

MARCELLO Hello, everyone. Welcome to the first class of Autodesk University 2016. Welcome, everyone.

SGAMBELLURI: Come on now. Welcome, everyone.

[APPLAUSE]

All right. Is everyone ready to learn some structure? Oh, come on now. Is everyone ready to learn some structure?

AUDIENCE: Yeah.

MARCELLO Yeah, all right. This is a topic that's very near and dear to my heart. My name is Marcello

SGAMBELLURI: Sgambelluri. I'm the BIM director at John Martin and Associates. We're a structural firm in downtown Los Angeles.

Today we're going to be talking about high-tech structural engineering-- using new technologies to enhance your workflows. And what does that mean? I'll get into that in a little bit. But I have to tell you, I've been presenting regularly at Autodesk University since 2012. And this is actually the first structure class I have ever taught here. So this is something that's very near and dear to my heart. I'm very passionate about it, and I'm very excited to share with you, today, all of this stuff. And this has been about five years in the making to finally put everything together and show you today.

This class is really going to talk about what technologies are out there and how we can use them for structure and to structure discipline. So I want to get to know everybody in here. And my presentations are very informal. So if you have a question, raise your hand, and I'll call on you. I have no problem with you interrupting me, or you have a question or a comment. It's all welcome.

So I want to get to know everyone before we start. And here's my Twitter handle as well, in case anyone wants to tweet. I also run a blog site-- I post regularly-- as well as I do a podcast called *Simply Complex*. So I encourage everyone to check that out.

So I want to know who I'm talking to in the audience. How many people here either are structural engineers, structural designers, structural drafters, or have to manage some kind of structural modeling within their office? Yeah? Oh, look at that. OK, that's about 85%. All right,

and who else am I talking to? Are there just some architects in the office? Although-- yeah, good, OK.

Although if you're an architect, I imagine, at some point, you need to be modeling structure, right? OK, good. Anyone else in here? Or do we have any MEP or-- MEP? OK. No? OK, how about any contractors? One in the back-- OK, very good. All right, any owners or anything else? OK, some owners-- OK, excellent.

So that's great. I'm really glad to hear that. Because actually, everything I'm going to show you is relevant today. So let's just go ahead and get started.

So really, what we're going to do today is talk about the technology that's out there, and really, how it applies to structural discipline. Because a lot of the technologies you see out there, like virtual reality, real-time rendering, to some extent, Dynamo, even within Revit, some of the newer features like the adaptive components have more open towards architecture and how they use it. But I want to take all those technologies and twist them so that you can use them for structure. So that's the focus today.

And even if you've heard of the technology, we're going to twist it even more so that we can use it to our very specific advantages. So I need everyone to open their minds today, because we're going to go on a wild ride, all right? We've got about 60 minutes-- I've got 56 now-- and then, we're going to get through this.

Has anyone heard me talk before? Anyone? Oh, goodness, OK. So you know how lively I am. I'm going to get excited. I'll probably start sweating up here. I'll run around. But we're going to get into this, because I-- [BREATHING OUT]-- I absolutely love this stuff, all right?

We'll talk about some game engine technology. We're just going to have a blast, all right? We're going to just go through these topics one by one.

This is technically an industry talk, because we are talking about industry trends for the structural subdiscipline. Just keep that in mind. I do have a lot of PowerPoints, but there will be some demo sprinkled in.

All right, so these are just the learning objectives as well. We'll go through this as we go through the presentation. So let's just get started, everyone.

What is the age of your technology in your office? That's something you should be asking

yourself. And how effectively are you using it? Right now, I imagine-- how many people are using Revit on a day to day basis as a production tool? I imagine, just about everybody. All right.

How old is Revit now, using it in production? Maybe 16 years? So when we start in talking about Revit and we start talking about how to model certain things, structural beams, walls, those kind of things, let's start looking at the newer technologies within Revit, not some of those older tools, like some of the old beam tools, some of the old wall modeling tools. Let's talk about some of the newer stuff. Let's talk about the new concept called Dynamo, all right?

And then also, what's a big part of this is also-- whoops, backed up-- is also-- let's see here-- is who knows you're using that technology. That's so important, even within your office-- so sharing with your clients. I'm going to talk about that a bit more, and how important it is to not only focus on what you're doing and making yourself more productive, but making everyone productive on the entire team. And I'll talk about how to share these technologies too, OK, because it's really, really exciting.

So let's just go ahead and get started with real-time rendering. Ah, real-time rendering-- oh, I love real-time rendering. Wait, am I on the right-- I love real-time rendering. Oh my goodness, I love real-time ren-- has anyone used real-time rendering yet in their office? A little bit? OK, I'm going to show you, as a structural person or structural discipline, how you can use real-time rendering. There's a few ways you can use it. And it's not just for visualization and pretty pictures.

One big thing you can use it for is quality control, OK? But let me talk a little bit about real-time rendering and how important it is in our industry. It's all based on game engine technology, which is something I'm really passionate about, which means you get real-time response, right?

So if you look at this PowerPoint slide, there's a lot of things you can do. And when you put structure into a game engine or into virt-- into real-time time rendering. We'll talk about virtual reality in a minute. In real-time rendering tools, things become alive and they breathe. And it's just easier to touch the structure, and feel it, and be part of it. And I'll talk about that, like being the building, being the structure. Because you want to take pride in what you do. And when you take pride in what you do, then, things become better, and it's better quality, and everyone wins.

So you can look at this slide. And there's things you can do in real-time rendering. Like, you can actually change time of day like this. Or you can do shadows. We can do shadow studies. Or you could even actually step in to the game engine like this. Do you see how easy and immersive this is?

Can you do this in Revit? Can you make yourself immersive like this in Revit, where you have real responses like this? It's very difficult. And why is it difficult? Because in Revit, it's based on old technology. This is new technology.

So the first thing you can use real-time rendering for is not for pretty pictures-- though we'll get into that-- it's for quality control. So what we do in our office is we take all the models that we happen to build, and we stick them inside this new technology. I won't promote any particular one, although this one I'm using right now is called Enscape. But there's other out there. Autodesk has a product called Live. Another one is Fuzor. And there's quite a few others. Revizto's another one-- just where you get this real-time response between Revit and the actual game engine, OK?

