all of the workspaces from Dynamo and all the custom nodes that I have. And again, the handout goes through step by step what the information is and how you can use that.

At the end of this class, you should know a lot more about how Revit can help you for landscape architecture and how Dynamo can help improve those workflows inside of Revit to use for landscape architects. And then also, I want to make sure that we understand how the BIM database-- so the information behind the model-- can be utilized in your design and documentation, and then really, just become more comfortable with the idea of using Revit.

So a little bit about me-- I mentioned I'm the BIM director of BSA LifeStructures. We're a multi-discipline A&E design firm. We have pretty much every discipline except for structural. So don't let the name fool you. I've never understood that. It gets me every time.

But we do have civil engineers and we have architects in house. Myself-- I'm architectural by background. But I started using Revit in 2004. And I've done a ton of different project types and a lot of 3D modeling with site work. So it really helped me work with our landscape architects on how we can do this.

Outside of that, I'm a committee member for the St. Louis Revit user group-- we got a few people in the front from there-- something I'm very proud of. I love working with it and helping the St. Louis community.

I'm also one of the site moderators for the LinkedIn group, the Revit Users. It was established by Brian Myers. That's another one I'm really proud of. If you're not a member of that group, I suggest going in and joining.

What we've tried to do is keep all the advertisement outs and the self-promoting blogs out and let it just be a spot to just share ideas and ask questions. So it's a really good resource. And we've got well over 90,000 people on there. So please sign up.

And then also, I live in St. Louis with my wife, Liz. And I've got an eight-month-old son, Hank, this year, and my Greyhound, Helen.

So I'm going to sit down because I'm going to jump in and out between PowerPoint and Revit and Dynamo. So I'm going to need both hands.

But the question I've been getting a ton is why am I presenting on this. Why is an architect talking about landscape architecture? When I started at BSA LifeStructures, I made a point to go around to all of our different offices, meet with all of our disciplines and all the people within those disciplines to see where we're at and what we do well and what we could improve on.

In meeting with our Civil group, they're really tech-savvy and were asking me about using Revit for Civil. We kind of said, no. Civil 3D seems to be way better for that.

But in meeting with the landscape architects, we started looking at what we do and how we do it. And what we're doing is drawing our plans in AutoCAD. So we draw the trees. We lay out the site.

And then we still have to present it. So they're taking it, going into SketchUp, and modeling that for presentations, and then also exporting to Photoshop to pretty up the site plan, all for the presentation documents. That gave us three different locations of things that needed to be updated.

And basically, you're chasing your tail throughout the whole project. And you're working three times. Revit seemed to be a pretty good fit based on that.

So we started looking at it and talking about, how can Revit benefit us? So the three initial things that I thought of are the database. So whatever we put in, we're able to use that information for our cost, our quantity, and our data.

Families-- we could quickly and easily specify different looks for the families. And then just generally, the visible graphics-- we were able to do a lot more of these presentation diagrams. And I'll show some of this as we go through.

I always talk about the database. It's probably too much. But I think it's really important. Revit is a BIM offering software. It isn't BIM. BIM isn't Revit. But Revit writes BIM models.

And a BIM model's a 3D representation of a database. And anybody have a good definition of a database that they like to share? No? Cool. Even better.

The analogy I always give is a file cabinet of employee records. So by definition, a database is

an organized collection of related information. So I say that a file cabinet of an employee records is a database of everything about your different employees. Each folder stores information about that particular employee.

Now, looking at it in terms of Revit and BIM, each one of those folders would be a category inside of your file. So there's a folder for your plants. There's a folder for your typography, a folder for your walls. And all the information about those gets stored in those folders. And we can access that inside of Revit.

So what does that mean? It means one source of truth. So we're able to display the same information-- multiple drawings, multiple times, multiple schedules, and multiple locations-- and use that information.

So families-- families are kind of like blocks in AutoCAD. You can specify what that item's going to look like. Where they're better inside of Revit is we can have a group of common parameters and then a group of families that are called type.

So you could have one that's just a conifer for a tree. And then you could have the different types of trees within that. So here, what I'm doing-- we're able to specify how that family looks in plan, elevation, and 3D at the three different detail levels.

So we can specify whether it looks with just a circle in a coarse detail level, which you'd use for your documentation. You can have a prettier graphic. You saw the tree that was just up there-- so same family here. I'm just changing how it looks.

So this allows us to do our presentation drawings. It allows us to do our construction document drawings and then some schematic diagramming-- really powerful feature of Revit.

I wince every time I hear the term "I hate line weights in Revit" or "line weights in Revit suck." To me, it-- Revit offers you so many opportunities to control the different line weights for the whole model as a whole, the individual views, and then the individual items within those views.

So what I'm going to do is I'm going to jump into Revit here. And this is just a blank project template. First, I'm just going to look at the database. So if I go and I place families, you can see down here we have a schedule.

So I just placed six trees. We see what type of tree we. See the mark of it. If I go and I place another type of tree-- so I place three of those-- you can see our schedule updates with the

different types of trees.

The schedule's kind of that window into the database. So we're able to add whatever information we've stored with those different families. And we can sort and organize it however we want.

So here, I've got ornamental trees as a type and evergreen trees. So what I can do is sort by that parameter. I may give it a header. I'm going to then sort by type mark, make that hidden.

And so now we're able to group the information by how we want to. So we can make it more organized, more scheduled. But it's not just that. We have the counts. And so if we store information like the cost of the plant itself, just there right now, we're saying that this tree cost \$300 each.

But we can also say that we want to have that cost show the total cost. So all six of these now costs \$1,800. Where Revit's fantastic is we can take that a little bit further. And we can do formulas based on those, the cost information.

So let's say that we have a marked up cost. So for this, I'm just going to call it Marked Up Cost. And I'm going to pick Currency. I'm going to say cost times 1.5. So we're going to mark it up 25%.

Here, I'm going to not calculate the total. And then this one, I'm going to calculate the total. So now what I have is I can show the unit cost of that particular tree. And I can show this marked up formula of that costs.

The other thing with it-- so that's working just seeing the data. But we can use our tags. And tags allow us to display that data in our drawing. So same information that we're showing inside of the schedule, we're able to show out onto our drawing. So I'm just going to hit Tag All. And I give it a liter.

And so now I'm able to tag it and see which types of drawings are on our trees. We have two separate families. So these families are showing differently by symbols. This is a conifer. And this is a deciduous tree.

So we're able to display those differently. And that becomes the symbol that we use. Even though these are-- we can have multiple of types of these trees, I can click on this tree. And let's say that we have to change this name to PICB.

You can see that that changes all of the trees that are tagged at the same time. This is that database working for you. But it also changes it in our schedule. And what's nice is Revit lets us change this information in a ton of different locations.

So if I change it here in the schedule and I go back to our drawing, you can see that all these edited-- same thing here. I can click and edit information about this particular tree. I'm going to change that to a D. And I'm going to change the cost while I'm in here.

So I'm going to say that this one costs \$400. I hit OK. And we go back to our schedule. And our unit costs changed. Our total costs changed. And still, we're coordinated with what that mark is.

So our documents are coordinated with what we schedule. We can show a pretty much limitless number of views and show this information and not worry about whether or not it's correct. And that's the reason I originally switched and started using Revit-- is I got sick of coordinating just elevation views in section because the information's tied to the database.

So taking it a little bit further, these tags-- they're just labels. And all we're doing is saying what parameter we want to show. So they're not limited to what you have out of the box.

You can come in and you can put-- so for this one, I'm going to put that type comments where we had the evergreen tree in there. And we can draw lines to make it display however we want. So this-- I'm just deleting that box that was in there.

And now we're displaying that evergreen tree and the information that we're sorting by. So you can do different types of information if you're doing types of drawings. So a schematic package-- you may not care exactly what the mark is. You may care more of what type of tree it may be-- and same thing with this.

I can change this to pine. And now I come over here. And this header does change. So it's all reading the information. And that's the entire point of it.

Now what I'm going to do is close this. Here we have three different views of the same area. And what I'm going to do is just kind of show a little bit of how Visibility Graphics can be used to control the view and look of your file.

So you can go to the Manage tab. And under Object Styles, we can come down to Planting. And what I'm going to do is I'm just going to make all of our trees green. So hit OK. And you

can see all three views at the same time.

Did they? Maybe. What did I click? I clicked on the wrong one. Let's give that thicker line. There. Sorry about that.

But now you can see in all three of these views, those trees show up as green. However, we can come into an individual view. And they have Visibility Graphics. What this allows us to do is override those object styles for this particular view. So I'm going to come down to our plants.

And I'm going to give this tree a green solid fill. So we're going to make them look colored as if we were doing that in Photoshop. And I'm going to change this outline, instead of the green that we have, to black. No. Wait a minute. There we go.

So now you can see all of these trees in this view are green with a black outline, where I didn't affect any of these other views-- same thing as far as control and ability to change the information how you want to show it. You can select a number of these trees, right-click, and overwrite graphics and view by element.

And for these selected trees, I'm able to control further how we want to do. So I'm going to make them obnoxiously magenta. And we're just going to not give them a pattern. So now you can see there's no pattern.

So this lets us control how those individual objects look. If that's still not enough for you, there is the Line Weight Override tool, which allows you to pick individual lines inside of these families and override how they look. Most often, what I use this for is if parts of the architectural building are showing up that I really don't want to show, you can click on Invisible Line and hide those individual lines.

But that's just hiding them. You can also override how they want to look. So if you want to emphasize something to show it differently than it does, you can dash a line just simply by picking that individual line.

So that level of control really lets you set your drawing however you want. And you're not affecting other drawings. It's that particular individual view. The one thing else with Visibility Graphics-- it takes that even further-- are filters.

So the filters allow you to create rules and criteria for pieces of a certain category. So we're able to pick-- for this one, I picked Planting. What we wanted to do is show all of our perennials

as halftone-- so a little bit lighter-- so that they showed up differently than our trees and our trees really punch out on the site.

So what I did is you can pick any parameter you want to. I picked the family name. And you can do these-- the different conditions. So you can do equals, doesn't equal, less than, greater than.