So what I do, when I actually build a model, I'll stick it in the game engine. And I'll just start cruising around. And then I'll start using quality control on a macro level. So I can already see there's a problem up in the corner. But let me just show you a little demo here, really quick, on how you can actually accomplish this, OK? So let me go ahead and close this. And then we'll get into it. So let's see here. Are we moving?

Did we crash? I think we crashed. I think so. OK, maybe there. Oh, boy. All right, we'll fix this. Hold on a minute.

All right, are there any questions about this before we continue on? I've got to restart this computer. Oh, thank you. we'll keep that slide up. All right, so let me explain, while I restart my computer, the way this process works is, basically, you build your Revit model. And then you take your add-in, like Enscape or Fuzor. And then you just click Start. And then it'll actually just bring it right into the game engine like you see here, OK? And then you can start moving around.

Things that game engines have are, of course, real-time rendering shadows. But it also has real-time physics. So you're actually allowed to walk around and move around. While this is starting up, let me also do this. I think I had too many things open. All right, we'll fill this time with something else while we start up.

OK, has anyone got the handout online or downloaded it? Anyone-- and studied it and read it cover to cover? It's not a test. I happened to print hard copies. There's an extended version out there on the data set. It's a little big, so AU is trying to put it together. But I happened to bring copies as well. So I'm going to pass these around so everyone can look at them.

Hold on a minute. See here? There's 1,000 pages each. So you can download these and look at them. So I'll pass one to this side and one to this side. Just make sure I get them back, OK? And I'll be talking about these a little bit later, all right? Can you help me pass this around until we get started? OK, thank you. All right.

OK, good, looks like we're up and running again. OK, could we go ahead and switch the screen? Just had to restart there, because we crashed. Can we just get that back open?

Also, what I did was I surrounded my-- if you notice, my background on my desktop is actually the template for the PowerPoint presentation. So technically, anything you see with a live demo is surrounded by the template. So I consider it part of the presentation. All right, so here we go. Ready? Let's go ahead and fire this up.

And I might-- let's see, do we want to do this? OK, here we go. All right, we're up and running. Let's just go. All right, so what I do is I like to give out-- I like to give out little goodies when I show my demos. So this is a sample file that you're going to get. And it's going to demonstrate how you can do some of this real-time rendering tools.

And I like to give little goodies too. So there's actually a little family in here everyone can have. See? There it is. Oh, we'll visit that a little bit later too, OK? Very cool, huh.

All right, so anyway, you've got a structure like this. And the way this works is really simple. All you have to do is just build your model and then click Start. That's how most of these work, OK? Autodesk Live sends it up into the cloud. But really, they all were pretty much the same way, OK? And I want to show you some of the stuff you can do with the quality control. Here we go. It doesn't take too long. Oh, there we go. OK.

So you can see it's really immersive. You can fly through, that kind of thing. You can also do walk-throughs as well. You can turn on gravity. Let's see, let's go ahead and turn on gravity and so on, OK? So [INAUDIBLE]. You see? Turn on gravity, and you can walk around.

And see, this is what I do every time I finish a model is I'll just walk around and start looking

around. Because it's much easier to do this inside of the game engine than it is within Revit, OK? And I can actually already see a problem right there. You see, this kicker's actually a little bit lower.

So what I do then is I switch back over to Revit. And there's ways to do camera matches one to one, but I won't do it at the moment. Let's go ahead and hide this upper slab. There we go. And then, Enscape will be then making that update. There we go. See how it removed the slab? See, so you can see there, we still have that problem.

So you can go back to Revit. And then you can make the appropriate change. Let's see, where's it at? It's right here. I'll go in, a little bit later, how to technically do a lot of these changes. But for now, we'll do you like that. And then you can see, inside of Enscape it's going to automatically make that update.

Do you see how easy that is? It's just immersive, and it just brings you right in. It's so awesome, OK? So that's one thing we use it for is quality control. So think about that when you build a model. Some of these viewers are even free, OK? So just think about how you can use and immerse yourself in the model for some of this quality control in what I want to call on a macro level.

All right, now, there's another really, really awesome thing that we use this for, and it's actually a communication tool. And what I mean by that is, a lot of times, we'll have to talk with our clients or the architect about the way something looks. And what we typically do if there's a if there's a certain condition like a joint, things like that-- let me get around here-- where you want to actually look at a particular joint or zoom in on a particular section, what you can do inside of Revit is you can isolate those particular locations, OK? And then you can bring it out.

And then, in Enscape, you can isolate it. And then you're able to-- with all these kind of softwares, you're able to do these exports. And because this is based on game engine technology-- let me show you how it works-- then you can actually send pieces of the model out. And this is what really helps a lot. Because a lot of times-- let me show you here-- a lot of times-- a lot of times, you want to talk about a particular thing, right?

And 3D PDFs, things like that don't immerse you as well. So what we do is we create these little snippets of the model. And you can actually send this. It becomes an EXE file. You can actually email it. You may have to zip it. You can email it off or put it on an FTP site. It's pretty

small.

And then you can send this to the client or whoever you're talking about. And then you can have a discussion about that particular joint. And the really cool thing is that they don't need the software on that end, because it's a game. They're actually playing a game. They're playing games at work. How cool is that, right? So you're like, you want to play a video game, during the next time you talk to your client. And they'll be like, yeah. OK, send them this. And you're like, yeah, and we could talk about the column and so on.

Another thing that this software does is it-- basically, what you see is what you get. So if you have a linked in architectural model, or architectural, you know, furring, or maybe a wrapper around a column, that would also show up as well. And then you can also talk about some of the changes, things like that.

So this becomes of really good communication tool. But also, what are you doing is you're also kind of showing off your technology is what you're doing. And that's a big point. Because we've gotten a lot of clients started on this kind of stuff only because we showed them.