And so I just said any family name that does not contain the word tree. And so I'm going to add that on here. And then I can make all of those show up halftone.

So here, you can come down and you could see that all of the smaller plants on my site show up halftone, where the larger trees stick out in our construction document. So you can start controlling the information based on criteria that you decide.

So a really good example would be the trees diameter. So you can say any tree that has a diameter greater than 10 feet, I want to show up thicker or a height of 50 feet-- I want that to show up darker. So that can start punching out and you can make three-dimensional drawings and a look within your documents.

Once you have all of the graphics set up the way you would like them to look, what we can do are make things called view templates. So view templates allow you to set all of the different-- or define the Visibility Graphics of the view and reuse that over and over for different views.

So if you have a typical look for your planting diagrams or seeding diagrams, you can set that up. What I've done here is I made one for fall colors. So I stored information. And I'm just going to go to Filters here.

I stored information inside of the families for their fall color. So what I could do here is say that any plant category whose fall color parameter equals purple, I can override how that looks.

So what I did is I picked colors that I like and made them solid fill. So now when I apply this view template to our view, we have a nice range of waterfall-colored diagram. And what this allows-- I typically use this for coordinated information. So the big one is if something requires electrical plumbing, I'll make it show breads up red so if somebody's just graphically coordinating what's in there-- but this allows you to see your site differently.

So you can see maybe I didn't realize I had this cluster in green in the front and I wanted it to look prettier in the fall. So I can see different information. Rather than just guessing and

coordinating, I can just graphically look at it. And that's some of the power with Revit.

And I'm going to real quick start this off in Dynamo. Hang on a second. I'm only doing this because it takes a minute to do. And then I'm going to talk about Dynamo. Well, let's run it.

But here, I'm just going to select everything in our view. And let's go back to PowerPoint. So how can Dynamo help a landscape architect?

You should use Dynamo to do what Revit cannot. There are a lot of times where I get way too carried away using Dynamo. And I do things that are-- I'll do one that was just auto-tag everything in the view. You saw the Tag All button earlier. We don't need that.

So you can go a little crazy with it. But the biggest things it is great at are connecting to external information, performing tedious tasks, and then performing actions based on calculations.

So looking at that a little bit further, this one is a really fantastic example. A simple example of connecting the external information would be reading an Excel file.

But this-- Timothy Logan with HKS put together a package of nodes called Elk nodes. And what they allow you to do is go to GIS sites. So this one is openstreetmap.org.

You can select an area and export out an OSM file. What that OSM file-- is basically in XML file. And Dynamo can read pretty much any file format that's rows and columns. So like an Excel file, there's rows and columns. Databases are rows and columns.

So what it can do is write to rows and columns as well. So we can start connecting to anything-- so an XML file, like what's going to come out of here-- we can use Dynamo to read that file, read the information in the file, and then push that into Revit.

So what this does here-- and it'll take just a second. So here, I pulled in all the line works and roads of the area that I selected on OpenStreetMap. And that can go directly into Revit, you can use those to make your floors, or topography, whatever you really need to. These files contain building outlines, building heights, floors, topography, all sorts of information. So this just kind of the power of it. If you want to learn more, search for Timothy Logan HKS Vimeo elk nodes, he's got a couple of videos on Vimeo that walk you through step-by-step how to do this.

The bigger one, and what I said to run in Dynamo, is the very first thing that we identified with the landscape architects, of what we want to do with-- or what we needed to do with Dynamo. When we draw our landscape designs, we lay out a bunch of trees, and then when we document them, we draw lines connecting all those trees. While we're doing that, we're counting lines, and we say how many trees are in that chain of lines, and what types of trees those are. This is miserable in Revit. I mean, there's a little bit-- you can select trees and find out how many trees you selected, but it's pretty bad. However, in Dynamo, this is really easy. So I'm just going to jump back to it. In that time I was talking, we've annotated our whole drawing. And what we did is I selected everything in our view. And I'm just going to make this bigger. Can you see? OK good.

So what we did is we filtered out everything that we selected for just the plants. And then what I did is sorted all of the plants by the type of plant. So here we've got a nice list of our different types of plants. I used the family instance location node to find the center point of each one of those plants. And what I do is use that point to draw lines connecting to individual-- to the different lists of plants. So you can do a line by start point and end point. And so what I did is I took that list, I remove the first one from one list and I remove the last one from the same list. So I had a start point and end point, and I connected those as a chain of trees.

Now this one is a custom node, and it is included. But what I allowed you to do-- let's say we had an oak tree here and an oak tree here. We probably don't want a line drawing across, our documents going to look like spaghetti. It's just going to be horrible. So what I did is set it in that we can specify a maximum length of that line. So I said anything over 50 feet, I don't want to connect that in a chain. So what I've done with that is spread this, or sorted of this by groups of continuous chains of trees with our exceeding 50 feet from each other. Then I draw a line in our document to actually show the trees chained.