We said, look at this awesome technology. And they say, wow, where did you get that? And then you start the conversation. You're like, you want me to show you? You want me to come to your office? I can show you how to do this. We'll get on the phone. It's really great. And then everyone wins, all right? So when you do this stuff, also share it. Is there a question?

AUDIENCE: I have two.

MARCELLO Yes.

SGAMBELLURI:

AUDIENCE: [INAUDIBLE]?

MARCELLO The question was, could you place text? I'm just going to leave it there. I don't want to talk

SGAMBELLURI: about a particular software. But could you put text? There are options to put text, yes-- not in this particular example. If I was going to do it in this particular example, I'd put 3D text in Revit and then have it show up. And we do those kinds of things all the time, actually.

AUDIENCE: The other question I had was [INAUDIBLE].

MARCELLO Yes. Oh, OK, another question is how we're navigating through this. This is just my mouse and

SGAMBELLURI: keyboard. These things, nowadays, also support mouse-- game pads. They also support virtual headset technology. And we'll get into that in a little. Bit but it's really easy to learn, right? You don't have to have a training course on this.

And usually, they have these little tutorials on the bottom. So you can get started-- a client can get started-- even if they've never played a video game before, could get started-- in, like, 20 seconds, OK? Because you just simply navigate like the way you would, like with either the arrow keys or the WSAD, I believe it is. And then, rotate is just with the mouse, OK? Really simple to use, all right? Are there any other questions about this before I move on the next one? Yes.

AUDIENCE: How about dimensioning?

MARCELLO How about dimensioning-- that's a good question. I'm not going to get too much into this, but

SGAMBELLURI: all of that is available. It just depends on what particular product you're using. OK, yeah. All right, let's keep moving. We're only getting warmed up.

I've got to open up my PowerPoint again, because we crashed. Let me just close so we're not getting to risky here. OK. All righty. Ah, here we go.

OK, so of course, the next thing you can do with this is real-time rendering. So when you have something in the game engine and you want to render it in real time-- like, did you see that joint? Can anyone tell me how you would render that in real time if you're in the real-time rendering engine, and you see what you want to see, and you have the shadows exactly the way you want to have it? Can anyone tell me how you would then render that? Anyone? Come on now. No one has any ideas?

AUDIENCE: Print Screen.

MARCELLO Print Screen, that's exactly right. Print Screen, right? Because you're rendering in real time. So

SGAMBELLURI: just Print Screen it. That's how I did it. In fact, this is an article-- we'll get into this building a little bit later. This was an admin building at Cal Poly Pomona in Southern California with co-architects. And this was an article I helped write with some colleagues in *Civil Engineering* magazine.

And can anyone guess, once I built the model, and I pushed start, and I got this into the game engine, how long it took me to render this? Any guesses?

AUDIENCE: 30 Seconds?

MARCELLO I heard 30 seconds. Anyone else?

SGAMBELLURI:

AUDIENCE: Two minutes?

MARCELLO Two minutes-- 13 seconds. It took me 13 seconds to make this image, all right? So you have

SGAMBELLURI: all these options now with this real-time rendering. It's really awesome. And I encourage everyone to get into it, all right? Simply amazing-- oh, I love it. Oh my goodness.

All right, let's talk about something else that's really also near and dear to my heart, which is sequencing an animation. Does anyone have to do sequencing an animation in their office where they have to tell a story with animation? Anyone? OK, if you're not doing it now, I seriously encourage you to do it, OK?

We're never asked, in our office, to do sequencing of construction. So what we do is, when we make a particular project or we have a concept, we will typically then animate it to show how we think it should go together. And this is typically used either in pursuit projects, or interviews, or even when a project starts out. It's just really a good way to help communicate what we're trying to do and how to realize our vision.

And so this is one particular example. And I want to spend a little bit of time on this, because it's really exciting. And I want to get everyone involved in this if you're not right now, OK? Because it's awesome, and it's so easy.

So let me show you the video that that actually created from this, OK? And then we'll get into a little bit more. So here we go. So let me show you the animation really quick.

All right, so here's the animation, all right? It's just basically a building to show how the connections together. This was a large timber building, all right-- really simple, 30 seconds long. It's about 800 frames. Does anyone want to guess how long this took to create? Now, that's rendering 800 frames.

From the time the model was built in Revit-- once the model's built in Revit, from that point-- it's time zero-- till you're actually watching an animation like this-- can anyone tell me how long it-- anyone-- how long this would take? Two days-- ooh, that's good question. OK, any other-- I mean, sorry, that's a good guess. Anyone else?

AUDIENCE: 4 And 1/2 hours.

MARCELLO 4 and 1/2 hours-- 30 minutes-- 28 minutes. It took 28 minutes to make this, all right? If you
SGAMBELLURI: could turn your structure into an animation like this, wouldn't you want to do it if it only took 28 minutes? OK, I'm going to show you how this works, all right? It's really cool.

There are some new tools that are out there now that help you do this. And if you're not doing it in your office, bring it up. Did you know my office wasn't doing this before? And you know what I did? I said, hey, can we create an animation for that presentation we're going to make? We don't need it. Yeah, but it's really good and-- never mind, right? So you know what I did, of course.

I built it in my own time, an animation. And I said, look at this. Look what I have. Why don't we use this? And then what was the response? Absolutely, let's use that, right? So that's how-- it's usually better to ask for forgiveness, right, than permission. So that's kind of how the way you have to view this. Because if you're looking for out in this new technology, your company, your clients, your peers aren't going to immediately adapt it, right?

You're going to be the one that's going to have to push the limits. You're the one that's going to have to piss a few people off to get people started on it, right? But once they realized how beautiful it is, they just love it, all right? And they just dig it. And so we're doing this all the time now, because I started that initiative. And I encourage everyone else to do that. All right, so this is how easy it is. Ready? Watch this.

OK, so let's do this. Oh, it's so easy. Watch this. OK, so now, with 3ds Max, because 3ds Max now, typically, is bundled with your software, you'll typically get it if you have Revit. Also, 3ds Max, in the new version, as well as 16, also will bring in native Revit files, right? OK? So all you have to do is just open up Max and then open up Revit.