I take the count of the number of trees in that list, and I put that-- and that would be here-- I put that into a shared parameter called plant count. So then I can take the first tree in that chain of trees and tag it. But also, doing that, I needed to tag the other trees in our site. So what I did is took all of the other trees that weren't in a chain and tagged those. So what you end up with are lines connecting similar types of trees, and the numbers of those trees. And so you can see they run along, there's five of these trees here. There's one of this tree here. And there's cleanup on this, but that saves a ton of time, as far as your drawing goes. I mean these are connecting-- I'm not drawing, I'm just letting it process and do the information. And that's

how Dynamo can really start to extend what you're doing.

So I'm going to close that, open this one, and let's jump back here real quick. OK, so this is one of our projects, we had a requirement to place one tree per every 20 parking spots. I mentioned earlier that Dynamo can perform actions based on the calculations. We showed how we could calculate the costs, and do a marked up costs. We can do that stuff in Revit, but what Dynamo can do is take our calculations, and actually do something based on that. So what this workspace is going to do is find all of the parking spots that we have in our site, and divide that number by 20, and round it up. So we have the number of trees that we need, and it's just going to create a list of points to place those trees, because this is just a simple example. But then we're going to place the trees based on how many parking spaces we have.

So here, I'm going to bring this over here. So in Revit I've drawn 40 parking spaces. So if I hit run, you can see two trees show up. Now if I change-- Dynamo has manual mode and automatic mode. So manual mode, you can click run, it's going to do what you want it to do. Automatic mode, it sits there and just listens and waits for a change, and then it does whatever you told it to do based on that change. So something like this, I can be working and let Dynamo work in the background, making the number of trees I need, while I'm just laying out parking spaces. And it watches for changes inside a Dynamo, as well as inside of Revit.

So if I change the required number of plants to 10 spaces, you can see that four show up. Or if I change the number of spaces inside of our model, you can see that more trees show up. And it's not just adding them, it's watching and reacting. So if I were to remove a bunch of these spaces, let's see. You can see the number of trees also changes as that goes along. And I'm just hitting the undo button, and it's still reacting to my number of parking spots. So that to me is pretty awesome, and it allows you to kind of step into what computational design is. Letting the computer do the work for you while you're working.

OK, so topography. I'm going to loosely show some stuff. Topography tools in Revit are mediocre. They're OK, but even if you look at AutoDesk, they're supporting Civil 3D, and looking more at ways of connecting that information inside of Revit. So, yeah?

AUDIENCE: Do you have much experience with inside the [INAUDIBLE]

WILLIAM I have tried them and I hated them. Yeah, anybody else tried site-- the question was have I
CARNEY: had any experience with site designer. It's a plug-in for Revit, and it's geared towards doing

site work. It's really clunky, it's not intuitive, it's slow. I loved the concept, I loved where they're going, I liked seeing those features, but I just don't see the value there. So I don't recommend it, but by all means try it. Great question.

AUDIENCE: [INAUDIBLE]

WILLIAM Yeah

CARNEY:

AUDIENCE: [INAUDIBLE]

WILLIAM It's really slow. But, so when you are doing your site, there's two main methods that people use. Some people use floors, some people use topography. The things that I always go is, identify what is required for your project. Are you using Revit because you just want to do your documenting faster? Or are you using Revit because it's a requirement by the owner or the architect on the project, and you have to have coordinated exact elevations? Because still, if we're just looking at doing something a little better than we are, if you're using a flat floor with that site, you're still capturing the database as you work. So it's not all lost. And also review the site conditions. So if it's a vastly sloping site, using floors is going to be kind of horrible, and it's not going to look right. Where the topography is going to do that work a lot better.

And then also look at the flow of information. So where is it coming? Who's editing the topography on your project? Is it you? Is it the Civil Engineer? That's going to make your decision a lot easier, because once you have that information, then you pick the easiest method that's going to work with that criteria. And that's how you should do your topography. Some of these are just repeats of what I just said. The big one down in the bottom left though, also ask what information do you have to start from? Do you have two dimensional CAD work? Do you have 3D CAD with Civil 3D? Is it just a picture, or nothing at all? If you have nothing at all on a picture, then I recommend doing something like what we showed with the OSM example from OpenStreetMap. Import from somewhere else, because it's just going to waste a lot of time drawing over.

2D CAD, you can move the contours up three dimensionally, and link that into your model, and use that to generate your topography pretty quickly. They're just a couple of things to keep in mind, but generally if you have your flat site, decide whether what you want to use floor slabs with offsets for the different materials, or if you want to use topography with subregions. The big thing about the topography with subregions is there's no definition as far as the material

and structure. And I'll show a couple of examples with that.

Sloping site, to me it's kind of a no-brainer of using topography, but I will show an example of using floor slabs over topography because there's something kind of fantastic when that starts to happen. So let's just jump into Revit and get out of PowerPoint here. I'm going to close this.

AUDIENCE: We have a question.

WILLIAM Yeah.

CARNEY:

AUDIENCE: What about using roofs for exposing topography, is that something you'll be touching on?

WILLIAM Roofs?

CARNEY:

AUDIENCE: Yeah.

WILLIAM So roofs are basically the same feature as floors. Just there's a couple weird limitations with

CARNEY: them, you can do more with floors. So, yeah, same thing. Yeah, you definitely can. I'd go floors, because you can host more things to floors and you can roofs. But pretty much the same workflow.

AUDIENCE: There's also a [INAUDIBLE]

WILLIAM Yeah, that's a good point. Yes, so roofs, when you draw roof, it starts from the level that you

CARNEY: draw it on and builds upwards. When you draw a floor, it builds downwards. So they're really similar, there's slight little quirks.

What we've got on the screen are three different made sites. This one is topography. You can see the category over here. And then this, inside, is a subregion. So when we draw subregions, you just go on the masking and site tab, and you click on subregion. And you just draw an area of what you want, click finish, give it a material. This warning comes up, and is something I wanted to point out. You can see this is topography, topography, topography, floor, floor, floor, topography does not support surface patterns. I have no clue why, but it's something to be aware of, because a lot of times with our site designs we like to show areas.

So we'll so show different types of grasses, we'll show mulch, or the planter beds themselves.

Topography doesn't show a pattern, where a floor does. So that's a key difference to be aware of. Also when you look at it in section. This section is cut through where that sidewalk is, and all we're seeing is earth. There is no structure, no definition. I can select it, it's there. But it's not showing what makes up that floor. Where if I come to the section with the floor slab, you can see that structure. You can see our compacted gravel or concrete, and then that earth around it. So you can start detailing a little bit better.

Another thing to kind of be aware of is in 3D, when you look at these, there's no definition between this. It is adjacent with the surface next to it. Where a floor you can set it-- I'm just gonna make this three inches, just so it's exaggerated a little.

AUDIENCE: [INAUDIBLE]

WILLIAM What's that?

CARNEY:

AUDIENCE: [INAUDIBLE]

WILLIAM Yeah. Yeah, you could. Yeah, definitely. But yeah, so this is moving up and down. And we did
CARNEY: just mention that you can use the building pad feature. There are some limitations with that, as far as adjacent surfaces go. I've traditionally stayed away from it. One thing I do have to admit, in setting this up I was-- always my whole career, I'd stayed away from subregions, because early on they would delete when I would update my topography, and move it up and down. It doesn't, so that was news to me. But yeah, so if I edit my topography, I'm just going to add 10 feet.

Let's not do that.

And I'm gonna go to 20. And this is making topography by placing points, which is why I don't recommend this. It's kind of slow. However, we go to 3D, that site I was editing. And you could see that these subregions do edit and go along with it. Where if I were to edit this one with the floor inside of it-- let's place those same points-- you can see the floor does not go with it. So I had to edit something twice. Yes sir.

AUDIENCE: [INAUDIBLE] it hard to add-on from the exchange to match that out [INAUDIBLE]

WILLIAM We'll show one. Yep, correct. But we can edit the sub-elements of this floor. So I can say that

CARNEY:

this is about 30 feet. But this is a little slow, and a little bit clunky. And also you're editing multiple times, and so if I go back, you can see that that's moving the floor with it. So if you're doing that, I recommend going into a Dynamo. So what you can do, here we have that same site, it's sloping, we have a sub region. When I drew the subregion, and I was drawing the lines, that is what's called sketch mode.

You use sketch mode to make filled regions, floors, roofs, subregions, and a few other things. We can use Dynamo to collect that sketch. So what I'm going to do is open Dynamo. Let's see, is this-- I don't think that's even the right project. That's like, oh sorry, wrong button. Yeah, so I can use-- real quick jump in that-- to make a floor based on the subregion. So what this is doing is using the element sketch collector, and it gets those lines that I used, and I can use those same lines to make a floor. So all I have to do is hit select, I can pick this boundary, and hit run. And that what we have is a floor. But what I want to do is make that floor follow with our topography.

So there's another workspace in here. This one, I can select our site, I can select our floor, and I'm gonna hit run. And when this is going to do is find the lines of that sketch, divide those into equal points, and then move those points up to where they intersect with our site. So now, what we have is a floor that's actually following along our site. So we can cut that in section, we can host things to it, we can do a lot more with that. Which is really fantastic.

You can see it's not perfect, you can see a little bit here of glitchiness where the site's poking through, but it's still pretty good. So I'm going to come back to this, but I do want to show some stuff for modeling curbs, and some kind of advantages, disadvantages.

So here we've got two different methods of modeling a curb cut. I use slab edges to model curbs, and what a slab edge is, is you can select a profile, which is the section cut of whatever you want to draw. So you draw the section cut of what your curb would look like, then you pick what material it is. And just like the play-doh press, Revit will extrude that material around whatever line you select.

So over here we've got a floor, and because I'm using floors for some of my topography, I can do this. So I'm gonna go on the architecture tab, I'm gonna go to floor, and then slab edge. And here, you we can pick our profiles or whatever we draw in section, and then our material. And then wherever we click, it's going to extrude that shape. So pretty quick and easy, you get hit tab, and select multiple areas at once, which I really like.

And then looking at the actual curb cut, where this floor needs to slope down in order for somebody to actually move across it. This method I use the shape editing tools, which is similar to how we just edited that topography. They're the floor to follow the topography. And then this one, I used a family loaded in, that's going to cut the floor. And there's two major differences that I do want to show with this.