And then there are some tools out there that you can use to help do the keyframes in the animation. Even if you're not that familiar with it, you could hit YouTube and learn it. There's a tool out there called key transfer. That's a good one. That's in a handout. I won't go over it too much, but it just basically sets up your keyframes, OK?

So you set up your keyframes with this key transfer or other ones. You bring in the Revit model, you set up the keyframes. That's really fast. The last thing to do is rendering. And this is really the secret here.

When I was starting to do this, I was rendering out each frame like this. And I was already doing real-time rendering. I was like, ah, you know? That's kind of slow, isn't it? Isn't that kind of slow? Oh, I've got to wait 800 frames. I can't wait 800 frames.

I said, you know what-- oops, oops-- I said, you know what-- I said, you know what looks pretty good is actually the visual preview inside of Rev-- inside of 3ds Max. They have this little Preview button, right, that shows all the keyframes. I'm like, that looks pretty good. That looks really good. Because these are, a lot of times, conceptual. So can anyone guess how I speeded up my render time from about 3 and 1/2 hours to two minutes? Screencast, Camtasia-- oh my goodness.

Once I added the new version of 3ds Max, once I used the key transfer, and then, once I used the-- once I recorded my screen on this preview, oh, the time just went down. And I have literally have saved over 100 hours this year just because of these simple things, all right? So you can create an animation like this [SNAP] in a snap, all right? It's really easy. It's all spelled out in the handout.

So is that pretty cool stuff? OK, so when I say that, you've got to be like-- is that cool stuff?

AUDIENCE: Yes.

MARCELLO SGAMBELLURI: All right. OK, it gets even better. And by the way, you know what, I have to tell everyone something here, OK? So we're going to move on to act three. I have to tell everyone something here. If you have a vision, don't let people hold you back, OK? And what I mean by that is, there's times when we want to create an animation for a presentation, and the client, or the people we're talking to say, nope, you can't do a presentation. You cannot do an animation.

It's gotten-- we've been told this-- it's got completely out of control with all the animation. We don't want to see it anymore. No animation. What do you mean by "no animation?" Well, we don't want any digital files. Don't bring a screen. Don't present it. You have to give us a hard copy, all right?

So once we created this, I was like, a hard copy-- I'm not going to let that stop me. I have 800 frames-- well, it was about 500 when you kind of squish it down. I have 500 frames we need to show. So if we're only allowed a hard copy, why don't we make a flip book. Got it?

So the handout you have as well as this, actually, you can make a flip book if you're given the restriction of a hard copy. And I got a call yesterday from another animation we just did. And the CD we were talking to said hard copy only. And we said no problem, right? This is how easy it is. You want to turn this into a flip book? Watch this. Oh, so easy.

You're like, you're learning how to do flip books? That's low technology. Of course it is. But you're using high technology to put it in low technology, because you don't want to have people keep you down. You want to show off this stuff, right? So this is how you have to think when you start trying to reach out and people are pulling back. You've got to keep moving forward, all right? So this is how simple and ridiculously easy it is, OK?

All you do is just like this-- you get a flip book. Anyone see that handout, 1,000-page handout? Up in the upper right corner is that animation if you do a flip. I'll also demonstrate it up here. I got a copy up here.

OK, so all you do is build your hard copy, and then, of course, build your animation. And then you set it into these free softwares that are out there. This one happens to be called "Free Video to JPEG." Basically, all it does is it takes a video, and it breaks it up into a number of frames. That would be how many pages you have, right? In this one, on the front, we are 511 pages. So that's how many frames we did, right?

And then all you have to do, instead of having to place it one by one on your sheet in your Word document, there are scripts you can use. And this particular macro, everyone can have it. It's in the handout, where it'll actually auto-place them up in-- you know, you set the dimensions, and it'll place it. And then you get something cool like this. Can you cue my iPhone? I want to show you this. It's so awesome. Oh my goodness.

And you know what happens with the animations? They get more impressed when you're creative with these kind of things. Let me see here. Where'd we go. They get more creative-- you get more props when you're creative. So here I have an actual-- here's the other handout, and it's actually the flip book. So let me show you how this works.

So do you want to see the animation in a flip book? Said, you're not holding us down. Watch this. It's so cool. Oh my goodness. We get it? OK, here we go. Ready? Oh, so excited. I've never done this before. OK, here we go. Ready? It's upside down. But you got it? Do you see it, everyone?

Hold on, let me do it again. There it is. Everyone see it? Ah, wait. It's a little hard because I'm upside down. Everyone see it? Oh, Yeah. Uh, oh, that is so pretty. Oh my goodness, look at that. Oh yeah. You're not holding us down, no way. Look at that. Oh my goodness. There it is, oh, in all its beauty, oh. How cool is that? Come on, everyone.

All right. OK, can you flip the phone back, please? All right, so it's really ways you can think about outside the box and how you can use this technology. Because I guarantee you, you will get some resistance. All right. Ah. All right.

Any questions about that? Flip book? I'll even pass this one out. Here you go. This one's a little easier to flip. Here you go. And if you happen to get the extended one, which is in the data set, which is-- AU was trying to get it uploaded, because it's a little big-- you can do that, all right?

Ah, all right, let's talk about another technology that's really amazing that we're starting to implement in our office. And it's QR codes. And this kind of goes back to what I was talking about about how sometimes you're limited to what you can expose. But this technology's only good enough if you have-- if you expose it to someone else, right?

So QR codes are something really amazing. Because when you have hard copy drawings that need to go out to the field, you could put QR codes on them. And they can point-- basically, they're alphanumeric. But they can point to a web site so you can have access to certain things. It's really amazing. So I encourage everyone to look into QR codes. It's in the handout-- how to create them, where to link them, that kind of thing.

But what we started to do is, on our drawings, on our hard copy drawings that will go out to the field-- or even if they get printed out on the field-- we have a little QR codes on them. So there's a few things you can do. You can actually just scan the QR code. And can I have the phone back again, please? OK, good.

And then, you have a bunch of QR readers, right? And then you can just basically-- let's see if we can do this. And then you can actually scan the QR code. It's going to work-- there we go-- right? And then it gives you access to all the digital drawings, all right? Like, here's just one example. You can see him. There you go. Just give us a second to download. You see him? Right?

So these are the kind of things you can give access to people, right, if they have the hard

copies, right? Oh, but it gets way better than this. This is just boring 2D PDF stuff, right? I mean, that's probably how they got it originally. But there's other things you can do with this that's really cool.

Is don't stop there, right? You've built all your 3D models, right? What you can do in your drawings is you can also put QR codes for 3D model. See? There's our 3D model. It's kind of on its side. You see it there, right? There's our 3D model. There's another QR code. Let's see if we can get that one. Here we go. Here, look. Oh, watch this. Oh my goodness.

So you're like, here's the 3D view. Boom-- QR code. You want the 3D model? Oh. Come on now. Oh, there it is. Isn't that beautiful? Oh my goodness. Isn't this awesome? Come on now. Isn't that awesome? Come on now. Come on now. Wouldn't it be awesome to have your drawings in a little Revit [INAUDIBLE]? Like, boom, you can QR code. You can have access to this stuff. It's so easy.

This one happens to point to-- it's all in the handout of where it's basically pointing to. But these are just examples. Another one is that you can have responses to RFIs. And you know how you have details? You could say, here's the response the RFI. Here's a detail. And for reference, boom, here's another-- can you see that? Here's a detail, right? You can be like, OK, and for reference, look, here's your QR code. Boom. Let me get it. Boom, right? And you're like, here, for reference, now you've got the detail in 3D.

See? How cool is that? Come on now. Isn't that awesome stuff? Right? Come on now. This is cool stuff. You can just take these QR codes and point them to certain areas, and they can have access to this. Because that's the point, right? Isn't it? OK, so enough on QR codes. Any questions about QR codes? All right.

Can we switch back over, please? All right, excellent. All right, there's another thing I want to talk about really quick, which is virtual reality. How many people are using virtual reality in their office? Oh, look at that. Awesome. Awesome. OK, very good. Very good. I don't want to go over it too much, because everyone's kind of heard of it. Although I do want to talk about the topic of accessibility.

Because virtual reality, a lot of times you have the Oculus Rift, and you're kind of tethered into the computer. Is that how most people do it? Come on now. Is that how most people do it? All those hands with the VR, how many people are using the Oculus Rift or something else where you're kind of tethered into the computer? Come on now. OK, very good.

There's other technologies out there where you can kind of get easy access to. Those are great. But if you need to have a mobile solution, there's things like this, with QR codes. And you can create your model. Then, there's many ways to port this over. One software I like to use is called qrVR .

Can you cue up my phone one more time? I'm using my phone a lot because-- OK, so here's the model, right? So you can-- oops. So you can have access to this through the QR code, right, and so on. But what's really cool nowadays is not only have access to the QR code, but you can turn this into virtual reality, right, where you can actually then take your model and then put it on your mobile device. And you can get one of these things. These are anywhere from \$12 to \$50 at the most, right?

And then you just take your mobile device. And you just slap it in here, right? And then you've got an instant virtual reality like this, right? It's really easy. I got my whole office hooked on this stuff, right?

Like in this case, I think if you stand still for more than a second, it'll move to that spot. So let's see if we can see how this works. See? So you can move around and look around. It's really cool. Oh, did we-- oh my goodness, are we-- are we inside the AT-ST? Holy smokes, that's pretty cool. Or anyway, you get the idea, right? And you just slip it in one of these things, and then, boom, you're ready to go. It's so easy.

OK, can you flip back please? You just slip in. Bang, you're ready to go. And these things are so easy to deploy, because most people have smartphones, right? Some people are a little hesitant to get the thing and put it on. And they feel kind of silly. But all you have to do is just get one of these, go to a client meeting, slap in your phone or their phone, right? And then just-- boom, just show them, right?

And that's how we started. That's how I show my principle, all right? I was just like, look at this. I put it in there. I was like, look at this. And then he was like, whoa, that's amazing. Wow. That is-- wow. And that's the kind of response you want with this new technology, right? You have to sometimes force it on people, right-- I mean, politely, right? So I just-- you know, boom, right? I just went around the office and just-- boom, you know? All right? And then I got everyone hooked, all right? So it's so simple, right?

So that's some ways to deploy it. Everyone want to play with this later, you can do that. All

right, so that's enough of that. Any questions about that? Yes.

AUDIENCE: [INAUDIBLE]?

MARCELLO
SGAMBELLURI: In this particular case, this one-- in this particular case, it's a software called qrVR. You go online, and you can get it. They have a paid service coming up here, I think, the end of November. But basically, it's an add-on to Revit. And you basically port it over to their software.

You get their app on the phone. And then you fire it up. And then, you can do just a regular 3D model, or you can turn it. And then, you can get virtual reality, and then pop it in your headset, and away you go. It's cool stuff. That's just one. That's just this particular example, but there's many other options to do this. Yes.

AUDIENCE: [INAUDIBLE] ?

MARCELLO
SGAMBELLURI: The question was, does it take a long time to get the information from Revit into this particular mobile software. The answer is no. I mean, just in this case, 45 seconds, 50 seconds maybe. Because these aren't-- in this particular mobile case, it's not-- you know, the shading is a little bit more dumbed down, only so that it could be accessible on your mobile device, OK? All right. So are there any other questions about that? How are we doing on time? Ooh, we're doing going on time.

Let's talk about another thing really quick on technology is Google Earth. This is amazing technology. Has anyone used Google Earth in their office? Anyone? Oh, yeah? OK, good. Good. I encourage everyone to at least take a peek on it.

We weren't using it in our office. But what we did was we started showing some of the clients that we work with some of our structures in this particular software. It's really easy to use. Of course, Google Earth is free. And there's a big database. Let me see if I can get an example here. Did I-- whoops. Whoops. Did I lose internet access? I think we can still do it. Whoops. Did we do it?