But as far as editing this goes, I can click on my floor and I can modify elements. And what that is, is I can add points. So I can draw lines, I can draw points, that I can control the elevation of this item. So I can draw a line across here, and draw another one across here, one more here, and then I can modify the elevations on those. So this signifies a change in the surface of my floor.

So what I'm gonna do is say that this is negative six inches also. And then I'm gonna say it's going to curve up a little bit. And now when I go back into 3D and look at this, you can see that that floor slab is sloping. The other method of placing a family, you can see I just placed that family, and it's cutting my slab. So if I come here, I can align it, move it to whatever size. I can embed annotations in it. So like this, I just put an arrow inside of it, because it's family, I can define different information about it.

Big problem with this one, I find this a lot faster for visualization, than I do actually detailing your drawing. Because when you look at it in section, it's cutting the floor slab, so it's cutting out that portion of concrete. I don't think we pour concrete to be that thin. Where if we look at the other one over here, where we edited that slab, you can see the concrete and the base underneath it does slope. So you've got to look at how you would actually build something, if you were using these sorts of methods.

The pro of using the family is it's quick. It's click, put it where you need to go. You can do that over and over again. And it updates when you edit the family. This one is a lot more correct. And the reason this does work this way, is in the structure of the floor, you can check box variable or not. And you can see that this floor slopes with the edited information that's in there. So right now there'd be no concrete, just gravel exposed, in the way that I built this. So just something to be aware of.

The other thing that can be really tricky with Revit are the surface materials. So if we are using floors, and here we've got sidewalks, so we've got a reveal that goes around. This is considered one continuous surface, but yet we turn here-- if I rotate this surface, or if I rotate

the pattern, it rotates the whole thing. Which we don't want.

So what we need to do is split up this face. So from the modified tab, we can use the split face tool, pick our floor, and we can draw lines where we want to split that pattern. And I click finish. Now what we can do is click on the lines, and if I rotate this, now I'm perpendicular to this area. I can move these control joints around to where I would want them to actually be. Same with this one. So it lets you control the overall site and the repeating pattern. And this also renders that way if you set it up correctly.

Curves are a bit trickier, because there's a lot of them. So I just wanted to show this, kind of my method of doing it. But I'll draw basically a drafting line or a layout line, and I'll array it around at those points where I want to break the pattern. I'm not going to make you sit through all of it, but we can click array. You can do a straight array, which does just repeating in a straight line, or a radial array. And that will go around a certain point. So what I can do is specify 15 of these. I'm gonna say I want that the last, and that's gonna spread that array all the way around.

Now I have the different spots along my path that I want to split this line. So all I have to do is go to the split face tool, and trace over these lines. It's not great, I am gonna look at using Dynamo for this, I just haven't set anything up yet. But now we can control the pattern within those spaces. So if I use the align tool, I can pick our spot. And now you can see the actual pattern of our sidewalk starting to adjust. One thing you may notice is that this grasp pattern is going through our floor. If you are using floor as a model, there's a lot of ways you can do it. One common thing that I've seen done are people will draw out the area exactly how it is, and trim it up to where the different materials show. When I click finish, you can see that pattern's not extending. The problem with this is that this floor updates if we change the path of the sidewalk, then I've got to change two things at once, which I kind of hate.

So what am I to do instead is use the join tool. And this is a weird statement to say, but the join tool will cut the floor out of the other floor. Logically, I just can't get around it. But what we're going to do is click on our sidewalk, and then we're going to click on our site, and you can see that that pattern no longer extends through it. If I were to change this, the floor updates, because they're joined together. They're inter-relational. Or I don't know if that's a word.

But going back to our Dynamo floor, and this is new as of this year, railings can host the floors. So what we can do is draw a railing, and you can see that railing's going below of that. And I'm

gonna switch that back. Another example of that variable floor, it stayed where it was. But now I can click on this railing, and I can pick a host. So I can pick the floor, and now we have a railing that is following along our site. The thing about railings is similar to that curb suite, we're able to pick a profile and it's going to sweep it along the path. So if we're using a railing with this sweeping floor here, I can come in and I can make a rail that is with-- and I just made a wedge curb profile. Put it at zero for the height. And now if you look, I've got a curb running along my sloping sidewalk really quickly. We can do a lot with that. They also have balusters, so railings have a continuous sweep, and then they have a repeating pattern of family. So we can nest another family inside of a baluster. And what that would do is something like a light bollard, we could put into a nested family.

This is a big warning, these don't schedule, they don't tag that well without work arounds. So I recommend this for visualization purposes only, if you have to do a quick rendering, this is a really fast way to get things down and out. However, if you're documenting off of it, you're not getting those accurate costs. But-- yes sir?

AUDIENCE: Do you use Revit for fencing? [INAUDIBLE]

**WILLIAM
CARNEY:** We will get-- Well, I don't cover fencing. I-- site fencing, there is a great post that Marcelo does. And you can use Revit to trace lines, split them up, place families at points, and do everything you would want to while following the site. That's the better method, because site-- or the railing future has a limit to the number of posts that you can put. Which on a large site, it never makes it around. And the time is just terrible. So you can, I just don't recommend it. Good question.