Let me do it again. Come on now. All right, we'll do that. Let the warning win. So anyway, it's-- oh, boy. Oh, I see what's happening. I've got to connect up again. Yeah, there we go. I think that's it. OK. Come on now. Let's try that again. Come on now. There we go.

Please start again. All right, we'll start again. Here we go, one more time. Come on now. All

right, I think it'll work now.

OK, so basically, it's just, when you have a project, it's easy to get that information into Google Earth. And what's really nice about Google Earth, it has this huge database. This happens to be Dodger Stadium.

But you can take data from a lot of sources, and you can get it into these really rich environments. And what's really nice is you have the ability to show some of the visualization. And so when we were starting to do this, we would actually build-- you have two examples of just boxes there, but that could be a structure-- where you have-- we have a structure, and we start to build it. And then we place it into Google Earth. There's, like, three ways you can do it. I'll go over it in a second.

But then, we just handed this to the client. And we're like, is this what you want? And they're just blown away. Because they're like, well, how did you do that? And you're like, it's simple. It's just Google Earth and just some mesh. And it's really easy to do. And so there's tools out there that have this to make you realize this. And the technology is really easy. I mean, it's so ridiculously simple to use.

I'll open up this next one and describe how you do it. Basically, you can get it in through SketchUp if you happen to build a Revit model. You can then send it to SketchUp and then send it in as a KMZ file. There's other technologies out there. Even Navisworks has the ability to make these kind of files, right? I mean, you could put anything you want in here, right? You can have this right in the middle of Dodger Stadium. So cool, isn't it? Oh my goodness, right? So you can do things like this.

Also, there's a new software out there that I'm going to talk about next called Flux that has the ability to transfer information. They have an add-on called Terra, which allows you to actually take your models and then place them-- geolocate them in Google Earth, OK? So just kind of think about Google Earth as a way of another communication tool. Because we found it to be really effective, OK? Any questions about that? No? OK. The handout actually goes through detail, basically, on how to create that.

All right, so let me talk about the last thing before we get into some of the newer tools inside of Revit, which is this very beautiful thing. Has anyone heard of this word "flux" yet? Anyone? OK, this is, like, super-new, cutting-edge, awesome stuff, all right? Flux basically is a cloud storage device for building information data. It's really what it is, OK?

And it sits in the cloud. And basically, it can encrypt your data. So one of the tools we've been using this for is actually to transfer data into Tecla structures. Has anyone had to deal with Tecla at all in the past? A few? OK, how many people-- just Tecla aside, how many people-- have had to actually either import or export IFCs in and out of Revit? Anyone have to do that? OK, how many people absolutely love that transfer? And it's seamless, right? And it's beautiful. Oh, you love it?

All right, well that was the original way how you would have to get information back and forth between Revit and Tekla, and even other softwares, right? But there's new technology out there that's a beautiful thing. I say it transfers awesomeness. That's what I say. Because basically, you can get Flux to be able to move data back and forth between different software.

So in this particular case, when we wanted to build a Tekla model, we actually took our Revit, and we pass it into Dynamo. And then Flux read the Dynamo information, although it could have read Revit. And then basically, it stores it in the cloud. And then it can push it into Grasshopper or Rhino, and then into Tekla. And when I say push, I literally mean push. I literally mean push.

I don't mean-- there are no IFC exports in this case, OK? In fact, it's a beautiful thing. Because when you make a change here, can anyone guess what happens here?

AUDIENCE: [INAUDIBLE]

MARCELLO What?

SGAMBELLURI:

AUDIENCE: [INAUDIBLE].

MARCELLO It makes a change here. It's like a dynamic link. Why? Because all the information is the same.

SGAMBELLURI: And once you start realizing that, your mind opens up to something really amazing, which is the fact that we're not necessarily dealing with Revit data. We're not dealing with Tekla data. We're just dealing with data, with information.

And really, what shell that wraps it, whether it's wrapped with a Revit shell, or wrapped with a Tekla shell, or wrapped with anything else, it's almost irrelevant. It's your data. It's your ones and zeros that are important, OK? And Flux kind of opens that door to kind of see into that beautiful world. And I'm still mind-blown by this.

I had this huge awakening about last week when I kind of realized this. And I was like, oh my goodness, basically, exporting is so 2015, all right? So if you're exporting, rethink what you're doing. Rethink about how that process works. Because there's new tools out there to help you transfer that data seamlessly. And it's amazing, OK?

So keep an eye on this, Flux. It's brand new. They're adding more and more products each year. All right, so are there any questions about that? No? OK, awesome. Yes.

AUDIENCE: [INAUDIBLE] ?

MARCELLO The question was-- I'm sorry?

SGAMBELLURI:

AUDIENCE: [INAUDIBLE]?

MARCELLO The question was, does it handle native objects. The question-- does it handle native objects?

SGAMBELLURI: The answer is yes and no. There are some native elements that Flux will handle that can be exported-- I mean-- you've got me saying it-- that can be taken from Revit directly. But the ones that can't, you can then transfer those native elements in other forms, like through Dynamo.

But more and more native elements are being added all the time, OK? And we'll talk a little bit more about that later, OK, offline. But that's a good question. All right. OK, so everyone ready for act three? Let's start talking about some Revit and some Revit workflows.

Let's talk about this. Oh my goodness, this is awesome-- the analytical model in Revit. How many people turn off the analytical model in Revit? Don't do that. Where's my thing? Don't do that, please. I'm going to show you how you can keep the analytical model on and use it for beautiful things.

Why am I talking about the analytical model? Because the analytical model is based on newer technology than, for example, the physical structural beams. 16-year-old-- these came around in about 2012, 2013, OK? Three, four years old, OK? Old, new, old, new-- got it? So what can we do with the analytical model to help us in Revit?

One thing is you can use quality control. It's a beautiful thing. Oh, it's so amazing. Oh my goodness, this is the first time I actually get to show this here. I'm really excited about it. I've

been kind of getting this in the works for many years now, and I'm glad I can finally show it to everyone today.

But basically, it goes like this. The analytical model is always built behind the physical model in Revit if you're modeling a Revit structure beam, column, wall, and floor-- I mean, unless you deactivate it, OK? Right now I'm not going to talk about going to structural analysis. I'm not talking about that, OK? I'm only talking about, use the analytical model for quality control. Everyone clear on that? Not talking about analysis. Got it? OK.

So watch how beautiful this stuff is, OK? It's amazing. All right, so let me show you a quick example really quick. Let me get that closed, because I'm getting a little nervous that all these things are open. And I can close that. OK, so let me get something open really quick, and then I can show you, all right?

But one thing that-- OK, while that opens-- one thing that Revit does when you model structure, particularly beams-- and columns, I suppose-- is that it's trying to show how it would show in plan. So beams get offset. So if a beam is framing into a girder, the beam gets physically offset from the girder, right? OK? And that's how you visually see it.

So If you were to just scan your eye across, say, some roof framing, for example-- let's see here-- like this-- let's see, where am I here? So if you were to just do some quality control in a model that either you built, or you got from a team member, or if you're an architect and you got it from a structural engineer, then basically, you're looking at framing like this, right? And you would say, you know what, that looks pretty good. Doesn't it? Doesn't that framing look pretty good? Come on now. Doesn't it look pretty good? It looks pretty good, right? It's not good.

You know why? Because we're looking at it on a macro level. That's why. Because Revit intentionally made us think that-- it's a little dark up there. But do you see how you have these separations? Boy, it's much more red on my screen. But anyway, we'll get to it, All right?

So if you want to see if these two beams come into each other, what do you have to do right now? You can click on this one. You can click on this one, and you can kind of see where it ends. And then you click on this one really quick and see if you can find that one, right? You're like, click on that one, then click on that one really quick, right? You're like, oh, I don't know. Oh, there's something more beautiful out there to help you. Can anyone guess what that is?

AUDIENCE: Analytical model.

MARCELLO
SGAMBELLURI: Analytical model-- oh, oh, I love the analytical model. Turn that thing on. You get something from a peer, you model something, you're an architect, you get it from a structural engineer, turn it on. It is so revealing. You have no idea. I'm going to enlighten your minds. Watch this. Oh my goodness, do you see this? Do you see what's happening here? Can you see those-- is that hard to see? OK. But you can see them right?

You see those two dots? You would think that these two framing into a girder would come into a single work point, right, atop a steel. Then, that would mean that the analytical model would then collapse into one point. If you see two points there, then you know that they're not connected.

So you could take a little peek down here or up there. And you could see the little two. Can you see the little two there? You've got two nodes, right? So if you want to quality control something, just cruise around the model. Start looking for points that are doing this. You see the two points there? Right? That's pretty easy.

But what about this column? Does that look pretty good? Can you see that? It's really hard to see. I'm sorry?

AUDIENCE: [INAUDIBLE]

MARCELLO
SGAMBELLURI: I can put it in-- OK, I could do that, I suppose. Thank you. I could put it in hidden or wire. You see that little-- oh, there we go. Thank you. Does that look pretty good? That looks pretty good, right? Everyone want to see this? Boom-- ah, not so good. Look, you've got three there, right? You're like, what's going on? With further examination, you see, oh, that is not good. Oh, right?

Could you have seen that from back there? No. So you see how you turning on the analytical model can help you look and quality control this stuff? You're like, hmm, I don't know about that. I might want to fix that. I'll show you how to fix that in a moment. But you're like, why do you care, as a structural engineer? Why do you care as an architect?

Because this affects everybody, doesn't it? I mean, as an architect, you see this from a structural engineer. Wouldn't you want to tell him? I would. So it's kind of like this thing we always talk about, when you see something, say something, right? So that's how it works. Because I do that. I do that all the time for architecture.

I've gotten things like this. Hmm. Hmm. I'm not sure where to start with this. But I'm like-- when I get an architectural model like this and I turn on my structure, I look at this and I say, hmm, should I say something? So when you see those nodes not lining up, should you say something? Yeah, absolutely, right? But everybody, please say it nicely, OK? That's the key, right?

And sometimes you have to lay it on really thick, right? Like in this case, I was like-- you can't just say, it's all wrong, right? Email the entire company, principle, everyone, right? Maybe not, right? You may have to take it down a notch, right? You may have to just lay it on really thick.

Like, you know, architect, I was doing internal renderings of your project. And I was placing them up in my cubicle. And I just happened to look at this one. And I thought, gee, you know what, you may want to look at that again. But I'm no architect, right? So you know, you got a really-- and they're like, oh yeah, I'll look at that, sure, right? So it's that kind of attitude you have to have between team members, right?

So when you see something like this, say something, right? But don't get super cute, which I have made the mistake of. I actually had an architect come up to me and tell me, I have the hardest time modeling roof crickets in Revit. I just struggle with it so hard. I have such a hard time with roof crickets. I said, how hard is it to model a cricket on a roof? So I modeled this for him.

[LAUGHTER]

I thought they were going to be happy, and it didn't go so well. They're like, not a-- you know. Anyway, I won't go into detail. But there's the cricket, and there's a cricket, you know? Pick which one. But the point is, if you can do that in Revit, you can do that in Revit, right? All right, so anyway, when you see something, say something. OK, everyone? Got it? All right, cool.

So let's just quickly talk about how you can adjust this stuff, right? So basically, if you want to do an adjustment, it's really simple, OK? We've got a few minutes left. All right, so here we go. So what you can do, it's really easy. Watch this.

If you want to make an adjustment, all you have to do is the 3D align tool, OK? So if you see something like that-- OK? You got it? And then we turn on analytical, basically, like this, OK-- like this. You can see that there's-- if you come down here, you can see there's-- already a

problem right here, right? OK? So there's ways to fix that.

First thing you have to ask is either which one's right, right? And then you move that to the right location. Maybe none of them are right. That's another reason to bring this up, right? But it's really easy. All you have to do-- and it's really cool. Watch this-- is you come over here. And you can click on the analytical model, OK? You can select on it.