So yeah, here, I'm going to pick this light bollard family. And I'm gonna hit OK. And now we have light bollards repeating all the way along our path. We can specify the offset from that line. So here we're offset four feet, I'm gonna go ahead and just duplicate it. And I'm going to make this one negative two. And so there we've got light bollards rolling around. And I did one more where we set in trees, so really quickly, we're able to do some graphic stuff. I really don't recommend it for your documents though. So now we've got our trees running along our site, equally spaced, however we wanted them to.

I'm gonna close this. And I'm gonna jump to that, and skip through these.

OK, so similar to your question on the site for the fencing, we can use Dynamo to place families along a line. So we're going to look at a couple of things. We're going to look at

placing families along a single line, offsetting that line, and then placing families with a repeating pattern along that line. What that does is we can do a row of evenly spaced trees, posts, bollards, whatever we want to. And then the offset lets us do coordinated rows of plants. And then we can put multiple patterns of those plants along the lines. I'm just gonna jump into Revit, and I'm gonna open-- let's see-- that one.

So here what we're doing is we're selecting that line, and we're going to find its overall length, and divide it by that length, so we get the number of plants that we want to place along that line. Then we're going to take those points, and we're going to project them up to where they hit with the topography, and we're gonna place the plants along the line at those points. So if I select our line and hit run. Don't freeze up on me. OK, so we now have plants evenly spaced along this line, following our topography. We can change to automatic mode. So if you're trying to design with this, you can-- I broke it. Yeah, that was bound to happen =. But we can change this and let it update as we work.

I'm gonna close that. Let's hope we don't keep getting that. Close that one while we're at it. OK, I open Dynamo again. Any questions while I'm in here, while we're waiting? Yes?

AUDIENCE:

Can I mention that from an architect's point-of-view, when you're using these alternate methods, that you may bring in a shared parameter. Because as we start collaborating and using this information, especially in other applications, such as NavSource. We can start to filter out and catch things, your floors are coming across as floors. So a shared parameter allows us to deal with subfilters. So that we're not scheduling or pulling those materials into architectural projects or [INAUDIBLE] projects.

**WILLIAM
CARNEY:**

Perfect. Yeah, so I broke it. I'm going to just go through the slides on these, because we are running out of time. But here what we can do, similar to placing those plants along the lines, we can use the offset tool. Which is curve offset. And we can create two lines, we can find the amount of spaces. Because if you're doing a sweeping line, it's not the same length, but you do want repeating pattern of plants. So you're not necessarily spacing at that spacing, you're spacing by the number in between the others. So you find the number of plants that goes along the first line, and use that same number for the second line.

Placing plants in patterns is fairly easy, you can use the same stuff that we were looking at there. But we create a list of plants, or the family that we would want, and then we repeat that list by the number of points that we would have. So we have a list of three trees here, and then

we can create two lists of those trees and stacked them on top of each other. And create a list of six trees that we need to place, and that's going to place them in the pattern you want along your plant line.

Let's see if we can get that to work. I may have pushed this past its limit, but we'll find out. So let's look at this one here. So down here, we're picking three different trees. And we're using the list join, which is going to make a list of those three trees. So I'm gonna click run. Yeah, hold your breath, let's see if this works. Hooray! Yeah. Everybody go home. And now we've got our repeating plants. Which then we can start really doing more with this stuff. Taking that further-- and I'm just going to skip out of the lines here.

We can also place things within the regions. So this is just a field region, it's a hatch pattern area. We can use Dynamo. And I'm just going to run this, let's see. Plants by region. So what I can do with this is select our area, select the topography, hit run, and run away. While we're doing that, so we're talking about placing plants along lines. There's a lot of ways that we can get lines from Revit using Dynamo. So we can select edges, which will be like the outside edge of those floors that we've been working with. You can select face, so that's any plane. So like how we edited the floor slab for the sidewalk, we can get the whole boundary of that area using the surface perimeter curve. So that gets us lines again. Or, and you've seen a few times with that springs, collector, element, sketch. And all these get lines that we can use to place things on those patterns that we're showing with the lines. So that's where Dynamo can really take this kind of far.

But also the filled region, which is running in the background. What we can do is use the bounding box by geometry node, and what that does is creates a cube around the area that we've selected. And that cube gives us the overall length and width of the area. And so we can divide that by plant spacing, and use the surface divide node to create an even grid of all these points. And then we can use the geometry does intersect to find those points, shown in red, where we would want to place the plants. And we've got a list of the points where we want to place these plants, and we just use the family instance at point node to place all the plants equally spaced through our area.

I'm gonna jump back and check on it. And you can see, we have all of our plants evenly spaced throughout here. Yes, sir?

AUDIENCE: Could you use that method to sort of generate a random point of [INAUDIBLE]

**WILLIAM
CARNEY:**

Yes. Yep. Yeah, there's a great posting on landarchbim.org, where it talks about doing it for forests. And you can do randomized rotation, height, and trees. You can specify percentages that you want to put in there. So you can take it pretty far. The example I'm to show here is using it for a planter bed. And let's hope we don't break it, but I'm gonna go ahead and make a real quick subregion. And I'm going to give this a category of mulch. Yeah, got it. Close this.