And you see this analytical adjust? There's an analytical adjust world out there, and it's beautiful. And it's based on the massing environment. And why is it based on massing environment? Because it's new technology, remember-- old, new, old, new. And what allows you to do that? You can actually take the ends of these, and you can say, pick new host, and you can rehost this right here, and you can say Finish, OK?

And then you can do a 3D align, although this beam doesn't have a place to 3D align to, right? You can click here, but you can't click a center line. So what I do is I actually take my beam family, and I'll actually put a line in it like this. Watch how easy this is, right? And then I make it visible. So I just align it, the model line, right here. Click, click, align to the middle, click, right? And what am I doing?

All I'm doing is I'm just building a line so that I can model it to it. And you can do it invisible, or you can make it hide, or whatever. And you just load that right back in, OK? See how easy that was? And if anyone wants that, just email me. I'll make you one, OK? All right.

And then basically, all you do is just go boom-- oh, watch this-- and then, boom. Oh, isn't that beautiful? Come on now. Isn't it beautiful. Oh, I love it. All right.

So basically, you can do that. But if you don't want to do that-- like, let's say this was a bit further, you know? So for example-- OK? So what I do is-- I've done that. But then, here's the line, right? Sometimes I don't want to move the beam. So you know what I've done in the past? I've actually taken my 3D snap like this, and I've just placed it right on the analytical line.

And then I was like, wait a minute, what did I just do? Whoa. I still have my other being there, but I have now set up a work point and a work line for me to place it. OK, there's another one. Do you see that? And so I was thinking, how could I use this again to actually make me lay out more beans and do that same concept?

And I kept saying, well, the analytical line is just like the massing environment and just like the adaptive component environment. It's just like a massing and adaptive component. Why don't I

just use a massing or an adaptive component to do that? And once you realize that you're able to actually take a beam and pick it and use a 3D pick, a whole new world opens up to you. It's really amazing. Oh, it's so amazing.

So what you can do here, really quick, is-- let me show you how you can use some of the adaptive components to make you do some amazing modeling, OK? It's really cool. And we're talking about adaptive components because adaptive components are newer technology, OK? Let me start here.

So let's say we have some roof framing, OK? Flat, horizontal framing on floors, typically, you won't need do this. But for roof framing, when it starts to get really twisted, it really helps, OK? So just think about this kind of workflow.

If you have an adaptive component, you can actually make one. It's really simple. All you do is start-- let's see-- start a new one. This generic model adaptive, OK? And then, all you have to do is just place two points down. Let's find two points. And then, just go one, two, like that, OK? And then, you just take these, and you just make it adaptive. And then you're all done. You load it back in, right? It's that simple, OK?

What did I do? Oh my goodness, was that simple? Yeah, it's that simple, right? Isn't an analytical model line just a line with two nodes at the end? Then, an adaptive is a line with two nodes at the end. And if anyone needs help, email me. I'll build you one, OK?

All right, so here it is. It's just telling you, OK, where do you want to start and stop. I happen to already have one here, OK? So you basically can just place this anywhere, right? And the beautiful thing here is that you're able to actually host the nodes-- I'm not sure why they're not turning on. Is it because this on? Yeah.

And then, you see these nodes? You're actually able to host them anywhere along the beam, right? And then once you get it set, then you can take your beam and your 3D snap, and then you can go like that. Whoa, that is so amazing, right?

Another thing that really bothered me past was with these bean tools is when you do a 3D snap, when you do a structure beam like this, right-- where's my beam? Hold on a minute-- like this, sometimes you only get these at the midpoint, right? And sometimes you need the quarter point, right? And then, you can even look in the snaps. And you don't even see-- there's not even any quarter point here, right? Quarter points need love. Third points need

love, right?

Well, sometimes you need to set things at quarter points. Well, when you use an adaptive component with this point, you can host it anywhere, anywhere along this beam, whether it's curved. And you could come here, and you can then reset it based on this. So you see this says 0.86? That means it's 0.86 along here. So if you wanted this at the third quarter point, or the 2/3 point, for example, you would say 0.66. And then it would move it to that point, right, and then, the other one as well. Do you see how that works?

So what I do-- what we do in our office is we'll lay out all of our structural framing based on these adaptives. And that's really the easy thing-- especially kickers too. And another thing, too, is the amazing thing about an adaptive is you can actually not only host it to a line, but you can host it to a surface. Do you see this?

Like, does anyone have these situations where you have kickers that have to go half way down the beam? What do you do, cut a section? You don't have to cut a section anymore. If you use these new tools, you can model all your roof framing in 3D. It's beautiful, right? And these are still based on UV coordinates, OK?

And then, once you get it all set, then you could come back to your pick tool-- because this is the easy part-- and then just bang, bang, bang, and bang. Come on, how cool is that? Is that cool stuff? Yeah? All right, come on now. All right. Yeah, but you know what, it gets even better. You can use repeaters. You can use other things. So it's just ways of making you be able to have real snappy modeling with using this new technology, OK?

The handout also goes to how to utilize Dynamo to help you place the beams if you don't want to basically snap, snap, snap, OK? There's one thing I want to show you. Is there any other questions before we conclude here? Yes.

AUDIENCE: [INAUDIBLE]

MARCELLO Why not just use the beam tool? OK, that's a good question. Why not use the beam tool?

SGAMBELLURI: Because if we have sloping framing and things like that, and we want things on quarter points, the beam will not snap to quarter points if we have curved framing, things like that, if we want it at eighth points, things like that. So the beam tool can get you halfway there. But if you wanted this along the third point of the arc length, there's no way to do that with the current beam tool.

And why, everyone? Why can't we do that with the beam tool? Because why?

AUDIENCE: It's old technology.

MARCELLO It's old technology. All right. OK, everyone, I'm going to conclude there. Thank you, everyone,
SGAMBELLURI: for showing up.

[APPLAUSE]

I'll stick around if you have any other questions. And feel free to come up, and look at some of this stuff, and flip through the handout. All right, everyone, thank you.

[MUSIC PLAYING]