We're going to make a floor under there, and make that floor follow topography. I did do a little something different, I'm making the floor from subregion here. And I open the old one. Hang on. So what this one's doing is reading the material of the floor, so I made that-- or of the subregion. I made that mulch, and then it's going to find the floor type by that name. So we're going to create a floor called mulch, and we're gonna make that floor from here.

So I'm gonna go ahead and select our region, and I hit run. Then I'm going to open our topography. And I'm just going to go to 3D here so you can see what's different on this one. OK so there's our planter. Let's get rid of this guy. And there's our floor. So I'm gonna use Dynamo. I'm gonna select topography, I'm gonna select the floor, and I'm gonna hit run.

What this one does differently, is that it pulls all the points of our floor, and puts those inside of the floor slab. The other one, where we're running the sidewalk, we just did the outside edges, because typically sidewalks are not really bending in the middle, they're pouring portions. This, I'm using a planter bed, so I want it to arch all the way through, and follow what the topography was doing. So we did that, and now we have a floor that's following along.

We can use a slab edge to make an edge barrier, or anything that we would want, and then we can also go ahead-- and I'm gonna get this one running. I'm gonna select our area, and I'm gonna hit run, and I'm gonna go to PowerPoint. So what we're doing is this, we're making a planter bed, because planter beds have plants that follow an edge that's non-linear, and usually rows of them. And then plants placed inside evenly space. You can do different areas.

So what we're doing is using that springs, collector node to get the curves of our outside edge of the topography. I used curve offset to offset the first line inside, and then we can place plants along the lines, which we've shown already. We can offset that line again, and place plants again, same way. And offset the line a third time, and use that as the region that we want to place all the plants in.

Then we can use the filled region by curves node to actually annotate the way we would document. So we have the 3D showing of the plants inside of there, but we probably don't

want to document that way. So we're using a filled region in the same area, based on that information.

So let's see what we got. So here we've got our evenly spaced plants, we've got the outside rows of plants. One thing-- I botched it.

Let's see. Let's see here. No. There we go. Hang on. Sorry, I'm gonna just blow this one.

What we can do is set parameter information. So this one we've got work sets, and I set up a work set called graphics. So I can place these families on that particular work set. So I can say turn 18. And we are gonna just run out of time here.

I'm gonna stop on that, but that's kind of the power of what we can do with this. To me, it's fantastic. It extends what you can do, and it does go hand-in-hand. Are there any questions from anybody, anything I didn't cover for you? Yeah?

AUDIENCE: Just kind of an [INAUDIBLE] we're kind of green on Revit at the company we work for. So in terms of-- depending on the size of the site and the relationships, [INAUDIBLE] the right way to use fence in different context, does it really matter?

WILLIAM Yeah.

CARNEY:

AUDIENCE: Not knowing anything really about this, can you give your recommendation of how [INAUDIBLE] with Revit and with Dynamo, and still see that reference in relation to what we're designing, because here this is a very competitive space right now, but if there is a right-of-way or a road that we-- you know?

WILLIAM Yeah. So the question was, how do we work in context for the areas surrounding? Do we have to get out of here right away?

AUDIENCE: No, no. We have some time.

WILLIAM Cool. Yeah, so the question was, how do we get and work with the context of everything that's surrounding our sites. There's a lot-- the one thing that's bad about Revit is it's got kind of a two mile radius that you can work within. So that's a limitation. So there are other programs you would probably want to work with.

I've even, since I've been here, looked at like Flux.io, where they're exporting your Revit information directly to Google Earth. And then you can look at that stuff while you're working. Other programs, like InfoWorks, can also help with that. Yes sir?

AUDIENCE: There is an add-on on the exchange, called CAD to Earth, that can actually pull that kind of information directly into Revit. And it can also basically take a snapshot of that site as you see it in Google Earth, and turn it into a material. In case you wanted to use it, but it'll pull the terrain and all that stuff.

WILLIAM Yes sir.

CARNEY:

AUDIENCE: Just a quick comment on that, as well. I attended a class yesterday that meshed Revit, Civil 3D, and Dynamo. And it was done by AutoDesk and another individual. And they had a number of scripts that allowed you to pull. If you're working in an interdisciplinary firm that has Civil 3D data for some of those limitations and criteria, that you could generate it. Like for instance, a Civil 3D corridor, export out the IFC solids from Civil 3D, and use Dynamo to bring those into Revit. So they had a number of custom scripts that allow that, and I hadn't seen that before it at all. So seems like another great workflow.

WILLIAM I agree. Yeah, and I kind of hinted at that. That Autodesk is more pushing for interoperability
CARNEY: between the different software platforms. I mean, there's a business, and that's software that's making money for them. But also, you're trying to change a whole industry, so you're not going to push everybody into Revit, when this program works really well for them, and probably a little bit better. So yeah, they're definitely focusing on the interoperability. So I agree completely with that statement. Anything else? Yes sir?

AUDIENCE: As of 17.1, at least, you can import directly a LandXML file from Civil 3D.

WILLIAM Correct. All right. Any-- no more? OK. Well, thank you. Appreciate it. Thank you for being here.

CARNEY: